AN INTERGRATED APPROACH TO STUDYING SETTLEMENT SYSTEMS ON THE NORTHWEST COAST: THE NUXALK OF BELLA COOLA, B.C.

by

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Abstract

The major factors which influenced the settlement system of the late prehistoric Nuxalk of the Bella Coola valley are examined in this study. Detailed data on settlement, subsistence, environment and the socio-political and socio-economic worlds of the Nuxalk are presented. Ethnographic, ethnohistoric, archaeological and environmental data have been compiled for this purpose.

The theoretical approach applied in this thesis differs from other comparable studies on the Northwest Coast. Many studies are concerned only with the relationship between energy gains and settlement. In this study the potential determinants of settlement patterns are compiled from both the natural and cultural environment of the Nuxalk. Each determinant is examined within a cultural framework that would have been relevant to the Bella Coola valley Nuxalk.

The nature of the analyses and methodology employed here also sets this study apart from other settlement studies. Salmon-settlement studies investigate the importance of a single species at several sites, while site catchment studies concentrate on the relative importance of several resources at a single site. Here, several different sites are compared according to eight different determinants (the presence of salmon, other aquatic resources, plant resources, animal resources, mineral resources, trade, shelter from the elements and protection from raiding); each determinant is measured in a different manner according to the nature of the data set. A rank order of each village location is produced according to its accessibility to each determinant analysed.

From this, an overall ranking of settlements which combines all the determinants, is generated. The Nuxalk results are then compared to the settlement systems of other Northwest Coast groups, as a means of identifying more general statements concerning the pre-contact settlement systems of Northwest Coast Native peoples.

Results indicate that the presence of a range of food resources, especially plants and fish, was among the most important criteria for a preferred settlement location in the Bella Coola valley. The presence of a variety of other resources and cultural attributes was the minimum requirement of a suitable Nuxalk village location. Among other coastal groups, preferred village sites were those which offered the greatest number of resources from a single location. In the instances where primary villages were situated in areas that did not offer a range of resources, other (cultural) factors seem to have influenced the decision to settle in a specific location.

Additionally, it is hoped that this study contributes to the field of ecological anthropology by offering new methods for quantifying economically important plants. Previously uncollected information from Nuxalk elders adds to the body of knowledge concerning land use among the Nuxalk people specifically, and the peoples of the Northwest Coast in general.

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Chapter I

REVIEW OF METHODS AND THEORIES USED TO EVALUATE DETERMINANTS OF SETTLEMENT PATTERNS

Introduction

Although explicit studies of settlement patterns are few in the Northwest Coast literature (eg. Pomeroy 1980; Whitlam 1983; Bernick 1983) there has been much discussion concerning the influence of food resources on settlement (eg. Mitchell 1971; Burley 1980; Calvert 1980; Stieffel 1985; Cavanaugh 1983; Ham 1982). Rarely, however, is Northwest Coast settlement viewed in a larger cultural context (for a notable exception see Nolan 1977). In contrast to other Northwest Coast studies, this thesis provides an examination of the influence of a range of natural and cultural features on settlement patterns of the Bella Coola Valley Nuxalk in the late pre-contact period. The relevance of each of these determinants is assessed within the socio-economic framework of the Nuxalk of that era.

The Nuxalk Indians traditionally lived along several channels and valleys of the central coast area, however the availability of information dictates that this study be confined to the inhabitants of the Bella Coola valley only.

The Bella Coola valley Nuxalk were a relatively sedentary people in late pre-contact times. Large villages located along the Bella Coola River were used throughout the year as permanent residences or as base camps from which other seasonal activities could take place. Since the settlement had to serve many functions throughout the seasons, several constraints would have been placed upon site location.

Detailed data on settlement, subsistence, environment and the socio-political and socio-economic worlds of the Nuxalk form the basis of this analysis of Nuxalk settlement patterns. Ethnographic and ecological data collected through fieldwork and library research, as well as ethnohistoric and archaeological information from the literature, were compiled for this purpose.

In this chapter we begin with a review of the assumptions, parameters and methods of settlement studies in archaeology; approaches useful to this thesis are outlined. In Chapters II and III relevant aspects of the natural and cultural environment of the Nuxalk are presented in detail. This information forms the data base of the analysis chapter -- Chapter IV. In Chapter IV, eight determinants, salmon, other aquatic resources, plant resources, animal resources, mineral resources, trade, shelter from the elements and protection from raids, are examined to determine their influence on site selection. Each determinant is measured differently according to the available data to determine its potential influence on location of settlement. The actual effect of each determinant, as well as the sum total of all determinants, on specific settlement locations, is then examined. In Chapter V, the Nuxalk pattern is compared to the settlement data from five other Northwest Coast groups, and general statements are made concerning settlement on the coast in the late pre-contact era. In the concluding chapter (VI) the Nuxalk settlement system is summarized, and the relevance of this study is discussed.

