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The Legacy of Introduced Disease: The Southern Coast Salish

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The purpose of this paper is to develop more fully for the Southern Coast Salish the recently published chronology that describes and analyzes the effects of European-introduced diseases and illnesses on the aboriginal populations of the Northwest Coast.[1] A brief description of aboriginal population estimates and social structure is followed by a discussion of the nature of indigenous diseases and illnesses; last we present an analysis of the impact of introduced sicknesses on population, social structure, ceremonialism, and other aspects of traditional Southern Coast Salish culture.[2]

The impetus for this research stems from two sources. First, after the completion of an ethnographic study of the contemporary health care system and the lay health care-seeking strategies of the Puyallup tribal community in Tacoma, Washington, we were interested in assessing the impact of introduced diseases, illnesses, and Western medicine on the tribal societies of the area.[3] We were searching for answers to the following questions: Under what set of situations did the contemporary health care beliefs and

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practices of the Indian people arise from the aboriginal context? Why did these changes occur?

Second, a model has emerged which describes the general characteristics of the impact of introduced infectious viral diseases (particularly those spread by droplet infection and displaying a latency period, such as smallpox and measles) on hunter-gatherer-fishing societies and other subsistence-level, small-scale, tribal organizations. Common patterns of response to these diseases include (1) flight from infected areas, leading to the spread of the infection over wide geographic regions through social networks; (2) overloading of the health care system such that traditional health care practitioners are unable to treat all those infected; (3) utilization of inappropriate health care practices by traditional practitioners, leading to increased morbidity; (4) cessation of the full range of normal subsistence activities, leading to higher death rates due to nutritional stress; (5) a general breakdown in the sociocultural system in the face of the epidemic; and (6) a series of long-term consequences to the structure and character of the traditional culture due to the high rates of morbidity.[4]

We wanted to determine the extent to which the case of the Southern Coast Salish supported, extended, or modified this model. It is beyond the scope of this paper to address the second objective in great detail, but we will critique the general outline of the model, using the ethnohistoric data presented.

For our purpose, *disease* is a sickness, defined in Western biomedical terms, which is attributable to a relatively well-defined biological etiology, such as a virus or bacterium. The term *illness* will be used in reference to cultural (that is, learned and shared) conceptions of sickness among different cultural groups, both indigenous and Western. *Sickness* and *ailment* are used as cover terms to refer to both disease and illness.

POPULATION AND SOCIAL STRUCTURE

Southern Coast Salish subsumes two interrelated and similar cultures with different languages: the Lushootseed-speaking groups around Puget Sound and the Twana-speaking people of the Hood Canal area. The aboriginal population of the two groups at the time of first recorded contact has been estimated to be 11,835 Lushootseed speakers and 800 Twana speakers.[5]

The winter villages of these fishing-hunting-gathering people

were economic as well as social units. The village centered around one or more plank-houses. Summer residence was dispersed and seminomadic so that small groups of villagers could exploit a broad range of resource areas within a wide territory. During the winter, subsistence activities were minimal, while religious and ceremonial activities were at a maximum.[6]

There were three main social classes: an upper free class, a lower free class, and a slave class.[7] The political structure of the village community was not formalized to the extent found among other tribes on the Northwest Coast. Rather, prestige and influence lent a certain level of authority to the wealthiest head of household in each village. Kinship was based on bilateral descent, and kinship terms made no distinctions between the two parental lines. Polygyny was practiced, but usually restricted to the upper class.[8]

Certain ceremonial forms (including feasting and gift-giving, the winter spirit dance, the soul-recovery ceremony, the potlatch, and the secret society) often functioned as expressions and validations of upper-class membership and involved a number of village communities. Individually acquired and controlled guardian spirits, which found ceremonial expression in the winter spirit dance, were a primary component of the religious system. Shamanism was a specialization of the guardian-spirit complex, in which spirits were acquired through the vision quest, and involved alliances with the most powerful spirits for the purpose of curing and for working harmful magic. Illness theories were complex; some were based on a logic of supernatural causes requiring supernatural curative techniques; others were based on naturalistic and herbal knowledge. Beliefs concerning souls and the lands of the dead were well defined and received ritual expression in the curative soul-recovery ceremony.[9]

ABORIGINAL HEALTH AND SICKNESS

Information concerning aboriginal health and sickness in the Puget Sound basin, as in most areas, is extremely difficult to obtain.[10] Reports by early explorers and traders document existing sickness, but it is often difficult if not impossible to determine if observed diseases or illnesses existed indigenously or had been introduced prior to direct contact through aboriginal trade routes from previously contacted areas.

The general health of the indigenous people appears to have

been good; some individuals lived to sixty years of age and older.[11] The high-protein, low-carbohydrate, low-sugar diet consisted primarily of fish, shellfish, plant foods, and occasional deer, elk, and other land and sea mammals.[12] Teeth wear (from eating shellfish), and thus a frequent incidence of worn and open pulp chambers, may have led to high rates of abscessed jaw sockets, as observed among other Northwest Coast groups.[13] Dental cavities were minimal prior to the introduction of refined sugar and high sugar foods, such as molasses.

It is likely that any contagious diseases that existed prior to contact had been present in the population for a long enough period to cause minimal morbidity and mortality. Possibly present but undocumented were some diseases thought to be indigenous to America: dysentery (bacillary, amoebic), viral pneumonia, non-venereal syphilis, localized rickettsial diseases, streptococcus and staphylococcus, salmonella or other food poisons, and perhaps tuberculosis and trachoma.[14] Skeletal tuberculosis has not been identified in prehistoric remains from the Northwest Coast culture area, but there is evidence from two Northwest Coast localities outside the Puget Sound basin for the indigenous presence of treponemal infection.[15]

Of particular concern for the Puget Sound basin is the very real possibility of seasonal food poisoning in summer months from clams, oysters, and other shellfish.[16] The extent of indigenous precautions to prevent such occurrences is not known. However, it is known that the Twana and southern Lushootseed speakers used a seasonal change in a specific type of tree to mark clam season: "When the dogwood bloomed, it was a sign that clams were good." (In Twana, the name for the Pacific dogwood [*Cornus nuttallii]* was *Racing with the Clams.)* This precaution appears to be consistent with current patterns of red tide warnings in the Puget Sound area in which the butter clam is the first bivalve to be inedible due to high levels of toxin.[17]

An ailment described as "sore eyes" is frequently mentioned in early contact times on the Columbia River from Walla Walla to the mouth and seems to be associated with salmon processing. Partial to almost complete loss of sight is reported because of this sickness. The nature of this disease is uncertain, although conjunctivitis and trachoma are possibilities. The former may be caused by a wide variety of bacterium. The latter, a chronic disease (that is, a disease having a long duration, as opposed to acute), could have been brought to the Americas with the first immigrants over the

Bering land bridge.[18] The "sore eyes" syndrome was probably present in the Puget Sound basin also. The Southern Coast Salish utilized a large number of eye medicines for "sore eyes."[19]

Periodic starvation and other effects of malnutrition and undernutrition may have existed for the Northwest Coast culture area, generally because of dependence on unpredictable and cyclical food resources.[20] However, the constant presence of shellfish in the Puget Sound basin probably minimized this problem for the local people. Indeed, when upriver preserved salmon reserves and other food resources were exhausted, the upriver people often visited groups that had access to shellfish or that acquired shellfish from saltwater tribes.

Complications experienced by women and infants during childbirth, and accidents due to fishing, hunting, and other subsistence activities were probably among the leading causes of injury and mortality. Injuries received during intertribal raids also were relatively common.

There is some evidence that the indigenous people were subject to several culture-bound psychiatric syndromes that were symptomatic of the internal cultural stresses and social pressures of small-group, kin-based living.[21] Typically, such disorders were clearly defined, easily recognized, and readily treatable by shamans, the folk practitioners responsible for curing disorders caused by psychosocial stresses. Shamans occupied the ambiguous role of being able to both cure and cause illness. Because shamans were feared for their supernatural powers, they were often the source of individual and group anxiety. Shamans were sometimes killed if they were unable to cure a patient or if they were suspected of causing illness or death.[22]

The traditional material used for smoking was the kinnikinnick plant (*Arctostaphylos Uva-ursi*). The leaves were dried, broken up and smoked for narcotic effects. An intoxicated state was achieved by inhaling the smoke. Prior to contact, tobacco was introduced to southern Puget Sound and Hood Canal.[23] It was smoked alone or mixed with kinnikinnick, again as a narcotic. The following description from the mid-nineteenth century seems representative of aboriginal practices among the Twana:

> Smoking was a habit especially associated with old people, of both sexes, and shamans. The smoker inhaled vigorously, drawing to the bottom of his lungs. . . . "When old people smoked you could see streams of smoke as large as your

> thumbs spurting out of their nostrils. They'd get groggy. People smoked to get drunk, especially doctors; they smoked most anyway."[24]

Smoking among the elderly may have alleviated the pains of arthritis and/or rheumatism.

