Ethnobiology and Subsistence

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Ethnobiology, in its most inclusive sense, refers to data or analysis relevant to understanding how humans relate to plants and animals by means of culture. Ethnobiological studies range from purely descriptive inventories of culturally salient species to broadly theoretical and comparative analyses (Berlin, Breedlove, and Raven 1973; Bulmer 1974; Hunn 1982; Turner 1988a). Plateau ethnobiological research has figured prominently in the development of the field.

A variety of ethnohistorical, ethnographic, and linguistic material is relevant to contemporary ethnobiology. For example, Meriwether Lewis and William Clark, the first Euro-American visitors to the Plateau to leave an extensive written record of their observations, were trained naturalists. They collected dozens of scientific specimens and annotated these discoveries with ethnographic commentary (Moulton 1983–; Burroughs 1961; Cutright 1969). Other naturalists, such as David Douglas (Davies 1980), John K. Townsend (1839), Charles A. Geyer (1845–1846), and Frederick V. Coville (1897, 1904), recorded valuable ethnobiological data. Descriptive ethnographies recorded between 1890 and 1940 include extensive sections dealing with subsistence and material culture, with data relevant to the economic perspective on ethnobiology.

Collections of myths and stories in the native languages as well as word lists and dictionaries suggest nomenclatural patterns and give some indication of which species were perceived worthy of explicit recognition. They may also suggest how each species was perceived by members of the traditional cultures. However, these data are of limited value unless knowledgeable contemporary native speakers can provide confirmation and clarification of the earlier reports; the native language names cited in the earlier sources may be inexpertly transcribed and the scientific identities of the species referred to may be ambiguous or erroneous. Collaborative research involving ethnographers, linguists, biologists, and Indian experts has produced the richest material (Turner, Bouchard, and Kennedy 1980; Turner et al. 1990; Hunn 1990).

Comprehensive inventories conducted in accordance with contemporary methodological standards reveal total inventories of named plant classes of 200–350+ folk categories (Hunn 1980a; Turner et al. 1990:293–294). Hunn has recorded 290 folk zoological taxa for Sahaptin. Hunn found only a very few plant and animal categories listed by Everette (1883) and Curtis (1907–1930) for Sahaptin that could not be verified by consultants in 1976–1992.

The majority of the plant and animal categories named in Plateau Indian languages correspond closely to scientifically recognized taxa, most often to scientific species. In some cases native terminology draws finer distinctions than recognized by Euro-American taxonomists, as in the case of serviceberries (saskatoons) (*Amelanchier alnifolia*), certain lomatiums (*Lomatium cous*, *L. farinosum*), and certain salmonid fishes (*Oncorhynchus tschawytscha*, *O. mykiss*) (Hunn 1980; Hunn and French 1981; Turner et al. 1990).

A feature of Plateau ethnobiological classification and nomenclature that contrasts with both Euro-American scientific classification and folk systems of indigenous tropical agriculturalists is the rarity of both life form and folk specific categories, proposed as universal ethno-biological ranks by Berlin, Breedlove, and Raven (1973). Thus, Plateau Indian taxonomies exhibit minimal hierarchic structuring. In many languages folk-specific taxa are often labeled binomially. By contrast, binomial naming of plants and animals is very rare in Plateau languages with less than 2 percent of Sahaptin folk biological categories including binomially labeled folk-specific subdivisions.

The vast majority of folk biological taxa recognized in Plateau languages are folk "generics" (Berlin, Breedlove, and Raven 1974:29), that is, they are basic level or natural categories (Rosch 1978; Hunn 1982). C.H. Brown (1985) has tested the hypothesis that hunting-gathering peoples tend to employ minimally hierarchical taxonomies because their ethnobiological inventories are not so extensive as those of agriculturalists. Plateau examples support this hypothesis.

Folk biological life-form categories also tend to be poorly developed in Plateau systems. Sahaptin and Wasco-Wishram lack terms referring to 'tree' per se; the Sahaptin term most often glossed 'tree' means literally 'that which stands upright', as is true as well of Lillooet and Thompson (Hunn 1990:180; Turner 1987:63). Widespread life-forms such as 'vine', 'grass', and 'herbaceous plant' are reduced to folk generic or "empty life-form" status in several Plateau languages (Turner 1974, 1987; Randall and Hunn 1984). Hunn and French (1984) describe a Sahaptin predilection for indicating relations among similar taxa by stressing relations of coordination rather than those of

hierarchical subordination, while Turner (1987, 1989) has described a variety of nonhierarchic conceptual relationships among folk biological taxa recognized in Thompson and Lillooet.

Plateau ethnobiological research has also contributed to general theoretical debates concerning the nature of hunting-gathering modes of production. Hunn (1981) has argued that the superficial impression given by the Plateau ethnographic record concerning the relative dietary contributions of fish, game, and vegetal foods (Murdock 1967) is seriously biased. Rather than fish predominating as the primary staple food, many Plateau groups, at least in the protohistoric period, derived more than 50 percent of their food energy from starchy roots, culms, and bulbs. Plateau peoples valued vegetal foods highly, recognizing their value in narratives, and in religious and life cycle celebrations. Thus, women's economic product was not symbolically discounted in the Plateau (cf. Ackerman 1982). The perishability of "roots" in archeological contexts has made it difficult to document the antiquity of this early historic pattern (cf. Ames and Marshall 1980; Pokotylo and Froese 1983). The demonstrated importance of vegetal foods as dietary staples requires reconsideration of ecological analyses based on the assumption that fish and game were of overwhelming importance (Hewes 1973; Sneed 1971; Palmer 1975a, 1978; Kew 1976; Romanoff 1985, 1988).

Plateau ethnobiological work has also demonstrated the key role of sophisticated food harvesting and processing technologies in sustaining protohistoric population densities (Keely 1980; Konlande and Robson 1972; Kuhnlein and Turner 1986; Meilleur, Hunn, and Cox 1990; Norton et al. 1984; Turner 1977, 1981, 1988; Turner and Kuhnlein 1983; Turner, Kuhnlein, and Egger 1987). Overall Plateau population density has been estimated at the relatively high value of 0.95 people per square kilometer (Hunn 1990:135).

Turner (1988a) has used Plateau materials to develop a diagnostic tool that has been used to assess the "cultural impact" of development projects on traditional ethnobiological resources (Stoffle et al. 1990), while Hunn (1990) has documented the dense conceptual linkages between traditional ethnobiological knowledge and indigenous conceptualization of place. Plateau Indian ethnopharmacology has been studied (Stubbs 1966; D.H. French and K.S. French 1979; Turner 1984; Meilleur, Hunn, and Cox 1990).

Ethnobotany

The information on Plateau plant resources, unless otherwise specified, is summarized from the following sources: Hart (1979) for Flathead; Hart (1974, 1976) for Kootenai; Hunn (1990) for Sahaptin; Marshall (1977) for Nez Perce; D.H. French and K.S. French (1950–1992) for Wasco-Wishram; Coville (1897, 1904) and Spier (1930) for Klamath; Palmer (1975, 1975a) for Shuswap; Turner, Bouchard, and Kennedy (1980) for Okanagan-Colville; Turner et al. (1990) for Thompson; Turner et al. (1987) and Turner (1992) for Lillooet. General discussions and illustrations of most of the Plateau food plants are given in Turner (1978) and Hunn (1990) and are discussed in a more general context by D.H. French (1965) and Kuhnlein and Turner (1991). Plants used in Plateau technology are described and illustrated in Turner (1979) and Hunn (1990).

Food Plants

Approximately 135 species of plants were utilized by Plateau peoples as sources of foods, flavorings, or beverages (fig. 1). They include "root vegetables," "green vegetables," fruits and nuts, inner bark of trees, mushrooms, one lichen species, and a variety of casual foods, sweeteners, flavorings, and beverage plants. Many were being used in the 1990s.

• ROOT VEGETABLES — Over 30 species of "root vegetables," including true roots, corms, bulbs, tubers, and rhizomes, were used in the traditional diet. There is wide regional and cultural variation in relative importance of different species. The Northern Plateau groups, including Shuswap, Thompson, and Lillooet, used two upland species, spring beauty (*Claytonia lanceolata*) and yellow avalanche lily (*Erythronium grandiflorum*) in large quantities, whereas the use of bitterroot (*Lewisia rediviva*), "wild carrot" or yampah (*Perideridia gairdneri*), false onion (*Triteleia hyacinthina*), common camas (*Camassia quamash*) (Turner and Kuhnlein 1983), and several species of lomatiums (*Lomatium canbyi*, *L. cous*, *L. farinosum*, *L. piperi*, *L. macrocarpum*) (Hunn and French 1981) predominated among the central and southern groups, the Kootenai, Okanagan-Colville, Flathead, Columbia, Sahaptin, and Nez Perce. However, bitterroot and roots of two lomatiums (*L. dissectum*, *L. macrocarpum*) were also used by the northern groups.

Other "root vegetables" were also eaten, but generally less intensively: wild onions (*Allium cernuum*, *A. douglasii*, *A. acuminatum*, *A. macrum* and related species); balsamroot (*Balsamorhiza sagittata*, *B. carvana*, and *B. hookeri*); triteleias (*Triteleia howellii*, *T. douglasii*), mariposa lily (*Calochortus macrocarpus*), wild thistles (*Cirsium undulatum*, *C. edule* and related species); chocolate lily (*Fritillaria lanceolata*), yellowbells (*F. pudica*), tiger lily (*Lilium columbianum*), bugleweed (*Lycopus uniflorus*), false agoseris (*Microseris troximoides*), western sweet-cicely (*Osmorhiza occidentalis*), silverweed (*Potentilla anserina*), water-parsnip (*Sium suave*), Hoover's tauschia (*Tauschia hooveri*), edible valerian (*Valeriana edulis*), and mules-ear (*Wyethia amplexicaulis*). Most of these were collected in quantities large enough to be processed and stored for winter use.

The usual implement for harvesting roots was a pointed digging stick, made of wood (fig. 1 right), antler, or, since the late 1930s, an iron tyne from a harrow, or a section of steel rebar. A cross-piece was fixed at the top as a handle, and the implement was pushed into the ground beside the root to be dug, then pried back to loosen the turf and allow the root to be pulled out.

Several edible roots, including camas, onions, thistle, and balsamroot, contain a complex, relatively indigestible sugar, inulin, as a major portion of their carbohydrate. These were generally prepared by pit-cooking (fig. 2), which allowed the conversion of inulin to sweet-tasting, easily digestible fructose (Konlande and Robson 1972). After pit-cooking, those roots not consumed immediately were dried by spreading out on mats or threading on strings, after which they could be stored in baskets or bags. For use, they were simply soaked in water or cooked in soup to reconstitute them. Most of these inulin foods were notably sweet, "like candy," when cooked (Turner et al. 1990: 22).

Dried roots, particularly bitterroots, camas, and biscuitroots, were a common trading item among Plateau peoples. For example, the Okanagan-Colville traded dried bitterroot to the Shuswap, and dried camas to the Thompson. Even in the 1980s and 1990s, a gift of dried bitterroot, biscuitroot, or camas is deeply appreciated, especially by older people who find collecting traditional foods difficult. This trade extended west of the Cascade Mountains to Coast Salish Indians, who obtained dried bitterroots, a highly valued food, from Plateau Sahaptins via intermediaries (Smith 1940:245). In exchange, Plateau peoples received valued coastal products such as dried clams and shells.