Theories Used in Settlement Pattern Studies

Introduction

Studies of settlement patterns, like much of anthropological thinking of the past 15 years, have been greatly influenced by the "ecological approach". An underlying assumption of studies that adhere to this approach is that settlement patterns are the results of "the simple interaction of two variables - environment and technology" (Trigger 1968:54). The focus in such studies is often almost wholly on subsistence, to the exclusion of other aspects of the socio-economy. What we are left with are mere recontructions of the subsistence cycle, with little overall intergration into the culture as a whole (cf. Roots 1983).

In this chapter approaches for examining settlement systems are reviewed, and the underlying assumptions and parameters are discussed. In light of this review, two methods used to investigate settlement paterns -- salmon-settlement studies and site catchment analysis, are examined.

Before we begin the review, clarification is needed for what is meant by the terms settlement pattern and settlement system. In this study, settlement pattern refers to the distribution of sites on the ground. The settlement system, on the other hand, refers to the interaction between several cultural variables and settlements. The former can be reconstructed through archaeological excavation; the latter can only be interpreted through a study of the larger cultural system.

Assumptions and Parameters of Settlement Pattern Studies

A basic assumption underlying ecological anthropological thought is that people will try to minimize their efforts for maximum gains. Most often, energy gains specifically are viewed as the dominant goal of a group. This concept is not new to anthropological literature. The idea was first encompassed in the notion of hexagonal spacing of settlements to minimize movement costs (Krzywicki 1934; Wobst 1974), and later in the "minimax" theories that gained popularity in the 1960's (e.g. Burling 1962). Most recently it has been encompassed in "optimal foraging strategy" theory among hunter-gatherer groups (e.g. Winterhalder and Smith 1981).

That the focus on energy (usually subsistence) has gained such popularity in studies of settlement patterns is largely due to the difficulty of quantitatively measuring other non-material factors. Data on the availability, access and use of resources are much easier to gather than information on other aspects of a culture. Much of this information can be compiled from ethnographic sources or from native consultants today. Discussions of food and other resources are a topic which people can comfortably share. Present-day field quantifications of resource abundance and distribution can also be used to assess the influence of resources on the settlement system.

Data on resource use may also be relatively more available to archaeologists than other information about the social system. If conditions at the site lend themselves to preservation of plant, animal or mineral remains, then there is direct evidence of resource use. Unfortunately, it is often impossible to determine accurately the relative importance of these natural resources to one another because of problems of differential preservation.

This relative accessibility of resource-use information can lead to a narrow reconstruction by archaeologists of the prehistoric cultural system. Other cultural factors (eg. warfare, kinship, etc.) which may be less apparent in the archaeological record tend to be ignored. However, these factors may in fact have played a significant role in determining settlement location. This narrow focus results in what has been termed "ecological determinism" (Trigger 1968:54), that is, that ecological factors are considered solely to shape all other aspects of the society.

The focus solely on energy optimization may ultimately limit the utility of this approach. There is an increasingly large body of literature in ecological anthropology which cautions us against viewing human behavior strictly in terms of energy (eg. Keene 1983; Jochim 1976, 1981, 1983; Butzer 1982:258). In fact, the failure of many optimal foraging models to account for the foraging behavior of the animals for which they were originally developed shows that even in those cases energetic criteria are often overriden by other factors - territory defense, mating, risk and predation, nutrients (Caraco, Martindale and Whittam 1980; Erwin 1985; Glasser 1984; Reichman 1977; Smith, Grant, Grant, Abbott, and Abbott 1978; Willson 1971). The inadequacy of such models is also apparent in studies of human behavior (eg. Yesner 1981; Smith 1981; see also Martin 1983 review).

Other factors in addition to energy gains which have been suggested as influencing settlement location include (1) natural variables, ie. weather and terrain, (2) spacing due to competition with other groups for critical resources, (3) a desire to socialize, (4) security, (5) access to trade and transportation routes; (6) access to labor; (7) suitability of society's technology to exploit resources from an area, and (8) a desire for prestige (Hill 1971:56; Jochim 1976:49; 1981:89,154).

These factors require some additional discussion. The first factor involves possible deterrents or incentives in the local environment. In particularly inhospitable environments settlement location will be partly dicated by the degree of shelter available in any given location. Similarly, access to sunlight may also be of prime importance, especially in the winter or in cool environments (e.g. the cliff dwellings of the southwestern United States are predominately located on south-facing slopes).

The second, third and fourth factors are related to the nature of the social ties with neighbouring groups. Even if relations with neighbouring groups are amicable, there are limits to the extent of foraging that a group may undertake before they are intruding upon someone's territory. This situation is exemplified in the extreme among Northwest Coast hunter-gatherers, where territories were often strictly guarded among groups. Similarly, as a result of more hostile relations, fear of attack may prevent utilizing harvesting areas that are far from home base, as the dangers increase with increasing distance from the safety of the larger group. Conversely, a desire to socialize may take someone farther afield.

Access to trade and transporation routes and labor differ from the other determinants listed here in that they directly involve social ties with neighbouring peoples. Exchange plays an important role in the local economy, both as a means of gaining access to important resources (however they are defined), as well as a means of cementing social ties.