INTRODUCED DISEASES PRIOR TO DIRECT CONTACT

The date of first direct contact between the Southern Coast Salish and outsiders is unknown. The first recorded contact with European civilization is attributable to the George Vancouver expedition of 1792. However, a long history of irregular contacts between the Orient and America is thought to have existed prior to this time. Spanish exploration of the Northwest Coast began in the 1700s, but no direct contact with the Puget Sound people is recorded. English (Drake in 1579) and Russian (second Bering expedition in 1741) exploring expeditions touched the peripheries of the Northwest without contacting the Southern Coast Salish. The type of diseases that may have been introduced directly or indirectly to the Southern Coast Salish or other Northwest Indian people by these various contacts is largely an unresearched subject.[25]

The presence of horses in the Northwest, first introduced to the continent by the Spanish in Mexico, was evidence of extensive aboriginal trade and contact networks throughout North America. Haines dates the first appearance of the horse on the Columbia Plateau at 1730, seventy-five years prior to the first recorded European presence in the area.[26] Horses preceded Europeans to the Puget Sound basin, arriving possibly as early as the mid-1700s on the southern Puget Sound via migrations of the Sahaptin-speaking Indians over the mountain passes to the area.[27] By 1800, horses had spread to some neighboring Lushootseed-speaking groups, including the Nisqually and Steilacoom.[28] In 1824, during the second recorded European visit to the Puget Sound basin, John Work observed the marks of horses on Vashon Island, located between Puyallup and Shotlemamish territories.[29]

Horses may have fostered major changes in subsistence activities, including more efficient utilization of various wild foods, and therefore increased the carrying capacity of many regions. This was especially true for groups living in prairie areas, such as some

bands of the Nisqually Indians of the southern Puget Sound. Horses also broadened intergroup social relations by increasing mobility and thus the range, frequency, and speed of interactions among groups and individuals. Introduced diseases spread along aboriginal trade or contact routes, including those through which horses were exchanged or stolen.

The first disease epidemic known to have reached the Southern Coast Salish prior to direct contact is smallpox. The disease appears to have swept through the Northwest during the late 1770s along indigenous trade, contact, and ceremonial routes within the Northwest Coast culture area, and from the coast inland up the river systems and across the Plateau and Plains. The source of the introduction to the Northwest is disputed, but the presence of a population with minimal if any immunity appears to have insured the rapid spread of the disease.[30] While the previous presence of this disease cannot be ruled out (indeed, recent archeological research in the northern Columbia Plateau supports the theory of an epidemic in the first quarter of the sixteenth century), this epidemic was probably one of the major precontact causes of population decline among the Southern Coast Salish and American Indian people of the Northwest generally.[31]

The number of people infected in this population and the resulting mortality rates were probably extremely high. *Variola major*, or classical smallpox, is accompanied by a fatality rate, on the average, of at least 30 percent of those infected, with rates reported as high as 50 to 74 percent of the cases.[32] Complications associated with smallpox include pneumonia and pleurisy, encephalitis, scarring of the cornea and blinding, and boils and abscesses.

One of the earliest records of smallpox comes from Lieutenant Peter Puget and his longboat party from the Vancouver expedition, who encountered three Southern Coast Salish Indians in a canoe at Carr Inlet. "Two of the three in the Canoe had lost the Right Eye & were much pitted with small Pox, which Disorder in all probability is the Cause of that Defect." The journals of the George Vancouver expedition contain another reference to meeting many pockmarked people, several of whom had lost the sight of one eye, among the Twana people of Hood Canal. Vancouver stated that this sight loss is "owing most likely to the virulent effects of this baneful disorder [smallpox]." Peter Puget summarized his impression of the native people of Puget Sound and the Gulf of Georgia by stating that smallpox had raged with uncom-

mon strength among them. He claimed that most had had smallpox, most were terribly pitted, and many had lost their eyes. According to George Vancouver, there had been an "apparent depopulation" on Puget Sound as a result of smallpox a decade earlier.[33]

Smallpox is an infectious viral disease spread primarily by droplet infection (usually by sneezing), with an incubation period of seven to eighteen days (average of ten). Infection may also be transferred by physical contact with an individual in the infective stage. Some evidence supports the view that transmission may sometimes occur by touching a corpse within a few weeks of death or through contact with items that have been in close contact with the infected person.[34] However, the virus on objects appears to become inactivated rapidly, even when the objects have been heavily contaminated. There are no symptoms during the latency period, and the person is not infective. The incubation period is followed by a prodromal phase, with fever, headache, and body pains, that lasts about two days. A rash appears after about two weeks, followed by a series of well-defined stages. The time period from infection to recovery or death is approximately one month.[35]

Based on observations among other tribal groups and the inherent epidemiological nature of the disease, we logically conclude the following: Although not everyone in a group became infected simultaneously, the proportion of sick individuals in the population probably made the continuation of normal subsistence activities impossible. Thus, undernutrition or malnutrition contributed to the rate of infection and death, particularly among the most vulnerable in the population—infants, young children, and the very old. Nursing may have been severely reduced,since many mothers were unable to provide milk and many babies were unable to take the breast.[36] The long incubation period, combined with the high rate of mobility and intergroup contact in the Puget Sound basin, probably facilitated the continual spread of the virus. Purposeful flight from areas of high morbidity, reinforced by the Southern Coast Salish practice of avoidance of the dead (lest the spirit of the living be dragged to the land of the dead), probably increased the number of populations infected. Shamans, sucking doctors, and herbalists—the individuals who treated the sick—and undertakers—those spiritually prepared to deal with corpses—were perhaps differentially infected by close proximity to the dying and the dead. However, the traditional practice of burning the belongings of the dead, including in some cases the entire

house of an important person, perhaps helped to counteract the spread of the disease to a limited extent.

In addition to reducing the population of the Southern Coast Salish by considerable numbers, the epidemic probably caused a change in the geographic distribution of the surviving groups.[37] Some groups may have been severely impacted or even decimated, while others escaped with few fatalities. A pattern may have occurred of desertion of certain regions and regrouping and coalescence of survivors in more restricted areas. The sociocultural impact of the regrouping and coalescence of formerly distinct populations was probably considerable.

The following piece of oral history collected from the Hood Canal area between 1935 and 1936 may point to a movement of groups caused by the spread of disease. We suggest that this new group had recently settled in the area, since Lake Cushman was part of Skokomish Twana territory and received heavy summer use. At a minimum, even though the date to which it refers is unknown (perhaps the mid-1800s, during the 1852-53 smallpox epidemic that reached the Puget Sound basin), it suggests that smallpox did decimate entire villages:

> About three generations ago the [Skokomish] were said to have traveled inland to hunt and to have discovered on the trip a group of Indians living permanently at Lake Cushman. The Twana had previously been unaware of their existence. The newly discovered group spoke an unintelligible language and soon after was completely wiped out by smallpox.[38]

The indigenous health care practitioners were not prepared to deal with this type of introduced infectious disease, nor were they numerous enough to treat the mass of people infected.[39] Indigenous treatment strategies were not effective in stemming this new form of pestilence. Two treatments that probably increased the rate of infection and/or mortality were the sweat bath and the practice of gathering around the sick person to provide spiritual support. Curing in a group ceremony, with relatives and friends watching or participating in the practitioner's performance, accompanied by drummers and singers, likely increased the number infected. Sweat bathing followed by immersion in cold water—an available, family-based folk treatment (seemingly more common among Plateau groups than among the Southern Coast Salish)—caused shock or induced death through pneumonia.[40]

The indigenous culture observed by members of the Vancouver expedition probably had already been modified by the presence of smallpox. Some cumulated cultural tradition may have been lost, and social institutions were perhaps simpler than before. In oral-based societies, traditional knowledge (language, spiritual, ceremonial, kinship, and subsistence) is maintained primarily in the memory of elders, one of the most susceptible segments of the population to smallpox and smallpox-induced nutritional shortages. Elders are also the role models who maintain social and moral order. The effect of the loss of role models for children and adults had the potential of severely impacting social organization and stability.

