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''UP ON THE MOUNTAIN'': ETHNOBOTANICAL IMPORTANCE OF MONTANE SITES IN PACIFIC COASTAL NORTH AMERICA

Nancy J. Turner, Douglas Deur and Carla Rae Mellott

The Pacific Coastal Mountains of western North America have immense ethnobotanical significance. Since time immemorial, Indigenous Peoples have journeyed from permanent settlements in lowland regions to upland sites in order to harvest and process a range of plant resources –foods, materials and medicines– as well as to hunt and fish, and undertake spiritual activities. Two culturally significant montane areas, widely separated geographically, are described as case examples: **pt-én'i** *(Botanie Valley) in Nlaka'pmx territory of southern interior British Columbia, famous for its abundance of edible root resources; and* **iwamkani**, *an iconic huckleberry picking location for the Klamath in southern Oregon. Patterns of montane use are notably consistent throughout the region. Indigenous People intentionally modified montane landscapes through fire and other means to enhance resource productivity and predictability. In turn, mountain environments and resources have significantly influenced Indigenous Peoples' lifeways and knowledge systems. The integrity of montane biocultural systems has been threatened by industrial development, fire suppression and, most recently, the changing global climate. Yet, montane areas remain as key elements of biocultural heritage and must be protected for continued social-ecological health and well-being of Indigenous Peoples.*

Key words: *Indigenous Peoples, ethnobotany, subalpine, montane, traditional land management, Pacific Coast Mountains*

La chaîne de montagnes de la côte du Pacifique, située dans l'ouest de l'Amérique du Nord, revêt une grande importance pour l'ethnobotanique. Depuis la nuit des temps, les peuples autochtones de cette région quittent leurs villages permanents confinés dans les vallées et recherchent les montagnes pour cueillir et transformer diverses plantes employées comme nourriture, matériau ou remède, ainsi que pour chasser, pêcher et pratiquer certaines activités spirituelles. Deux régions en montagne, éloignées l'une de l'autre, et importantes du point de vue culturel, sont données comme exemples: **pt-én'i** *(vallée Botanie) dans le territoire Nlaka'pmx, situé au sud des terres de la Colombie-Britannique, est connu pour son abondance en racines comestibles, et* **iwamkani** *qui est un endroit renommé pour la cueillette des airelles par les Klamaths dans le sud de l'Oregon. La façon d'utiliser ces hautes terres est remarquablement identique dans toute la région. Les peuples autochtones ont volontairement modifié les paysages montagneux, par exemple en allumant des feux, pour augmenter la productivité ainsi que la prévisibilité des ressources. A l'inverse, les paysages et les ressources de la montagne ont grandement influencé les moeurs et les systèmes de savoirs des peuples autochtones. L'intégrité des systèmes bioculturels des hautes terres est menacée par le développement industriel, l'interdiction des feux et, plus récemment, par les changements climatiques. Cependant, les régions montagneuses demeurent des éléments clés de l'héritage bioculturel et doivent être protégées afin de maintenir la santé socioécologique et le bien-être des peuples autochtones.*

Introduction

Anyone flying on a clear day along the Pacific Coastal region of North America will behold a seemingly limitless vista of high snow-capped

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mountains. These are part of the Western or Pacific Cordillera, a vast area of mountain ranges, basins and plateaus in western North America extending from Alaska to northern Mexico. Ranges within the Pacific Cordillera include the Saint Elias Mountains of Alaska, the Coast and Cascade Ranges of British Columbia and Washington (including the Insular Ranges of Vancouver Island and Haida Gwaii), the Olympic Mountains of Washington, and the Sierra Nevada to the south (Tivy 2005), all of which are situated within the territories of Northwest Coast and Interior Plateau Indigenous Peoples (Suttles 1990; Walker 1998).

The goal of this paper is to highlight the ethnobotanical importance of mountainous regions of the western Cordillera, which we call here the Pacific Coast Mountains (Figure 1), and to bring recognition to the past, present and future roles of high elevation harvesting areas, particularly in the light of the growing threat of global climate change. Most of the examples we draw on – including our case studies– focus on areas of the southern coastal mountains of British Columbia and the southern Cascades of Washington and Oregon, because these are areas for which we have the greatest personal knowledge.

For millennia, high-elevation habitats surrounding the tall snow-capped peaks of the Pacific Coast Mountains have been significant sites of human activity. The areas in proximity to the upper tree line, known as the subalpine parkland zone or subalpine parkland ecotone (also called the *alpine treeline ecotone*, hereafter, called simply subalpine parkland) (Körner and Paulsen 2004; Pojar and MacKinnon 1994:20), are transitional environments between the more continuous subalpine forest below and the treeless alpine tundra ecosystems of the mountaintops (Arno 1984; Coupé et al. 1991). In some cases, especially in the lower latitudes of the study region, such as Washington and Oregon, where the mountains tend to be smaller and the tree line extends higher, the subalpine parkland expands over the very summit of mountains, with little or no alpine tundra. As ''ecological edges,'' subalpine parkland areas offer a significant array of diversity, and also serve as ''cultural edges'' –as a focus of social and economic activities and meeting places where knowledge and goods are produced and exchanged (Turner et al. 2003).

Existing archaeological records indicate that human use and seasonal occupation of the Pacific Coast Mountain subalpine parkland regions have been longstanding, in some cases extending back over thousands of years (Dickson et al. 2004; Hallett et al. 2003; Hayden 1992, 1997; Lepofsky 2004; Mack and McClure 2002; Matson and Alexander 1990; Matson and Magne 2007; Mudie et al. 2005; Olympic News 1999; Peacock 1998; Pokotylo and Froese 1983). Yet, with a few exceptions (including those studies previously cited), these environments and their plant resources have received little detailed attention in ethnographic literature, and their importance to Indigenous Peoples often remains unrecognized.

In this paper, we review historical and contemporary human-plant interactions in the subalpine parkland. We then explore the details of these interactions at two specific places within the study region: ***pt-én'i*** (Botanie Valley) in the eastern Coast Mountains of British Columbia within Nlaka'pmx Interior Salish territory; and ***iwamkani***, near the Cascade crest in southern Oregon within the territory of the Klamath people. (The English name and exact

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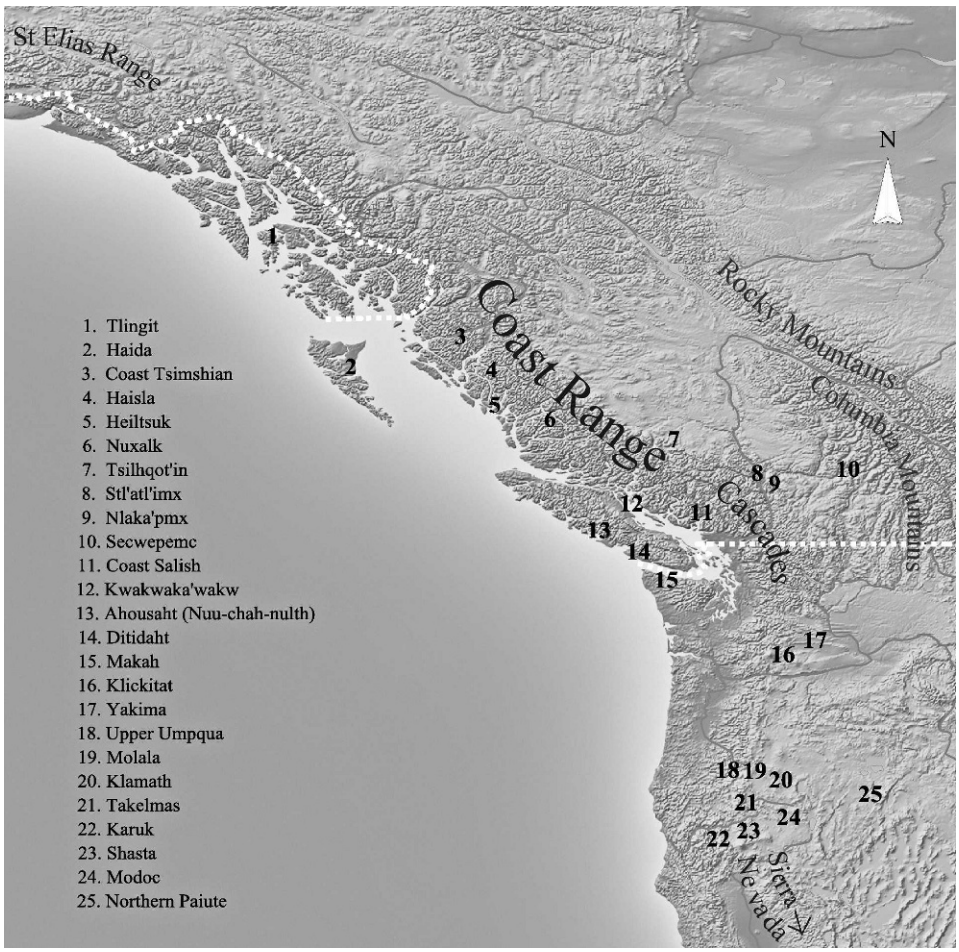


Figure 1. Map of Pacific Coastal Ranges showing location of the Indigenous groups mentioned in the text (for territories of all of the Indigenous groups of the study area, please see Suttles 1990 and Walker 1998).

location of ***iwamkani*** is omitted to prevent encroachment by others). While these are both multi-use areas providing many different resources, ***pt-én'i*** is well known for its diversity and productivity of edible roots, and ***iwamkani*** for the richness of its huckleberry (*Vaccinium membranaceum* Dougl. ex Torr.) harvests. Based on peoples' experiences of ***pt-én'i*** and ***iwamkani***, as well as from other accounts, we then identify some key historical changes in the availability and use of montane areas, focusing on some contemporary issues affecting Indigenous Peoples' access to and use of traditional subalpine parkland harvest sites and resources. Because much of our discussion pertains to past activities, we often use past tense in our descriptions unless we are referring specifically to a contemporary situation. This in no way dismisses the current, ongoing importance and future use of montane regions by Indigenous Peoples. Furthermore, although we focus here on the importance of plant resources, we

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acknowledge that animal and mineral resources (as well as water, snow and ice) are highly significant in fully understanding the cultural value of these montane areas, and that the spiritual domain and agency of mountains as sacred places is also highly relevant (Cruikshank 2005).

Perhaps the easiest way to visualize the vegetation of the subalpine parkland is to imagine walking upwards from the lower slopes of a Pacific Coastal Range mountain. The forests of the lower and middle elevations – typically dominated (at least in the central and northern regions) by coniferous forests of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), lodgepole pine (*Pinus contorta* Dougl. ex Loud.), western red cedar (*Thuja plicata* Donn.), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), amabilis fir (*Abies amabilis* (Dougl.) Forbes) or other species– give way to subalpine forests that may be dominated by one or two high elevation tree species, such as subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.), yellow-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach), Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), whitebark pine (*Pinus albicaulis* Engelm.), or mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.). Yellow-cedar tends to be restricted to coastal mountains, and Engelmann spruce and whitebark pine to the Interior Plateau mountains (Klinkenberg 2010).

Still further up, the continuous forest cover ceases, sometimes abruptly, sometimes more gradually, and trees give way to open meadow areas densely covered by perennial grasses and sedges and flowering plants with brightly-colored blooms: lupines (*Lupinus* spp.), asters and fleabanes (*Aster* spp.; *Erigeron* spp.; *Eurybia* spp.), paintbrushes (*Castilleja* spp.), arnicas (*Arnica* spp.), penstemons (*Penstemon* spp.), ragworts (*Senecio* spp.), valerians (*Valeriana* spp.) and others. Along the veins of drainages and seepages and in deep soil pockets, however, many of the subalpine forest trees extend upwards in long, continuous clumps that eventually thin out into isolated patches of stunted, slow-growing trees called *krummholz*. Shrubby ericaceous species such as dwarf mountain bilberry (*Vaccinium caespitosum* Michx.), Cascade bilberry (*V. deliciosum* Piper), black mountain huckleberry (*V. membranaceum* Douglas ex Torr.), kinnikinnick (*Arctostaphylos uva-ursi* (L.) Spreng.), red mountain heather (*Phyllodoce empetriformis* (Sm.) D. Don), and other low-growing shrubs like creeping juniper (*Juniperus communis* L.) and crowberry (*Empetrum nigrum* L.), often form dense patches around the tree thickets or are interspersed with the meadow and wetland vegetation (Pojar and MacKinnon 1994).