• GREEN VEGETABLES Green shoots, stems, and leaves were generally consumed only for a short time in the spring, while still mild and tender; most become tough and bitter as they mature. The young budstalks and leafstalks of cow parsnip (*Heracleum lanatum*), a large herbaceous perennial in the celery family, often called Indian celery or Indian rhubarb, were, and still are, eaten by virtually all the Plateau groups (Kuhnlein and Turner 1986). The stalks were gathered in the spring (fig. 3 right), before the flowers expand, and were always peeled, since the skin contains high concentrations of phototoxic furanocoumarins that irritate and discolor the skin in the presence of sunlight.

Other commonly eaten greens include the inner tissues of fireweed shoots (*Epilobium angustifolium*), the embryonic leaves and budstalks of balsamroot (*Balsamorhiza sagittata* and *B. careyana*), the young leaves and flower scapes of barestem lomatium, also called Indian celery (*Lomatium nudicaule*), the sprouts of other lomatiums (*L. grayi*, *L. salmoniflorum*, *L. dissectum*), the young stems of mules-ear, and the stems of cacti (*Opuntia fragilis*, *O. polyacantha*, and *Pediocactus simpsonii*). Cacti were available year-round. Prickly pears (*Opuntia* spp.) were sometimes sought in times of famine, and were said to have sustained life when no other food was available (Turner et al. 1990:195). Within the historic period, many Plateau people have also used introduced greens, including common dandelion (*Taraxacum officinale*), lamb's-quarters (*Chenopodium album*), and watercress (*Rorippa nasturtium-aquaticum*).

Fig. 1. Digging and preparing roots. left, Drawing from Kootenai coloring book *Living In Harmony* (Salish Kootenai College 1987), showing digging for bitterroots, center, left to right, Alice Sam, Wasco and Warm Springs Sahaptin; Blanche Tohet, Warm Springs Sahaptin; and Ida Warnsee, peeling bitterroots (Warm Springs Sahaptin: *grayi*, Wasco: *łgwich*) in preparation for a root feast. A cornhusk bag in which the dug roots were packed lies on the table. Photograph by David and Katherine French, Warm Springs, Oreg., 1951. right, Shuswap digging stick of serviceberry wood with iron tip and handle. Collected by James A. Teit, Canoe Creek, B.C., before 1903. Length, 73 cm.

[illegible]

2. Preparation of camas. Elizabeth P. Wilson, Nez Perce, demonstrates the cooking of camas bulbs in a pit. The bulbs, collected in Mussel-Shell Area, north of Kamiah, Idaho, were prepared in an oven pit 36 inches in diameter and 22 inches deep on the Wilson property. Layers of wood and rocks were placed in the pit, and a wooden platform of wide boards was built over the entire pit. Rocks, used year after year, were then placed on the platform. Top left, Drawing of camas plant. Top right, Wilson's grandson Velma Lawyer building a tepee of wood over the rocks and starting a fire. Center, Wilson's son-in-law Archie Lawyer observing as Wilson smooths out the fire surface before adding the mud around the rocks for a better surface. Center right, Placing wet willow branches over the rocks, followed by clumps of wet alfalfa and rye grasses. Bottom left, Wet sacks placed over 2 bags camas bulbs. Bottom center, Dirt placed on the sacks, which was tamped down. Another fire was built up over the pit and cooked all night. The next day, it was tested the next day; if it was not the proper dark brown color, the fire was kept going another night. Bottom right, Wilson checking the fully baked camas bulbs. The baking took 2 1/2 days (Downing and Furniss 1985). Photographs by Lloyd S. Furniss, 1985.

• FRUITS, SEEDS, AND NUTS. Throughout the Plateau region, a prominent fruit was serviceberry, or saskatoon berry as it is known in Canada (*Amelanchier alnifolia*). Several different varieties of these fruits, each with its own berry and habit characteristics, were recognized and named in Thompson, Lillooet, and other Interior Salish languages. The berries were eaten fresh and were also dried in cakes or individually like raisins, then used alone or mixed with many different foods, including other berries, bitterroot, dried fish, dried meat, and animal fat. Each year, a family group would harvest and preserve large quantities of these berries, especially in the Northern Plateau where they were the most important of all fruits. They were also an important trading item. Chokecherries (fig. 3 center) (*Prunus virginiana*) were used widely throughout the Plateau region and preserved in large quantities. Black huckleberries (*Vaccinium membranaceum*) were a preferred fruit, still very important in the 1990s. They and chokecherries are the primary fruits of the Southern Plateau.

Many Plateau families formerly traveled to the mountains for two or more weeks each summer to harvest huckleberries, and people still harvested them in quantity in the 1990s. Huckleberries were commonly dried over a slow fire set in a rotten log (Filloon 1952). Other types of huckleberries, blueberries, and cranberries (including *Vaccinium alaskaense*, *V. caespitosum*, *V. deliciosum*, *V. globulare*, *V. myrtilloides*, *V. ovalifolium*, *V. oxycoccus*, *V. parvifolium*, *V. scoparium*) were used within their ranges.

Many other types of fruits (including true berries, pomes, drupes, and aggregate fruits, all generally called "berries") were used to varying degrees: kinnikinnick (*Arctostaphylos uva-ursi*), Oregon grape (*Berberis aquifolium*; syn. *Mahonia aquifolia*), red-osier dogwood, or "red willow" (*Cornus stolonifera*; syn. *C. sericea*), hawthorn (*Crataegus douglasii*, *C. columbiana*), wild strawberries (*Fragaria vesca*, *F. virginiana*), salal (*Gaultheria shallon*), pin and bitter cherry (*Prunus pensylvanica*, *P. emarginata*), currant and gooseberry species (including *Ribes aureum*, *R. cereum*, *R. hudsonianum*, *R. irriguum*, *R. lacustre*, and others), rose hips (*Rosa acicularis*, *R. woodsii*, *R. nutkana* and other species), wild raspberries (*Rubus idaeus* and, in the north, *R. acaulis*), thimbleberry (*Rubus parviflorus*), blackcap (*Rubus leucodermis*), elderberries (*Sambucus cerulea*, and, to a lesser extent, *S. racemosa*), soapberry or soopolallie (*Shepherdia canadensis*), and highbush cranberry (*Viburnum edule* and *V. opulus*). Other species essentially coastal in distribution but used along the westernmost Plateau area and along the east slopes of the Cascades include: low Oregon grape (*Berberis nervosa*), salmonberry (*Rubus spectabilis*), and trailing wild blackberry (*R. ursinus*).

Wild strawberries, raspberries, thimbleberries, and blackcaps were eaten fresh or were dried for winter, like serviceberries, chokecherries, and huckleberries, if large enough quantities were obtained. Tart fruits like Oregon grapes and red-osier dogwood berries were often mixed with saskatoons or other sweeter fruits. Kinnikinnick berries, being

Fig. 3. Picking vegetables and berries. left, James Selam, John Day River Sahaptin, with corms of yellowbell just harvested. Photograph by Eugene Hunn, Cantwell Flats, Wash., 1977. center, Selina Tunoyakin, Northern Okanagan, picking chokecherries. Photograph by Dorothy Kennedy, Penticton Indian Reserve, B.C., 1976. right, Bill Edwards, Lillooet, peeling the leafstalks of cow parsnip. Photograph by Nancy Turner, Pavilion Mountain, B.C., 1984.

Fig. 4. *Preserving Foods.* The home of Joseph Umtuch, Yakima, with food supplies contained in traditional baskets and canning jars. Photograph by Robert Dupuis, Harrah, Wash., 1923.

somewhat dry, were usually cooked in animal fat. Hawthorn fruits, considered seedy and constipating, were seldom eaten in quantity. The outer rind of rose hips was eaten occasionally, sometimes as a famine food. Soapberries, which contain a small amount of saponin, were and still are, whipped with water into a frothy confection, sometimes referred to as "Indian ice cream." This practice seems to have originated within the Northern Plateau but in the 1990s was quite widely distributed among aboriginal peoples of British Columbia and neighboring areas (Turner 1981).

Most fleshy fruits were dried for winter use, although kinnikinnick, elderberries, highbush cranberries, soapberries, and some currants and gooseberries could be stored fresh. In the late twentieth century, most fruits were preserved by freezing or canning (jarring) (fig. 4), although a few people still dried serviceberries and soapberries.

Plateau peoples did not use grains to any extent, and their use of seeds and nuts was limited to a few species, with one exception. Seeds of several coniferous tree species were harvested on occasion, but the most important were the large seeds of white-bark pine (*Pinus albicaulis*), a montane species growing near timberline. The cones were harvested in fall, then roasted or dried and the seeds extracted. These were usually cracked open and the kernels eaten as a snack, "like peanuts." Seeds (small, dry fruits) of balsamroot (*Balsamorhiza sagittata* and *B. careyana*) were harvested in some areas, then dried and pounded into meal, which was eaten alone or mixed in soup or other dishes. Hazelnuts (*Corylus cornuta*) were the only species of nut available in the region, and they were gathered and used wherever they occurred. Hazelnuts, locally abundant in some areas, were a common trading item to regions where they do not occur. Sometimes they were gathered from caches of squirrels. Acorns of garry oak (*Quercus garryana*) were also of some significance in the Columbia Gorge area, where they were baked underground after leaching in "blue" mud. An important exception to the relatively low importance of seeds in the Plateau diet is among the Klamath, who traditionally harvested and ate a wide variety of seeds, including grains of grasses, seeds of knotweeds (*Polygonum* spp.) and goosefoot species (*Chenopodium* spp.), and particularly the seeds of yellow pond-lily (*Nuphar polysepalum*). These

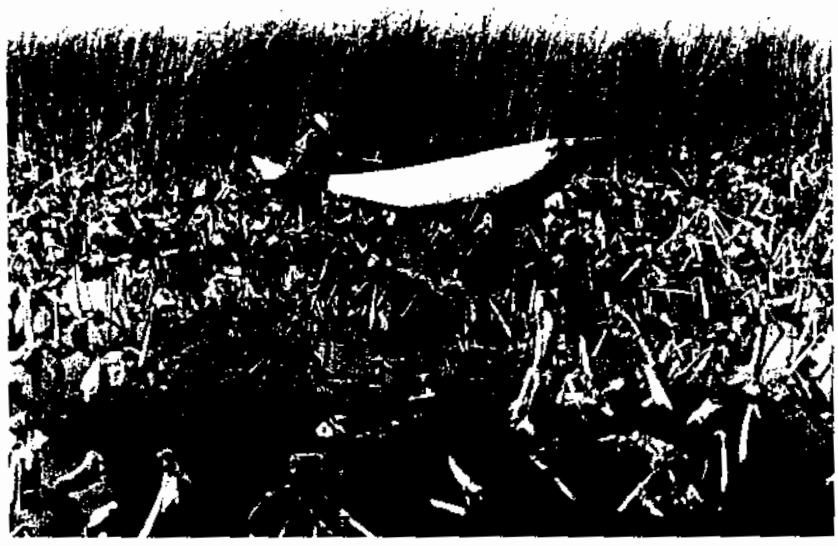


Fig. 5. Collecting and preparing wokas. *left*, Woman collecting the seeds of wokas in a shovel-nose canoe. *right*, Wife of Modoc Henry, Klamath, probably Chiloquin, Oreg. Photographs by Edward S. Curtis, c. 1923.