The loss of continuity in family and extended kin-based social units through the death of infants, spouses, grandparents, and other relatives may have led to significant social change. Certain of the simple, fluid social organizations observed among other early contact hunter-gatherer populations may not be typical of the aboriginal situation, but instead may be changes arising from the disruptive effects (including depopulation due to introduced disease) of contact with more technologically complex cultures.[41]

The impact on metaphysical and moral belief systems from the loss of shamans from disease, or from murder in the face of the unexplainable death of patients, as noted above, should not be underestimated. Nor should we underestimate the disgrace of shamans and other practitioners at being unable to control the introduced contagious diseases. Faith in the metaphysical system certainly was shaken. This type of disruption in the philosophical system may have created a society that was more open to introduced culture, including medical technologies, religious ideas, and social institutions. The forces of the rumored but not-yet-contacted outsiders may have appeared powerful and beyond local control.[42]

In addition to the impact on social organization and the philosophical system, disease-based depopulation probably diminished the ability of the local culture to maintain certain social institutions and accompanying rituals that required a minimum number of members of specific categories to be able to function normally.[43] There may have been a minimal population level needed to maintain the range of different task groups necessary for carrying out certain subsistence activities such as salmon fishing or procuring. Depopulation may have caused these task groups to fall beneath their minimum levels, thus threatening

their existence and eroding the nature and efficiency of the groups' subsistence efforts.

There is the possibility, too, that in northern parts of the Northwest Coast, ceremonial groups decreased in number to the level where they could no longer function normally for a time.[44] Thus, fewer ceremonies may have been held, and the existing traditional religious knowledge may have been impacted further by limited opportunities to convey it to the young. This effect would probably have been different among the Southern Coast Salish, because initiation rituals and celebrations of status changes were more individual in nature and could be performed by a kin group.

The aboriginal potlatch system of the Kwakiutl of the Northwest Coast was based on a fixed number of individually owned statuses distributed throughout a relatively stable population. When a status was inherited, this transition was marked by a potlatch. Following the epidemic of the late 1770s, a marked increase in potlatch activity probably occurred to compensate for the lack (or delay) of transfer of the fixed number of inherited statuses to the heirs apparent. This phenomenon was reported for the Kwakiutl following disease-based depopulation in the mid-1800s.[45] The effect of disease-based depopulation on potlatching activity of the Southern Coast Salish is unknown at this time; among them, potlatches were much less marked by fixed status and inheritance.

INTRODUCED DISEASES FOLLOWING DIRECT CONTACT

Smallpox appears to be the leading cause of population decline among the Southern Coast Salish both prior to and following contact with Europeans. Hudson's Bay Company censuses during the years 1839 through 1842 offer an estimate of 5,479 for most of the Lushootseed speakers.[46] At least four more waves of smallpox ravaged the Northwest after the late 1770s epidemic: 1800-1801, 1836-37, 1852-53, and 1862. Two of these epidemics (1800-1801 and 1852-53) reached the Puget Sound basin. At least two more localized outbreaks of smallpox occurred in the basin following the 1852-53 epidemic.[47]

The indigenous populations of the Northwest were not dense or continuous enough to support the continual existence of the disease. Thus, the periodicity of Northwest smallpox outbreaks is based on two major factors. Smallpox occurred according to its time and place of introduction from outside the region and on the

existence of a significant number of nonimmune susceptibles in the Indian population.[48]

Smallpox was reintroduced to the Northwest in 1800-1801, a generation after its initial documented appearance. The portion of the population primarily affected must have been the individuals born after the prior outbreak, since persons who survive the disorder acquire lifelong immunity. There should have been a sizable proportion of the population above twenty years of age who were unaffected, resulting in a smaller percentage of deaths.[49] Thus, the types of effects on the population would have been different. There would have been more elderly and other adults to maintain social institutions and social norms. However, the impact on families, the grief and mourning over of the loss of young kin and lesser numbers of adults, would have been enormous. The youth, who were to replace adults in key leadership roles, were those most affected.

Again, the epidemic was not witnessed by Europeans. Existing records consist largely of oral accounts collected from native peoples in later years. In contrast to the late 1770s epidemic, the second appears to have been limited to the central portion of the Northwest Coast. The origin in the Great Plains and transmission by interethnic contact appear certain. From the lower Columbia, the disease spread north along the coast, reaching the Twana on Hood Canal and the Clallam of the Olympic Peninsula.[50] It seems certain that this epidemic spread throughout the Puget Sound basin.

There is some evidence that the threat of disease was used by Euro-Americans as a means of controlling Northwest Indian populations following the 1800-1801 epidemic. After the *Tonquin* disaster of 1811 (in which all the members of the trading ship were killed by Indians from Vancouver Island and Cape Flattery), McDougal reportedly threatened the chiefs at Astoria, Oregon, with a "bottle" of smallpox should they attack the whites; he declared that although his force was weak in numbers, he was strong in medicine. A "Sinnamish" hunter and chief in 1833 told a story of the arrival of two American ships at Cape Flattery. The captains threatened to send disease among them if they did not trade beaver skins. The latter episode followed closely the epidemic of "fever and ague"—to be discussed shortly—that devastated the Indian peoples of the lower Columbia Valley and elsewhere between 1830 and 1831.[51]

In 1833, at the newly established Fort Nisqually, Dr. William

Fraser Tolmie, the first representative of Western medicine to reside in the Puget Sound basin, enlisted the help of local Indians to search for herbal cures to problematic diseases.[52] One of his motivations was to find a local cure for "intermittent fever," also called "fever and ague," an epidemic among the Indians of the lower Columbia Valley and elsewhere between 1830 and 1831. The cause of this epidemic seems to have been malaria. Dr. Tolmie used the bark of the dogwood tree as a replacement for quinine to treat malaria in Indian children in the Oregon country as early as 1833. It seems certain that this epidemic did not reach the Southern Coast Salish, since the carrier (the mosquito, *Anopheles malculipennis*) is not found in this area. The fact that the malarial parasite is transmitted by mosquito bites was not known until the 1890s.[53]

Dr. Tolmie noted that the Indian people had good dentition and did not suffer from undernutrition or malnutrition.[54] Indeed, he observed their diet to be healthy and varied. The continued presence of Fort Nisqually, however, led to increased aboriginal dependence on outside food items and a disruption in the subsistence system, leading to increased nutritional and dental problems. Many Indian people were attracted to and set up residence near this fort because of the trade and labor economy represented by the fur trade, agriculture, and animal husbandry. Even those who lived in the surrounding region participated to some extent in the new economy. This changed traditional subsistence patterns, and the new concentration of population led to an increased exposure to all introduced diseases, especially those viral disorders spread by droplet infection and face-to-face contact, such as colds and influenza. New varieties of colds and flu were brought by trading parties and battalions that converged upon the fort from distant locations.

While Indian people living in more marginal subsistence environments characterized by periodic winter food shortages may have suffered increased nutritional deficits due to partial cessation of traditional subsistence activities, the constant presence of shellfish minimized this phenomenon in the Puget Sound basin. However, changes did occur in gender-specific subsistence activities as women supplemented food stores decreased by male participation in the cash economy.

The *Fort Nisqually Journal of Occurrences* describes how a "violent disease of inflammation" (probably influenza) attacked a Segwallitchu family in 1836. Suffering from sore throats, an eighteen-year-old girl and her sister died. The text notes that the Indian doctor "suc-

ceeded in killing" the last son by improper application of cold water to the body. The Indian doctors spread the word that it was William Kittson's (the individual in charge of Fort Nisqually) tobacco that had made the Indians sick.[55]

Another smallpox epidemic arose among the northern and southern segments of the Northwest Coast in 1836-37. However, the Puget Sound basin was bypassed. This epidemic apparently did not spread to populations that suffered from the 1800-1801 epidemic, perhaps because there were not enough nonimmunes to allow the disease to become established.[56]

Edward Jenner discovered in 1798 that vaccination with the benign cowpox virus would produce immunity to smallpox infection. In 1804, Thomas Jefferson instructed Meriwether Lewis to take "some matter of the kine-pox" with him to the Northwest.[57] Vaccine was present in California by 1806 and in Sitka by 1808. The technique had not been used in the two previous smallpox epidemics, and there is no evidence that it was present in any quantity on the Northwest Coast or that any Indian people were vaccinated prior to 1836.

In the summer of 1837, the Hudson's Bay Company seems to have made a concerted effort to block the spread of smallpox from both the north and the south. The technique used was smallpox vaccine, sent from Fort Vancouver to major Hudson's Bay posts, including Fort Nisqually, in areas threatened by the epidemic. Indians were being vaccinated by Dr. Tolmie at Fort Vancouver in June, and on 10 July the head of Fort Nisqually stated that "all the women and Children of the place" had been inoculated.[58]

At Fort Nisqually, the vaccination effort was evidently limited to local natives, trading partners, and prominent men.