Similarly, proximity to transportation routes means increased access to neighbouring people and information. Access to a larger labor force at critical times in the economic cycle may be essential in sparsely populated areas. All are advantageous to the local socio-economy and therefore may play a significant role in determining settlement location.

The society's available technology, and knowledge of the natural environment will also affect the ability to utilize certain resources. A resource which is readily accessible to a certain group may not have been exploited by another because the people do not have the technological knowledge to exploit it (or to exploit it in a given set of environmental parameters). Furthermore, the type of available technology may also dictate preferences for specific locations where the technology may be used most efficiently (Jochim 1981:139).

A desire for prestige may also be an important consideration in settlement studies on the Northwest Coast. A high value was placed on prestige, which was often acquired by amassing important resources. This might motivate people to travel farther afield than was most energy efficient.

That other factors play a role in settlement systems does not negate the importance of studying the relationship of subsistence to settlements. It is essential, however, that such relationships be examined within a cultural framework. "If human behavior is viewed in systematic terms, then subsistence certainly provides one point at which to enter the system for study" (Jochim 1981:164; see also Keene 1979). Since information concerning subsistence practices is relatively more accessible to researchers studying settlement systems, they are a logical place to begin.

Minimizing Effort as a Goal in Settlement Systems

Although the utility of an absolute maximization (or optimization) postulate as the sole mechanism shaping settlement systems is questionable, minimizing effort does appear to be one important goal of hunter-gatherers. The notion of minimizing effort in resource acquisition is translated into settlement studies by stating that sites will tend to be located to minimize the distance to important resources (see also Jochim 1976:48-9, 1981:140). Procurement costs increase as distance from a settlement increases. If all other cultural factors are equal, then, sites will be located closer to more important rather than less important procurement locations (cf. Jochim 1981:141).

Distance to resources, however, can be measured in several different ways. Vita-Finzi and Higgs (1970) suggested that distance is more appropriately measured in terms of the time involved to travel a certain distance than distance itself. This "time-distance" measure is particularly important in areas of rough and/or uneven terrain. The idea of time-distance was also explored by Chisholm (1962) who suggested that in measures of distance, points of access must be taken into consideration. In all but flat, unbroken terrain, rarely can a point be reached via a straight line from another point. Time-distances would take into account more meandering paths to a resource area.

The location of a site in close proximity to important resources ultimately translates into minimized work effort or energy expenditure. By minimizing energy output, the net gain of a resource, in terms of energy value, will be increased. Lee (1972:181) specifically translates the notion of energy expenditure or work effort directly as the number of kilometers walked in pursuit of food. He also suggests that the distance factor is partially a factor of group size. That is, as the group size increases, so will the travel distance required for an adequate food supply.

Lee's definition of work effort is too narrow in scope to be applied to all other cases. Hill (1971:60) elaborates on the notion of work effort (which he terms "pursuit time") to include, "the amount of time and energy expenditure in exploiting, transporting and distributing critical food resources."

"Exploiting" can be further defined as "search time", or the time taken to locate the resource, and "pursuit time", or the time taken to capture a resource once it is located (cf. Jochim 1976:27; Winterhalder 1981b:68). Presumably harvesting time of non-animal resources would also be included in the notion of pursuit time; processing time, both for immediate consumption and for storage should be included in the notion of exploitation effort. Work effort, then, can be more fully translated into the total amount of energy expended on a resource before it is finally used.

Keene (1981) broadens this notion even further to include the risk involved in harvesting a food (see also Wilmsen 1973:6-10; Martin 1983:614). Although this cannot be directly translated as energy output like the other variables, it is a potential "cost" to the harvesting activity. Keene defines risk as "the probability of a loss or the possibility of an unfortunate outcome (Keene 1981:179, from Wiessner 1977:5), as well as "the risk of coming home empty handed" (Keene 1981:179). Keene does suggest however, that predictability should be viewed over a long term, as a more productive, stable resource may ultimately yield greater harvests than one with widely fluctuating productivity (ibid.:179). For plant resources risk of failure at foraging can be translated into the degree of predictability that once the plant is located it will be bearing the usable part.

Each of the concepts of search and pursuit time and risk will also be influenced by cultural values. Jochim (1983:160) points out that scales of measurement are a relative cultural phenomenon. For instance, the difference in a few hours of search time may mean the difference between whether a resource is considered obtainable or not by a particular group (see also Jochim 1981:92).

Determining Important Resources

Obviously, it is most important to determine not only the correct distance measure, but also to what resource (or resource zone) the distance is being measured. This is not as easy as it sounds, and in fact, archaeologists often side step this issue (e.g. Wood 1978). An assessment must be made of the relative importance of the resources according to the people who used them. Without detailed accounts from indigenous people on resource selection, the anthropologist can only speculate about which attribute may be significant.

