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"WHEN EVERYTHING WAS SCARCE": THE ROLE OF PLANTS AS FAMINE FOODS IN NORTHWESTERN NORTH AMERICA

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ABSTRACT.—Interviews with indigenous elders and literature reports indicate that plants have historically played an important role as famine and survival foods for Indigenous Peoples of northwestern North America. Over 100 species of plants are noted to have been used in any of a variety of circumstances to alleviate hunger and aid in survival in times of food scarcity. In prehistoric and early historic times, food shortages occurred periodically, usually in late winter and early spring when bad weather and other circumstances coincided with low quantities of stored foods and unexpected scarcity of fish and game. Plant foods used in times of food scarcity fall generally within four categories: regular foods whose use became more important under certain circumstances, largely due to extended availability; alternative, less preferred foods, used casually in normal times but having minimal dietary contribution except in times of food scarcity; starvation foods or products never used under normal circumstances but only consumed in times of extreme hunger or famine; and hunger suppressants and thirst quenchers, generally used during short periods of food and water deprivation. The cultural role of famine plant foods in the study area is examined.

RESUMEN.—Las entrevistas con ancianos indígenas y las fuentes bibliográficas indican que historicamente las plantas han jugado un papel importante como alimentos de hambruna y de sobrevivencia para los pueblos indígenas del noroeste de Norteamérica. Se ha encontrado que más de 100 especies de plantas han sido usadas en cualquiera de una variedad de circunstancias para aliviar el hambre y ayudar a sobrevivir en tiempos de escasez de alimento. En la epoca prehistórica y a principios del período histórico, las hambrunas ocurrían periodicamente, generalmente a fines del invierno y principios de la primavera, cuando el mal tiempo y otras circunstancias coincidían con bajas cantidades de alimentos almacenados y escasez inesperada de pesca y caza. Los alimentos vegetales empleados en épocas de escasez generalmente entran en cuatro categorías: alimentos consumidos regularmente, cuyo uso se hacía más importante bajo ciertas circunstancias, principalmente debido a su amplia disponibilidad; alimentos alternativos, menos preferidos, usados casualmente en tiempos normales pero que ofrecen una contribución dietética mínima excepto en tiempos de escasez; alimentos o productos para hambruna, nunca usados bajo circunstancias normales y sólo consumidos en tiempos de escasez extrema; y supresores de hambre y de sed, generalmente usados durante

períodos breves de carencia de alimento y bebida. Se examina el papel cultural de los alimentos vegetales para hambruna en el área de estudio.

RÉSUMÉ.—Les entrevues avec des autochtones aînés et des articles scientifiques indiquent que les plantes ont joué historiquement un rôle très important comme nourriture dans les conditions de disette et de survivance pour les peuples autochtones du nord-ouest de l'Amérique du nord. Plus de 100 espèces de plantes sont réputées d'avoir été utilisées dans des circonstances diverses pour apaiser la faim et pour aider dans les périodes de disette. Aux temps préhistoriques et aux premiers temps historiques, la disette arrivait périodiquement, généralement vers la fin de l'hiver et au début du printemps quand le mauvais temps et d'autres circonstances coïncidaient avec une réserve limitée de provisions et un manque imprévu de poisson et de gibier. Les aliments végétaux utilisés en temps de disette de vivres se classent généralement dans quatre catégories: les aliments réguliers dont l'usage est devenu plus important dans certaines circonstances, dû surtout à leur disponibilité prolongée; d'autres aliments moins préférés, utilisés infréquemment dans des circonstances normales, mais ayant une contribution diétique minimale sauf dans des périodes de disette de vivres; les aliments ou produits de fortune, jamais utilisés dans des circonstances normales, mais consommés seulement aux temps de faim extrême ou de famine; et les moyens de fortune pour tromper la faim et la soif, utilisés généralement pendant les courtes périodes de disette d'eau et de vivres. Nous examinons également le rôle culturel joué par des plantes alimentaires employées aux temps de famine dans la région de cette étude.

INTRODUCTION

> The people of mythical times were dying of hunger. They had only sagittaria-roots [*Sagittaria sagittata*] to eat. They had only small sagittaria-roots and skunk-cabbage [*Lysichitum americanum*] and . . . rush roots [?*Typha latifolia*] to eat. In the spring of the year the Salmon went up the river. They had first arrived with many companions. . . . Then the Skunk-cabbage said: "At last my brother's son has arrived. If it had not been for me, your people would have been dead long ago." Then the Salmon said, "Who is that who is talking there?" "Oh, that is the Skunk-cabbage who is talking." "Let us go ashore." They gave him five elk skins and put war clubs under his blanket, one on each side. . . . Then they carried him inland and placed him among willows (Kathlamet Text, Oregon. Boas 1901:50).[1]

Northwestern North America, particularly the Northwest Coast, is a region generally assumed to be rich in traditional food resources (see map of study area, Fig. 1). For example, in a description of Haida Gwaii (Queen Charlotte Islands), Beals and Hoijer (1959:27) note that for the Haida ". . . Both land and marine fauna are exceptionally rich . . . Coastal waters and rivers teem with fish . . . The potential food supply is consistent and dependable, for though it is less in winter, there is no season when food is really difficult to obtain. . . ." Suttles (1990:28) describes the Northwest Coast as an area ". . . providing everywhere abundant and dependable sources of food." The Interior region of northwestern North America is also considered to be well endowed with food resources, especially along the salmon rivers (Marshall 1977; Romanoff 1992; Hunn 1990; Kennedy and Bouchard 1992). Throughout northwestern North America a wide variety of both

FIG. 1.—Map of northwestern North America showing Aboriginal groups mentioned in the paper.

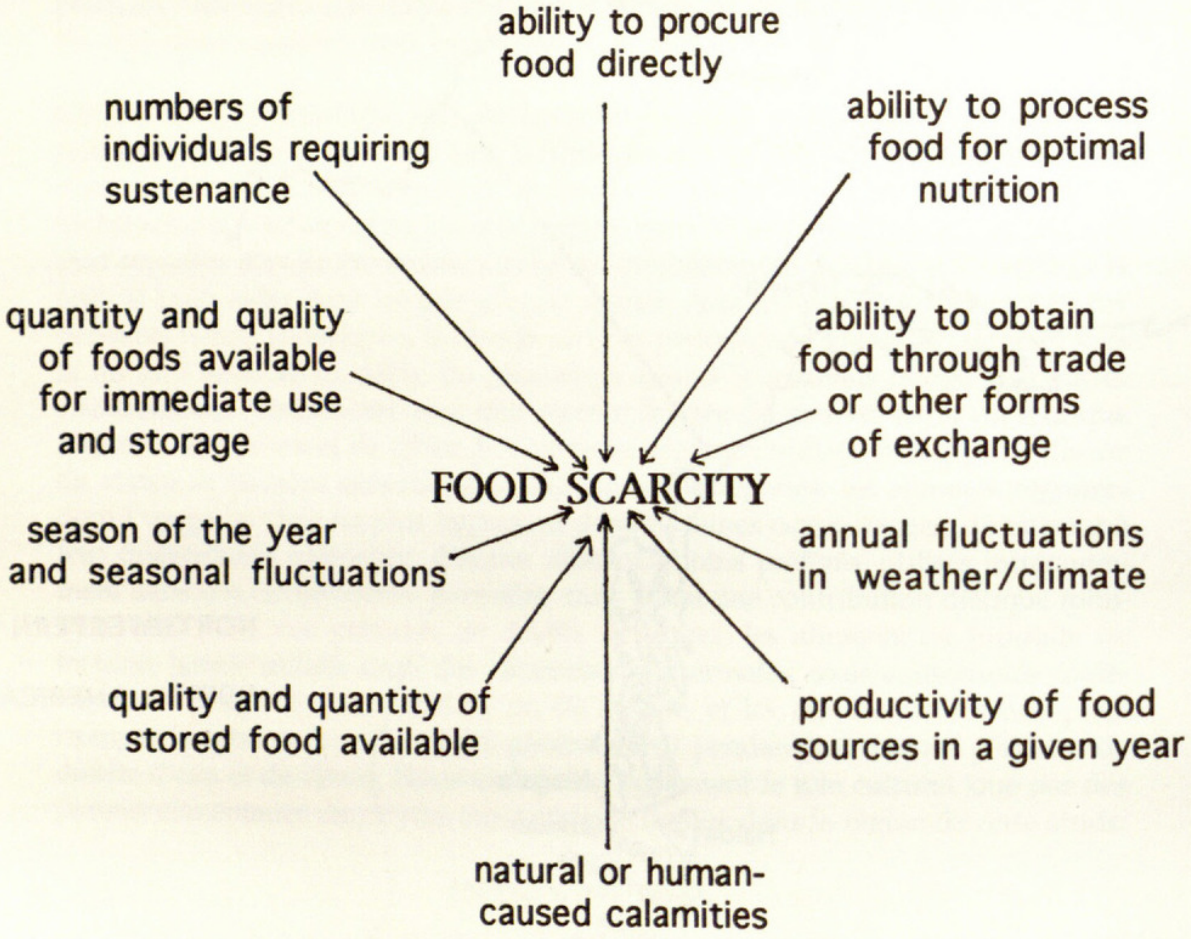

FIG. 2.—Factors influencing food scarcity.

animal and plant foods contributed to the traditional diet (Teit 1900, 1909; Turner 1975, 1978; Marshall 1977; Laforet et al. 1994; Keely 1980; Norton 1981; Hunn 1981, 1990; Hunn et al. 1994; Kuhnlein and Turner 1991).

Yet, for any group of people within the area, the ability to sustain themselves depended upon a wide variety of factors, mostly unpredictable, shown schematically in Fig. 2. Sometimes several of these factors acting together resulted in a scarcity of foods within a locality or over a broader region. If a period of severe or stormy weather occurred in a season of the year such as early spring when there were few fresh or stored food resources available, the result could be food scarcity. If stored foods were destroyed by some natural disaster such as fire or flood, or in warfare, at a time of the year when fresh food was not readily available, famine could ensue. At such times, certain plant foods, because of their more constant and reliable presence, became critical for survival. This paper explores the consumption of plant foods during times of food scarcity in northwestern North America. First, a general overview of circumstances causing food shortages within different regions and groups will be presented, followed by a discussion of different types of famine plant foods. Finally, some cultural considerations and other features of famine foods will be addressed.

Conditions of famine among northwestern aboriginal groups.—Famine conditions are reported from early times throughout the study region, although frequency and

severity of food shortages varied. Suttles (1987) notes generally that in places along the Northwest Coast, food scarcity could result from a prolonged stretch of bad weather, or from the failure of a fish run, combined with human failure to have accumulated an emergency food supply. Drucker (1951) and Dewhirst (1978) also report the occurrence of famine under certain circumstances among Nuu-chah-nulth (Nootka) of the west coast of Vancouver Island, particularly in early spring, sometimes as a result of a poor dog salmon or herring run followed by an unusually stormy winter or spring.