Fig. 6. Products from trees. left, Sam Mitchell, Lillooet, removing bark of lodgepole pine with a mule deer antler. Once the bark is removed, the soft cambial tissue is scraped off and eaten fresh. Photograph by Nancy Turner, Pavilion Mountain, B.C., 1974. center, Louie Pichette, Colville, twisting gray willow withe, which is strong but flexible enough to use for tying. Photograph by Dorothy Kennedy, Colville Res., Wash., 1979. right, Delsie "Elsie" Albert Sohm, an elder Yakima from the village of Nawaws at Alderdale, Wash., stripping alder bark used to make a red dye. Photograph by Eugene Hunn, Alder Creek, Wash., 1986.

seeds, known as wokas (fig. 5), formed a substantial proportion of the Klamath diet (Coville 1904).

In all, about 60 species of fruits, seeds, and nuts were incorporated into the traditional diets of Plateau peoples.

• OTHER FOOD PRODUCTS. In spring, the sweet, juicy cambium and secondary phloem tissues of several types of trees were sought as a food, but were apparently rarely eaten in the Southern Plateau. Lodgepole pine (*Pinus contorta*), ponderosa pine (*P. ponderosa*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) were three favored types. Slabs of bark were removed using a sharp implement (fig. 6 left), and the edible tissue was scraped from the outside of the wood or the inside of the bark, depending on the stage of growth of the cambium. It was generally eaten fresh and greatly enjoyed. The implement used for scraping off the edible tissue was often fashioned from the shoulder blade of a deer or other animal. A modern equivalent is made from a sharp-edged piece of tin can, whose curvature fits that of the tree. Use of this food has sharply declined within the twentieth century, partly due to prohibitions on harvesting by forestry officials.

Several species of mushrooms were eaten. These include pine mushroom (*Tricholoma magnivelare*; syn. *Armillaria ponderosa*), cottonwood mushroom (*T. populinum*), and oyster mushroom (*Pleurotus ostreatus*). They were generally harvested in mid to late fall, cooked and eaten fresh, or sliced and dried for storage. Within the twentieth century, they are often stored by freezing or canning (Turner et al. 1987).

A black, hairlike tree lichen ("Middle Columbia River Salishans," fig. 2, this vol.), known as "black moss" or "tree hair" (*Bryoria fremontii* and possibly other species), was another source of food. It was harvested from fir or pine branches in montane forests, usually in late summer, and had to be leached in running water, pounded, and then slowly pit-cooked to render it edible and digestible. It was sometimes cooked with wild onions or sweetened with serviceberry juice to enhance the flavor. It was formerly dried in flat cakes, which were cut into pieces for winter storage. Used to thicken soups and other dishes, it was also important as a famine food (Turner 1977).

A sweet, crystalline mixture of sugars, including melezitose, was formerly obtained under special environmental conditions from Douglas fir boughs (*Pseudotsuga menziesii* var. *glauca*), but most people who recall tasting it from their childhood days say Douglas fir sugar can no longer be found (Turner et al. 1990:107–109). Larch and birch are said to yield a sweet tasting sap, used by the Kootenai and others. A refreshing lemonadelike beverage is made from soapberries, and, as of the 1980s and 1990s, was still drunk in many Plateau households. Beverages were made from Labrador tea (*Ledum groenlandicum*, and *L. glandulosum*), mint (*Mentha arvensis*), wild bergamot (*Monarda fistulosa*), wild rose stems and flowers (*Rosa* spp.), and several other plants. The aromatic celery flavored seeds and dried leaves of barestem lomatium were used as a flavoring for tobacco and tea. Additionally, mint, wild bergamot, and some wormwoods (*Artemisia* spp.) were used as preservatives, to repel flies and other insects from meat, fish, or berries being dried or stored. Pitch of pine, spruce, and larch were sometimes chewed as gum, as was the latex of milkweed (*Asclepias speciosa*), mountain dandelion (*Agoseris glauca*), and some other plants. Several types of plants were used to line cooking pits, serving to flavor the food as well as protect it from burning. These include Douglas fir boughs, dried needles of ponderosa pine, wild strawberry plants, fireweed stems, wild rose leaves and twigs, "red willow" branches, mountain alder branches (*Alnus incana*), shrubby pen-stemon (*Penstemon fruticosus*), and sticky geranium (*Geranium viscosissimum*).

Technologically Significant Plants

Materials from approximately 125 plant species were used in traditional Plateau technologies, including woods for fuel and construction; bark sheets for containers and

canoes; root, stem, bark, and leaf fibers for cordage and weaving; and other plant materials used for dyes, preservatives, glues, caulking, scents and cleansing agents, and many other purposes.

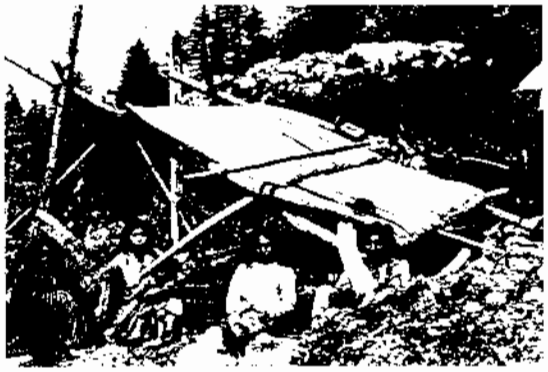
• FUELS Almost any available type of wood could be used as a general fuel, but for specialized purposes, specific types were preferred. In the drier regions of the Plateau area, fuel was notably scarce, and people relied on driftwood or shrub-steppe species such as big sagebrush (*Artemisia tridentata*). Originally, fires were started by friction, using a hand "drill" and a "hearth." The drill was made of fairly dense, dry wood, often of pine tops or roots (*Pinus contorta, P. ponderosa*), black cottonwood roo. (*Populus balsamifera* ssp. *trichocarpa*), or willow (*Salix* spp.). In Lillooet, for example, the name for *Salix lasiandra* translates as "match plant", alluding to its former use as fire drill material. The hearth was made of larger pieces of these materials, or of western red-cedar wood (*Thuja plicata*). Materials used specifically as tinder include: dry bracket fungus (*Hemitopsis pinicola, Fomes fomentarius*, and other species; apparently a modern usage); cinder conk (*Inonotus obliquus*); dried balsamroot taproot (*Balsamorhiza sagittata*), inner bark of western red-cedar, dry grass, and sagebrush bark. Douglas fir, pines (*Pinus* spp.), spruce (*Picea engelmannii*), quaking aspen (*Populus tremuloides*), and cottonwood were known as good general fuels, with green alder (*Alnus crispa*) being valued for baking and smoking fish.

• WOOD AND BARK General use of wood for construction of pit houses, frames, and various implements might sometimes have been opportunistic, but more often, preferred types of wood were used for specific purposes. For example, Douglas fir, lodgepole pine, and ponderosa pine were often employed for large construction projects, including houses and fishing platforms. Among the Kootenai and Flathead, tepee poles were often of lodgepole pine, whereas on the middle Columbia, peachleaf willow (*Salix amygdaloides*) was often used for lodgepoles. Dugout canoes, frequently of black cottonwood, were also made of western red cedar (the usual dugout material for Northwest Coast peoples, and available as drift logs on the middle Columbia), Douglas fir, and ponderosa pine. Sapling wood of Douglas fir was used for dipnet hoops and shafts, as well as for snowshoe frames, berry drying racks, and other items. Western yew (*Taxus brevifolia*), when available, was a preferred material for bows and was also used for implement handles, digging sticks, and snowshoe frames. Rocky Mountain maple (*Acer glabrum*) was also used for such items and, in the southern area, was the preferred material for dip-net hoops. Rocky Mountain juniper (*Juniperus scopulorum*) was used for bows as well and for drum frames, as was western juniper (*Juniperus occidentalis*) in the southern Plateau. Oceanspray (*Holodiscus discolor*), serviceberry, and mock-orange (*Philadelphus lewisii*) woods were used for arrowshafts, digging sticks, salmon-spreaders, and roasting sticks. Garry oak, which like oceanspray and mock-orange was known as an "iron wood," was also valued for its hardness in implement making. The flexible stems of red-osier dogwood and various willow species were used as spreaders in drying salmon and meat, and in constructing fishing weirs and traps, drying frames, sweatlodges, and temporary dwellings. Douglas fir boughs, and the aromatic boughs of grand fir (*Abies grandis*) and subalpine fir (*A. lasiocarpa*) were often used as "thatching" and "flooring" for these.

Large sheets of bark, cut and pried from standing trees, were important materials. The best known is paper birch (*Betula papyrifera*), used by Northern Plateau peoples for bark canoes and many types of containers, some of which were still being made by Shuswap in the 1990s. Canoes and vessels made of bark from white pine (*Pinus monticola*), Engelmann spruce (*Picea engelmannii*), and subalpine fir were also common in the northern region. Cottonwood bark was used for buckets, and bark sheets of all of these species were used for lining cache pits and as roofing.

• FIBROUS PLANTS Beautiful and intricate coiled baskets of many styles were made from the split roots of western red cedar and, sometimes, Engelmann spruce. The foundations for these were of bundles of split roots, or sometimes, thin splints of cedar sapwood. In the Northern Plateau geometric designs and patterns were made with natural colored and dyed-black cherry bark (*Prunus emarginata, P. pensylvanica*), with the split culms of grasses such as reed canary grass (*Phalaris arundinacea*) providing red, black, and white imbrication or overlay. In the Southern Plateau, beargrass leaves (*Xerophyllum tenax*) and, since the 1800s, corn husks, were of primary importance for basketry design. Lower Lillooet, Thompson, and Klikitat women were famous for their coiled cedar-root baskets. Klikitat berry baskets were also made from the outer bark of red cedar, folded and sewed with cedar root (Kuneki, Thomas, and Slockish 1982; Schlick 1994). Within the historic period, many supported their families by trading their baskets for food, clothing, and other necessities. They even adapted this weaving style to make European-type objects—trays, fancy tabletops, and cups with saucers—to appeal to White settlers and tourists. The art of making these baskets was still practiced in Mount Currie and some other communities of British Columbia and at Husum in Klickitat County, Washington, in the 1990s. Red cedar and spruce roots were also used for sewing and lashing, and red-cedar withes were used to make a strong rope. Hazelnut withes were used as bindings and straps.