True alpine vegetation begins at around 1500 or 1600 m in the southern part of the Pacific Coast Mountains and at about 1000 to 1500 m in the north. On the western slopes, where climate is moderated by the proximity of the Pacific Ocean, the subalpine parkland typically extends higher than on adjacent eastern slopes which are subjected to a more extreme continental climate (Campbell 1997; Douglas and Bliss 1977; Fonda and Bliss 1969; Pojar and Stewart 1991).

Methods

To summarize and assess Indigenous Peoples' use and occupancy of high elevation environments in western North America, we reviewed historical

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records, as well as published and unpublished literature in archaeobotany, ethnobotany and ethnography. Each of us has undertaken extensive ethnobotanical and ethnoecological research in montane areas in collaboration with Indigenous Peoples (cf. Deur 2002a, 2005; Mellott 2010; Turner 1992, 1999; Turner et al. 1990), and some of our collective data are drawn from these experiences, including interviews with Indigenous Elders and other Indigenous knowledge holders and participatory observation, provided with informed consent under the research ethics provisions of our respective institutions and participating tribal cultural offices. The case studies of ***pt-én'i*** and ***iwamkani*** are based largely on collaborative research by Turner and Deur respectively. Mellott's participatory work with Tsilhqot'in elders and other cultural specialists around their long-time use of ***tsinuzch'ed*** in the Chilcotin region of southern Interior British Columbia also provides key insights. We have specifically examined patterns in use of montane localities by Indigenous Peoples, distinctive activities relating to plant use, and the importance of Traditional Ecological Knowledge in identifying the ongoing but changing roles of montane areas in peoples' lifeways and the implications for biocultural diversity.

Historical and Contemporary Human Use of the Subalpine Parkland of the Pacific Coast Mountains

Table 1 lists and characterizes major montane plant resources utilized by Indigenous Peoples within the study region based on the various literature sources described previously, as well as our own research. Edible roots and berries have been the key plant resources sought from mountain habitats, along with diverse materials and medicines. Game (mountain goat (*Oreamnos americanus*) and mountain sheep (*Ovis* spp.), bears (*Ursus americanus, Ursus arctos horribilis*), deer (*Odocoileus* spp.), marmots (*Marmota* spp.), grouse (various species) and ptarmigan (*Lagopus* spp.)), trout and other fish, and minerals such as obsidian and chert for arrowheads and tools are other resources people commonly sought from upland regions. Spiritual training and spirit questing at such places were also important activities (York et al. 1993).

Peoples' travels to montane areas, as with their other resource gathering traditions, followed an orderly seasonal round that depended on both the availability and the quality of particular resources at different locations throughout the harvest season. Harvesters watched for phenological or climatic cues –the blooming of certain flowers or the melting or changing of shape of particular snowbanks visible from lower elevations– to determine when they should ascend to their mountain harvesting grounds (cf. Lantz and Turner 2003; Turner et al. 1990). Tsilhqot'in people report sending out riders to scope out mountain potato, or western springbeauty (*Claytonia lanceolata* Pall. ex Pursh) sites to see if they were ready, sometimes watching the montane slopes for snowmelt patterns to know when it was ready for harvesting (Figure 2; Mellott 2010). Other examples of local indicators are provided in the case studies.

Some of the culturally important plant species of montane areas, such as subalpine fir, do not usually grow at lower elevations except at the far north of their range. Many subalpine parkland species, however, have distributions

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extending over a range of altitudes. Yet, all other things being equal, people have often expressed a preference for the upper elevation plants, reflecting a common belief that montane plant populations have different and more desirable properties than their lowland equivalents (Deur 2002b, 2005, 2006). Certain medicinal plants, such as devil's-club (*Oplopanax horridus* (Sm.) Miq.) and false hellebore (*Veratrum viride* Ait. –a highly toxic plant), are particularly sought from the mountains because the high-elevation strains are said to be more potent –a point supported by the observation that active chemical compounds, such as phenolics and coumarins, in certain plants may be concentrated by the shorter growing season, dryer soils and more intense ultraviolet light found at upper elevations (Larson 1988). Several elders have commented on the aromatic qualities of subalpine vegetation as well, which are associated with the plants' healing properties (Turner 2009).

Another reason for seeking out montane populations of plant species that also occur at lower elevations is that they develop later in the season at higher altitudes, and this helps to extend the duration of people's annual harvesting for given resources. In many locations, people routinely harvested certain berries, greens, root vegetables and inner bark of conifers from the valleys and lower slopes earlier in the year and then moved up into the mountains to harvest from the same or related species later on (Burtchard 1990; Hunn 1990; Mary Thomas, Turner unpublished field notes, July 1994; Turner 1992; Turner et al. 1990). This pattern of progressive harvesting still holds today.

Other advantages of subalpine resources include a more concentrated flavor in the berries and other plant foods from upper elevations (as noted by a number of elders), better preservation capabilities for drying and storing foods, with cool nights potentially limiting bacterial decay and enhancing food preservation as compared with lower elevations, and the sheer aesthetic beauty of the high country: the clear mountain air, the wildflower meadows, and the vistas provided from mountain slopes, added to the cooler temperatures in comparison to the summertime heat of the valley bottoms.

High elevation sites can also serve as vantage points for hunters searching for game, as sources of rock for tool manufacture, and as spiritual retreats for shamans and others training for powers (York et al. 1993). They have also provided viewpoints and viewsheds for monitoring the landscape and territory, including viewing the effects of fire (both intentional and natural), predicting weather and seasonal changes, and for defensive purposes and observing the approach and return of harvesting parties and family members.

Due to the extreme weather conditions, Indigenous People seldom ventured into the subalpine and alpine regions of their territories in winter and early spring. However, as soon as the growing season began, when the snows started to melt, and until the winter snows set in, the upper elevation sites became important destinations for individuals and groups of people, remaining so to this day. In the past, in years of scarcity when foods of the lower elevations failed, people particularly depended on montane plants for survival (Alexander 1992; Kari 1987; Turner et al. 1990, 1992). Nlaka'pmx elder Annie York, for example, was told by her own elders about spring famines when there were no deer and the salmon did not come up the river. At these times, women and entire families

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Table 1. Key plant resources accessed by Indigenous Peoples from subalpine parkland and adjacent montane areas of the Pacific Coastal Ranges.

Scientific and Common names	General use/notes
Lichens	
Bryoria fremontii (Tuck.) Brodo & Hawksw. (Bryoriaceae); ***wila*** or black tree lichen	Usually gathered in late summer and fall; cleaned, leached in water, pit-cooked (with camas or other food), eaten or dried and stored for winter; usually mixed with other food; used as poultice
Letharia vulpina (L.) Hue (Lethariaceae); wolf lichen	Gathered and boiled in water as a yellow dye for mountain goat wool, horsehair and other materials
Ferns and Fern-Allies	
Dryopteris expansa (K.B. Presl) Fraser-Jenkins & Jermy (Dryopteridaceae); spiny wood-fern	Rootstocks pit-cooked or baked, and eaten
Equisetum arvense L. and other spp. (Equisetaceae); common horsetail and other species	Stems used as abrasive for scouring and sanding; used medicinally by some
Gymnosperms	
Abies amabilis (Dougl.) Forbes (Pinaceae); amabilis fir or silver fir	Boughs for bedding; sheets of bark used for containers, roofing; bark and pitch used for medicine
Abies concolor (Gord. & Glend.) Lindl. ex Hildebr. (Pinaceae); white fir	Bark for tanning hides, medicine; wood for fuel
Abies lasiocarpa (Hook.) Nutt. (Pinaceae); subalpine fir	Inner bark and cambium eaten; wood used for fuel; boughs for bedding, shelters; sheets of bark used for containers; bark and pitch used for medicine; trees used for shelter
Chamaecyparis nootkatensis (D. Don) Spach (Cupressaceae); yellow-cedar	Wood used as fuel and for carving; inner bark used for blankets, clothing, hats
Juniperus communis L. (Cupressaceae); common juniper	Berries eaten in small quantities; boughs used for beverage and medicine
Juniperus scopulorum Sarg. (Cupressaceae); Rocky Mountain juniper	Wood used for toolmaking and bows; boughs for medicine, incense, smudging
Larix lyallii Parl. (Pinacae); alpine larch	Wood used for fuel; boughs and bark used for medicine (southern part of area only)
Picea engelmannii Parry ex Engelm. (Pinaceae); Engelmann spruce	Wood used for fuel; roots used for cordage and baskets; sheets of bark used for containers; pitch and bark used for medicine; trees used for shelter
Pinus albicaulis Engelm. (Pinaceae); whitebark pine	Inner bark and cambium eaten; cones usually gathered in late summer and fall, roasted to extract seeds, which are large and edible; wood used for fuel; bark and boughs sometimes used in roasting pits; pitch, nuts and bark used for medicine
Pinus contorta Dougl. ex Loud. (Pinaceae); lodgepole pine	Inner bark and cambium eaten; seeds sometimes eaten; wood used for fuel; sheets of bark used for containers; bark and boughs sometimes used in roasting pits; pitch and bark used for medicine
Taxus brevifolia Nutt. (Taxaceae); Pacific yew	Wood used for toolmaking and bows; wood and bark used for medicine
Tsuga mertensiana (Bong.) Carr. (Pinaceae); mountain hemlock	Boughs used for bedding, ritual scrubbing, medicine
Angiosperms	
Acer circinatum Pursh (Aceraceae); vine maple	Wood for snowshoes, drum hoops, implements (southern part of study area only)
Achillea millefolium L. (Asteraceae); yarrow	Leaves, roots and entire plant used medicinally for many purposes

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Table 1. Continued.