Kennedy and Bouchard (1983:25) report one instance for the Sliammon (Comox) when ". . . . the berries did not ripen, the salmon did not come and the animals seemed to have left the country" and famine resulted, but note that such occurrences are rare. For the Kwakwaka'wakw (Kwakiutl), starvation was also rather infrequent, with famine stories occurring mainly among the tribes living at the heads of the inlets of the mainland, not among those who dwell near the open sea, where seals, sea lions, salmon, and halibut are plentiful (Boas 1935).

Further north along the Pacific Coast, conditions of scarcity increased in frequency and severity. Boas (1935:171) notes that the Tsimshian were more vulnerable to famine than the Kwakwaka'wakw (Kwakiutl), a circumstance supported by other researchers (e.g., Port Simpson, People of 1983:53). Suttles (1987) speculates that the northern coast had fewer resources, but these occurred in greater concentrations, thus possibly magnifying the dangers of resource failure through human error or natural calamity. The trend towards increasing incidences of food shortage for northerly latitudes is emphasized by the work of Eidlitz (1969) for the circumpolar region.

In inland regions, the risks of food shortage were apparently greater still. The Gitksan of the Upper Skeena River, the Nisga'a of the Nass River, and the Koyukon of inland Alaska, for example, were all subject to bouts of starvation ('Ksan, People of 1980; Nelson 1983). "If the winter was longer or colder than usual, or if the salmon run was late, or the winter supply of stored food was destroyed by fire, or raiders came from the Nass, or some other calamity occurred, then things could be tough—very tough . . ." ('Ksan, People of 1980:13–14).

Teit (1909:513, 515, 517) notes "times of great famine" and "great scarcity" among the Secwepemc (Shuswap), and periods of famine due to seasonal fluctuations in salmon, deer and other game were also known to the Lillooet and Nlaka'pamux (Thompson) (Turner 1992; Turner et al. 1990; Teit 1900). Teit (1900, 1909) described several major fluctuations in populations of deer, mountain sheep, mountain goat, elk, and caribou in the Nlaka'pamux (Thompson) and Secwepemc (Shuswap) areas that certainly would have influenced food availability. Natural disasters also played a role in determining food supply. Hayden and Ryder (1991) concluded that a major prehistoric cultural collapse in the Lillooet area probably occurred due to catastrophic landslides that dammed the Fraser River disrupting salmon supplies. Hunn (1990), in his work with the Sahaptin of the Mid-Columbia, supports the general contention that winter and early spring are critical times for food shortages, and that maintaining an adequate supply of dried provisions was essential for survival.

Aside from general communal or regional food shortages that affected large

numbers of people simultaneously, there were instances where individuals and families suffered from food deprivation due to particular circumstances. For example, a hunter pursuing game may prefer to go hungry than return empty-handed, and may resort to certain emergency foods or hunger suppressants to enable him to continue. A traveller or hunter may become lost, or simply run out of food before a destination is reached. Or a family may be unlucky enough to lose a provider, and hence not be able to accumulate necessary food supplies. In all of these cases, people might resort to more easily procured but possibly less desirable sources of nourishment.

FAMINE PLANT FOODS OF NORTHWESTERN NORTH AMERICA

The nature of famine foods.—Famine foods are those resorted to at times when, for whatever reason, the foods normally eaten are unavailable (Minnis 1991). As noted previously, plant foods seem to have taken on a particularly prominent role during times of food scarcity, because for those that could be harvested at lean times of the year, their availability was more predictable than that of fish or game. Plant foods used in times of food scarcity fall generally within four categories:

(1) regular foods whose use became more important under certain circumstances, largely due to extended availability;
(2) alternative or secondary foods, used minimally or casually in normal times, but used in larger quantities in times of food scarcity;
(3) true famine foods—those never eaten except in times of extreme hunger; and
(4) hunger suppressants and thirst quenchers, generally used during short periods of food and water deprivation.

Tables 1 to 4 list examples of plants within these four categories of use during times of food scarcity.

It is difficult to differentiate completely among these general categories, since there is considerable variation in the roles of particular plant foods in different regions, or even among various cultural groups and individuals. Ecotypic and chemical intraspecies variation result in different qualities and quantities of a particular food. For example, Bouchard and Kennedy (1977) note that the tiger lily *(Lilium columbianum)* bulb varies in taste depending on the particular area in which the plant is growing. Cow-parsnip *(Heracleum lanatum)* is also known to vary in flavor and quality from one area to another (Kuhnlein and Turner 1987). Different cooking and preparation techniques affect the palatability and digestibility of certain foods. (Turner 1977; Turner and Kuhnlein 1983). Boas (1921:533), for example, notes that a woman digging clover roots *(Trifolium wormskioldii)* might eat them raw when she gets hungry, but implies that the roots were much preferred cooked. Furthermore, there are cultural preferences for certain foods. Fireweed shoots *(Epilobium angustifolium)*, for example, are eaten only in times of scarcity in some areas, and eaten as standard fare in others (Turner 1975). Furthermore, mature fireweed stalks were sometimes used out of necessity, but were less preferred than the young shoots.

Black tree lichen *(Bryoria fremontii)* is another food having highly variable

preference ratings in different regions. Some people, such as the Flathead of Montana, regarded it as a luxury, especially when it was mixed with dried, powdered camas *(Camassia quamash)* (Stubbs 1966). Ray (1932:104) classes it, when cooked together with alternate layers of wild onion as "one of the best liked of all vegetable preparations" among the Sanpoil-Nespelem Okanagan. Yet in other areas it was not highly regarded. This is possibly due to ecotypic variation, or to the contamination of this apparently mild-tasting species with other, more bitter species of *Bryoria*. Certainly, there are indications that the lichen varies widely in taste, depending on locality, elevation, and species of substrate tree (Turner 1977; Marshall 1977). Furthermore, preparation techniques likely influenced the palatability of the lichen considerably. It could be eaten raw and unprocessed in times of extreme need (Mary Thomas, Secwepemc elder, personal communication to NT, 1991). Under normal circumstances, however, the preparation procedures for it were complex, involving harvesting in quantity from pre-tasted populations, soaking in fresh water for several hours or overnight, pounding or working with the hands, then pit-cooking. (Marshall 1977; Turner 1977; Turner et al. 1980). The cooked "loaves" were then dried. Most people who know about this lichen agree that cooking is essential to make it edible. Cooking presumably helped to break down partially the complex lichen carbohydrates that were mostly indigestible for humans. The cooked, dried lichen that could be stored without deterioration for three or more years, was said to be a good sustainer on long journeys (Turner 1978). In times of scarcity, the Kootenay were said to boil it with the stomach contents or even droppings of the "fool hen" (grouse) for flavoring (Hart 1976). The unprocessed, raw lichen, when dry, could also be stored overwinter, to be processed and used as needed. Thus at times, and in some regions, black tree lichen could be considered a standard, "normal" and even preferred food. Under other circumstances, it would serve as an alternate food, and in some cases, it could be classified as a true famine food that was potentially toxic, or at least indigestible, when not properly prepared.

It seems that, even in the best of times, black tree lichen was not as highly regarded a food as salmon. This is reflected in the Lillooet story of "The Abandoned Boy" (Bouchard and Kennedy 1977:31), when Raven got salmon from the boy (during a food shortage), after the boy had obtained special powers from the Sun. Raven, not wanting to reveal his good fortune to the other villagers, told them that the food he had was black tree lichen bread, with the implication that this was not a particularly desirable food.

Despite such obvious discrepancies, for purposes of this paper an attempt is made to differentiate among foods within these categories. In cases such as that of black tree lichen and fireweed, these are included under more than one category in Tables 1–4.

Standard plant foods particularly valued in times of food scarcity.—Table 1 provides a list of plant foods of northwestern North America, eaten generally in normal times, but which have been noted in the literature, or by Indigenous elders in interviews, as having been particularly valuable or useful as survival foods in times of food shortage. Also included are plant foods known particularly for their

availability for harvesting during the winter and early spring, seasons when food shortages occurred most frequently.

Table 1 lists over 60 plant foods recognized as having had particular importance in times of scarcity, or in times when food scarcity was a highly probable occurrence. Included are 10 tree species whose inner bark was eaten, 19 green vegetable species and 30 "root" vegetables available in early spring, one lichen and one alga, as well as balsamroot seed meal and three fruits that could be found

TABLE 1.—Traditional plant foods of northwestern North America, used regularly, but particularly valuable or useful as survival foods in winter and/or early spring.

Plant (common name)	Part Consumed	Cultural Group	Reference
Inner Bark			
Abies lasiocarpa (Hook.) Nutt. (subalpine fir)	inner bark (occasional)	Nlaka'pamux	Turner et al. 1990
Alnus rubra Bong. (red alder)	inner bark	Saanich, Sechelt, Coast Salish, general	N. Turner, unpublished notes, 1992, 1972, (in her possession)
Picea engelmannii Parry ex Engelm. (Engelmann spruce)	inner bark	interior peoples, general	Kuhnlein and Turner 1991
P. glauca (Moench) Voss. (white spruce)	inner bark	interior peoples, general; Tanaina	Kuhnlein and Turner 1991; Kari 1987
P. sitchensis (Bong.) Carr. (Sitka spruce)	inner bark	coastal peoples; Tanaina (emergencies)	Kuhnlein and Turner 1991; Kari 1987
Pinus albicaulis Engelm. (whitebark pine)	inner bark	interior peoples, general	Kuhnlein and Turner 1991
P. contorta Dougl. ex Loud. (lodgepole pine)	inner bark	interior peoples, general	Kuhnlein and Turner 1991
P. ponderosa Dougl. (ponderosa pine)	inner bark	south interior peoples, general	Kuhnlein and Turner 1991
Populus balsamifera L. (balsam poplar, cottonwood)	inner bark	Nuxalk, Lillooet, Haisla, others	Kuhnlein and Turner 1991
Tsuga heterophylla (Raf.) Sarg. (western hemlock)	inner bark	Coast Tsimshian, other coastal and neighbouring peoples	Port Simpson, People of 1983; Kuhnlein and Turner 1991