After thoroughly examining the ethnographic literature, Jochim arrived at a list of food attributes which were recognized as being important by several hunter-gatherer groups (Jochim 1976:19-21, 1981:82, 89). These attributes are, weight, fat content, taste requirements, variety in the diet, density, aggregation size, mobility and non-food yields.

For the hunter-gatherer, weight and taste are the two most commonly mentioned subjective attributes of preferred foods (Jochim 1981:89). The notion of weight is clearly most applicable for animal resources. In adaptive (i.e. non-subjective) terms weight translates to higher yield per catch. Taste of foods, too has real adaptive value. Those foods which are better tasting are often those which have a high fat content. Fat is an important source of energy and vitamins and is strongly associated with protein content (ibid. 82-83). In fact, archaeological evidence suggests that hunter-gatherers do select for those animal parts with the highest fat content (Speth 1983). Fat- rich foods in the Northwest Coast diet included ooligan (Kuhnlein, Chan, Thompson and Nakai 1982), fatty salmon and game.

Speth (1983:154-155) suggests that hunter-gatherers may seek foods high in carbohydrates as well as those high in fat. Some carbohydrate is essential for the proper metabolism of protein by humans. Foods high in carbohydrates may also be selectively chosen for taste appeal. On the Northwest Coast foods containing carbohydrate would include the berries, root foods and animal or fish liver (see Pennington and Church 1980 for carbohydrate content of these food types).

Other nutritional requirements (vitamins, minerals, fiber, for example) are also important attributes of food. Although Jochim (1983:159) points out that these would not have been subjective requirements of preindustrial peoples, they none-the-less would have been important adaptive requirements. With a growing body of literature on nutritional attributes of Northwest Coast indigenous foods (Keely 1980; Kuhnlein, Chan, Thompson and Nakai 1982; Kuhnlein, Turner and Kluckner 1982; Hooper 1984; Turner and Kuhnlein 1983), it will soon be possible to examine how such requirements are met by the dietary patterns of a hunter-gatherer group. A desire for variety in the diet also insures a number of different foods consumed. These hopefully contribute to a range and balance of nutrients in the diet.

Density, aggregation size and mobility will also affect which resources are exploited. Jochim (1976:56-60) using the gravity model from locational geography (see Haggart 1965) measured the amount of interaction between settlement and resources. He found that those resources which are least mobile, most dense and least clustered will be preferred. These attributes are linked to the notions of search and pursuit time mentioned earlier. Those resources that are densely packed in time and space (e.g. salmon and caribou) will be preferred (Jochim 1981:102). Plant species which produce each year in the same locality would also fall into this category.

Another important quality, not often considered, is the seasonal availability of a resource relative to others. Late summer and early fall is usually the peak time of most hunter-gatherer subsistence cycles. At this time there is a greater variety of resources which could fulfil the subsistence needs of the group. This in turn could result in a range of settlement location possibilities. In late winter and early spring, however, when stores are low, the choice of settlement locations is more restricted to areas around those few available and essential resources.

Advantages of a Broad Resource Base

Once important resources have been identified, it is necessary to determine their relationship to the settlement system. Hill states that for mobile hunter-gatherer groups the single most critical resource in any given season will affect the location of a site. Lee (1969:60-61) suggests that this is the case for the !Kung Bushmen. He notes that distance from the most critical resource of the !Kung, which is water, restricts peoples' movement across the landscape, and thereby determines ultimately where villages are to be located.

The notion that a single critical resource determined site location for mobile hunter-gatherer groups is too simplistic. Although there is little doubt that the absence of water in an area makes it unsuitable for habitation, the converse is not necessarily so. That is, if an area is plentiful in one critical resource, but absent in others, it will not necessarily be chosen as a settlement site. This point is encompased in the notion of "necessary and sufficient causes" from philosophy of science (cf. Cohen and Nagel 1934:250). That is, the presence of water is a necessary factor for settlement location, but alone is not sufficient. Anthropologists conducting settlement pattern studies should take care to distinguish between these two qualities.

This idea is illustrated in the ethnographic literature. The G/wi Bushmen, for instance, "are concerned not with the relative richness or poverty of an area in a single item, but with the availability of a nexus of resources which they require to fill a wide range of needs and in all seasons of the year" (Silberbauer 1972:294). Similarly, Wilmsen (1973:8) observed that

> "spatial allotments to each band unit appear to be demarcated in such a way that access to several different plant producing areas is assured. Compensation is thus made for fluctuations in areal productivity, and consequently each group has an appreciably better chance of meeting its requirements for this type of resource."

Several specific reasons have been put forth as to why hunter-gatherers will not overconcentrate on a single resource. Such non-specialized behavior is favorable because (1) it decreases risk of foraging failure by spreading the chance of failure out among several resources, (2) it may present a contrast of low and high prestige items, (3) it allows for new role differentiation by creating a dual economic focus, and (4) it satisfies the need for variety in the diet (Jochim 1976:27).

As mentioned earlier, a range of resources in the diet is not important solely because of the energy gains, but also because of the increased likelihood of supplying necessary amounts of essential vitamins and minerals. The absence of any essential nutrient in the diet would be physically debilitating. That a balanced indigenous diet includes a range of food types (Kuhnlein 1983) is not accidental.