Scientific and Common names	General use/notes
Actaea rubra (Aiton) Willd. (Ranunculaceae); red baneberry	Used as medicine (toxic)
Allium cernuum Roth and other *Allium* spp. (Liliaceae); nodding onion and other onions	Edible bulbs dug in May through mid-August, depending on elevation and place; usually pit-cooked and dried for winter use
Alnus viridis (Chaix) DC. ssp. *crispa* (Aiton) Turrill and other *Alnus* spp. (Betulaceae); mountain alder and other alders	Wood for tools, firewood; bark for dye and medicine
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roem. (Rosaceae); Saskatoon serviceberry	Berries picked in July and August; eaten fresh or dried; branches used for arrows, digging sticks, basket rims, drying racks
Anemone multifida Poir (Ranunculaceae); Pacific anemone	Fresh leaves used as medicine; irritant to skin; poisonous to animals
Arctostaphylos nevadensis A. Gray (Ericaceae); pinemat manzanita	Berries as food and drink (southern part of the study area only)
Arctostaphylos patula Greene (Ericaceae); Green-leaf manzanita	Berries as food and drink (southern part of the study area only)
Arctostaphylos uva-ursi (L.) Spreng. (Ericaceae); kinnikinnick	Berries harvested in late summer and fall and eaten, fried in grease; leaves toasted and used as tobacco; plants used for medicine; known to be food for grouse, bears and other animals,
Artemisia frigida Willd. (Asteraceae); northern wormwood	Plant used as smudge and for medicine for flu, colds and other respiratory ailments
Balsamorhiza sagittata (Pursh) Nutt. (Asteraceae); arrowleaf balsamroot	Greens, shoots eaten in May; roots dug in August, September, pit-cooked and dried for winter use; seeds ground into meal and used to thicken soup
Betula nana L. (Betulaceae); scrub birch or bog birch	Leaves and twigs used for tea (northern part of study area)
Brodiea spp. (Liliaceae); brodiaeas	Bulbs used as food and medicine (southern part of study area)
Calamagrostis rubescens Buckley (Poaceae); timbergrass or pinegrass	Grass used for drying berries, to surround food in pit-cooking and as bedding
Camassia quamash (Pursh) Greene and *C. leichtlinii* (Baker) Wats. (Liliaceae); edible camas	Edible bulbs dug in May through mid-August, depending on elevation and place (in southern region mountains only); usually pit-cooked and dried for winter use
Ceanothus velutinus Dougl. ex Hook. (Rhamnaceae); redstem ceanothus or snowbrush	Leaves and stems used in infusion or decoction as medicine
Cercocarpus ledifolius Nutt. (Rosaceae); mountain mahogany	Wood used for tools (southern part of study area only)
Chamerion angustifolium (L.) Holub (Onagraceae); fireweed	Young shoots split open and insides eaten; used in pit-cooking by Tsilhqut'in
Chimaphila umbellata (L.) W. Bartram (Ericaceae); pipsissewa	Medicine: powerful tonic and tea for colds, influenza, or respiratory infection and immune enhancer
Cicuta douglasii DC.) J.M. Coult. & Rose (Apiaceae); water-hemlock	Root used as arrow poison (southern part of study area; extremely toxic)
Cirsium edule Nutt. (Asteraceae); edible thistle	Taproots pit-cooked and eaten
Claytonia perfoliata Donn. ex Willd. (Portulaceae); miner's lettuce	Fresh leaves eaten (in southern part of study area)
Claytonia lanceolata Pall. ex Pursh (Portulacaceae); mountain potato or western springbeauty	Corms harvested from May through mid-August, depending on elevation and location; gathered in fall from vole caches; pitcooked, or steamed and dried or stored fresh in caches for winter; used on large quantities
Cornus canadensis L. (Cornaceae); bunchberry	Berries eaten on a casual basis

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Table 1. Continued.

Scientific and Common names	General use/notes
Corylus cornuta Marsh. var. *californica* (A. DC.) Sharp (Betulaceae); hazelnut	Nuts eaten; shoots used for cordage
Dryas drummondii Richards. ex Hook. (Rosaceae); mountain dryas	Whole plants used as medicine (Secwepemc)
Empetrum nigrum L. (Empetraceae); crowberry	Berries eaten (northern part of study area)
Erythronium grandiflorum Pursh (Liliaceae); yellow glacier lily or avalanche lily	Edible bulbs usually dug in July through mid-August, after leaves start to die back; pit-cooked and dried for winter use (mostly used in northern part of region)
Fragaria virginiana Duchesne and *F. vesca* L. (Rosaceae); blueleaf strawberry and wood strawberry	Berries harvested in July and August; eaten fresh and sometimes dried; runners used for string; plants used by Tsilhqut'in for pit-cooking, around food
Fritillaria affinis (Schult.) Sealy (Liliaceae); chocolate lily or riceroot	Bulbs cooked and eaten
Heracleum maximum Bartram (Apiaceae); cow-parsnip	Shoots harvested in May through July from mountain areas, before flowering; hollow stems as pea shooters; roots used medicinally (phototoxic; must be peeled and handled with care)
Hydrophyllum capitatum Douglas ex Benth. (Hydrophyllaceae) ballhead waterleaf	Roots cooked and eaten (Nlaka'pmx)
Iris spp. (Iridaceae); iris	Leaves used for twine; plant for medicine (southern part of study area)
Ligusticum canbyi Coult. & Rose (Apiaceae); Canby's lovage, ''Indian marijuana''	Roots used medicinally and for spiritual purposes; sometimes smoked or used as incense; also known as bear medicine
Lilium columbianum Leichtlin (Liliaceae); tiger lily or Columbia lily	Edible bulbs usually dug in mid-August after flowering; pit-cooked and dried for winter use; bitter-tasting; used as more of a condiment
Lomatium macrocarpum (Nutt. ex Torr. & A. Gray) J.M. Coult. & Rose (Apiaceae); desert parsley	Roots of non-flowering plants dug, cooked and eaten in spring
Lomatium nudicaule (Pursh) J.M. Coult. & Rose (Apiaceae); ''wild celery'' or barestem lomatium	Young leaves eaten as greens, potherb; seeds used medicinally and as flavoring for tea, soup and tobacco
Lomatium spp. (Apiaceae); biscuitroot	Roots eaten (southern part of study area)
Lonicera involucrata (Richardson) Banks ex Spreng. (Caprifoliaceae); black twinberry	Leafy twigs and bark used as medicine, as a wash and drunk as infusion or decoction
Lupinus arcticus S. Wats. (Fabaceae); Arctic lupine	Known as marmot food, horse medicine; medicine for humans
Mahonia aquifolium (Pursh) Nutt. (Berberidaceae); tall Oregon-grape	Sour berries eaten fresh or dried; bark and roots used for medicine and yellow dye
Mentha arvensis L. (Lamiaceae); field mint	Leaves and whole plants used for tea and as infusion or decoction for medicine
Monardella odoratissima Benth. (Lamiaceae); monardella	Plants used as medicine (southern part of study area)
Nuphar lutea (L.) Sm. ssp. *polysepala* (Engelm.) E.O. Beal (Nymphaeaceae); yellow pond-lily, wokas	Rhizomes used for medicine; seeds roasted and eaten (southern part of study area)
Oplopanax horridus (Sm.) Miq. (Araliaceae); devilsclub	Inner bark of stems and roots used for medicine of many types; plant used for spiritual purposes
Oxyria digyna (L.) Hill (Polygonaceae); mountain sorrel	Leaves eaten fresh or cooked

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Table 1. Continued.

Scientific and Common names	General use/notes
Penstemon fruticosus (Pursh) Greene (Scrophulariacae); shrubby penstemon	Used in pit-cooking, as vegetation around roots being cooked (Secwepemc)
Perideridia gairdneri (Hook. & Arn.) Mathias (Apiaceae); wild caraway or yampah	Roots eaten like carrots (southern part of study area)
Platanthera dilatata (Pursh) Lindl. ex Beck (Orchidaceae); bog orchid	Scented flowers and plants used as charm and for spiritual purposes
Populus balsamifera L. ssp. *trichocarpa* (Torr. & A. Gray ex Hook.) Brayshaw (Salicaceae); cottonwood	Wood used for fuel; buds used to make medicinal salve for skin infections and wounds; inner bark sometimes eaten; logs for dugout canoes
Populus tremuloides Michx. (Salicaceae); trembling aspen	Wood used for fuel; and construction; bark used for medicine
Prunus subcordata Benth. (Rosaceae); Klamath plum	Small plums eaten
Prunus virginiana L. (Rosaceae); choke cherry	Cherries eaten fresh or dried for winter; bark used for medicine (southern part of study area)
Rhododendron albiflorum Hook. (Ericaceae); white mountain rhododendron	Leafy twigs used for medicine
Rhododendron groenlandicum (Oeder) K.A. Kron & W.S. Judd, *R. neoglandulosum* Harmaj (Ericaceae); Labrador tea and Trapper's tea	Leaves (and sometimes flowers and twigs) used for beverage tea and medicine
Ribes hudsonianum Richardson (Grossulariaceae); black currant	Berries harvested in July; eaten fresh (northern part of study area)
Ribes inerme Rydb. and other gooseberry species (Grossulariaceae); gooseberries	Berries harvested in July; eaten fresh and dried
Ribes lacustre (Pers.) Poir. (Grossulariaceae); swamp gooseberry	Berries harvested in July and August; eaten fresh, rarely dried; tea made from leafy twigs
Rosa acicularis Lindl. and *R. nutkana* C. Presl (Rosaceae); prickly rose and Nootka rose	Hips harvested in July; eaten fresh and sometimes dried; wood for baskets, cradle boards, arrow shafts; plants used for medicine
Rubus idaeus L. (Rosaceae); wild raspberry	Berries harvested in July; eaten fresh and sometimes dried; plants used for medicine
Rubus laciniatus Willd. (Rosaceae); cutleaf evergreen blackberry	Berries eaten at ***iwamkani***; introduced species
Rubus leucodermis Douglas ex Torr. & A. Gray (Rosaceae); blackcap	Berries harvested in July; eaten fresh and sometimes dried; young shoots also eaten
Rubus parviflorus Nutt. (Rosaceae); thimbleberry	Berries harvested in July; eaten fresh and sometimes dried; young shoots also eaten; leaves used to dry berries on, and in pit-cooking
Rumex acetosa L. ssp. *alpestris* (Scop.) A. Love (Polygonaceae); sorrel	Young leaves eaten as spring vegetable
Rumex paucifolius Nutt. (Polygonaceae); alpine sheep sorrel	Seeds eaten (southern part of study area)
Salix barclayi Andersson, *S. glauca* L. and other *Salix* spp. (Salicaceae); Barclay's willow & other mt willows	Wood, bark used for cordage; wood for drying racks; bark, leaves, twigs used for medicine
Sambucus nigra L. ssp. *cerulea* (Raf.) R. Bolli (Caprifoliaceae); blue elderberry	Berries eaten; hollowed stems used for straws; berries and other parts for dye; plant used for medicine (leaves, bark, roots toxic) (used in southern part of study area)
Sambucus racemosa L. (Caprifoliaceae); red elderberry	Berries eaten after cooking; hollowed stems used for straws; plant used for medicine (leaves, bark, roots toxic)

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Table 1. Continued.

Scientific and Common names	General use/notes
Shepherdia canadensis (L.) Nutt. (Elaeagnaceae); soapberry	Berries harvested in July, whipped into frothy confection; also used for beverage; branches and berries used for medicine
Sorbus sitchensis M. Roem. (Rosaceae); Sitka mountain-ash	Berries eaten; cooked with marmot meat; plants used for medicine
Taraxacum officinale F. H. Wigg. (Asteraceae); common dandelion	Young leaves eaten as greens; introduced from Europe
Urtica dioica L. (Urticaceae); stinging nettle	Plants used for medicine and stems for twine; some people cooked and ate the young shoots and leaves
Vaccinium caespitosum Michx. (Ericaceae); dwarf bilberry	Berries harvested in August; eaten fresh and dried in large quantities
Vaccinium deliciosum Piper (Ericaceae); Cascade bilberry	Berries harvested in August; eaten fresh and dried in large quantities
Vaccinium membranaceum Douglas ex Torr. (Ericaceae); black mountain huckleberry	Berries harvested in August; eaten fresh and dried in large quantities; an important trade item
Vaccinium myrtillus L. (Ericaceae); dwarf bilberry	Berries harvested in August; eaten fresh and dried in large quantities
Vaccinium ovalifolium Sm. (Ericaceae); oval-leaved blueberry	Berries harvested in July; eaten fresh and dried in large quantities; also harvested from lowland areas
Vaccinium scoparium Leiberg ex Coville (Ericaceae); grouseberry	Small red berries harvested in July and August; eaten fresh and dried
Vaccinium vitis-idaea L. ssp. *minus* (Lodd.) Hultén (Ericaceae); lingonberry or mountain cranberry	Berries harvested in July; eaten and stored fresh or boiled (northern part of region)
Valeriana edulis Nutt. ex Torr. & A. Gray (Valerianaceae); tobacco root	Roots pit-cooked and eaten (in southern part of region); strong smelling
Valeriana sitchensis Bong. (Valerianaceae); Sitka valerian	Roots and plants an important medicine; used fresh or dried, as an infusion or decoction
Veratrum viride Ait. (Liliaceae); false hellebore	Plants, especially the roots used medicinally; very powerful and toxic due to alkaloids; considered an important spiritual plant in many areas; usually used externally
Viburnum edule (Michx.) Raf. (Caprifoliaceae); highbush cranberry	Berries eaten, usually cooked
Xerophyllum tenax (Pursh) Nutt.; (Liliaceae); common beargrass	Fibrous leaves valued for basketry; sometimes traded among different groups; areas burned to maintain it

would climb up to the mountain slopes to dig bulbs of yellow glacier lily (*Erythronium grandiflorum* Pursh), tiger lily (*Lilium columbianum* Leichtlin), mountain potato corms, edible thistle (*Cirsium edule* Nutt.) and other roots, and to harvest the green shoots of cow-parsnip (*Heracleum maximum* Bartram) and other plants whose presence and location were known and predictable. At such times, these upland plant foods became vitally important (Turner and Davis 1993; Turner et al. 1990). Finding caches of edible roots collected by voles and other rodents also sometimes assisted people in feeding themselves in the mountains (cf. Turner et al. 1990).