> Purposeful or not, there was a selective process involved in this differential treatment. The most acculturated segment of the native population was given an edge in survival and future increase that was not shared with the unacculturated majority.[59]

The first American settlers arrived on Puget Sound at Olympia in 1845, three years after the first big wagon train crossed the Oregon Trail to Oregon Territory. These settlers brought with them a series of minor infectious diseases that had previously been present only transiently, if at all, among the Indian people of the Puget Sound basin.[60] The first line of impact of these introduced

diseases was along the Oregon Trail and the lower Columbia. One observer noted,

> Every Fall the Indians were excited as to what new ill was to come. . . . Every year they [the immigrants] brought something new. . . . Whooping cough, measles, Typhoid fever etc. . . . [T]he country was free from all these malidies [sic] till then—when first introduced they seemed much more violent than now. . . . All these things we think so lightly of now scourged the poor Indians dreadfully.[61]

The region was now part of the wider Euro-American disease pool. Whooping cough, dysentery, typhoid, typhus, and measles were all reported among both Indian and white populations. Cholera, scarlet fever, and Rocky Mountain spotted fever appear to have afflicted whites only at this time.[62]

Measles appeared on the Columbia in 1847-48. From its initial focus on the mid-Columbia, it spread in all directions, arriving during January and February of 1848 at Fort Nisqually. A letter from John Work suggests that the disease was carried from Nisqually to points north by the Hudson's Bay supply ship *Beaver*. Mortality rates for the coast south of Nisqually were "a ninth," while higher rates were reported for other Northwest groups outside the Puget Sound basin. The practice of sweat bathing contributed to increased death from this disease. The simultaneous presence of secondary diseases such as dysentery, typhus ("camp fever"), and the flu or a cold probably was responsible for increased mortality in selected areas.[63]

Based on an extensive population analysis of the Puget Salish between 1839 and 1856, Boyd states that in contrast to other Northwest populations during this period, disease among the Puget Salish was relatively unimportant in shaping population; "only the 1848 measles outbreak had any obvious impact."[64] The mortality apparent on the reserve on Fox Island during the Indian war, to be discussed later, may give us some reason to revise this conclusion.

Another epidemic of smallpox appeared in the Northwest in the winter of 1853. (It is probably not a coincidence that in 1854, in a speech transcribed at the time by Dr. Henry A. Smith, Chief Seattle predicted the demise of his race.) The disease evidently was introduced at more than one location by trading vessels originating from San Francisco. From one initial focus at the mouth of the Columbia, the epidemic spread in two directions, including north

as far as Quinault territory and the head of Puget Sound. From a second focus at Neah Bay, it was introduced to the Nitinat and Clallam along the Strait of Juan de Fuca. The disease also was reported in Nooksack territory and among the lower Skagit. Its entry into the Puget Sound basin apparently was stalled by a vigorous program of vaccination. Mortality from this epidemic appears to have been the greatest at the two points of introduction and along the intermediate portion of the Washington coast, where somewhat more than 40 percent of the Indian people died. The death rate was considerably lower among populations peripheral to these areas. The total number of deaths in the afflicted areas of the coast appears to have been in the range of two thousand to three thousand persons.[65]

Also in 1853, the first settlers crossed the Cascades through Yakima land into the Puget Sound basin.[66] Pierce County was organized in the same year. The issue of access to Indian land became the paramount concern of the outsiders.

Governor Isaac Stevens began treaty negotiations with the Indians of the Puget Sound basin in 1854, and the Medicine Creek Treaty was signed that year.[67] Problems with the treaty plunged Euro-Americans into a war with some of the Indian groups that lasted until August 1856. Even during the war, further mortality due to disease was evident. It is clear that the disease-based population reductions, prior to and after contact, lessened the Indian peoples' ability to resist the intrusions of outsiders.

On Steilacoom Reserve on Fox Island, from 1 April to 30 September 1856, eighty Indian people died of disease. On 15 May 1856, there were 692 individuals on the reserve. If the mortality rate had remained consistent for an additional six months, the death rate for the year would have been 23 percent (160/692). It was probably safer to remain in traditional areas off the reserve and risk death due to war. The reserve had been established in November 1855, but by December 1856 the population had begun to decrease. In March 1857, only a few Indians remained (until the winter of 1857).[68] We can conservatively estimate that 30 percent of the reserve population was decimated over two years. It would be informative to compare this with the number of Indians living outside the reserve who were killed or died of disease.

In December 1856, Sidney S. Ford, Indian agent at Steilacoom, stated, "The only sickness I have observed worth mentioning is that of bleeding of the lungs[;] of this some three have died recently."[69] In June 1856, Ford asked Dr. Tolmie to come to the

reserve. Ford's journal entries for 14 and 15 June state, respectively, "Many of the Indians are sick and many dying," and, "Found many sick probably in consequence of too long confinements."

Dr. Tolmie's assistance and concern were characteristic of a man who played an important role during the postcontact period and consequently became well respected by the Indians.[70] They trusted him more than others. Indeed, throughout the early contact period, the tribal people received more help from the old colonialists than the new. The interventions of Western doctors (both British and American) such as Tolmie, McLoughlin, Townsend, and Maynard were in part responsible for the inclusion of a physician in the Medicine Creek Treaty of 1854.

DISEASES AND ILLNESSES DURING THE EARLY RESERVATION PERIOD

The population of the Lushootseed speakers is estimated to have been 4,872 in 1856.[71] An 1870 census counted only 3,549 Lushootseed.[72] By 1885, the population of the Southern Coast Salish appears to have decreased to less than 2,000, although this figure may not have included all Indians living outside of reservations.[73] Their numbers did not begin to grow until sometime in the early twentieth century; by 1984, the population may have reached over 18,000.[74]

Following the end of the war in 1856, venereal diseases became established in many reservation communities, and tuberculosis also began its devastation.[75] Although the Medicine Creek Treaty, signed in 1854, guaranteed a physician and a medical support system to the Puyallup Reservation, individuals responsible for this provision were extremely slow to provide the promised care.[76] The Indian agent in 1859 stated that he had not been able to secure a doctor at the salary provided, even though he had been searching for nine months. There were at least three reasons for this problem: physicians who would not perform their sworn duties at the given salary level; Indian Service inaction regarding the treaty obligation; and the inaction of federal representatives responsible for the funding of Indian Service physicians. The first physician to "remain any great length of time in the service" on the Puyallup Reservation was Dr. Spinning in 1863. Even after Dr. Spinning was secured, medical support remained inadequate: "Though the

need of a hospital was constantly urged, none was built for many years, and that one was for the school children. The doctor's medicine was shipped to him quarterly from the east; and he frequently complains of the supply not being large enough." As late as 1876,

> [a]n epidemic of itch and measles swept the school and some died and many of us lay rotting with no care of any sort—not even fed. But for timely arrival of our parents, the school might have closed for want of scholars. Once in a while someone would show up and look at our tongues and would quietly go away with no comment.[77]

Many of the Puyallup thoroughly liked and respected the physicians who held negative attitudes towards their traditional healing practices. For example, a tribal leader describes the feelings of some Puyallups toward Dr. Spinning:

> The good doctor lived up the Stuck Valley, but rode down nearly every day and visited the Indians from place to place looking for the sick. The changing of our way of living to the white's was very fatal and Dr. Spinning did much to serve the young. No other Doctor had done such noble conscientious work, going out in all kinds of weather and nothing but trails to follow and sometimes make his own trails, fording streams, and often a-foot, always hailing with that cheery voice.[78]

This reference to serving the young most likely reflects the pattern, common in bicultural contexts, in which children frequently are the first patients introduced to new forms of medicine.[79] This situation arises for multiple reasons, including a willingness to try all forms of intervention for seriously ill children and the adults' more strict adherence to traditional medical beliefs and practices. In many cultural contexts, economic hardship is also an issue, adults being willing to forgo treatment if the cost is prohibitive.

While serving as Indian agent at the Skokomish Reservation prior to becoming Indian agent at the Puyallup Consolidated Agency, Edwin Eells once followed the practice of incorporating traditional healing into his health care referral system. In 1871, when confronted with an Indian illness for which the agency doctor had "no suitable remedies," Eells permitted the "minstrations" of an "old Indian Doctor. . .who offered his services."[80]

After Tacoma was chosen as the terminus of the Northern Pacific Railroad in 1873, the individuals who profited from the expansion of railroads to the Puget Sound basin did not pause to consider that the increased ease of transportation would exacerbate the misery of the Indians from introduced disease.[81] Venereal diseases became established early in some coastal populations active in the fur trade.[82] For example, venereal diseases had become common in the Chinookan population of the lower Columbia by the early 1800s. They became a major health problem for many populations after reservations were established. The spread of syphilis and other venereals by white males seeking sexual congress with available and relatively powerless Indian females was a major problem.