Jochim points out that specialized settlements for a single resource do exist, but they are very rare. Such sites are located at the source of the resource (i.e. a rock quarry). Furthermore, he suggests that they "are either extremely short-term or else highly dependent upon others in a complex set of economic exchanges" (ibid.:152).

Predicting Settlement Patterns According to Resource Distribution

The above discussion suggests that ideally, settlements will be placed such that a maximum number of profitable resources can be exploited from a given spot with the least amount of energy output. In this way, the group can have a relatively more sedentary seasonal round. In most hunter-gatherer groups, however, the seasonal availability of certain resources requires that short term resource procurement camps be set up. Such camps enable part of the group to remain at the base camp, thereby increasing the sedentariness of at least part of the population. The decision to move the base camp or set up a limited occupation site must be weighed for each resource.

Research on prehistoric site location in Southern California illustrates the possible relationship between temporary camp and village location (Tartaglia 1980:188):

> "Base camps are located to minimize distances between village sites and specialized resources. Village sites are located to minimize distances between a number of diverse resources; the dominant

> resource is located to minimize the distance to other secondary resources. Villages and base camps which are not located near critical resources appear to be situated primarily along access routes crossing the mountainous topography and/or contact zones between coastal and inland sites.

The nature of the distribution of the resource may also affect the nature of the settlement pattern which is adapted. Heffley's (1981) analysis of data from three northern Athapaskan hunter-gatherer groups revealed that their settlement patterns varied according to whether the resources being exploited were (1) clumped, mobile and unpredictable (e.g. caribou), (2) stable and evenly spaced (e.g. small game), or (3) clumped and predictable (e.g. cached resources). She found settlements centrally located in relation to resources which fell into the first class, while small settlements were evenly dispersed to exploit resources which fell within the second grouping; resources which fell into the third group also allowed for aggregation of users (Heffley 1981:146; see also Wilmsen 1973: 6-8).

Resource ownership will also affect settlement patterns. This is particularly relevant on the Northwest Coast where valuable land was carefully apportioned. Calvert (1980) found that access to such holdings is also evident in varying food patterns between sites. Such cultural factors may cause a deviation from the expected settlement patterns.

On Reconstructing Past Environments

Difficulties of reconstructing past settlement systems do not lie only in the cultural realm, but also in the reconstruction of the natural environment. Such criticisms have been put forth as shortcomings of both site catchment and salmon-settlement studies (e.g. Foley 1977:182; Hodder and Orton 1976:233; Pritchard 1977). All such studies involve assessing the present-day environment and extrapolating to the time the site was occupied. Assumptions that the local environment has not been greatly altered through time may lead to erroneous conclusions concerning the settlement system. In many cases the local environment (in post-Pleistocene times) can be adequately reconstructed for use in settlement studies.

The distribution of land resources can be recreated through a knowledge of local ecology. Documentation is often available which outlines the most recent human-induced changes on the landscape. Resource distributions in similar undisturbed environments will give clues as to the original habitats. Information on preferred habitats of land mammals can result in past distributions of animals in a given area.

Likewise, past distributions of salmon and other aquatic species can be reconstructed. The most severe changes to the distribution of these resources has occurred only in very recent historical times. Early documentation by fisheries agencies can be helpful in reconstruction. Exact precontact numbers are more difficult to recreate, but relative abundances between and within waterways are certainly obtainable.

In fact, relative abundances and distributions may be all that is needed in settlement pattern studies. Since the environment as a whole is viewed within a certain set of cultural parameters the "real versus perceived" environment may be quite different from one another (Butzer 1982:252). The perceived environment is "that part of the real environment that is perceived by human beings, with motives, preferences, modes of thinking and traditions drawn from their socioeconomic context" (ibid.:253; see also Kirk 1963; Jochim 1983:158). Attempts to distinguish between the real and perceived environments should be a focus of all researchers studying settlement systems.

Summary

In sum, it should be possible to predict settlement patterns if they are viewed within the larger settlement system. People will try to minimize their effort for maximum gains, but the society's goals must be defined within a cultural framework specific to that group. Both energy and non energy factors should be considered. Energy needs will be met through a range of important resources. Settlements should be located such that a range of these resources can be more easily accessed from a single location.

Two methods used to study settlement patterns -- salmon-settlement studies and site catchment analysis are reviewed in the following sections. The methodological and theoretical bases of each will be examined according to the criteria outlined above. The shortcomings and utility of each will be outlined.

Methods Used to Determine Settlement Patterns

Site Catchment Studies

Introduction

Site catchment analysis is a method which is commonly used by archaeologists to determine the relationship between settlement and land resources. Site catchment studies, like other location models, are based on the idea that resources physically closer to the site will play a more major role in the economy of that site and those at increasing distance from the site will play a decreasingly important role. Since its first application to archaeological data by Vita Finzi and Higgs (1970), many researchers have used this method to examine the relationship of a site and its surrounding environment. Several variations on the original approach have been attempted, but with few exceptions, the basic method and theory applied by Vita-Finzi and Higgs remain essentially the same.