Plant (common name)	Part Consumed	Cultural Group	Reference
Lichens and Algae			
Bryoria fremontii (Tuck.) Brodo (black tree lichen)	whole thallus	Nlaka'pamux, Lillooet and other interior peoples	Turner 1977; Turner et al. 1990; Kuhnlein and Turner 1991
Porphyra abbottae J. Agardh. (red laver)	whole, young plants	Coast Tsimshian and other coastal peoples	Turner 1975; Port Simpson, People of 1983
Springtime "Green Vegetables"			
Balsamorhiza sagittata (Pursh) Nutt. (balsamroot, spring sunflower)	young leaves	Okanagan and other interior peoples	Turner 1978; Turner et al. 1980; Kuhnlein and Turner 1991
Epilobium angustifolium L. (fireweed)	young shoots	Haida, Nisga'a, Lillooet and others	Turner 1975, 1978; Kuhnlein and Turner 1991
Equisetum arvense L. (common horsetail)	young shoots	western Washington groups	Gunther 1973
E. telmateia Ehrh. (giant horsetail)	young shoots	coastal peoples, general	Turner 1975; Kuhnlein and Turner 1991
Heracleum lanatum Michx. (cow-parsnip, "Indian rhubarb")	young budstalks and leafstalks	northwestern peoples, general	Port Simpson, People of 1983; Turner et al. 1990; Kuhnlein and Turner 1991
Lomatium dissectum (Nutt.) Math. & Const. (chocolate tips)	young shoots	Okanagan; Nez Perce and Warm Springs Sahaptin	Turner et al. 1980; Meilleur et al. 1990
L. grayi Coult. & Rose (Gray's lomatium)	stems, young shoots	Nez Perce	Marshall 1977
L. macrocarpum (H. & A.) Coult. & Rose (desert parsley, hog-fennel, "wild carrot")	young leaves	Nlaka'pamux	Turner et al. 1990
L. nudicaule (Pursh) Coult. & Rose ("Indian celery"; barestem lomatium)	young leaves and shoots	Lillooet, Nlaka'pamux, Secwepemc and other interior peoples	Turner 1975, 1978; Kuhnlein and Turner 1991
L. salmoniflorum (Coult. & Rose) Math. & Const. (salmon lomatium)	young leaves	Nez Perce	Marshall 1977
Lomatium spp. (lomatiums—general)	young greens	Sahaptin, Nez Perce	Hunn and French 1981; Hunn 1990

TABLE 1.—Traditional plant foods of northwestern North America, used regularly, but particularly valuable or useful as survival foods in winter and/or early spring. (continued)

Plant (common name)	Part Consumed	Cultural Group	Reference
Opuntia fragilis (Nutt.) Haw. (fragile prickly-pear cactus)	fleshy stem segments	Nlaka'pamux, Okanagan; interior peoples, general	Kuhnlein and Turner 1991
O. polyacantha Haw. (plains prickly-pear cactus)	fleshy stem segments	Nlaka'pamux, Lillooet, Okanagan; interior peoples, general	Turner et al. 1980; Turner et al. 1990; Kuhnlein and Turner 1991
Rubus idaeus L. (wild red raspberry)	young shoots	Nlaka'pamux and other interior peoples	Kuhnlein and Turner 1991
R. leucodermis Dougl. (blackcap, wild black raspberry)	young shoots	Nlaka'pamux and other interior peoples	Kuhnlein and Turner 1991
R. parviflorus Nutt. (thimbleberry)	young shoots	coastal and interior peoples, general	Turner 1975, 1978; Kuhnlein and Turner 1991
R. spectabilis Pursh (salmonberry)	young shoots	coastal peoples, general	Turner 1975; Port Simpson, People of 1983; Kuhnlein and Turner 1991
Triglochin maritimum L. (arrow-grass)	young leaf bases of vegetative plants (Note: may be toxic)	Sechelt, Comox and other coastal peoples	Turner 1975; Kuhnlein and Turner 1991
Typha latifolia L. (cattail)	young shoots	Carrier and other peoples	Carrier Linguistic Committee 1973
Zostera marina L. (eelgrass)	leaf bases and rhizomes	Kwakwaka'wakw and other coastal peoples	Boas 1921; Turner 1975
Some "Root" Vegetables Available in Spring			
Balsamorhiza hookeri Nutt. (Hooker's balsamroot) and other *Balsamorhiza* spp.	taproots	Sahaptin and other southern Plateau peoples	Hunn 1990
Balsamorhiza sagittata (balsamroot, spring sunflower)	taproots, side roots	southern interior peoples, general	Marshall 1977; Turner 1978; Turner et al. 1980; Turner et al. 1990; Hunn 1990

Plant (common name)	Part Consumed	Cultural Group	Reference
Brodiaea hyacinthina (Lindl.) Baker [and *B. douglasii* S. Wats.] (false onion)	bulbs	Lillooet and Nlaka'pamux Sahaptin	Bouchard and Kennedy 1977; Turner 1978; Turner et al. 1990; Hunn 1990
Calochortus macrocarpus Dougl. (mariposa lily)	bulbs	Lillooet, Secwepemc, Sahaptin, and others	Bouchard and Kennedy 1977; Turner 1978; Hunn 1990
Camassia quamash (Pursh) Greene (common camas)	bulbs	coastal and southern interior peoples, general	Turner 1975, 1978; Marshall 1977; Turner and Kuhnlein 1983; Hunn 1990; Kuhnlein and Turner 1991
C. leichtlinii (Baker) Wats. (giant camas)	bulbs	coastal peoples, general	Turner 1975; Turner and Kuhnlein 1983; Kuhnlein and Turner 1991
Cirsium undulatum (Nutt.) Spreng. (wavy-leaved thistle)	taproots	Nlaka'pamux and other interior peoples	Turner et al. 1990
C. edule Nutt. (edible thistle)	taproots	Nlaka'pamux and other interior peoples	Turner et al. 1990
C. hookerianum Nutt. (Hooker's thistle)	taproots	Nlaka'pamux and other interior peoples	Turner et al. 1990
Claytonia lanceolata Pursh (spring beauty)	corms	Nlaka'pamux, Chilcotin, and other interior peoples	Turner 1978; Turner et al. 1990; Hunn 1990; Kuhnlein and Turner 1991
Dryopteris expansa (Jacq.) Woynar (spiney wood fern)	rootstocks	Northwest Coast, and some interior peoples, general	Turner et al. 1992
Erythronium grandiflorum Pursh (yellow avalanche lily)	bulbs	Nlaka'pamux, Secwepemc, Chilcotin, and other interior peoples	Turner 1978; Turner et al. 1990; Kuhnlein and Turner 1991
E. revolutum Smith (pink Easter-lily)	bulbs	Kwakwaka'wakw and some other coastal peoples	Boas 1921; Turner 1975
Fritillaria camschatcensis (L.) Ker-Gawl (mission-bells)	bulbs	Haida and other coastal peoples; Nisga'a, Gitksan	Turner 1975; Niblack 1890
F. pudica (Pursh) Spreng. (yellowbells)	bulbs	Lillooet, Nez Perce, and other interior peoples	Bouchard and Kennedy 1977; Marshall 1977; Turner 1978; Hunn 1990
Glaux maritima L. (sea milkwort)	roots	Kwakwaka'wakw	Boas 1921; Turner 1975

TABLE 1.—Traditional plant foods of northwestern North America, used regularly, but particularly valuable or useful as survival foods in winter and/or early spring. (continued)

Plant (common name)	Part Consumed	Cultural Group	Reference
Lewisia rediviva Pursh (bitterroot)	taproots	Interior Plateau peoples	Turner 1978; Hunn 1990; Turner et al. 1990
Lilium columbianum Hanson (tigerlily, Columbia lily)	bulbs	Lillooet, Nlaka'pamux, and other peoples, both coastal and interior	Turner 1975, 1978; Turner et al. 1990
Lomatium canbyi Coult. & Rose (Canby's lomatium)	tuberous roots	Nez Perce; Nlaka'pamux, and other Interior Plateau peoples	Marshall 1977; Hunn 1990; Turner et al. 1990
L. cous (Wats.) Coult. & Rose (cous, biscuitroot)	tuberous roots	Interior Plateau peoples	Turner 1978; Hunn 1990; Turner et al. 1990
L. grayi Coult. & Rose (Gray's lomatium)	tuberous roots	Sahaptin and other southern Plateau peoples	Hunn 1990
L. macrocarpum (Nutt.) Coult. & Rose (desert parsley)	taproots	Interior Plateau peoples	Turner 1978; Hunn 1990; Turner et al. 1990
Lomatium spp. (biscuitroots, other species)	thickened roots	various parts of the Plateau region	Hunn and French 1981; Hunn 1990
Lupinus nootkatensis Donn ex Sims (Nootka lupine)	roots (possibly toxic)	Kwakwaka'wakw, Nuxalk, and other coastal peoples	Boas 1921; Turner 1975
L. littoralis Dougl. ex Lindl. (seashore lupine)	roots (possibly toxic)	Haida, Kathlamet, and possibly other coastal peoples	Turner 1975
Perideridia gairdneri (H & A.) Mathias (Yampah, "Indian carrot")	tuberous roots	coastal (?) and southern interior peoples	Turner 1975, 1978; Hunn 1990
Potentilla anserina L. ssp. *pacifica* (L.) Howell and ssp. *anserina* (silverweed)	thickened roots	coastal and interior peoples, general	Turner and Kuhnlein 1982; Turner et al. 1990; Kuhnlein and Turner 1991
Pteridium aquilinum (L.) Kuhn. (Bracken fern)	rhizomes	coastal and interior peoples, general	Turner 1975, 1978; Norton 1979; Turner et al. 1990
Tauschia hooveri Math. & Const. (tauschia)	tuberous roots	Sahaptin and other southern Plateau peoples	Hunn 1990

Plant (common name)	Part Consumed	Cultural Group	Reference
Typha latifolia L. (cattail)	rhizomes	Lillooet, Nlaka'pamux, Kathlamet, and other peoples	Boas 1901; Bouchard and Kennedy 1977; Turner et al. 1990
Fruits (available in winter and/or spring)			
Arctostaphylos uva-ursi (L.) Spreng. (kinnikinnick)	berries	coastal and interior peoples, general	Carrier Linguistic Committee, 1973; 'Ksan, People of 1980; Kuhnlein and Turner 1991
Balsamorhiza sagittata (balsamroot, spring sunflower)	seed meal, as porridge	Flathead, Okanagan, and other southern Plateau peoples	Hart 1976; Turner et al. 1980
Empetrum nigrum L. (crowberry)	berries	northern peoples, general	Kuhnlein and Turner 1991
Viburnum edule Raf. (highbush cranberry)	berries	Carrier, interior people general	S. Birchwater, Anahim Lake, personal communication to NJT, 1991

during the winter and early spring, although two of the latter (*Arctostaphylos uva-ursi* and *Empetrum nigrum*) were in some areas less preferred fruits (see Table 2).