Both tule stems (*Scirpus lacustris*; syn. *S. acutus*) and cattail leaves (*Typha latifolia*) were used to make mats and bags of various types, with tule predominating throughout (fig. 7). Mats were used as mattresses and coverings for tepees and summer lodges, as well as for berry-drying. Stems of common reed grass (*Phragmites*



[illegible] Use of fibrous plants by the Thompson: top left, People dressed in wool and cedar bark capes for a Passion Play. An adult cape contained about 100 stems of Indian hemp to produce the thread and took about 2 weeks of work to gather and prepare the hemp (Teit 1900: 23–31). Photographed at the Nicola Ranch, Kerr[illegible], B.C., about 1900. top right, Hat and leggings made of shredded sagebrush bark twined together with fiber. They are trimmed with buckskin strips and painted with red and brown dots. Bark hats were used sometimes by very poor people of both sexes, but more commonly by old women as a rainy weather hat. Bark leggings were used by a very few poor old women. (Collected by James A. Teit, Spences Bridge, B.C., before 1[illegible].) Height of hat 10 cm. bottom, left, Model of tule canoe. Actual tule canoes were made of 4 or 5 thicknesses of tule mats overlapping the gunnel and sewn underneath. The ribs were made of light wands placed every 6–8 ins., and the floor was of bark. These canoes varied in size, but all were very lightweight and easily carried by a single person. The tules swelled when the canoe was placed in water, making the craft watertight. Collected by James A. Teit in 1901. Length 29 cm. Bottom center, Fishing bag make of rushes. Collected by James A. Teit from the Upper Thompson, 1903. Length 49 cm. bottom right, Chemehuevi. "River camp with sunshade and backrest made of plant fiber mats." Photograph by Frederick Dall, 1867–1888.

australis; syn. *P. communis*) were also used to make berry-drying and fish-draining mats in some areas such as along Nicola Lake, British Columbia, and in Sahaptin country. Stem fiber of Indian hemp (*Apocynum cannabinum*) was formerly a primary material for cordage ("Wasco, Wishram, and Cascades," fig. 8, this vol.), fishnets, woven bags, and capes and other types of clothing. The mature stems were harvested in the fall, split and dried, then pounded and worked to separate the fiber from the brittle, pithy stem tissues. The bundles of fiber were then hand spun into twine, usually by rolling it along the leg, with additional fiber being spliced in at intervals. Large balls of Indian-hemp twine were a valuable trading item in some areas. A "time ball" of Indian hemp twine was kept by a woman as a record of key events in her life, with knots signifying events tied in sequence (Leechman 1921; M.R. Harrington 1921a).

The inner bark of silverberry (*Elaeagnus commutata*) was another important fiber, limited to the northern and eastern margins of the Plateau. It was woven into cordage and used for bags and capes and other clothing. Willow stems (fig. 6 center) and bark were also used for cordage, particularly sandbar willow (*Salix exigua*, known as "rope plant" in Lillooet. Sagebrush bark and black tree lichen were sometimes used for weaving clothing (fig. 7 top right; "Northern Okanagan, Lakes, and Colville," fig. 7, this vol.) but were generally regarded as suitable only for poor people. Occasionally stinging nettle stem fiber

(*Urtica dioica*) was used, but this was far more common on the coast. Coastal peoples preferred Indian hemp twine, which they obtained through trade, to that of nettle-bark for its greater strength (Elmendorf 1960).

• DYES, STAINS AND PRESERVATIVES A reddish-brown dye obtained from alder bark (fig. 6 right) (*Alnus incana, A. crispa*) was used to color buckskin, wool, hair, feathers, porcupine quills, and other materials. Indian paint fungus (*Echinodontium tinctorium*) conks were powdered and mixed with deer fat, then applied as a face paint, by the Sahaptin and other Plateau peoples. Wolf lichen (*Letharia vulpina*) and the inner bark of Oregon grape yield bright yellow dyes. In the Southern Plateau, the rhizomes of veiny dock, *Rumex venosus*, were used to make a reddish-brown colorant for moccasins and preserved skins. Various other stains from fruits, flowers, and leaves were used to some extent (Turner et al. 1990:38). Cherry bark for basket imbrication was used in its natural reddish brown color or dyed black by burying it in moist organic soil for several months. Alder bark apparently functioned as a preservative or tanning agent when used on hides. Other agents for curing or smoke-tanning hides include bracket fungi, rotten wood, sagebrush and wormwoods (*Artemisia* spp.), Rocky Mountain juniper (*Juniperus scopulorum*), and ponderosa pine cones. The root of chocolate tips (*Lomatium dissectum*) was used as a bleaching agent for hides at Warm Springs Reservation.

• OTHER TECHNOLOGY Various moss and lichen species, especially sphagnum moss in northern areas, were used to chink the cracks between logs of cabins; many elders recall as children collecting large quantities of moss for this purpose. Mosses and cattail and milkweed seed fluff were used as diaper material to line cradles. The rough-stalked horsetails (*Equisetum* spp.) were used as abrasives for smoothing and polishing wood and soapstone pipes. Cottonwood bud resin was used as a glue and paint base, spruce pitch as an adhesive, and prickly-pear cactus mucilage as a paint fixative. The blossoms and leaves of snowbrush (*Ceanothus velutinus*), mock-orange, and cottonwood inner bark yielded a lathery substance used as soap.

Many plants, especially coniferous trees and aromatic plants, were used for scents and cleansing agents, and a number of these were specifically applied to protect the user against illness, death, or other harmful influences. For example, juniper boughs (including Rocky Mountain and western junipers) were used almost universally in this capacity, to cleanse a household at times of severe illness and death. Subalpine fir boughs were highly regarded as a scent (Turner 1988; Hunn 1990:185). Wild rose (*Rosa* spp.) was used like juniper as a cleansing, disinfecting, and protecting agent. Among Sahaptins, it was the primary agent used against "ghosts" and "haunting." The strongly scented big sagebrush and its relatives were also used in this way. There are numerous other uses of plant materials, ranging from the use of silverberry seeds as decorative beads, vanilla leaf (*Achlys triphylla*) as a cachet, and ponderosa pine needles to stuff mattresses and pillows, to the use of water knotweed (*Polygonum amphibium*) flowers as trout bait and of fleabane (*Erigeron* spp.) and shooting star (*Dodecatheon* spp.) flowers for patterns in basketry (Turner et al. 1990:39–40).

Medicinal Plants

The Thompson alone used at least 200 species of plants in medicinal preparations, for treating illnesses and injuries, and for the maintenance of health. Nearly 120 species of medicinal plants have been recorded for Sahaptin-speaking peoples. When the entire Plateau region is considered, medicinal plants must number somewhere between 250 and 300 species, and many of these were still being used as of the 1990s. As well as these, many plants were used as charms and "spiritual" medicines for strengthening, purification, and protection.

• CONCEPTS OF ILLNESS AND HEALTH Steedman (1930:456) provides a glossary in Thompson for a wide range of recognized ailments—colds and coughs, indigestion and loss of appetite, tumor, headache, sore feet, internal pains, swellings, constipation, retention of urine, "spreading and eating sores," vomiting, and diarrhea—virtually all of which were treated with herbal medicines. Injuries, broken bones, and aspects of menstruation, conception, and childbirth were treated with medicinal plant preparations. Various herbal preparations were applied to the maintenance of health, cleansing and purification, and "changing of the blood" in spring and fall. Palmer (1975:41) provides a comparable table of Shuswap ailments and botanical cures.

It is impossible to separate medicine and ritual practice in traditional Plateau cultures. Plants used as protective scents, and those taken internally or used externally in ritual purification, are considered to be as important in the maintenance of health and well being as are medicines used for coughs or to alleviate constipation. Physical and "spiritual" health are not clearly divided, nor are the treatments for ailments of the body and spirit. Disorders attributed to supernatural causes may be alleviated by a shaman, or "Indian doctor," who is trained in the "magical" applications of plants and other techniques relating to the world of the supernatural. Other ailments are generally treated by a herbal specialist, or by anyone within the community having particular knowledge of medicinal plants. Even "ordinary" herbal medicines are treated with great respect, seriousness and a certain amount of ritual. It was said to bring bad luck to the user to pull up medicines in a casual or frivolous way, and medicines gathered carelessly may, it was believed, lose their ability to heal.

It is also unrealistic to separate totally "medicine" and "food" in Plateau cultures, since many foods, such as soapberry, were taken to improve health, and many medi-

cinal preparations also provided important nutrients (Turner et al. 1990:43).

• HERBS. Herbal medicines include all parts of plants: leaves and stems, bark, roots, sap or resin, flowers, and fruits. Many of these—particularly tonics, general medicines, digestive tract medicines, medicines for colds and respiratory ailments, medicines for kidney and urinary ailments, and medicines used as gynecological aids—were in the 1990s taken internally in the form of an infusion (made by soaking the medicinal plant part in boiling water) or a decoction (made by boiling the medicine for a period of time). The decoction is considered slightly stronger. Infusions or decoctions might be drunk over a period of several days or weeks, as a replacement for other beverages. Sometimes whole parts of plants or pitch were chewed and the juice swallowed. For certain ailments such as respiratory complaints or fever, the medicine could be inhaled as a vapor, often as a steambath in a sweatlodge. Aromatic plants such as juniper (*Juniperus* spp.), wormwoods (*Artemisia* spp.), and yarrow (*Achillea millefolium*) were particularly used in this way.

External applications consisting of mashed or bruised plant parts, salves, or powdered dried or burned plants were the usual treatment for skin disorders—cuts, scrapes, boils, or burns. Counterirritants such as stinging nettle and members of the buttercup family (Turner 1984), or local anaesthetics such as the highly poisonous Indian hellebore (*Veratrum viride*), were applied externally to alleviate arthritic pain, bruises, and other subcutaneous afflictions. Arthritis, rheumatism, and muscular pains were treated with external washes of plant solutions and in the sweathouse. Palmer (1975:49) describes the use of tree fungus tissue (cinder conk) for treatment of pains, stiff and sore joints, headache, toothache, and bruises; it is ignited over the site of the pain and allowed to burn until it "pops," after which the pain vanishes.

Animals, especially horses, were commonly treated with herbal medicines; for example, the Flathead applied sticky geranium and the rhizomes of yellow pond-lily to horses' sores and cuts. Sahaptins had their winded horses inhale a vapor of chocolate-tips roots to increase their stamina. Saddle sores on horses were treated with these roots (Meilleur, Hunn, and Cox 1990).

Comprehensive lists of herbal medicines are provided by Turner et al. (1990:44–51) for Thompson, and by D.H. French and K.S. French (1979) and Hunn (1990:351–358) for Sahaptin. Table 1 lists a few examples of widely used plant medicines of Plateau peoples.

Few of these or other medicinal plants traditionally used by Plateau peoples have been thoroughly analyzed for their biochemical content or physiological effects. Initial research indicates positive correlations between medicinal use and efficacy in many cases. The effectiveness of cascara (*Rhamnus purshiana*) as a laxative is documented (Claus et al. 1970). Similarly, use of kinnikinnick as a urinary tract medicine and of Oregon grape as an eye medicine are known in commercial pharmacology. The use of willows, which contain salicylic acid, a precursor to acetyl salicylic acid, or aspirin, for fevers and sores is another indication of the depth of medicinal knowledge of Plateau peoples. Chocolate tips is known for its bactericidal properties (Meilleur, Hunn, and Cox 1990).

Plateau peoples were aware of the highly toxic properties of plants such as Indian hellebore, water hemlock (*Cicuta douglasii*), death camas (*Zigadenus venenosus*), and baneberry (*Actaea arguta*), and learned to use them, with extreme caution, as medicines. The best antidote for poisoning from these plants was said to be salmon oil or some other type of fat.