Social Aspects of Montane Resource Use

In general, the cultural norms for accessing and using upland resources were, and are, similar to a group's resource use in other areas. Even remote sites in the mountains –especially prime resource locales– might be claimed by particular

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Figure 2. Digging for mountain potatoes (western springbeauty corms –*Claytonia lanceolata*) at ***tsinuzch'ed***, British Columbia. Photograph by N. Turner.

families or clans, in some cases under the proprietorship of a hereditary chief or house leader (Deur 2002a; Turner et al. 2005). Patterns of ownership varied along the Pacific mountain crest, reflecting the broader configurations of land and resource tenure for the communities living along the cordillera. Especially rich montane gathering areas might be accessed and occupied by multiple tribes that maintained overlapping claims to resources at their territorial margins. It is likely that there were many different proprietorship arrangements in these montane areas, as there were for territorial hosting and resource exchange in lowland areas (cf. Suttles 1987; Turner and Clifton 2009; Turner et al. 2005). Since women were primary harvesters and processors of the berries, roots and other plant products, they would be expected to have had an important role in determining access, use and maintenance of their harvesting grounds.

Sometimes ownership of harvesting areas and campsites was strictly enforced, whereas in other cases it was more informal, and a harvesting place might be open to any individual belonging to the group, or to others with rights through intermarriage or other associations. However, people from outside a particular group's or family's territory or site would expect to ask permission to harvest, and when this was given, might give a portion of whatever they obtained to the owner or representative. Failure to do so could result in some instances in severe punishment. For example, oral histories tell of battles between the Tsilhqot'in and their Salishan neighbors over a site called ''Many Roots'', known for its edible root resources, near Bridge River (Teit 1906: 256, 237). Even today at ***iwamkani***, tribal members express vehement disapproval of those who occupy another family's vacant camping area to which they have no hereditary rights (Deur 2002a). In general, however, the status and shared proprietorship of overlapping territories has changed over time, with fewer people harvesting and shorter harvesting periods.

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People's social activities and social organization were intimately connected with seasonal travel and residency patterns. For general harvesting during the seasonal round, groups of families connected through kinship or friendship would travel together annually to their customary places in the subalpine parkland. They would set up their camps at the upper edge of the tree line, usually in the same places each year, along different creeks but in the same vicinity, so they could be independent but could also work together and help each other (Ignace 2008; Mellott 2010; Turner 1992; Turner et al. 1990). In the spring and fall, it was more common for individuals or small groups of women – sisters, a grandmother and her granddaughters, or aunt and nieces rather than entire families– to venture into the mountains to harvest roots, tree bark or medicines, or for small groups of men to go hunting in the mountains. In such cases, people might stay for shorter periods, or even make quick day trips (Dawson 1892:19; Mellott 2010; Turner 2003). Ahousaht elder Stanley Sam recalled that his grandmother used to travel alone into the Vancouver Island mountains to harvest yellow-cedar bark, staying for up to two weeks at a time and returning with multiple bundles of inner bark for weaving (Clayoquot Scientific Panel 1995). Even when people were simply traveling through the mountains from one valley to another, for trade or other purposes, they would usually harvest resources as they went, if they were entitled to do so.

As with resource harvesting in general, there was a usual division of labor in procuring montane resources, with women accessing the berries and roots, and men hunting or fishing. Women also tended to undertake the cooking, drying and other processing of both plant and animal resources. There were exceptions; for example, when the Stl'atl'imx families from Shalalth at Seton Lake, British Columbia went to Mission Ridge during the root-digging and berry-picking season, men often picked the berries along with women (Turner 1992). In Tsilhqot'in territory, men sometimes helped to dig roots or pick whitebark pine cones, but more commonly they went off to hunt deer, which the women then skinned, butchered and processed (Mellott 2010; Turner 2004). Similarly, in the Oregon Cascades, Klamath men sometimes helped with huckleberry picking, but more usually groups of male kin fanned out into the mountains and valleys surrounding the berry patches in order to hunt deer and elk (Deur 2002a).

Children also participated in harvesting, even from a young age. Stl'atl'imx elder Edith O'Donaghey recalled, ''The girls would go out with the women to berry-pick. They were made to work very hard. There were no excuses in those days!'' Boys, depending on their age, might help their mothers and grandmothers, or accompany the men in hunting (Turner 1992:425). Children were responsible for hauling water and gathering firewood, among other tasks. This might involve specialized knowledge, as in knowing what fuel and plants were best for pit-cooking, and children would learn about this through participation and instruction.

In the central British Columbia Coast Range, the usual time for high elevation root-digging was around mid-May to the end of July, depending on elevation and latitude (cf. Teit 1900). The inner bark of lodgepole pine was also harvested around this time (Alexander 1992). Groups of women might travel to the mountains to harvest these foods, or sometimes the first products might be

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procured by men who had gone up to the mountains for hunting before the main migration of families. For example, in late spring, the men might bring buckets of fresh inner bark, sometimes called ''pine noodles'', back from the mountains to their permanent homes for the entire family to enjoy (Turner 1992).

Summertime was the most common time for larger groups of families to travel and camp together in the high country. Some root vegetables, such as yellow glacier lily and tiger lily, are best harvested at this time, after they have gone to seed and when the leaves are starting to turn yellow (Loewen 1998; Peacock and Turner 2000). Mountain potatoes are often harvested at this stage as well (Mellott 2010). The prime season for berry harvesting is also generally mid-summer through early fall, a time when daytime temperatures are warm and snow cover minimal, although in some places mosquitoes and black flies can cause misery for berry pickers. Late summer to early fall was the usual time for harvesting and processing ***wíla*** (black tree lichen, *Bryoria fremontii* (Tuck.) Brodo & Hawksw.) and whitebark pine cones with their edible seeds, from the upper elevation forests (Crawford 2007; Turner 1977, 2006). By this time, most family members would have descended to the valleys, leaving these products to be harvested by a few people, sometimes men, after the women confirmed which might be the prime harvesting trees.

For the Stl'atl'imx and others, periods of montane resource harvesting were interspersed with salmon fishing down along the Fraser River and its tributaries. People sometimes waited until the summer sockeye fishery was completed before the families ascended to the mountains for berry picking and root harvesting; in this case, they might bring dried sockeye with them as food for their mountain camps. Others might use some of their mountain-harvested resources to trade for salmon and other lowland resources if they happened to miss getting some themselves (Turner 1992).

Diverse medicines, including bark and pitch of subalpine fir (called ''medicine tree'' in some languages), roots of false hellebore, Sitka valerian (*Valeriana sitchensis* Bong.), Canby's lovage (*Ligusticum canbyi* Coult. & Rose) and whole plants of mountain dryas (*Dryas drummondii* Richards. ex Hook.) and yarrow (*Achillea millefolium* L.) were, and still are, collected preferentially from montane areas because they are considered to be stronger and more effective (Turner 2009). The medicines might be dried after gathering, then transported to permanent homes to be used as needed over the winter.

Traditional food harvesting and processing in the mountains is hard work but there is also a pleasurable aspect to the mountain camps that draws people to the subalpine parkland. Mountain gatherings were, and are, important social occasions, with visiting, courting, games, races and contests being common activities. Within the last century, many of the high elevation sites have included makeshift rodeo grounds, dancing grounds, horse and foot races and other gaming (Deur 2002a; Mellott 2010; Turner 1992, 1995; Turner et al. 1990).

Mountain stays were also a time for teaching and storytelling. Many tales were recounted as families gathered around the campfires at night, or as groups of women dug roots or picked berries together (see McIlwraith 1948; Turner 1992). Often, animals and their habits feature in the stories; some, for example, involve bears and women digging roots up in the mountains (Smith 2008; Teit

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1912), and others refer to mountain goats, marmots and other animals of the high country (Turner et al. 1992). There are narratives of some mountains themselves having been people originally, with many human traits and even their own families, who were turned into stone at some time in the ancient past (Mellott 2010; Smith 2008).

Because of their history and immense power, many mountains are known to be important places for physical and spiritual healing. Individuals seeking spiritual assistance or guidance may travel long distances and stay in the mountains for long periods of time to achieve important powers or knowledge that will help them in some way (Robinson and Wickwire 1995; York et al. 1993).

Montane Biomass Flows

The permanent villages of Indigenous communities are typically located in valleys or along coastlines far from resource sites in the subalpine parkland. The montane regions of peoples' territories were accessed via networks of trails, some of which are still in use today. Although people transported some resources –typically equipment like root-digging sticks, baskets, berry-raking combs and some food– from lower elevations (cf. Dawson 1892; Teit 1906, 1909), the bulk of resource movements were food products transported from upper elevation harvest sites down to the permanent living areas for winter use or trade. Some montane plant resources were used *in situ* as people traveled –and still do– extensively from one high elevation environment to another to get various resources, including firewood, which could become sparse around established camps. Food was sometimes cached to be used on later trips or to be transported to wintering sites. One can thus visualize resource flows both within and towards, but mainly away from montane regions.

Many elders today recall the treks with their families down from their mountain camps, transporting substantial quantities of harvested food to the main villages and residences (Ignace 2008). For example, Tsilhqot'in elder Catherine Haller recalled how her mother would shoot a deer in order to fashion a packsack to carry hundreds of pounds of ***sunt'iny*** (mountain potatoes), dried meat and medicines down from ***tsinuzch'ed*** (Mellott 2010). Other elders recount similar experiences, with ''baskets and baskets'' of dried roots, berries and meat being brought down from the mountains for the winter (e.g., Stl'atl'imx elder Edith O'Donaghey's accounts in Turner 1992). Families in the Oregon Cascade Range reported going home with enough huckleberries to supplement their diet for much of the year. Many products of mountain environments, such as dried yellow glacier lily bulbs, mountain potato corms and dried huckleberries, were harvested in excess of immediate family needs to be used as trade goods (Deur 2002a, 2005; Mellott 2010; Smith 2008; Teit 1906: 231–2; Turner and Loewen 1998). The scale of the harvest appears to have intensified as horses (and sometimes wagons) allowed families to transport larger quantities home, in some cases enabling them to bring fresh, unprocessed roots and berries to be dried or preserved at the permanent village site, thus lessening the time required in the mountains for food processing (Deur 2002a, 2005, 2007; Mellott 2010; Turner 1992). Klamaths report families returning home with ''several wagon-loads of berries'' each year, and with the arrival of automobiles, families sometimes filled the interiors of their Model Ts with huckleberries and other food from the mountains.