Spiney wood fern *(Dryopteris expansa)* is a good example of a "root" vegetable (Turner et al. 1992.). The rootstocks, which were dug and eaten in quantity from fall through spring, were also known in many areas as a good survival or starvation food. Tanaina consultants compared them favorably with clams as a survival food (Kari 1987); Gitksan people with hemlock cambium *(Tsuga heterophylla)* (Jeff Harris Sr., cited in Turner et al. 1992). The 'Ksan (Gitksan) people note that this fern ". . . has warded off starvation more than once." ('Ksan, People of 1980:79).

Some of the root vegetables were also used as staples in various areas, but might be specially sought when other, less predictable food sources failed or were unavailable for one reason or another. *Lilium columbianum* roots, for example, were normally used in small quantities as a condiment, but one Lillooet woman fed her family almost exclusively on these roots, cooked as soup, when she had no other food available (Margaret Lester, Mount Currie Band, personal communication, 1984). A similar situation has occurred in other areas. For example, among the Fisherman Lake Slave, the root vegetable *Hedysarum alpinum* L. was used as a winter starvation food as well as staple (Lamont 1977).

Alternative or less preferred plant foods.—In northwestern North America, a variety of traditional foods fit into the category of "less preferred." Among animal foods, fish-heads, storm-killed small fish, mussels and other shell-fish (Nuu-chah-nulth, Nlaka'pamux), small birds such as robins (Nlakapa'mux, Koyokon), and small predatory mammals, including dogs (Secwepemc), martins, and wolverines

TABLE 2.—Alternative plant foods: those eaten to some extent during normal circumstances, but having a minimal contribution under a normal dietary regime.

Plant (common name)	Part Consumed	Cultural Group	Reference
Inner Bark (see also TABLE 1; some species less preferred by some groups)			
Abies grandis (Dougl. ex D. Don) Lindl. (grand fir)	inner bark; cambium	Nlaka'pamux and some other groups	Turner et al. 1990; Kuhnlein and Turner 1991
Picea mariana (Mill.) B.S.P. (black spruce)	inner bark; cambium	Tanaina	Kari 1987
Pseudotsuga menziesii (Mirb.) Franco (Douglas-fir)	inner bark; cambium	Carrier and some other groups	B. Compton, personal communication to NJT, 1992
Lichens and Algae			
Bryoria fremontii (black tree lichen)	whole thallus	some interior groups	Kuhnlein and Turner 1991; see text
Green Vegetables			
Epilobium angustifolium (fireweed)	shoots; occasionally mature stalks	Haisla and some other groups, not preferred	Turner 1978; Teit 1909; Louise Barbetti, personal communication to AD, 1992)
Opuntia spp. (prickly-pear cacti)	fleshy stems	Blackfoot	Kuhnlein and Turner 1991
"Root" Vegetables			
Balsamorhiza incana Nutt. (balsamroot)	taproot	Nez Perce	Marshall 1977
Glaux maritima (sea milkwort)	roots (raw)	Kwakwaka'wakw, Sechelt, and Comox	Boas 1921; Kennedy and Bouchard 1983
Lomatium gormanii (Howell.) Coult. & Rose (Gorman's lomatium)	tuberous roots (*L. canbyi* roots preferred)	Nez Perce	Marshall 1977
L. salmoniflorum (salmon lomatium)	tuberous roots	Nez Perce	Marshall 1977
Lysichitum americanum Hult. & St. John (skunk-cabbage)	rhizomes (possibly toxic)	Lower Lillooet; Kathlamet	Boas 1901; Bouchard and Kennedy 1977
Polystichum munitum (Kaulf.) K.B. Presl (sword fern)	rootstocks	coastal peoples, general	Turner et al. 1992

Plant (common name)	Part Consumed	Cultural Group	Reference
Fruits			
Arctostaphylos uva-ursi (kinnikinnick)	berries	Lillooet and others	Kuhnlein and Turner 1991; Heller 1976
Berberis aquifolium (Pursh) Nutt. (tall Oregon-grape)	berries	general	Turner et al. 1990; Kuhnlein and Turner 1991
B. nervosa (Pursh) Nutt. (common Oregon-grape)	berries	coastal peoples, general	Turner et al. 1990; Kuhnlein and Turner 1991
Comandra umbellata (L.) Nutt. (bastard toadflax)	berries	Lillooet	Kuhnlein and Turner 1991
Cornus stolonifera Michx. (syn. *C. sericea* L.) (red-osier dogwood; "red willow")	berries	interior peoples, general	Turner et al. 1990; Kuhnlein and Turner 1991
Crataegus douglasii Lindl. (black hawthorn)	berries	coastal and interior peoples, general	Turner 1992; Turner et al. 1980
C. columbiana Howell (red hawthorn)	berries	interior peoples, general	Turner et al. 1980; Kuhnlein and Turner 1991
Disporum hookeri (Torr.) Nicholson (Hooker's fairybells)	berries	Nlaka'pamux and others	Turner et al. 1990
Maianthemum dilatatum (Wood) Nels. & Macbr. (wild lily-of-the-valley)	berries	coastal peoples, general	Turner 1975, 1978; Kuhnlein and Turner 1991
Oemleria cerasiformis (H. & A.) Land (Indian-plum; bird cherry)	drupes	south coastal peoples, general	Gunther, 1973; Turner 1975; Turner et al. 1990
Quercus garryana Dougl. ex Hook. (garry oak)	acorns	south coastal peoples, general	Gunther 1973; Kuhnlein and Turner 1991
Ribes aureum Pursh (golden currant)	berries	Nez Perce	Marshall 1977
R. cereum Dougl. (squaw currant)	berries	Interior Plateau peoples, general	Turner 1978; Turner et al. 1990
R. hudsonianum Richards. (northern black currant)	berries	interior peoples, general	Turner 1978; Turner et al. 1990
R. laxiflorum Pursh (trailing currant)	berries	coastal peoples, general	Turner 1975

TABLE 2.—Alternative plant foods: those eaten to some extent during normal circumstances, but having a minimal contribution under a normal dietary regime. (continued)

Plant (common name)	Part Consumed	Cultural Group	Reference
R. viscosissimum Pursh (sticky currant)	berries	Interior Plateau peoples, general	Turner 1978; Turner et al. 1990
Rosa acicularis Lindl (prickly wild rose)	hips	Western Washington and interior peoples, general	Gunther 1973; Hart 1976; Turner et al. 1980; Turner et al. 1990
R. nutkana Presl. (Nootka wild rose)	hips	coastal and interior peoples, general	Turner 1975, 1978; Kuhnlein and Turner 1991
R. gymnocarpa Nutt. (dwarf, or baldhip rose)	hips	Nlaka'pamux and other peoples	Teit 1909
R. woodsii Lindl. (Wood's wild rose)	hips	Nez Perce and other interior peoples	Marshall 1977
Rubus pedatus J. E. Smith (trailing raspberry)	druplets	coastal and interior peoples, general	Turner 1975, 1978; Norton 1981; Turner et al. 1990
Sambucus cerulea Raf. (blue elderberry)	berries	Nlaka'pamux and other interior peoples	Turner et al. 1990
S. racemosa L. (red elderberry)	berries	Straits, and other coastal peoples, general	Turner 1975, 1978; Kuhnlein and Turner 1991
Shepherdia canadensis (L.) Nutt. (soapberry, soopolallie)	berries	Blackfoot, and some other interior peoples	Johnston 1987
Smilacina racemosa (L.) Desf. (false Solomon's-seal)	berries	Nlaka'pamux and other interior peoples	Turner 1978; Turner et al. 1990
S. stellata (L.) Desf. (star-flowered Solomon's-seal)	berries	Nlaka'pamux and some other interior peoples	Turner 1978; Turner et al. 1990
Sorbus sitchensis Roemer (Sitka mountain-ash)	berries	coastal and interior peoples, general	Turner 1978; Turner et al. 1990
S. scopulina Greene (western mountain-ash)	berries	interior peoples, general	Turner 1978; Turner et al. 1990

(Koyokon) fit into this category, all being ". . . disdained in normal times" (Drucker 1951:36–37; see also Teit 1909; Laforet et al. 1994; Nelson 1983).

Table 2 provides an inventory of traditional plant foods of the secondary, less preferred type that became prominent when regular, preferred foods were un-

available. A total of 40 species are included, the majority (28) of which are fruits, together with about six less preferred root foods. An example of food in this category is rosehips (*Rosa nutkana* and *R. woodsii*) used by the Nez Perce, as well as by other groups. Marshall (1977) notes that these were not a favored food of the Nez Perce, and were collected only as a supplement to the regular diet, except in years where other fruits were in short supply. Then they would be gathered and dried in quantity for winter use. Another example is black hawthorn *(Crataegus douglasii)* among the Gitksan: "The fruit is dry and mealy and was eaten only if nothing else was available . . ." ('Ksan, People of 1980:72; see also Turner 1992 for Lillooet and Turner et al. 1980 for Okanagan).

As mentioned, some of the foods listed in Table 2 vary from one region to another in the preference people have for them. For example, soapberry *(Shepherdia canadensis)* was eaten only "in lean times" by the Blackfoot (Kuhnlein and Turner 1991), but the berries were, and still are, widely consumed as a whipped confection and as a beverage base by Aboriginal Peoples in British Columbia. Kinnikinnick *(Arctostaphylos uva-ursi)* berries are another rood well liked in some areas, and eaten only in necessity in others (Turner 1975, 1978).

Seasonal variation in berry productivity was often a cause for resorting to secondary fruits (Laforet et al. 1994 for Nlaka'pamux). Seasonal variation in "ripening" of root vegetables as noted by Marshall (1977) among the Nez Perce (for *Lomatium canbyi,* with maturation dates ranging from mid-March to mid-May depending upon the year), could also result in the need to search for alternative foods.

True famine foods.—Some "foods" were never eaten except in times of extreme hunger. There are many examples of such plant materials from central, northern, and eastern North America (Parker 1910; Aller 1954; Jones 1965; Eidlitz 1969; Lamont 1977; Marles 1984; Leighton 1985). Many of these famine foods are bitter and unpalatable, and some are toxic (Lamont 1977; Kuhnlein and Turner 1991).

There are a few examples of such foods from northwestern North America. These are listed in Table 3. Some of these, such as black tree lichen *(Bryoria fremontii)* and Nootka lupine roots *(Lupinus nootkatensis),* were used more generally as well, but as emergency or famine foods they were eaten raw. *Bryoria* contains bitter lichen acids, and, in its raw state, indigestible complex lichen carbohydrates that could cause discomfort and pain in the digestive tract. Lupines contain a number of potent alkaloids, including lupinine, lupanine, anagyrine, and sparteine, which act on the nervous system. Some also contain enzyme inhibitors and other toxins. These cause symptoms ranging from headaches to nausea and dizziness (Turner and Szczawinski 1991). Yet, in desperation, people turned to such foods.