The extent of venereal diseases among the Southern Coast Salish during the fur trade and early reservation periods is unknown. However, by 1872 Dr. W. Price, physician in charge on the Skokomish Reservation, treated the Indian people for syphilis in the following way: "He first prepares the system and then gives them freely the *Liquor Arsenici et Hydragyri Iodidi.* This seems to have a very happy effect. . . ." He used it in "hundreds of cases," since "[a] large proportion of this tribe (and we learn that the same is true with all,) are suffering with the worst and most loathsome forms of syphilitic disease."[83]

Another source in 1903 explains for the same group, "[T]here are fifty-two families, and in twenty of these there is not a child. A few of them never had any, but most of them had some, and several had five to thirteen, but they are all dead."[84] Dr. F. R. Payne reported in 1872 that, in this area, "a large majority of the half-breed girls die from emansio-mensium and its consequences. They are full of life and vigor until the age of puberty; then gradually pine away and die. Some never menstruate, while others have a slight flow, and then disease of the lungs, and low forms of fever supervene, causing the systemic waste to be much greater than the supply, and great emaciation and death is the result."[85]

We believe, based on preliminary investigation, that Dr. W. Price may have caused some of these effects with his syphilis treatment. As late as 1943, Eliason et al. reported that individuals received the following mercury-iodide treatment for syphilis for at least two-and-one-half years and at intervals thereafter: The solution was given orally or by rubbing into lesions until a slight soreness of the gums appeared, a sign of mercury poisoning, and

then the dose was reduced by about half until the symptoms disappeared.[86] The authors report that patients should be watched carefully for signs of mercury poisoning: soreness of the gums and increased saliva, metallic taste in the mouth, loose teeth, fetid breath, and diarrhea. The poisonous effects of the nonsalvarsan arsenic added to this type of mixture by Dr. W. Price undoubtedly increased the toxic effects of the treatment. To complicate the situation, a reliable diagnosis for syphilis was not available until the Wasserman test was developed in 1906.[87] One can but wonder how many tribal people were misdiagnosed and poisoned needlessly.

Consider the following dramatically absurd medical theories that were present at the time: Dr. F. R. Payne, M. D., reported that low levels of electricity resulting from the sparsity of thunder and lightening were undoubtedly the explanation for "the frequent occurrence of rheumatic forms of neuralgia and nervous diseases generally."[88] Later, in his presentation to the Clark County Medical Society, Dr. Payne described the deadly effects of the interbreeding of races: "[B]ut all careful observers are fully satisfied that this mixture of races results in an unhealthy and short-lived offspring." Major Charles E. Woodruff, A.M., "a learned surgeon of the army," described how the "excess of sunshine is injurious to the blond or Teutonic races and ultimately, without fail, leads to their extinction. . ." with the exception of the Pacific Northwest, where the people are "absurdly healthy. . . . They should thank God that they are protected from his sunshine."[89]

> [S]unlight is stimulating, but in excess, it causes mental, nervous and finally organic troubles. It is a curious commentary on our ignorance of climatology that the people of Tacoma, Seattle and all this region, attribute their exuberant health, small sick rate and small death rate, to all sorts of causes except the right one—protection from sunshine.

Because of the primitive state of Western medical practice, a real question arises as to which doctor was the "witch" doctor—the traditional or the introduced Western. Seen in this light, the 1871 ban on "Indian Doctoring" by the superintendent of Indian affairs of Washington Territory is most ironic.[90] Western doctors were the only legal source of healing at a time when Western medical science was in its infancy.

Another outbreak of smallpox emerged in Seattle and Tacoma in 1877.[91] In 1881, the Indian Shaker religion, a unique religious

movement that blended Christianity with aboriginal shamanistic beliefs and practices, was founded by a Squaxin Island Indian.[92] Smallpox again scourged the city of Tacoma in the same year, and a shotgun quarantine was organized.[93] Carbolic crystals (to be carried around in the pocket or used in carbolic acid baths) were sold as a guard against the contagion. As a further "preventative," Tacoma residents could be fumigated with the smoke of burning sulfur for twenty-five cents in Bonney's Drug Store.

The rate of emotional illness among the Southern Coast Salish during this time is unknown. However, the rapid culture change they were experiencing must have led to some emotional disorders. For example, 8 percent of the 4,599 cases treated by the three physicians on the main Sound (Tulalip, Puyallup, and Skokomish agencies) between 1883 and 1885 were "nervous diseases of which headache was the most common."[94] No cases of mental illness were reported, but an extremely high percentage of cases involved what are now called somatic complaints. Also, Lewis St. John stated that, in the year following the 1905 Heff decision of the United States Supreme Court, which opened up the sale of liquor to citizen Indians, drunkenness, crime, and death increased dramatically on the Puyallup Reservation; the legalized sale of liquor "spelled almost absolute ruin and prostration for the Puyallup Indians."[95]

CONCLUSIONS

The goal of this paper was to establish a detailed chronology describing and analyzing the effects of the introduced diseases and illnesses that impacted the Southern Coast Salish upon contact with European civilization. The nature of the impact of introduced diseases and illnesses on the tribal societies of the area defined, in part, the bicultural situation out of which the contemporary health care beliefs and practices of the Indian people arose from the aboriginal context.

The model that describes the general impact of introduced infectious viral diseases (particularly those spread by droplet infection and displaying a latency period, such as smallpox and measles) on hunter-gatherer-fishing societies and other subsistence-level, small-scale, tribal organizations is consistent with, but not empirically supported in every detail by, this case study. Common patterns of response to these diseases by the Southern Coast Salish were in many cases similar to those described for

other culture areas. However, in order to verify in detail the validity of this model for the area, further ethnohistoric research needs to be conducted.

As a tentative working model and set of research hypotheses, we propose the following. First, individuals (sometimes whole families or groups) often fled from infected areas, spreading the disorder over wide geographic regions through trade and kinship networks. Second, the aboriginal health care system became overloaded due to the large number of sick individuals. Thus, traditional health care practitioners (both lay and professional) were unable to treat all those infected. The overload was especially problematic in the situations where potentially adaptive medical practices, such as burning the belongings of the dead, were not exercised to the greatest extent possible. Third, traditional health care practitioners often utilized inappropriate health care practices that increased morbidity and mortality—particularly, gathering around the sick person for spiritual support and giving the sick person sweat baths followed by immersion in cold water. These practices occurred because of the lack of experience in treating introduced diseases. Fourth, normal subsistence activities often ceased, in whole or in part, causing higher death rates due to nutritional stress. This effect was less pronounced where easily obtained shellfish were in abundant supply and summer shellfish toxins were not a problem. Fifth, a general breakdown of the sociocultural system occurred in the middle of and shortly following the epidemic. Culturally appropriate mourning practices and disposal of the dead did not always occur. In an attempt to restore the social fabric torn by loss, naming ceremonials probably changed in nature or frequency as name-owners died and needed to be replaced. Consequently, individual initiation rituals often were interrupted.

Finally, a series of long-term consequences to the structure and character of the traditional culture followed from the high rates of mortality. For example, some traditional practical and metaphysical knowledge was lost because of high mortality among elders, the keepers of traditional knowledge. During the smallpox epidemic of the late 1770s, disease and illness took a heavy toll on elders, the keepers of spiritual and ritual knowledge. In Southern Coast Salish society, shared information and meaning were passed from generation to generation through myth, legend, and story. Elders were charged with the responsibility of instilling in other adults and youth an understanding of a proper relationship to nature.

Devastation of the physical numbers of elders and other adults during this period probably left surviving younger individuals in a situation where some essential myths, tales, and legends were lost, altered, or simplified. Specialized knowledge would be more affected than commonly repeated information regarding everyday social interaction or subsistence. Not only did the youth face a loss or alteration of some of the rules for appropriate conduct towards others and nature, but many of their grandparents, parents, uncles, and aunts (their intergenerational role models) simply no longer existed. Many of the people they respected and looked to for spiritual and practical guidance had disappeared.