Symbolically Significant Plants

Plants, animals, and all natural objects were respected for their innate power, and their ability to influence, positively or negatively, the lives of humans. Hence, plants were important in many rituals, either in a central capacity as a recognition of their primary resource value, or in a supportive role, wherein the innate qualities of the plants enhanced the ceremony or ritual observance of a life-cycle event or the seeking of supernatural aid or power. An example of the first is in the first-fruits ceremonies that celebrate the beginning of the harvesting season for bitterroot, serviceberry, black huckleberry, and other important gathered foods (Hunn 1990; Hart 1979; Turner, Bouchard, and Kennedy 1980:152).

The second type of ritual role is reflected in the use of aromatic plants such as juniper and wormwoods as incense for ritual purification in the sweathouse, or the use of plants such as wild rose, Oregon grape, and juniper to protect bereaved friends and relatives from the spirit of a recently deceased person. Another example is the widespread use of Douglas fir boughs in puberty rites ("Thompson," fig. 8, this vol.), hunting rituals, and other ceremonies (Turner et al. 1990:109–110). Many plants, some of which could be considered toxic if taken in excess, were drunk as infusions or decoctions to cleanse one's system, as emetics and laxatives. Those seeking special protection or strong powers for hunting, fishing, or healing would often undertake such treatment. For example, an infusion of tobacco was drunk as an emetic after the death of a close relative (Hunn 1990:230).

Tobacco and smoking rituals were important in Plateau culture. Originally, native tobacco (*Nicotiana attenuata*) was the major smoking ingredient, often mixed with kinnikinnick or other substances such as red-osier dogwood bark or the seeds of red columbine (*Aquilegia formosa*). Sumac leaves (*Rhus glabra*) were smoked with kinnikinnick in some Shuswap ceremonies. Within the historic period, commercial tobacco gradually supplanted the role of native tobacco and kinnikinnick. Sweetgrass braids (*Hierochloe odorata*), widely used as incense in purifica-

Table 1. Selected Herbal Medicines

Abies lasiocarpa (subalpine fir) - liquid pitch eaten or taken in hot water for coughs, colds, influenza, tuberculosis; used externally for sores, bruises, sprains; pulverized needles as baby powder, skin salve; decoction of bark used as eyewash, drunk for gonorrhea, and as purgative; decoction of branches used as wash or drink for ritual purification in the sweathouse; boughs used as protective scent for young women at puberty.

Achillea millefolium (yarrow) - leaves and roots used as blood purifier, and for colds, diarrhea, sore eyes, toothaches, cuts, sores, and swellings, and infertility (drunk as infusion; used as external poultice or wash).

Actaea arguta (baneberry) - (toxic); infusion or decoction of roots taken with extreme caution as emetic and purgative for general sickness, arthritis, bronchitis, syphilis, rheumatism, snake bites; said to make patient very sick initially.

Anemone multifida (Pacific anemone) - fresh leaves used as counter-irritant poultice for sores, swellings, bruises, arthritis; seed fluff used to staunch nose bleeds; infusion used as wash against fleas, lice.

Arctostaphylos uva-ursi (kinnikinnick) - decoction or infusion of leaves and stems used as wash for sore eyes, burns; drunk for colds, coughs, tuberculosis, kidney ailments, and as general blood tonic, especially in "changing of the blood" (Turner, Bouchard, and Kennedy 1980).

Artemisia ludoviciana and other *Artemisia* spp. (wormwoods) - purification in sweathouse; infusion drunk for coughs, influenza, tuberculosis, arthritis, indigestion, diarrhea; wash for swellings, bruises, itches, sores, broken bones; used as purifying "disinfectant" in house or sweathouse, against illness, death, and harmful influences.

Artemisia tridentata (big sagebrush) - infusion drunk or used as external wash or inhaled for colds, laryngitis, fever, headache, tuberculosis, arthritis (some say too strong for internal use); used in house and sweathouse as purifying and protective incense.

Berberis aquifolium (Oregon grape) - infusion used as eye medicine; drunk as contraceptive, liver tonic, blood tonic, and for upset stomach and venereal disease.

Ceanothus velutinus (snowbrush) - infusion drunk for colds, fever, influenza, dull pains, weight loss, diarrhea, or general illness; powdered leaves used as a salve for burns, sores; decoction of branches used as wash or in steambath for rheumatism, arthritis, broken bones, or gonorrhea.

Chaenactis douglasii (false yarrow) - decoction drunk for swellings and as stomach tonic; used as a wash or poultice for skin ailments, burns, wounds, spider and insect bites.

Equisetum hiemale (scouring rush) - infusion or decoction drunk for urinary ailments, venereal disease, childbirth and postpartum medicine; decoction of stems, or liquid from stem segments used as eye medicine; stem ashes used as powder for burns.

Goodyera oblongifolia (rattlesnake plantain) - leaves as poultice for cuts, blisters, boils, rheumatic pains, chewed as childbirth medicine, and to determine the sex of the fetus.

Heuchera cylindrica (alumroot) - root applied to boils and sores, especially mouth sores; infusion drunk for stomach ache and diarrhea.

Juniperus communis (common juniper) - infusion drunk for colds, tuberculosis, fevers, pneumonia, aching muscles, kidney ailments, high blood pressure; used as eye wash and protective wash for hunters and others requiring purification.

Juniperus occidentalis J. scopulorum (junipers) - boughs burned or steamed as purifying incense; infusion used as protective wash for hunters, bereaved people, and those seeking luck; used in sweathouse purification rites; infusion drunk for colds, coughs, sore throat, fever, measles, chickenpox, influenza, venereal disease, kidney ailments, and at the onset of labor in childbirth; "berries" eaten for kidney disease; decoction of boughs used as external wash for bites, stings, rheumatism, itching, and to kill ticks on horses.

Larix occidentalis (western larch) - infusion of boughs and bark drunk for tuberculosis, laryngitis, breast cancer, ulcers, poor appetite, any general illness; also used as temporary contraceptive.

Ligusticum canbyi (Canby's lovage) - root chewed for colds, sore throat, fevers, tuberculosis; used as poultice for cuts, burns.

Lomatium dissectum (chocolate tips) - infusion or poultice of root used for dandruff, lice, sores, boils; infusion drunk for colds, sore throat, fever, and as emetic; vapor used to treat winded horses.

Mentha arvensis (field mint) - infusion drunk for colds, coughs, fever, influenza; used as eye wash.

Oplopanax horridus (devil's-club) - decoction of wood drunk for tuberculosis; decoction or infusion of stem drunk for indigestion, arthritis, influenza, tuberculosis, general illness, post-partum medicine, and as tonic and blood purifier.

Paeonia brownii (Brown's peony) - infusion of root top as eye wash; root chewed or decoction drunk for worms, fever, tuberculosis.

Pinus contorta (lodgepole pine) - infusion of boughs drunk as tonic (not for pregnant women); pitch used as poultice for boils, swellings, sores.

Pinus ponderosa (ponderosa pine) - pitch as salve for burns, sores; infusion of young shoots taken for influenza (not for pregnant women).

Plantago major (broad-leaved plantain) - leaves a poultice for sores.

Rhamnus purshiana (cascara) - infusion of bark drunk as laxative and tonic.

Rhus glabra (smooth sumac) - infusion of root as eye wash or drunk for venereal disease, tuberculosis, kidney problems.

Salix spp. (willows) - leaves, shoots, bark used as poultice for cuts, wounds, sores; infusion drunk for coughs, colds.

Shepherdia canadensis (soapberry) - berry whip eaten as "health food" and for digestive tract ailments, decoction or infusion of branches and leaves drunk as purgative, laxative, tonic, stomach medicine, temporary contraceptive, and for high blood pressure; purgative properties used in ritual purification by hunters and young men at puberty.

Smilacina racemosa (false Solomon's-seal) - decoction of rhizomes drunk for colds, sore throat, lack of appetite, digestive tract and gynecological ailments, and internal injuries; decoction of leaves drunk for rheumatism.

Symphoricarpos albus (waxberry) - berries used as eye medicine; infusion of branches as wash for sores, eye wash; infusion drunk for tuberculosis, bed wetting.

able 1. Selected Herbal Medicines (Continued)

Urtica dioica (stinging nettle) - counter-irritant for rheumatic pain, arthritis, backache, paralysis; used in sweathouse.

Valeriana sitchensis (mountain valerian) - roots chewed or drunk as a decoction for respiratory ailments (colds, coughs, tuberculosis), influenza, and digestive tract ailments such as diarrhea; mashed roots and leaves, powdered dried roots, or decoction of roots applied externally for swellings, sores and wounds.

Veratrum viride (Indian hellebore) - (toxic) root as external poultice for arthritis, rheumatism; some use for sores, scalp sores and lice, but others say do not use over open sores or cuts.

Sources: Turner (1981, 1982, 1984, 1988).

tion ceremonies by the Plains peoples, were also used by the Flathead and neighboring Plateau peoples.

Many plants were used as special charms, by virtue of their spiritual powers; these charms were said to ensure long life, obtain friendship, or bring high status, love, wealth, and success in hunting, gambling, and other endeavors. Brightly colored flowers such as red columbine, tiger lily, and calypso (*Calypso bulbosa*) were valued as charms (Turner et al. 1990:55).

Plants also featured, in both natural and supernatural roles, in many Plateau myths and stories. For example, several versions exist of a story about the origin of black tree lichen from hair of Coyote, the trickster and transformer (Turner, Bouchard, and Kennedy 1980:14–15; Bouchard and Kennedy 1979:22–23). A widely known Salishan mythical tradition concerns the long taproot of desert parsley (*Lomatium macrocarpum*), called *ʔəqʔile* in Thompson. It is said to have been the father of one of the "transformers"—beings who traveled around the world when everything was different from its present state, using their magical powers to change things to their present condition. To this day, the *ʔəqʔile* root is associated with fertility and fathering of children (Turner et al. 1990:155). The Shuswap myth, The Man Who Married Grizzly Bear, focuses on the long-standing importance of "root vegetables" (Teit 1909:722). Another, about a poisonous tobacco tree (Teit 1909:646), emphasizes the important role of the native wild tobacco. A Northern Okanagan myth (Turner, Bouchard, and Kennedy 1980:103) concerns the origin of black huckleberries as a gift from the mountain goats. A Klikitat story relates how Cedar Tree taught women their basketry techniques (Beavert 1974; Kuneki, Thomas, and Slokish 1982:17–19).