Hunger suppressants and thirst quenchers.—Plant foods in this category are diverse and ecclectic (Table 4). They include products that could be considered simply as casual or occasional foods, but because some of them are specifically reported to serve as hunger suppressants, thirst quenchers, or sources of liquid in emergencies, they are included here, even though their actual survival value might be minimal. These "foods" were usually consumed by people travelling—hunters,

TABLE 3.—True famine foods: those never eaten except in times of extreme hunger.

Plant (common name)	Part Consumed	Cultural Group	Reference
Bark and Inner Bark (see TABLES 1 & 2; in some areas inner barks were eaten only in extreme emergencies)			
Lichens and Algae			
Bryoria fremontii (Black tree lichen)	raw thallus	Secwepemc	Mary Thomas, Salmon Arm, B.C., personal communication to NT, 1991
"Root" Vegetables			
Blechnum spicant (L.) Roth. (deer fern)	rootstock	western Washington peoples	Gunther 1973
Lomatium dissectum (chocolate tips)	taproots "starvation food"	Nez Perce	Marshall 1977
Lupinus nootkatensis (Nootka lupine)	raw roots (potentially toxic)	Kwakwaka'wakw	Boas 1921; Turner and Bell 1973; Turner 1975
Lysichitum americanum (skunk-cabbage)	rhizomes (potentially toxic)	Quileute, Kathlamet	Boas 1901; Gunther 1973
Fruits			
Elaeagnus commutata Bernh. ex Rydb. (silverberry)	berries	Blackfoot, Stoney, and others	Johnston 1987; Kuhnlein and Turner 1991)

berry pickers, or those lost in the woods—for temporary hunger or thirst suppression. A typical example is licorice fern rhizome *(Polypodium glycyrrhiza),* used as reported by Boas (1921:526): "When a hunter goes hunting, he holds a fern-root in his mouth in order not to get hungry and thirsty. . . ."

DISCUSSION

Importance of famine foods to survival.—The cultural and dietary significance of famine foods should not be underestimated (Turner 1988; Minnis 1991). Although many were used casually and some very infrequently, their contribution to survival of individuals, and even entire communities, was critical. This is illustrated by the following quotations from Nlaka'pamux (Thompson) elder Annie York, recollecting stories of famine told to her by her great aunt, Josephine George of the Nicola Valley (Turner et al. 1990:32):

TABLE 4.—Hunger suppressants and thirst quenchers[1]

Plant (common name)	Part Consumed	Cultural Group	Reference
Inner Bark (see also Table 2)			
Pyrus fusca Raf. (Pacific crabapple)	bark (chewed as thirst suppressant)	Oweekeno	B. Compton, personal communication to NT, 1992
Lichens and Algae			
Bryoria fremontii (black tree lichen)	raw thallus (chewed as thirst quencher)	Secwepemc	Mary Thomas, elder, Salmon Arm, personal communication to NT, 1991
Greens			
Arbutus menziesii Pursh (arbutus, Pacific madrone)	leaves (chewed for endurance)	Halkomelem	Turner et al. 1990
Arctostaphylos uva-ursi (kinnikinnick)	leaves (chewed as thirst quencher)	Nlaka'pamux	Turner et al. 1990
Blechnum spicant (L.) Roth. (deer fern)	fronds (hunger suppressant)	Ditidaht	Turner et al. 1983
Balsamorhiza sagittata (balsamroot, spring sunflower)	young shoots, greens (hunger suppressant)	Nlaka'pamux	Turner et al. 1990
Gaultheria shallon Pursh (salal)	young leaves (hunger suppressant)	Ditidaht	Turner et al. 1983
Lomatium salmoniflorum (salmon lomatium)	leaves (chewed)	Nez Perce	Marshall 1977
Picea sitchensis (Sitka spruce)	shoot tips (chewed)	Makah	Gunther 1973
Pinus contorta (lodgepole pine)	shoot tips (chewed)	Nlaka'pamux	Turner et al. 1990
Pseudotsuga menziesii (Douglas-fir)	shoot tips (chewed)	Nlaka'pamux	Turner et al. 1990
Tsuga heterophylla (western hemlock)	young shoots (hunger suppressant)	Ditidaht	Turner et al. 1983
"Roots"			
Polypodium glycyrrhiza (L.) DC. (licorice fern)	rhizomes (hunger, thirst suppressant)	Kwakwaka'wakw and other coastal peoples	Boas 1921; Kuhnlein and Turner 1991
Erythronium revolutum (pink Easter-lily)	raw bulbs (thirst quencher)	Kwakwaka'wakw	Boas 1921

TABLE 4.—Hunger suppressants and thirst quenchers[1] (continued)

Plant (common name)	Part Consumed	Cultural Group	Reference
Trifolium wormskioldii Lehm. (springbank clover)	raw rhizomes	Kwakwaka'wakw	Boas 1921
Fruits			
Cornus stolonifera Michx. (red-osier dogwood)	berries (chewed as thirst quencher)	Secwepemc	Mary Thomas, personal communication to NT, 1992
Juniperus scopulorum Sarg. (Rocky Mountain juniper)	"berries" (chewed as hunger suppressant)	Lillooet and possibly other groups	Kuhnlein and Turner 1991
Vaccinium oxycoccus L. (bog cranberry)	berries (chewed as thirst quencher)	Tanaina	Kari 1987
Viburnum edule (highbush-cranberry)	frozen berries (hunger suppressant)	Carrier and others of central British Columbia	S. Birchwater, personal communication to NT, 1991; Carrier Linguistic Committee 1973

[1]In addition to the above, the fluid in the hollow stem segments of *Equisetum telmateia* (giant horsetail) and *E. hiemale* L. (scouring rush) were regarded as safe for drinking in areas where the water might be contaminated by the Ditidaht, Gitksan *(E. hiemale),* and possibly other peoples ('Ksan, People of 1980; Turner et al. 1983).

Gum from the following trees was also chewed for pleasure, and possibly to suppress hunger: *Abies amabilis* (Dougl.) Forbes (amabilis fir; used by Ditidaht); *Larix occidentalis* Nutt. (western larch; used by Interior Salish); *Picea sitchensis* (Sitka spruce; Ditidaht and other coastal peoples); *P. glauca, P. engelmannii, P. mariana* (white spruce, Engelmann spruce; black spruce; Chilcotin, Carrier and other interior peoples); *Pinus contorta* (lodgepole pine—Nlaka'pamux and others); *P. monticola* Dougl. (white pine; Nlaka'pamux); *Pseudotsuga menziesii* (Douglas-fir; Nlaka'pamux and others) (cf. Carrier Linguistic Committee 1973; Turner et al. 1983; Turner et al. 1990; Kuhnlein and Turner 1991).

Teas were made from a number of plant products, and at some times, these may have been used to alleviate hunger or provide nutrients. "Tea plants" include: *Abies grandis* (grand fir; Nlaka'pamux and others); *A. lasiocarpa* (subalpine fir; Nlaka'pamux and others); *Pinus contorta* (lodgepole pine; Nlaka'pamux and others); *Pseudotsuga menziesii* (Douglas-fir; Nlaka'pamux and others); *Betula glandulosa* Michx. (scrub birch; Chilcotin); *Ledum groenlandicum* Oeder (Labrador-tea; widely used throughout region); *L. glandulosum* Nutt. (trapper's-tea; used by Interior Salish and Chilcotin); *Satureja douglasii* (Benth.) Briq. (*Yerba buena;* Straits Salish of southern Vancouver Island); *Mentha arvensis* L. (field mint; widely used); *Monarda fistulosa* L. (wild bergamot; purple beebalm; Secwepemc (Shuswap) and Kootenay).

But one time, that year was the famine. They had nothing, no fish, everything was scarce . . . So they went up Broadback [Mountain] . . . to try to get up to where this ***sk'áḿəc*** [avalanche lily, *Erythronium grandiflorum*] may be . . . they went up there in the spring. . . . And the people that eats ***hákʷu?*** [cow-parsnip, *Heracleum lanatum*] . . . was the ones that

> survived . . . They're very valuable food, when Indians had that ***hákʷu?*** . . . . and ***tətúwɬ*** [spring beauty, *Claytonia lanceolata*] . . . what they could dig out . . . survived. But the ones that didn't eat them, they're just trying to get a deer or something, then they died. [Those that ate] cow-parsnip and spring beauty, avalanche lily, tiger lily [*Lilium columbianum*] . . . and Indian carrot [*Lomatium macrocarpum*], and thistle [*Cirsium undulatum*] . . . so they eat that and they survive.
>
> They survived on that, too, the ***sá?eq*** root [bracken fern rhizomes, *Pteridium aquilinum*] . . . They go out and get that in the winter time . . . then take it and hit the bark off, and it's just the white in there, and you chew it. . . .
>
> The ***skéz'kəz'*** [prickly-pear cactus, *Opuntia fragilis* and *O. polyacantha*] they always eat it all right enough, but they had to eat it [during a famine]; my grandaunt told me, 'We eat that three times a day!' she says. There was no fish, nothing. And that [cactus] was all the children, even to the babies, had to eat . . . after they steam it. That was in springtime. . . .

Similarly, among the Haida, Niblack (1890:276–277) notes:

> Some of these berries are collected and dried for winter's use, forming, with dried fish, the principal winter's supply . . . they [Haida] often . . . eat up all the dried berries before spring, and were it not for a few bulbs [apparently *Fritillaria camschatcensis*] which they dig out of the soil in the early springtime, while awaiting the halibut-season, numbers of Indians really would starve to death.

Other foods such as black hawthorn berries *(Crataegus douglasii)* and spiney wood fern rootstocks *(Dryopteris expansa),* which might have been used casually in a mixed diet, or completely spurned in normal circumstances, took on far greater importance in lean times.

Of the various foods listed in Tables 1–4, only the "root" vegetables, and to a lesser extent the fruits, could have contributed substantially to the caloric content of peoples' diets. Cattail rhizomes *(Typha latifolia),* for example, contain 7.7 g protein and 79.1 g carbohydrate per 100 g fresh weight, and licorice fern *(Polypodium glycyrrhiza)* contains 24 grams carbohydrate, or 138 kcal. food energy per 100 g fresh weight (Kuhnlein and Turner 1991). However, in times of food shortage and famine, other nutrients might also have been limited. Hunn (1990:108) notes the potential importance of an early spring green vegetable in providing Vitamin C: "The key nutrient in these sprouts [*Lomatium nudicaule*] and stalks is Vitamin C. . . . Vitamin C may have been a nutrient in short supply in late winter for plateau peoples who had subsisted for several months on a diet of dried foods." Greens, roots, inner bark, casual foods such as those listed in Table 4, and even beverage and medicinal teas may have served as sources of such critical nutrients. Tables 5 and 6 provide levels of Vitamin A, Vitamin C, and B vitamins (thiamine, niacin, and riboflavin) in some of the springtime vegetables used by Indigenous People of northwestern North America (after Kuhnlein and Turner 1991).