Elders and other adults also were the keepers of practical subsistence knowledge: where to hunt and at what times of the year; how many animals to kill so as not to affect future resources; appropriate fishing and food gathering practices to avoid overexploiting particular geographical areas. Elders and other adults also knew best the aboriginal subsistence technology and technique. Introduced methods such as guns, steel axes, steel traps, and trapping for European trade goods were perhaps more easily adopted by the young when those who were committed to traditional methods were fewer in number. There is evidence that by 1824 the number of beavers in the Puget Sound basin had already been altered by the fur trade.[96] Indeed, the Nisqually River had evidently been decimated of beaver, that is, trapped out by this time.

All of these disease-introduced changes formed the context in which Indians accepted the introduced technologies, trade relationships, subsistence strategies, cash economy, and business ventures that transformed their relationship with nature. The Indian people often were in metaphysical liminality, a bicultural twilight zone between the traditional and the new. Westerners demonstrated a technological power to transform nature for human use that overshadowed the abilities of aboriginal people, even if Indians chose to exert technological power against nature.[97] Gradually, with improving biomedical techniques and scientific medicine (including vaccines, antiseptic surgery, and bacteriology), the advantage of Western medicine in the face of introduced epidemics was also perceived and accepted by many Indian people.[98] Given this context, it is not difficult to see how Western metaphysical ideas (including elements of Christianity that propose the radically different notion of a dichotomous and exploitative human-nature relationship) were eventually accepted

by some Indian people who experienced increasingly extensive culture contact and had time to test the power of the old and the new.[99]

NEW AREAS FOR RESEARCH

One of the new and unexplored areas of research regarding the Southern Coast Salish that follows from this disease chronology and analysis is the effect of introduced diseases on aboriginal treatments, the roles of traditional health care practitioners, and cultural explanations of disease etiology.[100] Of related interest are the concomitant changes that occurred in family-based treatments. Preliminary impressions suggest that traditional treatment strategies that were unsuccessful against new forms of disease were eventually dropped from the cultural inventory or at least modified to be used only on forms of illness they could affect. Sweat bathing is still used by some Southern Coast Salish, although febrile diseases now tend to be treated by Western biomedical methods. The cultural persistence of sweating, especially for minor ailments and mental health purposes, can be explained through its value as a cleansing and strengthening activity.

New treatments introduced by Europeans were added to the cultural repertoire, leading to more complex hierarchies of resort (patterns of lay health-seeking behavior) that combined both traditional and introduced elements. The cultures of the Indian people did not disappear; indeed, they displayed an amazing ability to persist in the face of massive introduced change. They accommodated their structures and beliefs to introduced elements and assimilated aspects of outside culture that were perceived to be adaptive.

Another area calling for new research is the analysis of the extent to which major religious change followed wrenching cultural change perpetuated by introduced disease.[101] The increased and inexplicable morbidity and mortality brought by new diseases required new explanations for the nature of existence and new ritualistic methods of coping.[102] The emergence of the Indian Shaker religion in 1881 followed a century marked by waves of contagion. Loss of confidence in the efficacy of traditional metaphysical and moral beliefs and practices, associated intimately with shamans and other forms of healers, led to more easy conversion to introduced religious beliefs.

A third new area of research, closely related to the issue of religious change, is an investigation of the extent to which the waves of contagion contributed to changes (primarily driven by larger socioeconomic factors) in the Southern Coast Salish philosophy of technology with respect to nature.[103] Martin has argued, based on ethnohistoric research on a Northeastern group, that introduced diseases caused changes in traditional human-animal relationships, allowing overconsumption of the beaver and other fur-bearing animals. Specifically, he states that Indian hunters tracked game remorselessly because they blamed wildlife for causing the devastating epidemics that had decimated their way of life. Martin maintains that some Indians came to believe that

> wildlife had decided, for some obscure reason, to direct their most potent weapon [disease] against man, who now felt himself imperiled by their terrible wrath. Wildlife had broken the compact of mutual courtesy. The dialogue between man and animal became acrimonious and then simply ended for many individuals.[104]

We have found no data among the Southern Coast Salish to support his conclusions. Yet a question of critical importance remains: To what extent did traditional metaphysical and ethical (derived from metaphysical precepts) constraints on the misuse of animals and nature persist in the face of rapid and often devastating sociocultural change, in part induced by introduced diseases and illnesses? If metaphysical and ethical constraints have persisted, do they constitute a difference in worldview (from that of Western culture) that influences contemporary actions towards nature?

NOTES

1. Robert T. Boyd, "Demographic History, 1774-1874," in *Handbook of North American Indians*, vol. 7, *Northwest Coast*, ed. Wayne Suttles (Washington, DC: Smithsonian Institution Press, 1990), 135-48. See also Robert T. Boyd, "The Introduction of Infectious Diseases among the Indians of the Pacific Northwest, 1774-1874" (Unpublished Ph.D. dissertation, University of Washington, 1985).

2. Funding for George M. Guilmet's initial part in this research was provided in a supportive and timely manner through two sources from the University of Puget Sound: a 1989 Martin Nelson Award for Summer Research or

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3. George M. Guilmet and David L. Whited, *The People Who Give More: Health and Mental Health Among the Contemporary Puyallup Indian Tribal Community*, American Indian and Alaska Native Mental Health Research (the journal of the National Center) Monograph Series, vol. 2, monograph 2 (Denver, CO: University of Colorado Press, winter 1989).

4. Boyd, "The Introduction of Infectious Diseases among the Indians of the Pacific Northwest, 1774-1874," 44-47; Alfred W. Crosby, "Virgin Soil Epidemics as a Factor in the Aboriginal Depopulation in America," *William and Mary Quarterly* 33 (1976):290-99, and "God. . .Would Destroy Them, and Give Their Country to Another People. . ." *American Heritage* 29 (1978):39-42; Henry F. Dobyns, *Their Number Become Thinned: Native American Population Dynamics in Eastern North America* (Knoxville, TN: University of Tennessee Press, 1983); Clyde Dollar, "The High Plains Smallpox Epidemic of 1837-38," *The Western Plains Historical Quarterly* 8 (1977):15-38; Shepard Krech III, "Disease, Starvation, and Northern Athapascan Social Organization," *American Ethnologist* 5 (1978):710-32; James Neel et al., "Notes on the Effect of Measles and Measles Vaccine in a Virgin Soil Population of South American Indians," *American Journal of Epidemiology* 91 (1970):418-29; Arthur Ray, "Diffusion of Diseases in the Western Interior of Canada, 1830-1850," *Geographical Review* 66 (1976):139-57; John Taylor, "Sociocultural Effects of Epidemics on the Northern Plains: 1734-1850," *Western Canadian Journal of Anthropology* 78 (1977):55-81; Russell Thornton, *American Indian Holocaust and Survival: A Population History Since 1492* (Norman, OK: University of Oklahoma Press, 1987); Bruce G. Trigger, "Ontario Native People and the Epidemics of 1634-1640," in *Indians, Animals, and the Fur Trade: A Critique of Keepers of the Game*, ed. Shepard Krech III (Athens, GA: University of Georgia Press, 1981), 19-38; Peter H. Wood, "The Impact of Smallpox on the Native Population of the Eighteenth Century South," *The New York State Journal of Medicine* (January 1987):30-36.

5. Boyd, "Demographic History, 1774-1874," 146; Wayne Suttles and Barbara Lane, "Southern Coast Salish," in *Handbook of North American Indians*, 501.

6. William W. Elmendorf, *The Structure of Twana Culture, Research Studies* 28:3, monographic supplement no. 2 (Pullman, WA: Washington State University, 1960), 3-4; Suttles and Lane, "Southern Coast Salish," 493-95.

7. Elmendorf, *The Structure of Twana Culture*, 3-4; Suttles and Lane, "Southern Coast Salish," 493-95.

8. Elmendorf, *The Structure of Twana Culture*, 3.

9. Ibid., 3-4; Suttles and Lane, "Southern Coast Salish," 493-95; Jay Miller, *Shamanic Odyssey: The Lushootseed Salish Journey to the Land of the Dead* (Menlo Park, CA: Ballena Press, 1988).

10. For an excellent account of aboriginal health among Alaska Natives, see Robert Fortuine, *Chills and Fever: Health and Disease in the Early History of Alaska* (Fairbanks: University of Alaska Press, 1989). For a comprehensive overview of aboriginal medicine among American Indians, see Virgil J. Vogel, *American Indian Medicine* (Norman: University of Oklahoma Press, 1970). For a general account of aboriginal health among hunter-gatherers, see Mark Nathan Cohen, *Health and the Rise of Civilization* (New Haven: Yale University Press, 1989).

11. Cecelia Svinth Carpenter, *Fort Nisqually: A Documented History of Indian and British Interaction* (Tacoma, WA: Tahoma Research Service, 1986).