Ethnozoology

Primary sources for information on the knowledge and use of animals by Plateau Indian peoples are the following: in general, Ray (1942); for Lillooet, Hill-Tout (1900), Teit (1906), Kennedy and Bouchard (1975b, 1992c); for Thompson, Teit (1900), Bouchard and Kennedy (1973–1981); for Shuswap, Teit (1909), Kennedy and Bouchard (1975); Palmer (1975a, 1978c); for Kootenai, Schaeffer (1935), Turney-High (1941); for Okanagan-Colville, Hill-Tout (1911), Teit (1927–1928), Ray (1933), Ehmendorf (1935–1936), Spier (1938), Kennedy and Bouchard (1975a); for Middle Columbia River Salish, Teit (1928); for Coeur d'Alene, Teit (1927–1928); for Flathead, Teit (1927–1928); for Nez Perce, Spinden (1908), Walker (1967), Marshall (1977); for Sahaptin, Hunn (1976–1991, 1979, 1980, 1980a, 1990, 1991), Hunn and French (1984), Murdock (1980); for Upper Chinookans, Spier and Sapir (1930), French (1961); and for Klamath-Modoc, Spier (1930). General information on Plateau fisheries is from Craig and Hacker (1940), Hewes (1973), Cressman (1977), Schoning et al. (1951), Rostlund (1952), Schalk (1977), Kew (1976), and Lovell et al. (1986).

Fishing

Most accounts of Plateau subsistence emphasize the preeminent role of anadromous salmonid fish as a dietary staple. Hunn (1981) has challenged the view that salmon supplied the bulk of food energy for Plateau peoples in protohistoric times. He argues that plant carbohydrates were at least equally important. Nevertheless, fishing technology was highly developed, and a diversity of fishing techniques is known to have been in use in the Plateau since at least 7000 B.C. (Cressman et al. 1960; Sanger 1970; Kirk and Daugherty 1978; Chance 1973). The availability of anadromous fish correlates strongly with Plateau population distributions (Sneed 1971; Kew 1976; Hunn 1990:135).

At least 35 species of freshwater fishes are native to the Columbia and Fraser river basins within the Plateau culture area (Carl, Clemens, and Lindsey 1967; Bond 1973; Wydoski and Whitney 1979). Plateau native languages may recognize nomenclaturally as many as 20 "folk species" of fish (Hunn 1982:832), most of which are used for food. Native ichthyological classification agrees closely with that of Euro-American scientists, in particular in recognizing as distinct each species of salmon (*Oncorhynchus* spp.) and sucker (*Catostomus* spp.) known to occur in local waters (Kennedy and Bouchard 1975, 1975a; Hunn 1980). In some cases local fishes are yet more precisely differentiated, as when "jack salmon" are distinguished from typical chinook

salmon and when sea-run trout, or steelhead (*Oncorhynchus mykiss*, *O. clarki*), are distinguished from nonanadromous populations of the same species (Hunn 1980). On the other hand, the several locally occurring species of dace (*Rhinichthys* spp.) and sculpins (*Cottus* spp.) are not distinguished nomenclaturally, but are "lumped" in single basic level taxa. Most of these "undifferentiated" species are less than 10 centimeters long and are not eaten.

Anadromous salmonids of five species (including the steelhead) spawn in Plateau rivers ("Fishing," this vol.). Collectively they are by far the most important food fishes in the region. Access to these species varied substantially within the Plateau. Quantity, quality (e.g., fat content), and diversity of salmon generally decreases upstream (Kew 1976; Hunn 1981). Peoples living near headwater streams—in particular those above salmon-blocking obstructions—might depend more on trade with downstream, better-endowed allies for their salmon stores than on fishing at sites associated with their own villages (Walker 1967). Large seasonal gatherings at key fisheries, such as The Dalles and Kettle Falls, are noted in the early historical sources (Ross 1956). Nonresident visitors at these locations numbered in the thousands.

Columbia River runs were more reliable than those of the Fraser River. For example, Fraser River sockeye (*O. nerka*) exhibit a four-year cycle, with a single year of great abundance followed by three years of relative scarcity, during which years runs were less than 5 percent of peak year abundance (Ricker 1950; Palmer 1978). No such regular and dramatic cyclic variation occurs in the Columbia system. Significant shortfalls of migrating salmon are reported for the Columbia only far upstream, as at Kettle Falls (Chance 1973). At The Dalles and Celilo Falls eight distinct runs of five salmonid species occurred each year between April and October, minimizing the impact of events affecting any single salmon population or species. Large surpluses were produced there by Upper Chinookan and Sahaptin peoples for trade throughout the Plateau and toward the coast.

Major fisheries were located at falls and rapids where migrating fish could be readily harvested with dip nets, setnets, basket traps, or spears. Fishing sites at the Cascades, The Dalles, and Celilo Falls were the "property" of families, often controlled by a group of related older men. "Ownership" did not imply a right of exclusive access, but rather the right to regulate access by granting permission to visitors to harvest for their immediate needs (Spier and Sapir 1930:175; Hunn 1982a:34–35). The Kettle Falls fishery was managed as a commons, under the direction of a salmon chief who directed the utilization of basket traps placed beneath the falls (Kane 1925:217–218; Kennedy and Bouchard 1975a).

Other anadromous fish significant as food sources were the Pacific lamprey, known locally as "eel" (*Entosphenus tridentatus*), and sturgeon (primarily if not exclusively the white sturgeon, *Acipenser transmontanus*). The large sea-run lampreys were prized throughout the Plateau, and substantial quantities were dried ("Fishing," fig. 5, this vol.). Curiously, sturgeon were disdained by most Western Columbia River Sahaptin people and by some Nez Perce (Moulton 1983–, 7:130–131; Hunn 1980; Scrimsher 1967). Chinookan speakers and the Okanagan-Colville expressed no such aversion (Spier and Sapir 1930:174; Kennedy and Bouchard 1975a).

Valuable nonanadromous food fish include suckers, of which four species are known from the Plateau. The largest species may attain a length of 60 centimeters and weigh over three kilograms. On the Columbia River above Celilo Falls large-scale (*Catostomus macrocheilus*) and bridge-lip (*C. columbianus*) suckers were snagged from pools in small tributary streams where they spawn in late winter. They helped close the late winter "nutritional gap." Though bony, their cultural value is attested in myth and ceremony (Kennedy and Bouchard 1975a; Hunn 1980). Resident trout (*Oncorhynchus mykiss*, *O. clarki*) harvests were incidental to other subsistence activities but supplied fresh fish for families camped in the mountains. The Okanagan-Colville called the Spokane Indians "Rainbow trout people" due to the abundance of that species in Spokane territory (Kennedy and Bouchard 1975a:12). Dolly Varden (*Salvelinus malma*) were avoided by Western Columbia River Sahaptins for their unacceptably eclectic feeding habits (Hunn 1990:163–165), while Lillooet and Shuswap knew the Dolly Varden but did not use it. The Okanagan-Colville called the Lakes Indians "Dolly Varden people" due to the abundance of this species in Lakes territory (Kennedy and Bouchard 1975a:12). Mountain whitefish (*Prosopium williamsoni*) were harvested throughout the Plateau in midwinter or early spring through the ice. Okanagan-Colville also fished through the ice for the introduced lake whitefish (*Coregonus clupeaformis*). Native cyprinids harvested for food include the northern squawfish (to 60 cm, *Ptychocheilus oregonensis*), chiselmouth (to 30 cm, *Acrocheilus alutaceus*), peamouth (to 35 cm, *Mylocheilus caurinus*), and redside shiner (to 18 cm, *Richardsonius balteatus*). They were too bony to be preferred.

Harvest techniques documented for the protohistoric Plateau include a variety of nets and traps; spears, harpoons, leisters, and gaffhooks; hooks and chokers; and a poisonous plant, *Lomatium dissectum* (Ray 1942; Rostlund 1952). Nets were knotted of Indian hemp twine. Mesh size was systematically varied using wooden net gauges depending on the target species. Dip and set nets used bag nets attached to a hoop—typically of vine or Rocky Mountain maple (*Acer circinatum*, *A. glabrum*) (Davies 1980:41; Hunn 1990:184). The hoop was lashed to a pole of Douglas fir up to five meters long. The net bag might be attached to the hoop via sliding rings of mountain goat horn (Teit 1930) so that the weight of a fish in the net would close the mouth of the net. Dip nets were hand held

and swept with the current down a prepared or natural channel. Set nets were larger than dip nets and were suspended from fixed supports where jumping fish would fall back into the net.

Long rectangular nets—some recorded as 100 meters long by more than two meters wide (Glover 1962:352)—were used as gill nets set perpendicular to the shoreline of a large river to intercept fish migrating upstream. Wooden floats and stone weights were employed to hold the nets in position. Stone artifacts that might have been net weights have been recovered near The Dalles in contexts dated as early as 5500 B.C. (Cressman 1977:118–119). Such nets were also employed as seines on sandy beaches, drawn between a canoe and a crew on shore (James Selam, personal communication 1992). Much shorter gill nets might be drawn between two canoes (Teit 1930; Ray 1942:108). Basket traps of willow branches were used in conjunction with stone diversion walls in small streams or were placed beneath a fall to catch jumping salmon. A large, communal basket trap was employed at Kettle Falls (Kane 1925; Kennedy and Bouchard 1975a). Willow withe weirs were built across small rivers such as the Colville and Walla Walla, directing migrating fish into a variety of basket traps and enclosures where they could be readily speared or gaffed (Davies 1980). The twined willow fencing could be rolled up and removed (Ray 1942:105).

Leisters (two- and three-point) and thrusting spears with detachable heads (harpoons) were in use throughout the region, perhaps for the past 9,000 years (Cressman 1977:114–116). The barbs of leisters were typically of bone splinters lashed to paired wooden prongs pointing backward and inward at a 45 degree angle. Spearing was most effective where fish passed up a shallow slope over pale-colored rocks. Artificial channels were sometimes constructed to facilitate spearing. At Priest Rapids nocturnal torchlight spear fishing was practiced and dip-netting prohibited by traditional law (Relander 1956:53). Torches were of bundled cedar splints set on shore. Curiously, at Celilo Falls night-time fishing was not allowed, while dip-netting was a favored technique there (James Selam, personal communication 1977). A bone choker was in use near the mouth of the Walla Walla River in 1806 (Moulton

[illegible]

Fig. 8. Mortars and pestles used in food preparation. left, [illegible] woman demonstrating method of pounding fish. Photograph by Edward S. Curtis, 1909. top right, Wooden mortar with incised design below rim. Height without handle 19 cm. bottom right, Wooden pestles used to [illegible] roots, or dried fish [illegible]. Collected by [illegible] at Warm Springs, Oreg., before 1921. Length of pestle on left, 24 cm.