What is Site Catchment Analysis?

In site catchment studies an area is delimited around a site to represent the zone of potentially high resource use by the site's inhabitants. The size of the "catchment" is most often determined by ethnographic studies of land use patterns. Those most often used in catchment studies are Chisholm's (1962:40) figures for agricultural groups of one to three or four km from a site, and Lee's (1969:59) distance of one day's walk, or 10 km radius from a site for hunter-gatherer groups. The shape of the catchment area used is usually circular, as it is assumed that "areas of movement will tend toward circularity" (Ellison and Harriss 1972:118). This assumption is made because, in general, a circle delineates the area uniformly accessible from a single point.

Within the designated catchment area a series of concentric circles is drawn to represent time or distance contours from the site outwards. Resource zones, which are characterized by resources that may have been important to the site's inhabitants, are delineated within the catchment area. The resource zones closest to the site are interpreted to be the most economically important at the site in question.

Flannery (1976b) approaches site catchment methods a little differently. He attempts to determine how far the inhabitants of the site must have gone to procure those resources for which there is evidence within the archaeological site. From this he defines the extent of the catchment. Thus, the catchment boundaries are not assigned arbitrarily by the archaeologist. Of course, this approach is not applicable to a settlement survey or to an excavation with poor preservation of resource remains. Moreover, this approach does not incorporate local exchange of items. Ideally, detailed archaeological data should be used in conjunction with ethnographic data.

Resource zones, have been "weighted" by some researchers according to their areal extent within the catchment area, such that the most extensive areas are considered to be more important than those more physically constrained (e.g. Adams 1977). It is unclear, however, how land area will accurately relate to economic value of different resources. To be sure, there is a certain areal extent below which a zone will not play a major role in the economy; for large resource zones, there may also be a similar threshold beyond which the areal extent of the zone is no longer important in determining its economic value. If the resource occurs in great enough density, a larger area may not necessarily be of greater economic importance given a certain population size at a settlement.

Review of Site Catchment Method and Theory

Similar to other approaches to studying settlement, critcisms of site catchment analysis are often related to its narrow cultural focus. Such criticisms are actually twofold -- they are directed at the disregard by some researchers of both the internal workings of a settlement, namely its culture, and at other external factors which influence it. Within the site the resource potential needs to be quantified according to cultural goals (cf. Dennell 1980:14; Roper

1982:461). External factors are ignored because site catchment studies generally focus on a single site (or site type). The framework can be broadened and some criticisms addressed if the relationship between sites is also examined (cf. Davidson 1980:22; Bintliff 1980:44; Roots 1983:196). Similarly, in order to assess accurately the relationship of resources surrounding the site and site location, the distribution of resources in the region as a whole must also be examined (Hodder and Orton 1976:235; Flannery 1976a:93).

Another criticism of some catchment studies is that they often only examine the relationship of a single resource to the site (cf. Roper 1979:126). By examining a single resource the analysis is subject to the bias of the researcher who has decided beforehand what is the most important resource to that site. The whole purpose of catchment studies is, however, to analyze the relationship of resources to that site. Furthermore, as discussed above, it is unlikely that a single resource will have substantial enough influence on a site to warrant doing an analysis of it alone.

Several other criticisms have also been raised concerning the methods which are used in catchment studies. The most basic problem, which is not necessarily restricted to catchment studies, is misrepresentation in the archaeological record. Unfortunately, smaller, single purpose sites are often not very visible in the archaeological record. As mentioned earlier, these sites, because they are often concerned with resource exploitation, are more likely to show a correlation between site location and resource distribution. Furthermore, in order to assess adequately the relationship of a site and its surrounding environment, it is important to determine the site's function (Cassels 1972:214). If the function assigned to the site is incorrect, erroneous notions concerning the site's economy will be developed.

Another methodological problem present in most catchment studies involves the nature of the catchment basin itself. The general acceptance of Lee's (1969) and Chisholm's (1962) distance figures for hunter-gatherers and agriculturalists respectively, brings up a question concerning the size of the catchment area. A literature search to investigate different catchment areas of different groups (Adams 1977:2) reinforced the 3-4 km distance suggested by Chisholm. Non-agricultural groups, however, were found to travel from 5 to 10 km from "home base" to collect plant resources (ibid.:2-3). Dennell (1980:5) further suggests that these figures are in fact most applicable to groups relying heavily upon plant foods.

Furthermore, such ethnographic examples are cited from areas where water may be a limiting factor in determining movement across the landscape. It is unknown how far people will regularly travel in an area where there is an abundance of water, such as the Northwest Coast. The presence of many navigable waterways increases one's ability to travel distances by offering drinking water and an efficient means of travel. Much greater distances than the 5 to 10 km suggested by Adams for hunter-gatherer groups could be travelled by someone who had extensive knowledge of the waterways. The Coast Salish, for example, are reported to have travelled regularly over 60 kilometers to procure seasonal resources (Barnett 1955: map facing page 24). Hazards of water travel and the range of the vessel itself are additional factors to be considered when determining time-distance of maritime communities (McGovern 1980:201).