12. The diet outlined here was typical of coastal villages. People living back from the saltwater ate more land mammals than their saltwater counterparts but less shellfish and fewer sea mammals.

13. Jerome S. Cybulski, "Human Biology," in *Handbook of North American Indians*, 58.

14. Marshall T. Newman, "Aboriginal New World Epidemiology and Medical Care, and the Impact of Old World Disease Imports," *American Journal of Physical Anthropology* 45 (1976):667-72.

15. See Cybulski, "Human Biology," for a review of the paleopathological evidence for the presence or absence of disease on the Northwest Coast.

16. Boyd, "Demographic History, 1774-1874," 135.

17. For data on the Twana, see Nile Thompson, Unpublished Twana Field Notes, 1975-79. For information on the Puyallup and Nisqually, see Marion W. Smith, *The Puyallup-Nisqually* (New York: Columbia University Press, 1940), 271.

18. Boyd, "The Introduction of Infectious Diseases," 331.

19. Erna Gunther, *Ethnobotany of Western Washington: The Knowledge and Use of Indigenous Plants by Native Americans* (Seattle: University of Washington Press, 1973). Among the washes listed for "sore eyes" are the following: Skagit—swamp current (*Ribes lacustre*), wild rose (*Rosa nutkana*), and trillium (*Trillium ovatum*); Snohomish—dogwood (*Cornus pubescens*).

20. Boyd, "Demographic History, 1774-1874," 136.

21. Melville Jacobs, "Indications of Mental Illness Among Pre-Contact Indians of the Northwest States," *Pacific Northwest Quarterly* 55 (1964):49-54; Smith, *The Puyallup-Nisqually.*

22. Boyd, "The Introduction of Infectious Diseases," 530-31.

23. Elmendorf, *The Structure of Twana Culture*, 245.

24 Ibid., 246-47.

25. Warren Cook, *Flood Tide of Empire* (New Haven: Yale University Press, 1973); Thomas F. Kehoe and Alice B. Kehoe, "Comment to Dobyns," *Current Anthropology* 7 (1966):434-35; Murray Morgan, *Puget's Sound: A Narrative of Early Tacoma and the Southern Sound* (Seattle: University of Washington Press, 1979); Gunnar Thompson, *Nu Sun: Asian Voyages to America, 500 B.C.* (Fresno, CA: Pioneer Press, 1989); Gordon Speck, *Northwest Explorations* (Portland, OR: Binfords and Mort, 1954).

26. Francis Haines, "The Northward Spread of Horses among the Plains Indians," *American Anthropologist* 40 (1938):429-37.

27. Daniel L. Boxberger, "The Introduction of Horses to the Southern Puget Sound Salish," in *Western Washington Indian Socio-Economics: Papers in Honor of Angelo Anastasio*, ed. Herbert C. Taylor, Jr. and Garland F. Grabert (Bellingham, WA: Western Washington University), 103-119.

28. Ibid., 115; Thompson, Unpublished Twana Field Notes, 1975-79.

29. T. C. Elliott, ed., "The Journal of John Work, November and December, 1824," *Washington Historical Quarterly* 3 (1912):198-228.

30. Boyd, "The Introduction of Infectious Diseases," 71, and "Demographic History, 1774-1874," 137; Dobyns, *Their Number Become Thinned*, 11-16; James Mooney, "The Aboriginal Population of America North of Mexico," *Smithsonian Miscellaneous Collections* 80 (1928):1-40.

31. For archeological evidence supporting the theory of an epidemic of smallpox in the Northwest in the first quarter of the sixteenth century, see Sarah K. Campbell, *PostColumbian Culture History in the Northern Columbia Plateau: A.D. 1500-1900* (New York: Garland Publishing Co., 1990). Also see Dobyns, *Their Number Become Thinned*, 11-16.

32. Crosby, "Virgin Soil Epidemics"; C. W. Dixon, *Smallpox* (London: J. and A. Churchill, 1962); Dobyns, *Their Number Become Thinned*, 11-16; F. Fenner et al., *Smallpox and Its Eradication* (Geneva: World Health Organization, 1988).

33. Peter Puget, "Log of the Discovery, May 7-June 11, 1792," *Pacific Northwest Quarterly* 30 (1939):198, and "Log of the Discovery, June 12-August 19, 1792," Public Records Office, Admiralty 55/27, London (microfilm no. 274, Suzzallo Library, University of Washington, Seattle); George Vancouver, *A Voyage of Discovery to the North Pacific and Round the World*, vol. 1 (London: G. G. and J. Robinson, 1798), 241, 256.

34. Fenner et al., *Smallpox and Its Eradication*, 194.

35. Dixon, *Smallpox*; Fenner et al., *Smallpox and Its Eradication*.

36. James Neel et al., "Notes on the Effect of Measles and Measles Vaccine," 418-29.

37. Boyd, "The Introduction of Infectious Diseases," 107-108.

38. Smith, *The Puyallup-Nisqually*, 18.

39. Boyd, "The Introduction of Infectious Diseases," 45-46; Hermann Haeberlin and Erna Gunther, *The Indians of Puget Sound* (Seattle: University of Washington Press, 1930), 67-81; Miller, *Shamanic Odyssey*, 1-50; Smith, *The Puyallup-Nisqually*, 75-92.

40. Boyd, "The Introduction of Infectious Diseases," 45-46; June McCormick Collins, *Valley of the Spirits: The Upper Skagit Indians of Western Washington* (Seattle: University of Washington Press, 1974), 64, 180; Elmendorf, *The Structure of Twana Culture*, 252-54; Smith, *The Puyallup-Nisqually*, 121-24.

41. Krech, "Disease, Starvation, and Northern Athapascan Social Organization," 710-32; Elman Service, *Primitive Social Organization*, 2d ed. (New York: Random House, 1971).

42. Boyd, "The Introduction of Infectious Diseases," 531; Krech, *Indians, Animals, and the Fur Trade: A Critique of Keepers of the Game*; Calvin Martin, *Keepers of the Game: Indian-Animal Relationships and the Fur Trade* (Berkeley, CA: University of California Press, 1978); Leslie Spier, *The Prophet Dance of the Northwest and Its Derivatives: The Source of the Ghost Dance*, General Series in Anthropology no. 1 (Menasha, WI: George Banta, 1935); Suttles, "The Plateau Prophet Dance among the Coast Salish," in Suttles, *Coast Salish Essays* (Seattle: University of Washington Press, 1987), 152-98; Christopher Vecsey, "American Indian Environmental Religions," in *American Indian Environments: Ecological Issues in Native American History*, ed. Christopher Vecsey and Robert W. Venables (Syracuse, NY: Syracuse University Press, 1980), 1-37.

43. Boyd, "The Introduction of Infectious Diseases," 528-29; Eric Smith, "The Application of Optimal Foraging Theory to the Analysis of Hunter/Gatherer

Group Size," in *Hunter/Gatherer Foraging Strategies: Ethnographic and Archaeological Analyses*, ed. Eric Smith and Bruce Winterhalder (Chicago: University of Chicago, 1981), 36-65.

44. Boyd, "The Introduction of Infectious Diseases," 528; Charles Wagley, "The Effects of Depopulation upon Social Organization as Illustrated by the Tapirape Indians," *Transactions of the New York Academy of Science*, series 2, 3 (1940):12-16, and "Cultural Influences on Population: A Comparison of Two Tupi Tribes," *Revista do Museo Paulista* 5 (1951):95-104, Sao Paulo, Brazil.

45. Boyd, "The Introduction of Infectious Diseases," 529; Helen Codere, *Fighting with Property: a Study of Kwakiutl Potlatching and Warfare 1792-1930*, Monographs of the American Ethnological Society 18 (New York: J. J. Augustin, 1950).

46. Boyd, "Demographic History, 1774-1874," 146.

47. Boyd, "Demographic History, 1774-1874," 137-42, and "The Introduction of Infectious Diseases," 71-72; and Mooney, "The Aboriginal Population of America North of Mexico," 1-40.

48. Boyd, "The Introduction of Infectious Diseases," 71-72.

49. Boyd, "Demographic History, 1774-1874," 137-38, and "The Introduction of Infectious Diseases," 99-108.

50. Boyd, "The Introduction of Infectious Diseases," 72-73.

51. Leslie M. Scott, "Indian Diseases As Aids to Pacific Northwest Settlement," *Oregon Historical Quarterly* 29 (1928):151-52; William Fraser Tolmie, *The Journals of William Fraser Tolmie: Physician and Fur Trader* (Vancouver, BC: Mitchell Press Limited, 1963), 238.