The toxic qualities of famine foods need further investigation. Johns (1990)

TABLE 5.—Selected nutritional constituents for some indigenous early spring root vegetables of northwestern North America (after Kuhnlein and Turner 1991).

Species/food	Thiamine mg*	Riboflav. mg*	Niacin mg*	Vit. C mg*	Vit. A RE*
Common camas/bulbs *(Camassia quamash)*	0.07	0.05	—	4.0	—
Spiney wood fern/roots *(Dryopteris expansa)* (steamed)	0.06	0.04	0.6	—	0.3
Riceroot *(Fritillaria lanceolata)*	0.04	0.04	0.2	29.0	0
Bitterroot/roots *(Lewisia rediviva)* (fresh)	0.10	0.02	—	27.0	—
Silverweed/roots *(Potentilla pacifica)* (steamed)	0.01	0.01	2.4	—	0.2
Clover/roots *(Trifolium wormskioldii)* (steamed)	0.06	0.04	0.6	—	0.3

*per 100 g fresh weight; RE = retinol equivalent of ß-carotene

and Johns and Kubo (1988) provide a general discussion of strategies employed by people for detoxifying potentially harmful foods. In times of hunger, people may have had to resort to less edible products, and due to energy considerations, may have forgone the usual detoxifying preparation techniques. For example, cooking apparently expells some of the toxic alkaloids in lupine roots *(Lupinus nootkatensis, L. littoralis)*. Eating these roots raw, as was apparently done in times of famine, would have exposed people to higher levels of toxins. Skunk-cabbage *(Lysichitum americanum)* rhizomes are also known to be toxic in their raw state, due to the presence of calcium oxalate crystals (Turner and Szczawinski 1991). Even when cooked, they were said to be "hot" and "peppery" (Bouchard and Kennedy 1977). Raw black tree lichen *(Bryoria fremontii)* and yellow avalanche lily corms *(Erythronium grandiflorum)* would certainly have been less digestible than the cooked versions (Kuhnlein and Turner 1991).

Other potentially toxic foods that may have caused poisoning under some circumstances if used excessively include red elderberries *(Sambucus racemosa)* which contain cyanogenic glycosides. They have a reputation for causing nausea when eaten raw, and Boas (1921:594) notes, "They never drink water after eating them," and further, that they will cause nausea if eaten in the morning (Turner and Szczawinski 1991). The springtime green vegetable, arrow-grass *(Triglochin maritimum)*, also contains cyanogenic glycosides, as does bracken fern *(Pteridium aquilinum)* and the seeds of various fruits of the rose family, including wild cherries (*Prunus* spp.), hawthorns (*Crataegus* spp.), and mountain-ash (*Sorbus* spp.). Black hawthorn *(C. douglasii)* fruits have a reputation for causing stomach ache and constipation if eaten excessively, and may have compromised people's survival when used in quantity as a famine food. However, if as was likely, the seeds were swallowed intact, they would not have been particularly toxic.

TABLE 6.—Selected nutritional constituents for some indigenous early spring green vegetables of northwestern North America (After Kuhnlein and Turner 1991).

Species/food	Thiamine mg*	Riboflav. mg*	Niacin mg*	Vit. C mg*	Vit. A RE*
Balsamroot/greens (*Balsamorhiza sagittata*)	—	—	—	13.8	—
Fireweed/leaves (*Epilobium angustifolium*)	—	—	—	88.0	22
Horsetail/greens (*Equisetum arvense*)	0	0.07	5.6	50.0	18
Cow-Parsnip/peeled stalks (*Heracleum lanatum*)	0	0.12	0.3	3.5	7.5
Labrador-tea/leaves (*Ledum groenlandicum*)	0.01	0.40	92.0	98.2	—
Indian celery/greens (*Lomatium nudicaule*)	0.02	0.08	—	66.0	—
Red laver seaweed (*Porphyra* sp.)	0.37	1.79	6.7	11.6	263
Thimbleberry, peeled shoots (*Rubus parviflorus*)	0.01	0.09	0.3	5.9	41
Eastern hemlock (*Tsuga canadensis*)	—	—	—	238	—

*per 100g fresh weight; RE = retinol equivalent of ß-carotene

Cultural elements of food shortage.—To what extent were food shortages caused by overharvesting or other human impacts on traditional food resources? There is some evidence that local shortages occurred from excessive harvesting. For example, among the Sahaptin, in spring, "The women climbed to the ridges above to dig bitterroot and Lomatiums . . . when the local supplies were exhausted . . . the people moved camp further upstream to the next tributary canyon." (Hunn 1990:123). Archaeologist Brian Hayden (personal communication to NT, 1985) believes that general overharvesting and subsequent depletion of root vegetables in the Lillooet area may have resulted in prehistoric population declines in areas such as the large village site at Keatley Creek.

The role of advances in technology and their effect on intensification of resource harvesting, increasing population, and possible subsequent resource depletion needs to be examined. For example, pit-cooking as a technique seems to have developed as a major method of root vegetable processing in the northern Plateau area within the last 3000–4000 years (Pokotylo and Froese 1983). What effect did this technique have on exploitation of root vegetables, and on human populations and resource plant populations in the region? To date, however, there is little concrete evidence to indicate widespread plant resource depletion in any region, except perhaps within modern times. Within the last century, landscape burning, said to enhance plant food production, has been suppressed by Forest Service policies, and this has caused a depletion in quantity and quality of some plant foods (Turner 1991). Other recent problems include overgrazing of livestock, pesticide use, and introduction of aggressive, weedy species, all of which

have been said to have caused a deterioration in traditional plant foods (Turner 1991, 1992; Mary Thomas, Secwepemc elder, personal communication to NT, 1991). It has been noted in diverse regions that the traditional selective harvesting of roots, greens, and berries, and the accompanying cultivation of the soil, "pruning" of berry branches, and burning of harvesting grounds have resulted in long-term sustainability of harvest areas (Marshall 1977; Turner 1991; Martinez 1992).

Another cultural aspect of food scarcity is noted by Minnis (1991), namely, that preference for particular foods may shift over time and under changing circumstances. In Arizona and New Mexico among traditional Indigenous Peoples, foods that are now considered "famine foods" were staples prehistorically; domination by European and North American states since Spanish contact has resulted in this change. Kuhnlein (1989, 1992) also notes changing dietary preferences in an Indigenous community of coastal British Columbia (Nuxalk). Thus, it is important that alternative food sources, and famine foods, be considered within their temporal and cultural context.

There are, naturally, many cultural factors relating to limitations in food supply in northwestern North America. Migration, social alliances, warfare, trade, communal strategies for food distribution and sharing, ritual and ceremonial practices relating to harvesting and renewal, and social discourse are some of the elements directly relating to food scarcity.

The "seasonal round" of all northwestern Aboriginal Peoples was a strategy enabling people to harvest the variety of foods and other resources they required for survival from different localities and habitats. Unlike agrarian societies, where people were relatively sedentary, focusing a major portion of their energies on food production in one area, hunter-fisher-gatherer peoples used a wider diversity of foods from a wider area, and hence mitigated the possibility of food scarcity by being less reliant on any one type of food (Brown 1985). When local scarcity did occur, people sometimes migrated to other areas. For example, Nlaka'pamux elder Annie York (personal communication to NT, 1985) was told about a time when there was no food to be had in the Fraser Canyon and Nicola Valley areas, and people travelled east to Douglas Lake in search of game and vegetable foods. She also mentioned (as quoted earlier) that people travelled to upland areas to get roots in early spring when other foods were not available.

There were other strategies for obtaining food. Food products from one region were routinely traded with those of another, and there were also affinal exchanges, potlatches, and other formal exchange media (Suttles 1987, 1990; Turner 1975, 1978; Turner et al. 1990).

Hunn (1981) has stressed the critical contribution of women in food production in the Columbia Plateau region. His points are emphasized by the particular importance of plant foods in times of scarcity, because of their greater reliability than animal foods. Furthermore, women contributed significantly to food acquisition through their basketry and other skills. Some of the Spuzzum Nlaka'pamux women, for example, were able to exchange their finely crafted coiled baskets of split cedar root for plant foods from the Upper Thompson area, including silverweed, bitterroot, dried saskatoon berries, and soapberries (Turner et al. 1990). Basketry products were also traded for food by the Lillooet and other peoples, right up until the present time (Margaret Lester, Mount Currie Band, personal

communication to NT, 1985). Clarkson et al. (1993) also stress the critical role of Indigenous women in preserving aspects of cultural knowledge such as the details of famine food use.

Perhaps another indication of the recognition of plant foods as constant and more reliable than animal foods is that, at least among the Nlaka'pamux (Thompson), despite a host of taboos against eating certain foods at certain ritually vulnerable times of people's lives, there were very few ritual restrictions on consumption of vegetable foods; most of the restrictions pertained to animal food products (Laforet et al. 1994).

Warfare also resulted in, and presumably alleviated, food shortages, as indicated by the following notation on the Sechelt people: "[The Sechelt] . . . did not store their winter supplies in their dwellings, but 'cached' them in the woods. Only a few days' supply was ever carried home. This peculiar custom was due to the marauding proclivities of the neighbouring ***YukEltas*** [***Euclataw***—a Kwakwaka'wakw group from Vancouver Island], who made periodical forays upon their settlement and carried off all they could lay hands upon. It was unsafe, therefore, to keep a large store of food by them" (Hill Tout n.d.:29–30). Drucker (1951:36–37) also notes the relationship between food shortages and intergroup conflict among the Nuu-chah-nulth: "Family traditions of local groups . . . speak of hunger and even starvation that led them to make alliances with or make war on groups who had territories along the inner channels and owned salmon streams." Dewhirst (1978:21) examines the role of resource scarcity in Nootka Sound, suggesting that the whale hunting technologies of the outside groups may have developed in response to "a tight fit between population growth with increased local groups and ownership of limited resource properties."

Within communities and extended families, food sharing was generally practiced (Kennedy and Bouchard 1983 for Sliammon), and food distribution was formalized in such ceremonies as the First Roots and First Shoots ceremonies of the Okanagan-Colville, Sahaptin, and others (Hart 1976; Turner et al. 1980; Hunn 1990). By their very nature, these ceremonies focused on some of the critical springtime plant foods listed in Table 1, including *Lomatium geyeri, Lewisia rediviva,* and *Claytonia lanceolata.*

Among the Sahaptin, Hunn notes that visiting also served as a means of redistributing food surpluses and compensating for local shortages, as "visiting has always been an occasion for feasting . . ." (Hunn 1990:121). Glutiny or selfishness regarding food use was considered shameful, however, as illustrated in the earlier mentioned Lillooet story of "The Abandoned Boy," where the son of a chief was abandoned by his father and all the villagers because he had been secretly begging food from people in the village (Bouchard and Kennedy 1977:30–31; Hill Tout n.d.:201–204).