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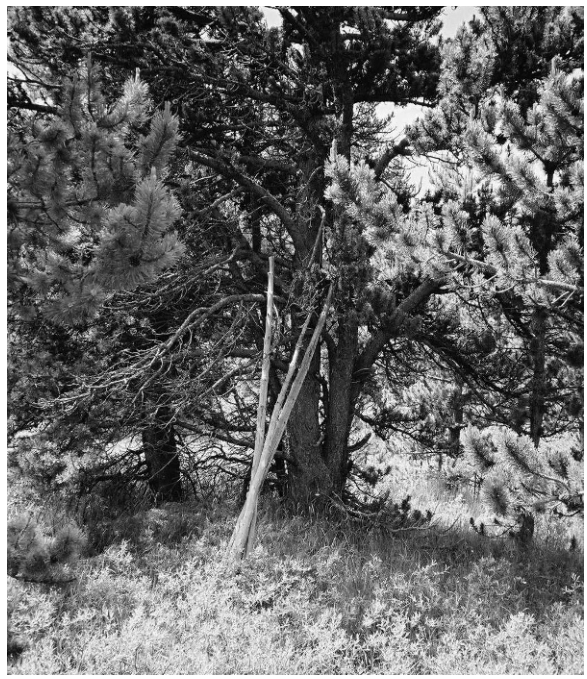


Figure 3. Tent poles of lodgepole pine (*Pinus contorta*) left leaning against a tree at ***Ts'ylos***, Tsilhqot'tin territory.

Bones, food scraps, broken tools and unusable plant parts such as the stems of root vegetables would often accumulate at montane camps (Lepofsky 2004; Matson and Magne 2007; Peacock 1998). Poles for shelters and tents, heavy tools such as grinding stones, as well as certain fishing equipment might be left at a camp from year to year (Figure 3; Mellott 2010). Items such as bark trays for drying berries and bark buckets for transport or food storage might be fashioned right on site from trees and other plant materials (Mack and McClure 2002). Sheets of bark and boughs harvested from nearby trees –leaving evidence as CMTs (culturally modified trees; cf. Turner et al. 2009)– were used as ''thatch'' for roofing, floor covering and bedding for seasonal shelters. Subalpine fir boughs (*Abies lasiocarpa*) are particularly appreciated for this purpose due to their fragrance, softness and springiness (Turner et al. 1990).

Management of Montane Plant Resources

In order to sustain the immense productivity of plant resources year after year, Indigenous Peoples of this region have managed montane landscapes and plant populations in myriad ways. Some of the techniques are similar to those used at lower elevations, including selective harvesting of root vegetables, with associated tilling, replanting of propagules, and timing of harvesting for optimal seed dissemination (see Beckwith 2004; Mellott 2010; Peacock and Turner 2000; Turner and Peacock 2005).

Intentional burning of meadows and mountainsides to clear away brush and promote the growth and productivity of food plants like root vegetables and black

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huckleberry, Cascade bilberry (*V. deliciosum*) and other types of berries, has been documented by Mack and McClure (2002), as well as by many others throughout the study region (e.g., Boyd 1999; Deur and Turner 2005; Kimmerer and Lake 2001; Hallett et al. 2003; Peacock and Turner 2000; Turner et al. 2000; Tveskov 2007; Zenk and Rigsby 1998). A narrative called ''Burning Mountainsides for Better Crops'', originally recounted in the Stl'atl'imx language by Baptiste Ritchie, a Lil'wat elder from Mount Currie, presents an extensive and detailed firsthand description of montane landscape burning in the Pemberton Valley region (Swoboda 1971:182–191; Turner 1999). It provides clues about the type of burning people undertook and explicitly identifies those species most enhanced by periodic burning: yellow glacier lily, mountain potato, tiger lily, huckleberries, gooseberries (*Ribes* spp.) and blackcaps (*Rubus leucodermis* Douglas ex Torr. & A. Gray). It also refers to stewardship of montane landscapes by individuals or families, and describes the changes that have occurred in the vegetation since fire suppression has been active. Traditional burning practices appear to be corroborated both by residual vegetation patterns as well as by the oral traditions of many peoples throughout the region (Lepofsky et al. 2005; Turner 1999).

Sometimes, people will burn individual trees or isolated clumps of trees to create firewood for the succeeding years. Turner witnessed this in Tsilhqot'in territory on ***tsinuzch'ed*** in the summer of 2003. She assumed it was a campfire that had accidentally spread, but a Tsilhqot'in elder explained that it was an intentional fire set to provide dry wood from the burned snags for future campers.

The act of harvesting itself is known to increase the productivity of certain root vegetables (Anderson and Rowney 1999; Beckwith 2004; Castle 2006). Minnie Charleyboy (Tsilhqot'in) explained that harvesting made the mountain potato grow better just like with garden potatoes: if you thin them out, the ones left have more room to grow (Mellott 2010; Turner 2004). Secwepemc elder Mary Thomas explained that selection of only the largest roots was also a common practice. She recalled from when she was a child that her grandmother carefully returned to the ground any of the smaller roots of glacier lily, mountain potato (western springbeauty) or chocolate lily (*Fritillaria affinis* (Schult.) Sealy) that Mary and her siblings had inadvertently selected, allowing these small propagules to grow for the subsequent years' harvests (Peacock and Turner 2000). Harvesting also softened and aerated the soil from repeated digging. Contemporary elders, including Mary Thomas and Minnie Charleyboy, have noted that the ground in areas where they used to dig their root vegetables (Neskonlith Meadows and ***tsinuzch'ed*** respectively) has become harder and more compact. Large scale, concentrated harvesting more typical of the past was said to have maintained these root beds just like garden soil.

In the case of root vegetables that are capable of vegetative reproduction, such as camas (*Camassia* spp.) or yellow glacier lily, small appendages or cormlets (propagules) were sometimes separated from the main edible structure (corm, bulb or tuber) and replanted (Loewen 1998; Peacock and Turner 2000; Turner et al. 2000). Woody plants like huckleberry and soapberry (*Shepherdia canadensis* (L.) Nutt.) were commonly pruned in order to increase their vigor and productivity.

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Timing is also an important consideration in maintaining the plant resources. Mountain potato corms, for example, are selectively harvested at the time of seed maturity and stem senescence, a time when the ''potatoes'' are said to taste better (Tsilhqot'in elder Catherine Haller and others, Mellott 2010). Scattering the stems containing ripening seed capsules was a ritual for Tsilhqot'in women who had been recently widowed. As part of the bereavement process these women would go up to the mountains, pull out the ripened stems of the mountain potato, and strew these over the ground where there were no ''potatoes'' growing to increase their abundance (Mellott 2010; Smith 2008; Turner 2004). Huckleberries and other berries have been managed similarly (Deur 2002a). Such traditional management practices continue today, but generally at more restricted scales in terms of area, duration and frequency.

Mack and McClure (2002) document intensification of huckleberries (*Vaccinium membranaceum, V. deliciosum* Piper) in the high elevation parklands on Mount Adams in the Washington Cascades (located between the two main case study areas we present below), which involves not only enhancement of huckleberry habitat through burning, but also increasing the available end product through efficient processing methods. They identified well over 200 berry-drying features and a multitude of berry camps, some dating back 3,000 years ago. At least over the past 600 years or so, Indigenous People on Mount Adams have been using a unique technology for broad scale production: drying their huckleberries on bark trays and racks over fires lit in long trenches.

Many of the features and processes described more generally relating to the ethnobotany of montane areas of the Pacific Coastal ranges are reflected in the two case studies presented in the following sections. Our intention is to show how all of these features act holistically and, like the Traditional Ecological Knowledge systems they comprise, seamlessly integrate social and ecological features over time and space (Turner et al. 2000). Both of these places, and the peoples who use them, have been subjected to intense changes in the period since the arrival of Europeans to the region. We discuss these changes and their implications to the case study areas and more broadly to montane areas in general.

Pt-én'i (Botanie Valley), British Columbia

The first case study of Indigenous use of subalpine parkland is of ***pt-én'i*** (Botanie Valley) and the surrounding mountain slopes by the Nlaka'pmx (Thompson) Interior Salish of Lytton and neighboring peoples of British Columbia (Turner 1998, 2006; Turner et al. 1990). This subalpine valley is located about 16 km southwest of Spences Bridge and about 24 km north of Lytton, which is at the confluence of the Thompson and Fraser rivers. The steep slopes are partially forested and part meadowlands (Figure 4), and ***pt-én'i*** is famous for its edible roots, as recounted in oral history:

> A powerful woman who lived at Lytton was taken away by a great chief, some said the Sun. She wanted to leave provisions for her people, so she dropped edible roots at Botanie, saying that ''Roots will grow in

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Figure 4. ***Pt-én'i*** (Botanie Valley), British Columbia, showing the interface between subalpine meadow and forest communities.

> abundance in this place, and all my children shall repair here to dig them'' (Steedman 1930:477).

Pt-én'i has been one of the key Nlaka'pmx upland destinations in their centuries-old seasonal rounds. It was a gathering place for many communities, each with its separate and recognized camping ground. Sometimes over a thousand people from all divisions of the Nlaka'pmx would gather there (Teit 1900:294). George Dawson also commented in his unpublished notes (June 4 & 5, 1890) on the ***pt-én'i***'s importance: ''Several camps of Indians up here [at head of the valley] at present, the women being engaged in digging roots…. Wonderfully luxuriant [sic] growth Everywhere.'' And later, ''Before we left Camp this morning, a number of Indian women passed on way out to dig roots each with a basket on back & digging Stick….'' (Turner et al. 1990:15).

Teit (1896–1918) reported in his unpublished notes on the timing of travel to ***pt-én'i***:

> Time when Botani [Valley] & other places vegetation just right [for harvesting]. When snow disappears from certain spots in mountains in view of homes. [At] Spences Bridge when last snow disappears from shady slope of a mountain top to the SW [southwest] in view of Spences Bridge about 6 or 7 mi [about 10 km] distant as [the] crow flies used as a sign by Spences Bridge people [that it was] just right to go [to] Botani (Turner et al. 1990:14).

Nlaka'pmx women, and some women visiting from neighboring tribes such as the Stl'atl'imx, would spend many days digging these root vegetables, including balsamroot (*Balsamorhiza sagittata* (Pursh) Nutt.), nodding onions (*Allium cernuum* Roth), yellow glacier lily, mountain potato, and chocolate lily. Sometimes the women harvesting roots on the upper slopes would bet their

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entire day's harvest on the outcome of races they were able to view in the valley below (Turner 2006). People also harvested other resources at ***pt-én'i***, especially cow-parsnip, ''Indian celery'' (*Lomatium nudicaule* (Pursh) J.M. Coult. & Rose), black tree lichen, Douglas-fir sugar, and various types of berries: black huckleberries, gooseberries, Saskatoons or serviceberries (*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roem.), and wild strawberries (*Fragaria* spp.), some of which were particularly large, as recalled by Annie York (Turner et al. 1990). The root vegetables and black tree lichen were cooked in underground pits, or earth ovens, a tradition that apparently extends back for hundreds, perhaps thousands of years. Some families might harvest as much as 100 kg or more of glacier lily bulbs and as great a quantity of mountain potatoes in a single season, pit-cooking then drying them before packing them down to the winter villages. The valley floor of Botanie Valley is dotted with pit-cooking depressions, indicating widespread and concentrated cooking of roots and other resources in this area, but more research and archaeological excavations are needed to provide further details of high elevation pit-cooking (Lepofsky and Peacock 2004; see also Alexander 1992; Matson and Alexander 1990).

Fire was a major tool to help people maintain the productivity of their plant resources at ***pt-én'i***, and protect the open meadow habitats from encroachment by scrub and forest. Annie York (Turner et al. 1990:13) recalled:

> But the way the Indians used to do it, to cultivate the ground, is in the fall, they watch the weather… watch it and look at the sun. Then, they lit a match to these places. That's why today [1980's], you go to Botanie, you don't get them [mountain potatoes] as big. You know, I seen them as big as this [5 cm across], as big as a potato. And then, they set fire to it and watch it. They just burn like this…. Sometimes it just rains, thunders, and puts that fire out. That's a funny thing. I seen it, up here, even to my time, when I was about 38 [1942]… [They burned] the mountainside.