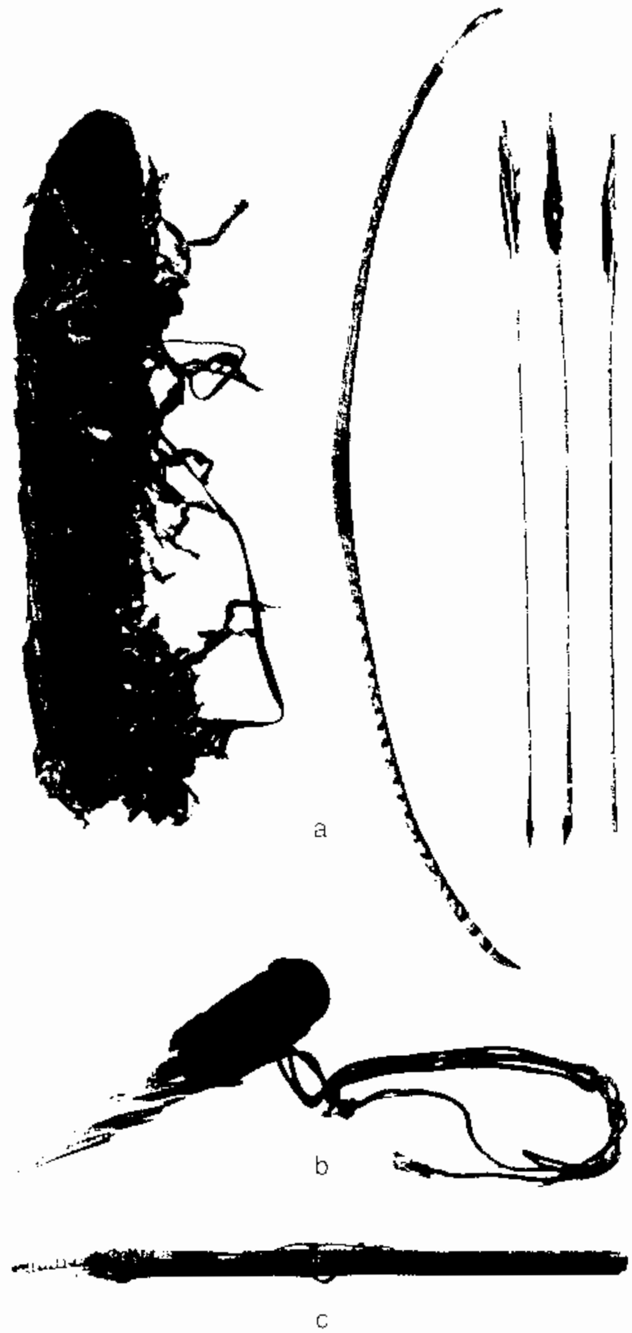
1983–, 7:170–172). Bone-pointed hooks were also used, attached to a hemp or willow bark line, baited with caddisfly larvae (*Trichoptera*), hellgrammites (*Neuroptera, Corydalidae*), crickets and grasshoppers (*Orthoptera*), fish eggs, or bits of meat (Kennedy and Bouchard 1975, 1975a). Horsehair nooses were also employed to "rope" small fish (James Selam, personal communication 1977). Finally, the root of chocolate tips was mashed into a small, still stream to stupefy trout (Meilleur, Hunn, and Cox 1990).

Fish were cooked by boiling or by roasting over an open fire, spread on a hardwood stick. They were most often wind dried in the shade of a ramada-like drying shed, the fish artfully cut to minimize spoilage and hung in a single piece. On the middle Columbia River, fall chinook salmon were preferred for winter storage, though large quantities of spawned-out salmon were dried as well (Moulton 1983–, 5:287). Sahaptins and Upper Chinookans prepared a special food from salmon by pounding the dried flesh (fig. 8) into a powdered meal ("Columbia River Trade Network," fig. 2, this vol.) that was packed in a cattail bag lined with salmon skin for winter storage and for trade. Each bag weighed some 45 kilograms (Moulton 1983–, 5:320).

Hunting

Hunting was of distinctly secondary importance as a source of food, at least in the central Plateau. Nevertheless, hunting prowess was highly regarded (Romanoff 1988). Groups occupying the headwaters of Plateau rivers, in particular those at or above the head of salmon navigation, depended more substantially on game for food. A greater dependence on game also characterized groups in the more heavily forested northern half of the Plateau region, where there were fewer root staples (Palmer 1975a). Likewise the Modoc are judged to have depended more heavily on hunting than their Klamath neighbors, who had access to a richer fishery (Stern 1965:4–5).

The primary big game species was the mule deer (*Odocoileus hemionus*). Two forms of this species were recognized in Sahaptin, which correspond to the black-tailed (*O. h. columbianus*) ("Kinship, Family, and Gender Roles," fig. 3 bottom right, this vol.) and Rocky Mountain (*O. h. hemionus*) subspecies. Elk or wapiti (*Cervus elaphus*) were highly regarded and widely pursued, though they were less abundant and more locally distributed than mule deer, except in the Klamath area where elk were more common (Spier 1930:155–156). Of lesser importance were big-horn sheep (*Ovis canadensis*), mountain goat (*Oreamnos americanus*), white-tailed deer (*Odocoileus virginianus*), pronghorn (*Antilocapra americana*), moose (*Alces alces*), and caribou (*Rangifer tarandus*). Bison (*Bison bison*) were not uncommon protohistorically in Flathead country and occasionally



a, Smithsonian, Dept. of Anth.: 4943; b, Smithsonian, Nat. Mus. of the Amer. Ind.; c, Amer. Mus. of Nat. Hist., N.Y.: 16/7993.

Fig. 9. Hunting implements. a, Flathead arrows, bow, and quiver. The bow is covered with snakeskin and wrapped in the middle with a fiber cord and on the ends with sinew. The quiver is probably made from otterskin. One arrow tip is missing; the remaining 3 are made of metal. Collected by James T. Graham, Ft. Colville, Wash. Terr., before 1869. Length of bow 98 cm. b, Shuswap bone beaver spear point fitted into a wooden foreshaft. This detachable point would have been fastened to a long wooden handle with a length of cord. Collected by James A. Teit, Carrier Lake, B.C., 1907. Length 25 cm. c, Thompson beaver spear constructed of a detachable horse bone point and a wooden handle. Collected by James A. Teit, B.C., before 1900. Length 76 cm.

Fig. 10. Preparation of meat for storage. Flathead women (Sophie Morese on left) drying meat over a slow fire. Photograph by Edward S. Curtis, 1909.

strayed farther west (cf. Schroedl 1973). They were regularly hunted in the upper Snake River plains and on the eastern slopes of the continental divide by mounted parties from the Plateau. Southern Plateau groups from as far west as the Yakima traveled east to hunt bison after they obtained horses (Anastasio 1972). Some parties returned with meat, but most subsisted on bison during the expedition, bringing home the hides for trade.

Deer and elk were most often hunted by small groups of men systematically working a single stream basin. A party would climb the dividing ridges to the head of the basin and wait while their partners worked upstream (Ray 1933:50–82). In more open terrain, large parties worked together under the lead of an individual noted for his hunting powers to surround a herd, driving the animals into a corral or ambush, then dispatching them with arrows (fig. 9). Cliff drives have been described for the Wanapam (Relander 1956:45), though that technique was apparently rarely resorted to. Deer might be driven into water where they could be dispatched by drowning or clubbing (Ray 1933). Dogs were used to drive game. Single hunters might stake out a spring, salt lick (fig. 10), or feeding site using a tree stand or stalk their prey wearing a deer skin and head for disguise, shooting the animal with bow and arrow when within range. Deer were attracted within range by blowing on a leaf to imitate the sound of a fawn (Ray 1933).

The importance of sweat bathing in preparation for hunting is everywhere stressed, as a means of eliminating the human scent as well as for mental and spiritual preparation.

Pit and deadfall traps and hoop snares were also sometimes used for deer, but were more often employed for smaller game. Bears might be shot with a bow and arrow if encountered on the berrying grounds; but they were pursued most often in their winter dens, smoked out, then shot while still half asleep. Bear meat was typically cooked in an underground oven (Teit 1930; Hunn 1990). Hunters pursued the grizzly bear only if possessed of appropriate spirit powers (Ray 1933:83).

The members of a successful hunting party shared the liver at the site of the kill, then the hunter who first struck the animal divided it among the party. The animal was skinned and butchered at the site and packed out on the men's backs. Strong social and presumed spiritual sanctions applied against those who wasted any usable part of the animal (Jacobs 1929:200).

Furbearers were hunted primarily for their skins ("Columbia River Trade Network," fig. 8, this vol.) though their flesh was consumed incidentally. These included most carnivores: red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*, south of the Columbia River only), gray wolf (*Canis lupus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), marten (*Martes americana*), fisher (*Martes pennanti*), mink (*Mustela vison*), weasel (*Mustela* spp.), wolverine (*Gulo luscus*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), river otter (*Lutra canadensis*), mountain lion (*Felis concolor*), lynx (*F. canadensis*), and bobcat (*F. rufus*). Also taken for their skins were hares (*Lepus* spp.), cottontail rabbits (*Sylvilagus* spp.), beaver (*Castor canadensis*), and muskrat (*Ondatra zibethicus*). Porcupines (*Erethizon dorsatum*) supplied quills and guard hairs, much used for ornament.

Several rodents were hunted or trapped for food and skins (fig. 11; "Northern Okanagan, Lakes, and Colville," fig. 5, this vol.). These include yellow-bellied marmots (*Marmota flaviventris*), ground squirrels (*Spermophilus* spp.), and tree squirrels (*Tamiasciurus* spp., *Sciurus griseus*). Colonial ground squirrels were flushed from their burrows with water. Rabbits might be extracted from their burrows with a forked stick twisted into their fur. When abundant, hares were harvested in communal drives using long nets, at least in the Southern Plateau. Men, women, and children all participated.

Skins or products of species rare or absent in one area but common elsewhere were exchanged through trading

Fig. 11. Lillooet marmot fur mittens. Collected by Harlan A. Smith in 1898. Length 35 cm.

[illegible]

Fig. 12. Hide processing and Flathead tools used at various stages of hide preparation for removing flesh and hair, stretching the hide, and squeezing out the liquid in which the hide had been soaked. top left, Elk antler flesher; top right, beaming tool made of a horse rib bone with [illegible] ends used when the hide is stretched over a log or beam; center left, stone scraper with bone handle lashed with buckskin; center right, [illegible] hide [illegible]. Collected by C.E. Schaeffer in Arlee, Mont., 1934. Length of top left, 23 cm; length of top right, 47 cm; length of center left, [illegible] cm; length of center right, 15 cm. bottom left, Kootenai woman making skin more pliable by stretching it. Photograph by Edward S. Curtis, [illegible]. bottom right, Agnes Kenmille, Flathead and Kootenai, wringing water out of rawhide. Photograph by Michael Crummett, Pablo, Flathead Res., Mont., 1994.

partnerships (Palmer 1975a:229). For example, woven mountain goat wool blankets and belts were obtained by the Shuswap from Lillooet and Carrier to the west (Teit 1909:535–537).

Birds hunted for food include Canada geese for meat and eggs (*Branta canadensis*), resident and wintering ducks, and swans (*Cygnus* spp.). All grouse were fair game. The only reptile or amphibian considered edible was the painted turtle (*Chrysemys picta*). The only invertebrates sought for food were several species of freshwater clams (*Margaritifera falcata*, *Anodonta* spp., *Gonidea* spp.) considered by some contemporary consultants to be "famine food" (cf. Lyman 1984). However, Sahaptin peoples considered dried saltwater clams a delicacy. Such clams were sought in trade from Coast Salish Indians (Elmendorf 1960; M.W. Smith 1940). Species most often traded were cockles (*Clinocardium nuttallii*), butter clams (*Saxidomus giganteus*), and horse clams (*Tresus capax*, *T. nuttallii*).

Animal Products in Technology

Skin, bone, teeth, antler, horn, hooves, sinew, hair, quills, feathers, and shell were employed in a great variety of ways in the manufacture of tools, clothing, and ornament (Ray 1942).