There were other limitations to communal sharing of food, at least in some societies. Among the Chinook, for example, Ray's principal consultant declared that the upper class could infringe as much as it pleased upon the lower classes and added that famine was unknown to the former since the food of the latter was appropriated in such a circumstance (Ray 1938:56).

Some food resources and harvesting areas were "owned" by individuals, especially within some Northwest Coast groups (Turner 1975; Turner and Kuhn-

lein 1983; Turner et al. 1983). Ownership carried with it obligations, however. A person who "owned" productive patches of silverweed and springbank clover was expected to share these food resources with his village, and, in some cases, to host feasts for particular groups or societies within the community. For example, Boas (1921:560) reports that among the Kwakwaka'wakw (Southern Kwakiutl), "When the people have a winter dance, the owner of lily-bulbs [*Fritillaria camschatcensis*] promises a lily-bulb-feast to the Sparrow Society. . . ."

As well as their direct nutritional value, plants also served in other ways to aid in survival. For example, the roots of chocolate-tips *(Lomatium dissectum)* were used as a fish poison for Interior Plateau peoples, mostly for small fish species of upland creeks (Turner et al. 1980; Meilleur et al. 1990). This use probably helped people to sustain themselves at times when salmon and other foods were not available. One Lillooet woman noted that her family had used stored bags of raw black tree lichen *(Bryoria fremontii)* to chink the cracks in their log cabin during a particularly cold winter (Turner et al. 1987, Lillooet).

Minnis (1991) notes the significant role of myth and ritual in indigenous societies as particularly important vehicles for transmitting the knowledge of famine food use between generations, stressing that this category of ethnobotanical knowledge is easily lost. There are many records in the myths and traditions of northwestern American Indigenous Peoples relating to times of hunger and famine. One example is the Kathlamet (Lower Chinook) story about skunk-cabbage *(Lysichitum americanum)*, quoted in the introduction (Boas 1901:50). Another example is a Haida myth alluding to people using sword fern root *(Polystichum munitum)* as an emergency food; this caused Fern-Woman, the mythical personification of Sword Fern, to cry (Swanton 1905).

Evidence points to the occurrence of major food shortages back into prehistoric times. Even within the historic period, however, food shortages were known to occur among Aboriginal Peoples. Food shortages were also experienced by European explorers, naturalists, and settlers, many of whom were able to survive only by learning about famine foods from the local Indigenous Peoples. Outside of the study area, perhaps the most famous incidence of starvation incurred by explorers was during the Richardson and Franklin expeditions, where desperate men chewed on rock tripe lichens (*Gyrophora* spp.), which caused severe gastrointestinal pains, but sustained them in critical periods (Houston 1984). In northwestern North America, Meriwether Lewis and William Clark owed their survival to the roots and black tree lichen provided by Plateau peoples, as did many other early explorers and naturalists (Cutright 1969).

During the Depression and World War II, when commercial food products were scarce and expensive, many Aboriginal People relied heavily on traditional plant foods, as well as some recently derived products. For example, Annie York mentioned the use of broad-leaved maple *(Acer macrophyllum)* sap by Nlaka' pamux during World War II as a sugar substitute (Turner et al. 1990). Introduced weeds, including burdock roots (*Arctium minus* L.), "Italian weed," or hedge mustard greens (*Sisymbrium altissimum* L.), mustard greens (*Brassica* spp.), dandelion greens (*Taraxacum officinale* Weber), and lamb's quarters (*Chenopodium album* L.) also became important foods for Aboriginal People during this period (Kuhnlein and Turner 1991).

SUMMARY AND CONCLUSIONS

Food shortages have occurred for Aboriginal Peoples throughout northwestern North America since prehistoric times. Generally the occurrence of shortages was related to a combination of factors, including poor climatic or local weather conditions, the winter or early spring (nongrowing) season, low productivity of food resources in the previous year, low availability of fresh and/or stored food supplies, inability to obtain food through trade or other forms of exchange, and natural or human-caused calamities. Individuals, such as hunters, travellers, and those lost in the woods, also occasionally experienced hunger or starvation.

Plant foods have played an important role as famine or emergency foods, at least in part because their availability is more predictable than that of fish or game species. At least 100 different plant foods from northwestern North America have been documented as having had some role as foods in times of shortage or starvation.

Plant foods playing a role in alleviating hunger have been categorized into four general classes. The first includes foods normally eaten, but which, because of ready availability, especially in early spring, took on particular importance when other foods were not available. Identified with this category are: inner bark and cambium tissues from number of tree species (e.g., *Picea* spp., *Pinus* spp., *Populus balsamifera, Tsuga heterophylla*); red laver seaweed *(Porphyra abbottae);* nearly 20 species of shoots and young greens (e.g., *Balsamorhiza sagittata, Epilobium angustifolium, Lomatium* spp., *Rubus* spp.); and 30 "root" food species (e.g., *Camassia* spp., *Cirsium* spp., *Dryopteris expansa, Lilium columbianum, Lomatium* spp.); and a few fruits (e.g., *Viburnum edule*).

A second category, characterized as alternative foods, includes plant foods that, though used occasionally under normal circumstances, were not preferred. However, when regular, preferred foods were in short supply, these secondary foods were harvested and used in greater quantities. Examples are: inner bark of *Picea mariana;* mature stalks of *Epilobium angustifolium;* roots of *Glaux maritima, Polystichum munitum,* and *Lomatium gormannii;* and 28 less preferred fruits, such as *Berberis* spp., *Crataegus* spp., *Maianthemum dilatatum, Oemleria cerasiformis,* and various species of *Ribes* and *Rosa.*

The third class are the true famine foods—plant substances that were never eaten except in emergencies. Although there are many examples from other regions, there are few from northwestern North America. Some, such as the roots of *Lomatium dissectum* and *Lupinus* spp., may be toxic, especially if eaten raw; they were used out of desperation.

Finally, a miscellaneous class of plants used as hunger suppressants and thirst quenchers is identified. These would generally be used over short intervals of food or water deprivation, such as might be encountered by hunters, berry pickers, or travellers. They include substances such as leaves of three ericaceous plants *(Gaultheria shallon, Arbutus menziesii, Arctostaphylos uva-ursi),* young shoots of three conifers *(Pinus contorta, Pseudotsuga menziesii, Tsuga heterophylla),* and parts of two ferns *(Blechnum spicant, Polypodium glycyrrhiza)* which in diverse regions were chewed to relieve hunger or thirst.

All of these types of foods, even those that were less preferred, should be accorded a high degree of cultural significance because of their survival value. Some apparently provided critical nutrients, such as Vitamin C, as well as limited food energy. Some would have been potentially toxic if eaten in excess or without adequate preparation. The cultural aspects of the use of plant foods in times of scarcity are complex and multifaceted, including such factors as migration, establishment of social alliances, warfare, trade, food sharing, ritual and ceremonial practices, and myth. Although modern living in North America generally precludes the possibilities of famine or even general food shortages, the cultural knowledge surrounding such events has great significance, rendered even more important because it is rapidly disappearing.

NOTE

[1]This is an excerpt from the first of two versions of a story entitled "Myth of the Salmon," or "Salmon His Myth," for which the original Kathlamet texts and word-by-word translations are also provided (Boas 1901:50–57).

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LITERATURE CITED

ALLER, W.F. 1954. Aboriginal food utilization of vegetation by the Indians of the Great Lakes region as recorded in the Jesuit Relations. Wisconsin Archaeologist 35(5):59–73.

BEALS, RALPH L. and HARRY HOIJER. 1959. An Introduction to Anthropology (second edition). Macmillan Publishing Co., New York.

BOAS, FRANZ. 1901. Kathlamet Texts. Bulletin Number 26, Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

_____. 1921. Ethnology of the Kwakiutl, Based on Data Collected by George Hunt. Thirty-fifth Annual Report of the Bureau of American Ethnology, Part 1, 1913–1914, Smithsonian Institution, Washington, D.C.

_____. 1935. Kwakiutl Culture as Reflected in Mythology. American Folklore Society Memoir No. 38, New York.

BOUCHARD, RANDY and DOROTHY I.D. KENNEDY (editors). 1977. Lillooet Stories. Sound Heritage 4(1):1–78.

BROWN, CECIL. 1985. Mode of subsistence and folk biological taxonomy. Current Anthropology 26:43–63.

CARRIER LINGUISTIC COMMITTEE. 1973. Hanúyeh Ghun 'Utni-i. Plants of Carrier Country (in English and the

Central Carrier Language). Carrier Linguistic Committee, Ft. St. James, British Columbia.

CLARKSON, LINDA, VERN MORRISSETTE, and GABRIEL REGALLET. 1933. Our Responsibility to the Seventh Generation. Indigenous Peoples and Sustainable Development. International Institute for Sustainable Development, Winnipeg, Manitoba.

CUTRIGHT, PAUL RUSSELL. 1969. Lewis and Clark: Pioneering Naturalists. University of Illinois Press, Chicago.

DEWHIRST, JOHN. 1978. Nootka Sound: A 4,000 Year Perspective. *in* Nu.tka. The History and Survival of Nootkan Culture. W.J. Langlois (editor). Sound Heritage 7(2):1–31.

DRUCKER, PHILIP. 1951. The Northern and Central Nootkan Tribes. Bulletin 144, Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

EIDLITZ, KERSTIN. 1969. Food and Emergency Food in the Circumpolar Area. Studia Ethnographica Upsaliensia, XXXII: v–175, Uppsala University, Uppsala, Sweden.

GUNTHER, ERNA. 1973. Ethnobotany of Western Washington. Revised Edition. University of Washington Publications in Anthropology 10 (1), University of Washington Press, Seattle.

HART, JEFF. 1976. Montana—Native Plants and Early Peoples. The Montana Historical Society and The Montana Bicentennial Administration, Helena, Montana.

HAYDEN, BRIAN and JUNE M. RYDER. 1991. Prehistoric cultural collapse in the Lillooet area. American Antiquity 56:50–65.

HELLER, CHRISTINE A. 1976. Wild Edible and Poisonous Plants of Alaska. Cooperative Extension Service Bulletin F-40, University of Alaska, College.

HILL TOUT, CHARLES. n.d. Report on the Ethnology of the Siciatl (Sechelt) of British Columbia, a Coast Division of the Salish Stock. Provincial Archives of British Columbia, Newcombe Collection #239885, Victoria, British Columbia. Undated manuscript from Ca. 1904.