Hunting deer and other land mammals, and fishing in the high elevation creeks and lakes, as well as medicine gathering and spirit questing, were other activities at ***pt-én'i***. Everyone –men, women, youth, children– as well as shamans, healers and others with specialized occupations, all found important work there.

Iwamkani, Oregon

Iwamkani, a place name literally meaning ''mountain with huckleberries'' in the Klamath language, is another prime example of the importance of montane sites in traditional and ongoing lifeways of Indigenous Peoples of Pacific North America. Set in the Cascade Range headwaters of the Rogue River, this volcanic massif of roughly 100 sq km is covered with some of the most productive black huckleberry patches to be found in the southern Cascades (Deur 2002a, 2005) (Figure 5).

Long before European contact, numerous tribes –Klamaths, Modocs, Molalas, Upper Umpquas, Takelmas, Shastas, and others– visited this place annually to gather berries and other plant products, to hunt, to escape the

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Figure 5. An ***iwamkani*** camp in the late-19th or early-20th century. Buckets and gunny sacks of black huckleberry (*Vaccinium membranaceum*) sit in the foreground, while a recently dressed deer (*Odocoileus* sp.) is hanging behind. Tents, impromptu shelves, and other items relate to extended residence of tribal members at these campsites. Camps were commonly located under the forest canopy, despite the presence of nearby meadows, providing shade and structural supports for camp equipment. Photograph by Hescock, courtesy Crater Lake National Park archives.

summer heat of the lowlands and to socialize. While all of the region's tribes maintained discrete territories, subalpine areas such as ***iwamkani*** represented multi-tribal use areas lining the territorial boundaries where different tribes seasonally coexisted at resource rich sites. ''We all shared the huckleberry patch,'' tribal elders assert, ''All the tribes gathered there.'' Berries gathered at ***iwamkani***, particularly the huckleberries, were a significant component of the traditional diet for all of these tribes. Moreover, seasonal camps at ***iwamkani*** provided people with access to many upland plant and animal resources that were uncommon in their lands in the basins below –especially important for the Klamaths, who dwell in the relatively arid high desert regions to the east of the Cascade Range. The Klamath traditionally watched the snowline recede up the mountains until it was apparent that their campsites were snow-free before beginning to relocate to their montane berry-picking camps. Their Umpqua neighbors to the west, meanwhile, awaited the appearance of certain insects that were said to predictably arrive when their camps were ready (Deur 2002a). ***Iwamkani*** thus became a cornerstone of the seasonal round, and one of the most important sources of foods, materials, and medicines to local tribes, a role it still maintains in a much-reduced capacity.

Recent ethnographic research has confirmed that the Klamath and possibly other tribal groups actively managed the plant communities of ***iwamkani*** historically. Certainly, subalpine plant management is consistent with broader

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traditions of Klamath and Modoc plant management techniques found in the valleys below, including the use of fire to manage subalpine, marsh-edge, and range vegetation at the time of European contact (Deur 2009). Similar patterns have been reported in a number of other ethnographic contexts within the southern fringes of northwestern North America, including subalpine areas (Boyd 1999; French 1999; Hunn and Selam 1990; Hunn et al. 1998; LaLande and Pullen 1999; Mack and McClure 2002; Pullen 1996; Tveskov 2007). Despite this, documentation of aboriginal burning practices among the Klamath and Modoc is surprisingly scarce, with only a few references in the published historical and ethnographic literatures; references to subalpine resource use are similarly rare, other than very general references to huckleberry gathering, hunting, and ceremonial activities in these high-elevation settings (Gatschet 1890; Minto 1898; Spier 1930).

However, oral traditions and published ethnographic literature suggest that traditional plant management was common among many of the Klamaths' neighbors to the west who shared access to ***iwamkani*** and other subalpine resource procurement areas (Deur 2008; Gray 1987; LaLande and Pullen 1999; Lewis 1993; Pullen 1996). Among these activities, none was more important than the use of fire. All ethnographically documented peoples of southwest Oregon and northern California appear to have engaged in periodic burning of both forest and meadow areas at the subalpine margin in order to enhance plant and animal resources (cf. Anderson 2005; Boyd 1999; Harrington 1932:63; Lewis 1993). Indeed, some of the earliest written accounts of the area tribes, compiled by members of the Wilkes Expedition in the 1840s, mention observations of women igniting the vegetation of ''the prairie & mountain ravines'' (Peale 1841). As LaLande (1995:2) has suggested, even though most aboriginal people were forcibly removed from the Rogue River basin in the 1850s, they left behind them the ''major enduring legacy'' of ''extensive acreage kept ''cleared'' of dense vegetation through repeated burning, particularly at low elevations and at the highest meadows.'' Their displacement resulted in a botanical transformation, as managed environments were left fallow (McKinley and Frank 1995). In upland environments, localized burning was carried out to achieve multiple aims, and fostered a variety of unique plant communities. These meadows of fire-tolerant or fire-dependent plant communities, while disappearing in the absence of regular burning, are still an important legacy of this form of management (Detling 1953).

The tribes living just west of the Klamath burned patches of hazel (*Corylus cornuta* Marsh.), iris (*Iris* spp.), ceanothus (*Ceanothus* spp.), and beargrass (*Xerophyllum tenax* (Pursh) Nutt.) in midsummer annually or bi-annually to obtain the best basketry materials (Schenck and Gifford 1952:386; Gray 1987). Patches of hazel were especially burned to enhance their production and produce the long, straight shoots that were preferred for basketry (e.g., Anderson 2005; Boyd 1999; Lewis 1993; Schenck and Gifford 1952: 382). As Harrington (1932:103) noted, ''The foundation [of a Karuk] basket consists usually of carefully chosen shoots of the California hazel gathered the second year after burning the brush at the place where it grows.'' O'Neal (1932:15) likewise noted that the Karuk ''went to burn the brush during a dry summer or in the early fall. The following spring the young shoots sprouted but were left uncut until their second year.'' The

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Karuk, Shasta, and other tribes also burned patches of hazel every year to enhance nut production by removing competing fir and hemlock trees, principally seedlings that became established at the prairie margins (Bright 1957:293; Fields 1985:51; Harrington 1932:63–65; Schenck and Gifford 1952:386).

Likewise, to the southwest of the Klamath, Karuk and Shasta consultants indicated that they used to burn vegetation high in the mountains to enhance other basketry materials, including beargrass (O'Neale 1932:21). The most durable and useful beargrass was said to be found in patches that were burned regularly. These managed areas were typically located on high-elevation ridgetops, resulting in significant concentrations of this liliaceous ''grass'' along mountain ridges close to the timberline (Bright 1957:293; Fields 1985:51). Meadows were burned continuously to keep conifers from encroaching on clearings where these and other culturally preferred species grew. Burning was conducted in the mountains for other reasons as well. People burned every year along trail networks to keep trails open and to channel the passage of deer along predictable passageways. Some individuals also set fires as part of a tradition of mountaintop signal or ceremonial fires, an action with ambiguous environmental intentionality but probable environmental effects (Jacobs n.d., Notebook 126:97; Sapir 1909:189).

Burning techniques, especially those meant to enhance the availability of culturally preferred plant and animal species, appear to have been traditionally the domain of specialists within the tribes. Some of these techniques involved ceremonial activities, and certain fires appear to have been lit in the region for specifically ceremonial reasons. Accordingly, Gifford's Karuk consultants reported, ''When setting a fire, the fire setters said formula for a big fire, yet one which would do no harm. Then the formulist blows in all four directions to keep fire from spreading. The formulist is a fire setter who knows the proper medicine'' (Gifford 1939, Notebook 174). These individuals commonly used fire drills, lit tinder, and possibly coals carried from home fires to ignite the vegetation. This burning was typically done at the end of the season in the mountains, once all hunting and gathering was complete. If this was done regularly, it was said to allow for small and controlled burns of the subalpine understory, often called ''cold fires'' by contemporary consultants, while prohibiting large and destructive canopy fires, sometimes called ''hot fires.'' As will be discussed in reference to ***iwamkani***, this burning was said to serve as a way of ''showing respect'' to the plants on which individuals depended and the spiritual forces that controlled their output (Deur 2009, 2008).

The tribes living just west of the Klamath used techniques other than (or in addition to) fire that were said to enhance the output of culturally-preferred plants in the subalpine zone. Harrington's Karuk consultants noted the importance of repeated management on the output of plant gathering areas:

> [T]hey knew indeed that where they dig…all the time, with their digging sticks, many of them grow up, the following year many grow up where they dig them. They claim that by digging Indian potatoes [sic], more grow up the next year again. There are tiny ones growing under the ground, close to the Indian potatoes. They also knew that it was good to drag a

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> bush around after sowing. And they also knew that it is good to pull out the weeds. Root and all they pull them out, so they will not grow up again, and by doing this the ground is made softer (Harrington 1932:73).

Contemporary ethnographic consultants from these tribes corroborate the existence of these practices, suggesting that continued management was necessary for the growth of these ''Indian potatoes'' and other culturally important plant foods (Deur 2008). While few detailed ethnographic accounts make reference to management of the southern Cascade Range generally, or Klamath resource management of these environments specifically, the case of ***iwamkani*** can help to remedy this oversight. On the eve of European contact in the mid-19th century, the annual return of the Klamaths and other tribes to ***iwamkani*** followed a regular rhythm. Some Klamath families began their ascent into the mountains as soon as the snow had retreated to a certain elevation, making ***iwamkani*** accessible once again. Families packed their provisions and followed well-worn trails to the mountain's summit, a trip that took several days. On arrival, each family dispersed to its own campsite, inherited along maternal lines. They often stayed in the mountains over the summer, only descending at the first sign of new snowfall in early autumn. Dwelling in the mountains over such a long term brought respite from summertime heat and comparative aridity at lower elevations (Deur 2002a, 2005).

Late 19th century accounts of ***iwamkani*** place the number of occupants at these campsites at over 3000 individuals. All lands and resources at ***iwamkani*** were subject to some form of tenure, and a family's rights to its camping spot were considered inviolable. The sites served as bases for wide-ranging gathering and hunting activities. Each morning, women, children, and the elderly fanned out to the huckleberry patches downslope from the camps, where they picked berries, placing them into baskets and other containers. In the afternoons, they would return to the camps, spreading the berries on mats in forest clearings to dry in the sun and thus be preserved for later use.

The terrain for miles around the campsites at ***iwamkani*** provided a wealth of other resources. Food plants were gathered in riparian areas and spring-side meadows of the subalpine and adjacent montane forest zones, including camas bulbs, cow-parsnip stalks, black tree lichen, and diverse fruits: saskatoons or serviceberries, choke cherries (*Prunus virginiana* L.), thimbleberries (*Rubus parviflorus* Nutt.), blue elderberries (*Sambucus nigra* L. ssp. *cerulea* (Raf.) R. Bolli), wild strawberries, gooseberries, currants, wild rose hips (*Rosa* spp.) and introduced cut-leaf blackberries (*Rubus laciniatus* Willd.). ***Iwamkani*** was also a center for gathering medicinal plants (e.g., pipsissewa (*Chimaphila umbellata* (L.) W. Bartram), and yarrow) and plants used for basketry, dyes, and other purposes (such as hazel shoots (*Corylus cornuta*), tall Oregon-grape (*Mahonia aquifolium* (Pursh) Nutt.) bark and roots, and wolf lichen (*Letharia vulpina* (L.) Hue)). While women, children, and the elderly picked and processed berries and other botanical products, groups of men fanned out to hunt and fish at a diffuse constellation of resource sites around the mountain's perimeter. To the west, families claimed salmon fishing sites on the upper Rogue River and the men speared salmon (*Oncorhynchus* spp.) from scaffolding constructed over certain

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chutes and riffles. Elsewhere, groups of male kin hunted at sites which were loosely inherited down the male line. Deer and elk (*Cervus elaphus*) were ambushed at springs or flushed into subalpine meadows where men waited with bows, arrows, and spears. Later, in the mid-20th century, this practice was adapted to the use of rifles and clearcuts.