An additional, major criticism of the catchment area concept involves the shape of the area used. In most catchment studies, circles of a designated radius are simply placed around a site without consideration of the time-distance factor. Although most people recognize the utility of the time-distance concept, it is seldom used. This is presumably because it involves knowing ahead of time that a catchment analysis is going to be done so that time distance figures can be collected in the field.

In reality, the catchment size and shape are modified by many external factors in addition to the distribution of resources surrounding the site. As mentioned earlier, relations with neighbouring groups (see also Higgs and Vita-Finzi 1972:33; Cassels 1972:208), the density and distribution of the resources themselves, as well as the size of the population at the site, will also affect catchment size and shape. Furthermore, the nature of the catchment area will vary from season to season and year to year within a group as the above factors change over time.

The catchment area, then, is best viewed as a visual representation of the potential environment available by choosing that site location. As Davidson (1980:26) points out, "it can say nothing about the resources which were chosen once the field of potential resources was itself chosen." This is where non-energy cultural factors will begin to mediate decisions.

The use of concentric circles within the catchment area has also been subject to criticisms. Jackson (1972) and Binford (1982) illustrate that for both agriculturalists and hunter-gatherers respectively, the pattern of resource exploitation is not best viewed as a series of concentric circles. This is especially so in areas of localized and patchy resource distribution. In areas of less patchy distribution of resources, the amount of activity is said to decrease logarithimically in intensity over distance, such that a "series of concentric but asymmetrical frames" (Clarke 1972:852) better represents the pattern of resource exploitation. Furthermore, there is no guarantee that traditional land use will be circular, especially in areas where resource ownership is highly territorial. Use of ethnographic data will be especially useful here (cf. Tartaglia 1980). Concentric circles within the catchment area are perhaps best viewed not as a representation of patterns of exploitaton, but simply as a visual aid to illustrate distance from the site.

Site Catchment Studies - Summary

In sum, although site catchment analysis has received much critism for its short-comings, it is still very useful methodologically. When using site catchment methods, the basic parameters of settlement studies must not be ignored. The site itself must be viewed within its cultural framework, and the relationship of each site to others in the settlement system should also be examined. Given this, the methods can be useful for determining the relationship between floral and faunal resources and a settlement. However, site catchment analysis has not to my knowledge been used for fish resources. This approach would form a nice complement to methods used in salmon-setlement studies.

Salmon and Settlement Studies

Introduction

The importance of salmon among Northwest Coast peoples has sparked the investigation of the relationship between salmon and other aspects of the Northwest Coast traditional cultures (eg. Matson 1983; Whitlam 1983). Studies which directly address the relationship between salmon and settlement are actually few (Hobler 1983; Pomeroy 1980); most examine the relationship between population and salmon (Kew 1976; Sneed 1971; Baumhoff 1963; and Donald and Mitchell 1975). These studies are also pertinent to this thesis as population numbers are useful indicators of settlement distributions. In all of these studies present-day salmon numbers are used to extrapolate back to the past. More detailed methods employed in each are reviewed below.

Salmon and Population Studies

Kew (1976) formulated a model of salmon abundance in the Fraser River watershed based on present-day figures from the Federal Department of Fisheries and International Pacific Salmon Fisheries Commision. Those runs which had been greatly reduced in number as a result of present-day industry of the watershed, were assigned increased estimated numbers. Unfortunately, it is not explicitly stated how it was determined which runs were affected in this way, by what amount these figures were altered, and how the new figures were derived.

To represent salmon more accurately as a food resource, the derived salmon run numbers were converted to a energy (caloric) value. Kew notes (after Idler and Clemens 1959) that the total energy value of salmon is reduced, due to loss of body fats, the greater distance the salmon swims upstream. Taking this into consideration, the value of salmon as a food source (in terms of its energy value), was calculated for each group living along the Fraser system.

Several points were brought to light concerning the nature of salmon in the study area, and its relevance to human populations. First, it is pointed out that the salmon which reached the upriver groups, and particularly those groups occupying the tributaries, were inferior energy-wise to those accessible to the down-river populations. In addition to inferior quality, the fish available to up-river groups were fewer in number and more likely to fluctuate in size from year to year than those further down the river. This difference in quality of the salmon resource along the river suggested to Kew that the confluences of the river were preferred places of residence. In fact, preliminary examinations of population densities and salmon abundance in the Fraser suggest "correlations becoming very close if the salmon variable is expressed as caloric value and averaged over the two middle years of the [four year] cycle." (ibid.:8). Unfortunately, these data were not presented in any further detail.