52. Tolmie, *Journals*, 230.

53. Boyd, "The Introduction of Infectious Diseases," 112-44.

54. Tolmie, *Journals*.

55. *Fort Nisqually Journal of Occurrences*, 4 March-6 April 1836.

56. Boyd, "Demographic History, 1774-1874," 140-41, and "The Introduction of Infectious Diseases," 167-69; Carpenter, *Fort Nisqually: A Documented History*, 86.

57. Boyd, "The Introduction of Infectious Diseases," 168-70.

58. Ibid., 169-70.

59. Ibid., 170.

60. Boyd, "Demographic History, 1774-1874," 141, and "The Introduction of Infectious Diseases," 174-76.

61. George B. Roberts, Letter of 28 November 1878 to Frances Fuller Victor, manuscript HHB(P-A83) in Bancroft Library, University of California, Berkeley. Cited in Boyd, "Demographic History, 1774-1874," 141.

62. Boyd, "The Introduction of Infectious Diseases," 348-49.

63. Boyd, "The 1847-1848 Pacific Northwest Measles Epidemic," *Oregon Historical Quarterly*, in press; "Demographic History, 1774-1874," 141; and "The Introduction of Infectious Diseases, 174-76.

64. Boyd, "The Introduction of Infectious Diseases," 476.

65. Boyd, "Demographic History, 1774-1874," 141, and "The Introduction of Infectious Diseases," 176-78.

66. Carpenter, *Fort Nisqually: A Documented History*, 165.

67. Ibid., 126-90; Morgan, *Puget's Sound: A Narrative*, 76-138.

68. Letter from Sidney S. Ford (Indian agent at Steilacoom) to Michael Simmons (Indian agent of the Puget Sound Tribes), 30 September 1856, Univer-

sity of Washington Library, microfilm room, Reports of Indian Agents; letter from Ford to Governor Isaac Stevens, 15 May 1856, University of Washington Library, microfilm room, Reports of Indian Agents.

69. Letter from Sidney S. Ford to Governor Isaac Stevens, 31 December 1856, University of Washington Library, microfilm room, Reports of Indian Agents; journal of Sidney S. Ford, 14 and 15 June 1856, University of Washington Library, microfilm room.

70. Carpenter, *Fort Nisqually: A Documented History.*

71. Boyd, "Demographic History, 1774-1874," 146.

72. Ibid.

73. George B. Castile, ed., *The Indians of Puget Sound: The Notebooks of Myron Eells* (Seattle: University of Washington Press, 1985), 31; Suttles and Lane, "Southern Coast Salish," 501.

74. Suttles and Lane, "Southern Coast Salish," 501.

75. Boyd, "The Introduction of Infectious Diseases," 525.

76. Elizabeth Shackleford, "History of the Puyallup Indian Reservation" (Unpublished B.A. thesis, College of Puget Sound, Tacoma, Washington, 1918), 59 and 75. The quotation is from page 59.

77. Henry Sicade, "The Cushman Indian School: A Brief History" (Unpublished manuscript, Tacoma Public Library, northwest room, Tacoma, Washington, 1927), 4.

78. Ibid., 3.

79. Arthur Kleinman, *Patients and Healers in the Context of Culture: An Exploration of the Borderland Between Anthropology, Medicine, and Psychiatry* (Berkeley, CA: University of California Press, 1980).

80. George P. Castile, "The Half-Catholic Movement: Edwin and Myron Eells and the Rise of the Indian Shaker Church," *Pacific Northwest Quarterly* 73 (1982):168.

81. See Morgan, *Puget's Sound: A Narrative* for a discussion of railroad development, 139-211.

82. Boyd, "The Introduction of Infectious Diseases," 112, 525; and Morgan, *Skid Road: An Informal Portrait of Seattle*, rev. ed. (New York: Viking Press, 1960), 58.

83. F. R. Payne, "Topography, Climate, and Diseases of Washington Territory," *The Medical Examiner* (1872):210. Text given of a paper presented to the Clark County Medical Society on 3 July 1872.

84. Myron Eells, "The Decrease of the Indians," *American Antiquarian* 25 (1903):148.

85. Payne, "Topography, Climate, and Diseases of Washington Territory," 210.

86. E. L. Eliason, L. K. Ferguson, and E. K. Lewis, *Surgical Nursing*, 4th ed. rev. (Philadelphia: J. B. Lippincott, 1943).

87. D. M. Jensen, *A History of Nursing* (St. Louis, MO: C. V. Mosby, 1943).

88. Payne, "Topography, Climate, and Diseases of Washington Territory," 209-10.

89. R. F. Radebaugh, *The Pacific Metropolis Where and Why* (Tacoma, WA: South Tacoma Press, 1913), 93-94.

90. Erna Gunther, "The Shaker Religion of the Northwest," in *Indians of the Urban Northwest*, ed. M. W. Smith (New York: Columbia University Press, 1949), 37-76; see Paul Starr, *The Social Transformation of American Medicine* (New York:

Basic Books, 1982) for an excellent account of Western medicine in America during this period.

91. Clarence B. Bagley, *History of King County, Washington*, vol. 1 (Seattle: S. J. Clarke, 1929), 375.

92. Gunther, "The Shaker Religion of the Northwest," 37-76; Pamela T. Amoss, "Symbolic Substitution in the Indian Shaker Church," *Ethnohistory* 25 (1978): 225-49; H. G. Barnett, *Indian Shakers: A Messianic Cult of the Pacific Northwest* (Carbondale, IL: Southern Illinois University Press, 1957).

93. Herbert Hunt, *Tacoma: Its History and Its Builders*, vol. 1 (Chicago: S. J. Clarke, 1916), 278.

94. Myron Eells, "Decrease of Population among the Indians of Puget Sound," *American Antiquarian* 9 (1887): 274.

95. Lewis H. St. John, "The Present Status and Probable Future of the Indians of Puget Sound," *Washington Historical Quarterly* 5 (1914):14.

96. Nile Thompson, "Opening the Pacific Slope: The 1824 McMillan Expedition," *Cowlitz Historical Quarterly* 33 (1991): 5-10. Included in the article is the journal of Francis N. Annance, a member of the Hudson's Bay Company party who made the trip from the mouth of the Columbia River to the Fraser River.

97. One should keep in mind that the Indian people did display technological superiority in some areas, for example, in small watercraft and fish catching devices.

98. For a description and analysis of the current state of acceptance of Western health care practices by a Coast Salish group, see Guilmet and Whited, *The People Who Give More*. See Starr, *The Social Transformation of American Medicine*, for an account of the development of scientific breakthroughs in Western medicine in the United States.

99. For an analysis of the dualism between humankind and nature in Christian thought, see Lynn White, Jr., "The Historical Roots of Our Ecological Crisis," in *Philosophy and Technology: Readings in the Philosophical Problems of Technology*, ed. Carl Mitcham and Robert Mackey (New York: Free Press, 1983), 259-65.

100. Guilmet and Whited, *The People Who Give More*, 41-93; Arthur Kleinman, *Patients and Healers in the Context of Culture*.

101. Boyd, "The Introduction of Infectious Diseases," 531.

102. For relevant background information, see Pamela T. Amoss, *Coast Salish Spirit Dancing: The Survival of an Ancestral Religion* (Seattle: University of Washington Press, 1978); "Resurrection, Healing, and 'the Shake.' The Story of John and Mary Slocum," in *Charisma and Sacred Biography*, ed. Michael A. Williams, *Journal of the American Academy of Religion*, Thematic Studies 48(3-4) (1982):87-109; and "Symbolic Substitution in the Indian Shaker Church," 225-49; see also June McCormick Collins, "The Indian Shaker Church: A Study of Continuity and Change in Religion," *Southwestern Journal of Anthropology* 6 (1950):399-411; Wolfgang G. Jilek, *Indian Healing: Shamanistic Ceremonialism in the Pacific Northwest Today* (Blaine, WA: Hancock House, 1982).

103. For information on the Southern Coast Salish, see June McCormick Collins, "The Mythological Basis for Attitudes towards Animals among Salish-Speaking Indians," *Journal of American Folklore* 65 (1952):353-59. For other areas in North America, see J. Donald Hughes, *American Indian Ecology* (El Paso, TX: Texas Western Press, 1983); Ake Hultkrantz, *Belief and Worship in Native North America* (Syracuse, NY: Syracuse University Press, 1981); Martin, *Keepers of the*

Game; Krech, *Indians, Animals, and the Fur Trade*; Vecsey and Venables, *American Indian Environments*.

104. Martin, "The War between Indians and Animals," in *Indians, Animals, and the Fur Trade*, 18.