Every few days, all of the meat and fish that the men had accumulated was taken back to the campsites at ***iwamkani*** where it was cut up and placed on scaffolds to dry. After an overnight stay, the men fanned out to hunting and fishing sites once again while women completed the processing of fish and meat along with their own harvests. This cycle of activity continued, with its feminine core and masculine periphery, week after week through the entire summer, stopping only once the snow began to fall. At summer's end, families gathered the stores of meat, fish, and berries and started home (Deur 2002a, 2005).

Like the Nlaka'pmx at ***pt-én'i***, the Klamaths and other tribes maintained the rich resources of ***iwamkani*** through repeated and intentional management. The women set fires over the berry patches once the harvest was complete. As contemporary elders suggest, burning ''…needs to be done right to keep [the berries] going.'' Regular fires eliminated competing vegetation, removed dead woody material (which increased the hazards of catastrophic fire, impeded foot traffic, and reportedly impeded huckleberry plant growth in some settings as well), and encouraged the development of new berry-producing shoots. One elder suggested another effect of clearing out the understory: ''When they burned, there was only berries and grass under the trees –there was no threat of a big fire.'' As at ***pt-én'i,*** burning at ***iwamkani*** maintained open meadows near the campsites, creating spaces for social and subsistence activities. In outlying locations, burning maintained clearings where elk and deer gathered, producing hunting sites with predictable concentrations of game animals.

Berry productivity was also enhanced through the ''First Huckleberry Ceremony,'' traditionally carried out by women. One Klamath consultant reported, ''The old people used to tell us that you had to take the first berries that you gathered up and throw them to the ground, and give them back to 'Mother Earth'.'' If this respect was shown properly and regularly, it was said, ''…you would always find lots of berries.'' Though conceived of as a cosmological act, it is clear that by fanning out to remote picking areas, regrouping at campsites, and tossing berries to the ground each year, these people effectively reseeded huckleberries around their camps. This, alongside burning practices that cleared the ground each year, tentatively explains the anomalously high densities of huckleberries immediately surrounding traditional campsites visible in these places today (Deur 2002a).

Historical Changes in Availability and Use of Montane Areas

Montane environments have been, with some exceptions, among the last traditional resource harvesting areas in western North America to have been heavily impacted by colonization and settlement of Euro-Americans. Even after the colonial and federal governments of Canada and the United States established reserves and reservations to confine Indigenous Peoples and curb

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their occupancy of much of their territories, the mountain areas –central to Indigenous lifeways– were marginal to the colonizers, and therefore the First Peoples were often able to continue their routine harvesting and social activities at these places. For example, in the late 19th century the United States government, motivated by desires for tribal containment and surveillance, created the Klamath Reservation some 48 km (30 miles) east of ***iwamkani***. Klamath, Modoc, northern Paiute and southern Molala peoples were forcibly relocated to this carceral space, despite both passive and armed resistance to displacement, culminating in the infamous Modoc War (Deur 2002a). Fortunately, however, ***iwamkani*** remained essentially beyond the limits of agency surveillance. Several consultants noted, ''Even when we were told to talk and act like white people [in the valleys below] our grandparents taught us to be Indians [there].'' (Deur 2002a). Thus, far from the colonial gaze, children were taken to ***iwamkani*** to be educated in ''what it means to be Indian,'' a function of the place that persists today.

In the case of ***pt-én'i***, the importance of this area to the Nlaka'pmx was recognized by the Canadian government, and major portions of the valley, including Botanie Lake and the surrounding mountain slopes, as well as the nearby valley and slopes above the upper part of Skoonka Creek, were designated as Bootahnie Indian Reserve Number 15, belonging to the Lytton Indian Band. Anyone wishing to go into this area is required to obtain permission from the Band authorities. Nevertheless, the colonial policies of assimilating Indigenous People into mainstream society influenced the utilization of these mountain environments in numerous ways. ***Pt-én'i*** was the site chosen by the new Bishop of the Church of England Diocese of New Westminster, Acton W. Stillitoe, to develop a presence and hold religious services at the time of a traditional springtime Nlaka'pmx gathering in May 1884. The Bishop held communion, performed baptisms, and instructed people on proper Christian deportment. He also excommunicated a shaman or ''medicine-man'' who had proved ''most difficult to deal with'' because he would not abandon his practice of stripping himself naked and ''dancing and howling'' as he performed his traditional healing rituals (Laforet and York 1998:120).

Despite the relative freedom some of these montane regions offer to their Indigenous occupants, particularly over the past century or so, extensive intrusions of industrial development have now impacted, or threaten to impact, montane ecocultural systems in many places. These include industrial-scale resource extraction (mining, high elevation logging) and livestock grazing, as well as commercial ski and resort developments, all with their associated road-building, dam construction, powerlines, soil compaction and impact on hydrological systems. Furthermore, government actions to ''protect'' and ''manage'' these areas as parks, national forests and ecological reserves have had their own effects. Montane areas have been, in fact, some of the earliest places to be designated as parks and protected areas in both Canada and the United States, and such designations have continued. In 1978, for example, an area of 850 ha within Botanie Valley was designated as Skwaha Lake Ecological Reserve by the British Columbia government, ''to preserve representative Interior Douglas-fir and Montane Spruce ecosystems, together with many diverse

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meadow communities containing outstanding wildflower displays and rare plants'' (BC Parks 2007). This reserve is outside the area designated as Indian Reserve lands and as such restricts the harvesting and management practices of the Nlaka'pmx and other First Peoples, although, at the same time it offers some protection to the diverse plant and animal species of the region (Turner et al. 1990).

In the past, Indigenous Peoples were routinely excluded from parks despite hundreds, sometimes thousands of years of previous use and occupancy. In some cases, parks personnel have simply not been aware of past use of these areas by First peoples. Fortunately, awareness and understanding are growing among park managers and others about the cultural values and importance associated with many of these protected areas, and arrangements for co-management or resumption of traditional uses within parks and nature reserves are now commonplace in both Canada and the United States. In addition, within the United States, mechanisms such as the designation of traditional use areas as ''Traditional Cultural Properties'' (TCPs) –a National Register of Historical Places designation under the National Historic Preservation Act– has afforded such places a modicum of protection, principally on federal lands where there is an unambiguous mandate to document and manage for TCPs.

Of greater concern is government- and industry-led resource extraction. During the 20th century, the U.S. Forest Service assumed the management of ***iwamkani***, and the tribal huckleberry gathering areas were incorporated into the ''working forest,'' a reservoir of readily exploitable resources that were to facilitate the economic development of the American hinterland. As early as the turn of the 20th century, this agency was working with Klamath Indian Agents to prohibit and police Indigenous burning traditions. In his Annual Report to the Commissioner of Indian Affairs, Klamath Indian Agent O. C. Applegate (1899:310–311) wrote:

> A police force is maintained in the huckleberry country during this season [summer 1899] to preserve order and prevent the spreading of fires. No party of Indians is permitted to go on these excursions into the forest reserve without being duly instructed as to our game laws and fully impressed as to the importance of preventing the starting of fires. I am quite certain that the destructive fires which annually devastate large areas of our timberlands are not usually traceable to our Indians….

Then, beginning in the mid 20th century, the U.S. Forest Service constructed public campgrounds in the midst of the tribal berry-picking camps, and initiated intensive logging atop ***iwamkani***. Klamath elder Orin Kirk sadly recalled, ''We went up to our family's campsite. Everything was gone. They had ruined our camp. They had taken all the trees and the berries didn't come back… My grandma was really sad… wouldn't even look at it. Most of our family stopped going there after that'' (Deur 2002a).

Similar efforts were being taken by the Canadian government to restrict Indigenous management practices and to develop the upland sites for resource extraction. In the early days of the 20th century, the forestry wardens were evidently more sympathetic to Indigenous burning, and people were able to

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continue their traditional harvesting right up into the 1940s and 1950s, as noted by Annie York: ''You see the Forestry [in the 1940s] are not like today [1980s], the forestry wardens. You can go there all summer, to the mountains up here, picking berries, gathering [yellow glacier lily] if you want to, you can gather these little wild potatoes. And I went with my step-grandmother'' (Turner et al. 1990:13). By the 1960s, however, restrictions were being more heavily enforced. Baptiste Ritchie remembered, from his narrative on ''Burning Mountainsides…'' (Swoboda 1971:191; Turner 1999):

> But now [1960s], because the white man really watches us, we don't burn anything. We realize already, it seems the things that were eaten by our forefathers have disappeared from the places where they burned. It seems that already almost everything has disappeared. Maybe it is because it's weedy. All kinds of things grow and they don't burn. *If you go to burn then you get into trouble because the white men want to grow trees*…. [emphasis added]

Fire suppression has resulted in notable changes to montane ecosystems of the region, and, in particular, is said to have reduced the abundance and productivity of root vegetables and berries, especially huckleberries and blueberries, and this has, in turn, negatively affected peoples' use of these resources (Anzinger 2003; Boyd 1999; Franklin et al. 1971; Kimmerer and Lake 2002; Turner 1999). Today there is an increased recognition of the ecological role of fire in fertilizing soils, regenerating seral vegetation and maintaining prairies and open habitats, and some controlled burns have reintroduced fire to montane ecosystems (Pyne 2002). However, renewal of traditional practices must be done with extreme care, since increased fuel build-up from fire suppression may result in extremely hot conflagrations –not at all the type of fire that characterized the continuous, controlled burns of the past (cf. Miller 2010). This is an ongoing issue, and one that may be key for ongoing cultural use of subalpine parkland by Indigenous peoples. Careful experimental burning and monitoring of results will be needed before this past management practice can be fully resumed.

Along with the banning of landscape burning, livestock grazing has taken a major toll on montane parkland ecosystems in many areas. For ***pt-én'i***, the Nlaka'pmx themselves, as well as European ranchers, started to graze cattle and horses there relatively early on, in the late 1800s. Grazing has significantly reduced the productivity of the native vegetation at ***pt-én'i*** and other montane environments, with trampling and soil compaction being a visible problem on the steep slopes. The soft mucky soils around upland creeks and lakes are especially vulnerable to trampling and pollution by livestock. Introduced weeds associated with livestock production are another serious problem, with dandelions (*Taraxacum officinale* Weber), thistles (*Cirsium* spp.), hounds' tongue (*Cynoglossum officinale* L.), knapweed (*Centaurea* spp.), Dalmatian toadflax (*Linaria dalmatica* (L.) Mill.) and introduced grasses (e.g., cheatgrass, *Bromus tectorum* L., and crested wheatgrass, *Agropyron cristatum* (L.) Gaertn.) replacing a significant portion of native forbs and grasses. The traditional root vegetables and berry bushes of the mountains are often heavily browsed and trampled, and therefore less productive (Peacock and Turner 2000; Turner and Brown 2004).

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Mining in montane regions continues to disrupt indigenous peoples' lifeways. A mine established by Noranda on Blackdome Mountain in northwestern Secwepemc Territory, where people had gone for generations to pick huckleberries and blueberries, gather whitebark pine seeds and harvest medicines is but one example. The mine was closed by 1991, but it left a legacy of destruction, with a mountaintop so riddled with shafts and tunnels that it is no longer safe for people to walk there. Secwpemc elder Lilly Harry described the mountain as like a fresh hide that was thoroughly scraped clean. Most of the food and medicinal plants she was familiar with were buried under tons of rock. Water channels were altered. Sheltering trees had been pushed over, and those remaining were buried almost to the top by rock and debris.