The mule deer was the most important source of hides for clothing throughout the Plateau. Buckskin breechcloths, shirts, dresses, leggings, and moccasins were typical articles of apparel at first historic contact. Such buckskin clothing has been attributed to late Plains influence (Ray 1933:46), but the presence of bone needles and hide scrapers in the Southern Plateau dating to 9000 B.C. (Kirk and Daugherty 1978:36) suggests great antiquity for skin clothing technology. Buckskin was also used for quivers, tumplines, and bags, while fawnskin was preferred for caps and for diapers and cradle bags for babies on the cradleboard (Ray 1933:47, 128–129).

The hide-softening process was described in early twentieth-century accounts (Teit 1930:44–46; Ray 1933:94–96; Hunn 1976–1991). It is the work of women (fig. 12).

Deer sinew taken from the backbone was the preferred material for bowstrings; that from the leg was glued to the back of the bow to strengthen it. Neck sinew might be used for whips to administer lashes (Ray 1933:113). Sinew was also used for binding feathers and stone points to arrow shafts (fig. 9) and for thread for sewing buckskin clothing.

Deer bone was used for awls ("Shuswap," fig. 5, this vol.) in the manufacture of coiled cedar root baskets (Schlick 1994), for sewing needles, and for tattooing (Teit 1930:81). A deer leg or clavicle bone was heated to split it into long, slender pieces from which needles, fish spear barbs, hook points, or gorges were made. Bone fragments were also used to carve wooden bows and to shape arrow shafts. Elk or bison scapula or ribs were used as bark and hide scrapers.

Elk antlers were commonly used for saddle frames, with hides stretched over them to form the saddle. A single antler section with a pointed or sharpened tine could serve as a digging stick (fig. 13), or a piece of antler might be hafted to a hardwood shaft as a digging stick handle. A small piece of antler served as the primary flint-knapping tool. A piece of deer antler might be used as the foreshaft of a fishing spear (Ray 1933:60–61) or as a wedge for felling or splitting trees and logs.

A bison horn was fitted as a handle on a polished stone pestle, or for hafting knife blades. Bighorn sheep, mountain goat, and bison horn were carved to make bowls, cups (fig. 13), and spoons (Ray 1933:42). Horn bows were sometimes manufactured by heating and then flattening the spiral horns of bighorn sheep (Ray 1942).

Fig. 13. Objects made from antler and horn: top left, Grease cup made of sheephorn. Collected by E.T. Waterman in Warm Springs, Oreg., before 1921; top right, Shuswap antler root-digger. Collected by Harlan I. Smith, Kamloops, B.C., before 1928; bottom, Unhafted antler quirt. Collected by J.W. Skill before 1925. Length of top: 8.7 cm; bottom: 32.5 cm; length of bottom: 36.5 cm.

Deer hooves were dried for use as dance rattles ("Music and Dance," fig. 4, this vol.), and the cartilage of the hoof extracted by boiling for use as glue (Ray 1933:88). Deer fat was employed as a medium for a medicinal salve and as a base for face paints. The Sanpoil mixed the marrow with hemlock needles as a hair pomade (Ray 1933:53). Elk teeth were often chosen to decorate a woman's dress ("Cayuse, Umatilla, and Walla Walla," fig. 10, this vol.). Beaver teeth were used as dice in a women's gambling game played throughout the Plateau (Ray 1942:183).

Virtually all locally occurring species of the cat, dog, and weasel families, as well as bears and raccoons, might be taken for their furs. The larger rodents, rabbits, and hares were also taken, though domestic cats and dogs were never so used. Most often these animals were caught in snares or deadfall traps. The skins of the smaller furbearers were typically dried with the hair on and worked by hand to soften and stretch them. Rabbit fur mittens and caps (with the fur turned inside) were worn in winter and winter robes and blankets were woven of long strips of rabbit skin. River otter and weasel skins were braided with the hair or tied to one's belt, shirt, or cap for decoration. Only the westernmost Sahaptin groups mention the use of mountain beaver (*Aplodontia rufa*) skin robes. That species is restricted to the west slopes of the Cascade Mountains. Fox, wolf, muskrat, and beaver skin caps were worn by the Sanpoil (Ray 1933:47). Beaver musk glands, tied in a buckskin bag, were used as a cachet and love charm by Sanpoil and Sahaptin men (Hunn 1990:143).

Wolf skin robes and porcupine skin hats were characteristic shaman's attire (Hunn 1976–1991). Porcupine guard hair roaches decorated Plateau war dance regalia, while porcupine quill decorative design work—the quills variously dyed—was an accomplished Plateau art. Coyote skins were widely used, for example, for quivers, for wrapping infants, for boy's shirts, for winter leggings (along with badger fur), and for ponchos on winter hunting excursions. Bear skins with the fur inside were also employed for the last two purposes (Ray 1933:46; Hunn 1976–1991). Bear claw necklaces were a badge of the successful hunter (Ray 1933:50). A shaman might use a skunk's tail as a brush in curing a child. The tail was then tied to the child's cradleboard (Ray 1933:127).

Feathers were popular decorative elements. Plains-style feathered headdresses have gained popularity in historic times ("Nez Perce," fig. 8, this vol.), though traditionally tassels of red-shafted Northern flicker (*Colaptes auratus cafer*) tail or wing feathers were worn by shamans and used to invite "stranger spirits" into the winter dance lodge (Ray 1933:197). "Red-headed woodpecker" (probably the pileated woodpecker, *Dryocopus pileatus*) scalps were popular ornaments (fig. 14), while eagle (*Aquila chrysaetos, Hali-*

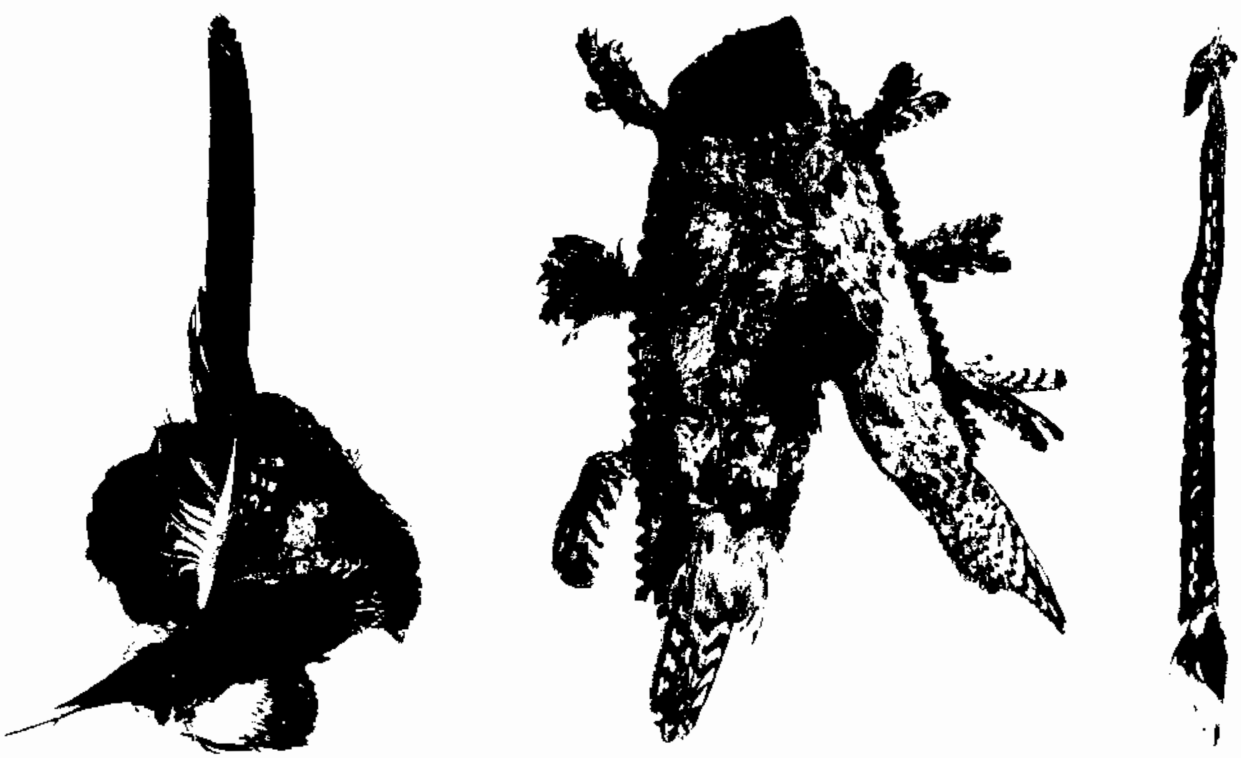


Fig. 14. Clothing made of fur and feathers. left, Loonskin headband with eagle feathers. Collected by James A. Teit from the Upper Thompson before 1900. Height 34 cm. center, Northern Okanagan buckskin and rabbitskin shoulder sash ornamented with hawk feathers and painted in designs representing arrowheads and arrowshafts. Collected by James A. Teit from the Nicola Okanagan in 1905. Length 85 cm. right, Kalispel hair ornament made from a woodpecker scalp, fawn hide, horse hair, and buckles. Collected by T.T. Waterman at Cusick, Wash., before 1921. Length 60 cm.

aceus leucocephalus), owl (*Bubo virginianus*), and hawk feathers were preferred for a warrior's costume. Tufts of eagle down decorated the characteristic Sahaptian basket hat (Schlick 1994). Eagle tail feathers were of great religious significance. Proper burial required (and in 1992 still required) that the corpse be interred with a pair of such feathers attached to the shoulder or arm. Magpie feathers were judged effective in deterring ghosts (Hunn 1976–1991).

Hawk and eagle feathers were preferred for fletching arrows. Split feather quills might be used decoratively much as were porcupine quills. To obtain eagle feathers, the birds were sometimes captured by hand from a pit blind or from ambush at the nest. Some accounts indicate that the feathers were plucked and the bird released (to molt new feathers), while others say the birds were killed for their feathers.

A goose bone tool was used to strip Indian hemp fibers from the stem, and the hollow wingbones of large birds generally were employed as whistles.

Rattlesnake venom was reputedly applied as a poison to arrow points (Walker 1973; Spier and Sapir 1930) by certain Plateau groups.

Horses

Lewis and Clark reported individual herds among the Nez Perce of 50–100 horses as common (Moulton 1983–, 7:252, 254). The rapidity with which horses were accepted and integrated into Plateau Indian life is striking. Haines (1938a) calculates that horses were first acquired by Cayuse, Nez Perce, and Flathead groups from Northern Shoshones on the upper Snake River by 1720 (cf. Teit 1930:350), from whom they had spread throughout the Plateau by the end of the eighteenth century. The Lakes never adopted horses, as their native environment was not suited to their use (Teit 1930:249). By the 1820s horses were in use among Nisqually (Southern Coast Salish) who got them from upriver Sahaptin-speaking neighbors (M.W. Smith 1940).

Horses clearly enhance the mobility of peoples already committed to extensive seasonal movements in pursuit of subsistence. Nevertheless, it is unlikely that the horse fundamentally altered basic subsistence strategies of Plateau peoples, as gathering and fishing continued to provide the bulk of subsistence needs well into the late nineteenth century.