HOUSTON, C. STUART (editor). 1984. Arctic Ordeal. The Journal of John Richardson, Surgeon Naturalist with Franklin 1820–1822. McGill-Queen's University Press, Kingston, Ontario and Montreal, Quebec.

HUNN, EUGENE S. 1981. On the relative contribution of men and women to subsistence among hunter-gatherers of the Columbia Plateau: A comparison with *Ethnographic Atlas* summaries. Journal of Ethnobiology 1:124–134.

_____. 1990. Nch'iwána. "The Big River." Mid-Columbia Indians and Their Land. University of Washington Press, Seattle.

_____ and DAVID H. FRENCH. 1981. *Lomatium:* A key resource for Columbia Plateau native subsistence. Northwest Science 55:87–94.

HUNN, EUGENE S., NANCY J. TURNER, and DAVID H. FRENCH. 1994. Ethnobiology. *in* Handbook of North American Indians, Volume 12, Plateau. Deward H. Walker, Jr., (editor). Smithsonian Institution, Washington, D.C., in press.

JOHNS, TIMOTHY. 1990. With Bitter Herbs They Shall Eat It. Chemical Ecology and the Origins of Human Diet and Medicine. The University of Arizona Press, Tucson.

_____ and I. KUBO. 1988. A survey of traditional methods employed for the detoxification of plant foods. Journal of Ethnobiology 8:81–129.

JOHNSTON, ALEX. 1987. Plants and the Blackfoot. Lethbridge Historical Society, Historical Society of Alberta, Occasional Paper No. 15.

JONES, VOLNEY. 1965. The bark of the bittersweet vine as an emergency food among the Indians of the western Great Lakes region. The Michigan Archaeologist 11:170–180.

KARI, PRISCILLA RUSSELL. 1987. Tanaina Plantlore. Dena'ina K'et'una. An Ethnobotany of the Dena'ina Indians of Southcentral Alaska. National Park Service, Alaska Region, Anchorage.

KEELY, PATRICK B. 1980. Nutrient Composition of Selected Important Plant Foods of the Pre-contact Diet of the Northwest Native American People. Unpublished M.A. Thesis, Department of Nutritional Sciences and Textiles, University of Washington, Seattle.

KENNEDY, DOROTHY and RANDY BOUCHARD. 1983. Sliammon Life, Sliammon Lands. Talonbooks, Vancouver, British Columbia.

_____. 1992. Stl'átl'imx (Fraser River Lillooet) fishing. Pp. 266–354 *in* A Complex Culture of the British Columbia Plateau. Traditional Stl'átl'imx Resource Use. Brian Hayden (editor). University of British Columbia Press, Vancouver.

'KSAN, PEOPLE OF. 1980. Gathering What the Great Nature Provided. Food Traditions of the Gitksan. Douglas and McIntyre, Vancouver and University of Washington Press, Seattle.

KUHNLEIN, HARRIET V. 1989. Factors influencing use of traditional foods among the Nuxalk People. Journal of the Canadian Dietetic Association 50:102–108.

_____. 1992. Change in use of traditional foods by the Nuxalk Native People of British Columbia. Ecology of Food and Nutrition 27:259–282.

_____ and NANCY J. TURNER. 1987. Cow-parsnip *(Heracleum lanatum):* An indigenous vegetable of Native People of northwestern North America. Journal of Ethnobiology 6:309–324.

_____. 1991. Traditional Plant Foods of Canadian Indigenous Peoples. Anthropology in Food and Nutrition, Volume 8. Solomon Katz (editor). Gordon and Breach Science Publishers, Philadelphia.

LAFORET, ANDREA, NANCY J. TURNER, and ANNIE Z. YORK. 1994. Traditional Foods of the Fraser Canyon ***Nɬəʔképmx*** *in* Lawrence C. Thompson Festshrift. Timothy Montler and Anthony Mattina (editors). University of Montana Press, Missoula, in press.

LAMONT, SHEILA M. 1977. The Fisherman Lake Slave and their Environment—a Story of Floral and Faunal Resources. Unpublished M.S. Thesis, Department of Plant Ecology, University of Saskatchewan, Saskatoon.

LEIGHTON, ANNA L. 1985. Wild Plant Use by the Woods Cree (Nihithawak) of East-Central Saskatchewan. Canadian Ethnology Service Paper No. 101, National Museum of Man Mercury Series, National Museums of Canada, Ottawa.

MARLES, ROBIN J. 1984. The Ethnobotany of the Chipewyan of Northern Saskatchewan. Unpublished M.S. Thesis, Department of Biology, University of Saskatchewan, Saskatoon.

MARSHALL, ALAN GOULD. 1977. Nez Perce Social Groups: An Ecological Interpretation. Unpublished Ph.D. Dissertation, Department of Anthropology, Washington State University, Pullman.

MARTINEZ, DENNIS. 1992. Restoring the Earth. CBC IDEAS, Canadian Broadcasting Corporation, Toronto, Ontario.

MEILLEUR, BRIEN A., EUGENE S. HUNN, and RACHEL L. COX. 1990. *Lomatium dissectum* (Apiaceae): Multipurpose plant of the Pacific Northwest. Journal of Ethnobiology 10:1–20.

MINNIS, PAUL E. 1991. Famine foods of the northern American desert borderlands in historical context. Journal of Ethnobiology 11:231–256.

NELSON, RICHARD K. 1983. Make Prayers to the Raven. University of Chicago Press, Chicago.

NIBLACK, ALBERT P. 1890. The coast Indians of southern Alaska and northern British Columbia. Annual Report of the United States National Museum, Washington, D.C., 1888, Pp. 225–386.

NORTON, HELEN H. 1979. Evidence for bracken fern as a food for Aboriginal Peoples of western Washington. Economic Botany 33:384–396.

_____. 1981. Plant use in Kaigani Haida culture: Correction of an ethnohistorical oversight. Economic Botany 35:434–449.

PARKER, A.C. 1910. Iroquois uses of maize and other food plants. Bulletin of the New York State Museum 144:1–119.

POKOTYLO, DAVID L. and P.D. FROESE. 1983. Archaeological evidence for prehistoric root gathering on the southern Interior Plateau of British Columbia: A case study from Upper Hat Creek Valley. Canadian Journal of Archaeology 7:127–157.

PORT SIMPSON, PEOPLE OF. 1983. Port Simpson Foods. Port Simpson Curriculum Committee and School District No. 52, Prince Rupert, British Columbia.

RAY, VERNE. 1932. The Sanpoil and Nespelem. University of Washington Publications in Anthropology 5, Seattle.

_____. 1938. Lower Chinook Eth-

nographic Notes. University of Washington Publications in Anthropology 7(2):29–165, Seattle.

ROMANOFF, STEVEN. 1992. Fraser River Lillooet Salmon Fishing. Pp. 470–505 *in* A Complex Culture of the British Columbia Plateau. Traditional Stl'átl'imx Resource Use. Brian Hayden (editor). University of British Columbia Press, Vancouver. Originally published in 1985 in Northwest Anthropological Research Notes 19:119–160.

STUBBS, R.D. 1966. An Investigation of the Edible and Medicinal Plants Used by the Flathead Indians. Unpublished M.A. Thesis, University of Montana, Missoula.

SUTTLES, WAYNE. 1987. Coast Salish Essays. University of Washington Press, Seattle.

_____. (editor). 1990. Northwest Coast. Handbook of North American Indians, Volume 7. Smithsonian Institution, Washington, D.C.

SWANTON, JOHN R. 1905. Haida Texts and Myths, Skidegate Dialect. Bureau of American Ethnology Bulletin 29, Washington, D.C.

TEIT, JAMES A. 1900. The Thompson Indians of British Columbia. Jesup North Pacific Expedition, Memoirs of the American Museum of Natural History, Vol. 1, Part 4, New York.

_____. 1909. The Shuswap. Jesup North Pacific Expedition, Memoirs of the American Museum of Natural History, Vol. 2, Part 7, New York.

TURNER, NANCY J. 1975. Food Plants of British Columbia Indians. Part 1. Coastal Peoples. British Columbia Provincial Museum Handbook No. 34, Victoria, British Columbia.

_____. 1977. Economic importance of black tree lichen *(Bryoria fremontii)* to the Indians of western North America. Economic Botany 31:461–470.

_____. 1978. Food Plants of British Columbia Indians. Part 2. Interior Peoples. British Columbia Provincial Museum Handbook No. 36, Victoria, British Columbia.

_____. 1988. "The importance of a rose:" Evaluating the cultural significance of plants in Thompson and Lillooet Interior Salish. American Anthropologist 90:272–290.

_____. 1991. "Burning mountain sides for better crops:" Aboriginal landscape burning in British Columbia. Archaeology in Montana 32(2):57–73, special issue. Kenneth P. Cannon, (editor).

_____. 1992. Plant Resources of the Stl'átl'imx (Fraser River Lillooet) People: A Window into the Past. Pp. 405–469 *in* A Complex Culture of the British Columbia Plateau. Traditional Stl'átl'imx Resource Use. Brian Hayden (editor). University of British Columbia Press, Vancouver.

_____ and MARCUS A.M. BELL. 1973. The ethnobotany of the Southern Kwakiutl Indians of British Columbia. Economic Botany 25:257–310.

TURNER, NANCY J., RANDY BOUCHARD, and DOROTHY I.D. KENNEDY. 1980. Ethnobotany of the Okanagan-Colville Indians of British Columbia. British Columbia Provincial Museum Memoir No. 21, Victoria.

_____ and JAN VAN EIJK. 1987. Plant knowledge of the Stl'átl'imx (Lillooet) people of British Columbia. Unpublished manuscript, Environmental Studies Program, University of Victoria, British Columbia.

TURNER, NANCY J., LESLIE M. JOHNSON GOTTESFELD, HARRIET V. KUHNLEIN, and ADOLF CESKA. 1992. Edible wood fern rootstocks of western North America: Solving an ethnobotanical puzzle. Journal of Ethnobiology 12:1–34.

TURNER, NANCY J. and HARRIET V. KUHNLEIN. 1983. Camas (*Camassia* spp.) and riceroot (*Fritillaria* spp.): Two liliaceous "root" foods of the Northwest Coast Indians. Ecology of Food and Nutrition 13:199–219.

TURNER, NANCY J. and ADAM F. SZCZAWINSKI. 1991. Common Poisonous Plants and Mushrooms of North America. Timber Press, Portland, Oregon.

TURNER, NANCY J., LAURENCE C. THOMPSON, M. TERRY THOMPSON, and ANNIE Z. YORK. 1990. Thompson Ethnobotany. Knowledge and Usage of Plants by the Thompson Indians of British Columbia. Royal British Columbia Museum Memoir No. 3, Victoria.