In some ways, access to the subalpine parkland has been made easier in recent times. Travel to montane areas, formerly solely by foot, gave way to access first by horseback, and then by mountain bike or motor vehicle. These newer modes of access, combined with larger road networks and changing lifestyles, have resulted in generally shorter durations of stay in the mountains. In many cases, families have been able to continue using their summertime camps to some extent, even as they entered the cash economy and experienced unprecedented summertime scheduling constraints that conflict with the seasonal cycle of traditional procurement activities (Deur 2002a, 2005; Lutz 2008; Turner 1992). Roads also generally allow faster and easier transport of harvested products to the lower elevations. Some recent trips and gatherings have even involved use of helicopters to bring elders to areas they otherwise would be unable to access. Power equipment, propane stoves and modern containers have facilitated camping and harvesting and it is no longer necessary to dry food on site because it can often be canned or frozen immediately back home.

In balance, the positive aspects of increased potential access to tree line camping and harvesting sites have been offset by the negative effects of the host of harmful impacts that have led cumulatively to lower participation in cultural activities of the subalpine parkland zone. The reasons for generally reduced use of montane areas are complex. The economic and social restructuring that has influenced the cultures and lifeways of Indigenous and rural peoples everywhere, including their use of montane areas, is part of a major global trend.

As well as the necessity for wage employment for adults, the requirement that children attend school presents another constraint for families wishing to move to the high country for periods of time. In addition, children may be more interested in activities other than plant harvesting. Children and elders who have the time and inclination to camp in the mountains in the summertime require the assistance of working-aged family to travel and stay with them. These adults are not typically able to take extended time away from their jobs and day-to-day lives, especially because montane areas can be more difficult and inconvenient to access than other traditional harvesting grounds.

Another factor is a loss of knowledge and interest in the old ways, including harvesting traditional food and other resources, resulting from generations of enforced acculturation. Marketed food is readily available to most people, and is generally more convenient to obtain and prepare than traditional food. As the wholesale transformation of Indigenous and local peoples' food systems from

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diverse, regionally-based, usually nutritious diets to less diverse, more imported, more highly refined and less nutritious foods proceeds apace, many individuals lose their taste for their ancestral foods and the knowledge of how to acquire and process them. This restructuring, commonly known as the ''nutrition transition,'' has had serious implications for peoples' health and well-being (Kuhnlein et al. 2006, 2009; Parrish et al. 2007; Turner and Turner 2008; Turner et al. 2008).

Always part of the informal economy (Ommer and Turner 2004), montane ecosystems have at times been subjected to adaptations to the formal economic systems. For example, huckleberries, in many cases an important component of Indigenous Peoples' trade at different times in their history (Turner and Loewen 1998), started to be harvested for sale during the late 19th and early 20th centuries. For some late-19th century Klamaths, particularly women, the modest income derived from berry harvests represented one of their first points of entry into the larger United States cash economy, and allowed unprecedented access to manufactured goods. By the 1940s, however, the sale of huckleberries seems to have been viewed as an insignificant source of cash used only ''to pay for your gas'' for the ***iwamkani*** trip, and by the 1960s, the harvest of huckleberries no longer provided even a supplementary income for tribal members, according to most elders (Deur 2002a).

The potential for ecotourism or specialty food products involving wild food harvesting, however, remains for some people. For example, in the Whistler area, where three British Columbia First Nations were involved in hosting the 2010 Winter Olympics, a cultural center, native plant garden and other infrastructure built for the occasion may support visitors in the future. Summertime use of their territories by tourists, it is anticipated, will help to provide opportunities for these peoples in the bioeconomy.

One major and increasingly recognized threat to the integrity of montane biocultural systems is that of changing global climate. Although paleoecological evidence demonstrates that the location of upper elevation tree lines has always been dynamic and that climate has fluctuated widely since the Pleistocene (Pielou 1991), recent global warming trends may lead to major upward advances in tree lines with concomitant ecological and socio-economic implications (Grace et al. 2002; Körner and Paulsen 2004; Laroque et al. 2000; Lepofsky et al. 2005). The inability of Indigenous people to continue managing these ecosystems through the use of fire and other mechanisms may limit the resilience of subalpine meadows to upslope movements of parkland areas, but the ultimate impacts are still unknown. Lower availability of water is another major issue related to changing climate. Many people have noted reduced snowfall in recent years, and the escalating melting of mountain glaciers has been well documented, leading to less predictable and overall lower availability of water flows throughout watersheds (GLORIA 2010; Higgs 2003). The growth, reproductive capacity and productivity of species best adapted to the subalpine parkland ecotone and its particular moisture and temperature regimes –including culturally important species such as black huckleberry– will likely be negatively impacted, as has happened in other habitats and other regions of the world (Hebda 1998; Laroque et al. 2000; Salick and Ross 2009; Swerhun et al. 2009; Turner and Clifton 2009), but again, the exact long-term impacts are uncertain.

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Despite the concerns about environmental deterioration and cultural loss in the context of montane habitats, Indigenous Peoples are resilient, and have made strong and ongoing efforts to retain their close relationships with the mountains. In recent years, for example, some communities have started organizing summer camps and gatherings in their mountain territories (reflecting in many ways their original camping practices as part of the traditional seasonal round), resuming root-digging, berry picking, and the social aspects of these activities as part of an overall cultural revitalization and restoration. These mountain camps serve as a pleasurable way for sharing and renewing knowledge, skills, experiences and stories –especially those pertaining to these mountain environments– across generations and among the different families (Senos et al. 2006).

Discussion

Though the two primary case studies we address here are separated by many hundreds of kilometers, on different sides of an international boundary, and involve the intensification of different species, the general patterns of traditional aboriginal use, management, and occupation in these settings are remarkably consistent. These consistencies reflect a broader pattern of seasonal subalpine resource use and management that are shared by Native peoples throughout the Northwestern Cordillera. Reviewing the similarities between these case studies, we propose that no fewer than five major themes can be identified regarding Indigenous Peoples' use and occupancy of the Pacific Coastal Mountains and subalpine parkland ecosystems of western North America. Firstly, Indigenous societies have relied for millennia on these ecosystems and their resources, including plant resources, which are often overlooked in ethnographic descriptions of peoples of the region. The use of mountain sites extends widely around the main centers of habitation, sometimes involving trips of many kilometers for hunting, fishing, berry harvesting or trading, while people are based at their mountain residences. Over 100 species of plants have been specifically documented as having been sought as sources of food, materials, or medicines (Table 1), and many of these have played a major role in peoples' subsistence and cultural practices. The significance of these places, however, is not limited to hunting, root harvesting or berry procurement. Montane environments have been major destinations in the course of peoples' seasonal harvesting rounds and as such, provide the context for a wide range of social activities and relationships. Many contemporary elders recall pleasant times from their childhoods or as young adults when they traveled with other individuals and families to camp for extended periods in the mountains, participating in harvesting food and medicines and in various social activities. Traveling to and from these key habitats and spreading out from these nodes is a part of who they are and what they represent. All of these diverse activities are inseparable components of the mountain experience.

Secondly, Indigenous Peoples have played a notable role in maintaining and managing montane ecosystems and resources. Through burning, ceremonial scattering of berries and seeds, pruning berry bushes and various other activities such as selective harvesting, they created productive anthropogenic landscapes

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(Anderson 2005, 2009; Deur and Turner 2005). Clearly, the ecosystems of ***iwamkani***, ***pt-én'i*** and other montane landscapes frequented by people are in some significant part anthropogenic, influenced and molded by human actions, although experimental data has not yet been gathered to assess the full dimensions of this human influence.

Thirdly, the events following European entry into western North America have affected Indigenous Peoples' use of and interactions with their montane environments in profound ways. In contrast to their lowland dwelling places, Indigenous Peoples were often able to continue some of their cultural practices and teachings in the mountains with comparatively little interference from colonial laws. Even here, however, they were restricted by the actions of the newcomers. Industrial scale resource extraction over the past century has impacted Indigenous lifeways in mountain areas heavily. Throughout the entire region, longstanding patterns of Indigenous resource use, management and tenure of montane environments have been significantly altered and generally suppressed. Common to all the cases of industrial degradation of subalpine parkland resources is that government and industry agencies have operated on the pretense that these montane regions are largely unoccupied and uninhabited, or that any known traditional uses are irrelevant in the face of economic development (cf. Furniss 1999). This assumption, and its vast and deleterious consequences, have clearly affected those parts of northwestern North America beyond the subalpine zone as has been discussed elsewhere in relation to indigenous resource use (Deur and Turner 2005).

Following from the previous point, and in large part as a legacy of colonial policies as well as other complex factors (cf. Turner and Turner 2008), the fourth observation is that use and occupancy of montane areas and traditional harvesting of mountain resources has declined in recent decades. In part, this decline has paralleled an overall loss of cultural knowledge and language, accompanying globalization and homogenization and loss of biocultural diversity on a global scale (Turner et al. 2008). The threat of global climate change looms large as a further and continuing constraint on the montane ecosystems important to Indigenous Peoples, as well as to others. The mountains, like the polar regions of the Earth, may be the most drastically affected by climate change, with impacts on snowfall and winter snowpack, soil moisture and species distributions at upper elevations (GLORIA 2007).

The final theme of this paper relates to the continued and future use of montane resource sites. Although Indigenous Peoples' use of montane areas has been heavily constrained in recent years, the cultural significance of these places remains strong and their attachment to areas like ***pt-én'i*** and ***iwamkani*** have not only endured, they are being strengthened and revitalized. Today, social and ceremonial gatherings reflecting ancient practices take place annually at many upland sites, reasserting peoples' ties to these distinctive places, which continue to serve as places of teaching, sites for reunion of family members widely dispersed at other times, and areas for maintaining long-standing harvesting practices –hunting, fishing, root digging, berry picking and medicine gathering– that tie people directly and intimately to their ancestors and their heritage. The foods that people harvest may no longer be staples in people's diets, but their

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consumption has become deeply symbolic of cultural persistence, of resistance, and of enduring connections to the land (Deur 2002a, 2005; Turner and Turner 2008). In short, many people have been able to retain key elements of their mountain seasonal rounds right to the present, and these serve as a legacy on which to build future relationships –relationships that may well serve to instruct people everywhere about sustainable use and cultural values in the context of modern lifestyles.

Conclusion

This article has examined, from previous ethnographies and case examples, an under-emphasized aspect of the cultural ecology of the Pacific Northwest, namely the traditional use and occupancy of the Pacific Coastal subalpine parkland ecosystems by Indigenous Peoples, including the effects of human activities on plant resources. It has also identified some of the changes that have occurred in these uses and practices as a result of colonial and industrial policies that have effectively limited people's access and control over traditional montane resource areas. Reduction in access to these areas and in use of their resources has, in some cases, reduced the resources themselves, since traditional practices often enhanced the productivity, diversity, and quality of key resource species and habitats. This is particularly the case for species promoted by traditional landscape burning practices. Our research is intended as a contribution to broader ethnography of the region, to raise awareness of the past and present ethnobotanical importance of subalpine parkland ecosystems. In particular, we hope it also begins to build a framework for anthropologists, biologists, managers and cultural heritage policy makers to better appreciate the scope of the traditional use of subalpine parkland and its role in high elevation ecosystems for First Peoples, and to assist in developing strategies that might lead in the future to increased recognition, preservation and renewal of traditional practices in montane areas.

All of the culturally valuable plants we have identified in this study still persist in their high elevation environments, and the remnant anthropogenic plant communities persist there too. This fact, alongside the enduring ecological knowledge of First Nations elders, gives us some hope that Indigenous practices of montane dwelling and high elevation resource use, and the plant communities and cultures they once sustained, will not disappear but rather will continue to be renewed and strengthened. Montane environments are highly significant elements of our biocultural heritage and greater effort should be made to document and protect them for continued social-ecological health and well-being.

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