In additon to abundance of salmon, Kew considered the accessibility of the resource. Accessibility, he suggested, is related to two types of factors, natural and technological. In the Fraser system Kew noted a trend towards increasing accessibility upstream due to the natural conditions of the river. However, where salmon are the least accessible, that is, at the mouth of the river, they have the greatest energy-value, and vice versa. The data suggest that technology will tend to be more complex and elaborate when it pays, namely where access is difficult and value is greatest (ibid.:10).

One final point concerning Kew's work is that the model presented does not allow for fluctuations in the pattern. Kew himself was also aware of this limitation in the model, as stated in page 5. The rigidity of the model is consistent with the treatment of the data when correlations were tested between salmon numbers and population. Here, salmon numbers from the middle two years of the cycle were averaged together; the highs and lows were not calculated, thus, unpredicted ecological disasters, for instance are not incorporated into the model. It would have been interesting to test whether population numbers are more closely correlated with the area of highest overall abundance throughout the cycle, or with those areas which are consistently higher during all years.

A slightly different approach to assessing salmon resources and their relationship to local populations was attempted by Baumhoff (1963) in Northern California, and later by Sneed (1972) in the Fraser River system. In order to assess the number of salmon available to each group, streams were categorized as primary, secondary, or tertiary, depending on the number of each salmon species present. Productivity of each stream was calculated by multiplying the mileage of primary streams in each group's territory by 2, leaving the secondary stream mileage as is, and dividing the mileage of the tertiary stream by two. The total number for each group was to represent the productivity of salmon within each group's territory. Both Baumoff and Sneed found a high correlation of salmon numbers and human population. Baumoff's results were simply plotted on a scatter plot so no exact correlation figure was given; Sneed, however, suggested that 87% of the total variation in population numbers was explained by variation in the fish resource.

Both Sneed's and Baumoff's studies are noteworthy. However, their results are not unequivocal. The methods employed to determine salmon abundance were quite inexact. The results are perhaps best viewed only as relative figures.

Donald's and Mitchell's (1975) approach for examining the relationship of salmon to settlements is by far the most sophisticated methodologically. Donald and Mitchell set out to test various models concerning the role of the potlatch as a leveling mechanism for resource variation within the Southern Kwakiutl area. To achieve this goal, statistical tests of the correlation between the potlatch rank of eleven Southern Kwakiutl groups in the first half of this century and several other variables were run. The first variable, salmon abundance within each group's territory, was determined by calculating the median escapement number over a seventeen year period from 1950-1967. The second variable, fluctuation in salmon numbers from territory to territory, was measured according to degree of variation around the median escapement value. Both salmon abundance and fluctuation figures were quite variable from territory to territory. The final variable correlated to group rank was the total human population numbers for each group at two points in time, the 1830's and the 1880's. This latter variable is of particular interest to this thesis as population numbers indicate the suitability of a location for settlement.

Donald's and Mitchell's test yielded some very interesting results. A very high correlation was found between rank and human population in the 1830's, with population accounting for 84% of the variation in local group rank. Also impressively high is the correlation between median salmon numbers in a territory and population in the 1830's, where salmon numbers account for 72% of the variation in local population numbers. Finally, median salmon numbers account for 54% of the variation in local group rank. Variation in salmon numbers accounts for little of the variability in both population numbers or rank. These figures suggest to

Donald's and Mitchell that an abundant salmon resource will attract people to a particular location. This in turn will result in a high potlatch rank for that local group, presumably because they were better able to amass surplus goods for a potlatch.

Donald's and Mitchell's analysis, although thorough, incorporates only a very small sample size. When Donald and Mitchell added five additional groups to the ranking calculations the results are somewhat altered. Here, the median salmon numbers account for 76% of the variance in rank, as opposed to 54% previously, and population in the 1830's accounts for 41% of the variance in rank as oppossed to 84%. Unfortunately, the percent correlation of population to salmon numbers is not given in these calculations. These calculations certainly do not dispute the importance of the role of salmon, but there is room for further investigation.

Donald's and Mitchell's data suggest that there is a minimum abundance of salmon which is essential to each group, but beyond this, the numbers may be superfluous. This is a similar concept to that discussed earlier concerning the economic value of large land holdings (see page 19). In this case, the second ranked group in Donald's and Mitchell's list has comparatively low salmon numbers, and very high fluctuation around this number. If high salmon numbers were the sole consideration attracting people to this group's territory, there would be some very disapointing years. This suggests, (1) that there is a minimum number of salmon that sustains this group's high ranking position, or (2) that other factors influenced its rank.

One final point concerning the relevance of Donald's and Mitchell's study to this thesis is that they were testing the suitability of an entire group territory by measuring the population within that territory. They were not testing the suitability of a specific location for settlement as I will attempt to do in the Nuxalk case. The Southern Kwakiutl territories ranged in size from approximately 15 square miles to over 35 square miles; some territories were broken up into several small locations. Winter villages as well as seasonal exploitation sites were located within these territories.

Salmon and Settlement Studies

Hobler (1983) attempted to test empirically the relationship of salmon to sites in the Central Coast region, specifically the Bella Coola-Bella Bella area. Tests of correlations were run between the variation in distribution of the number and kind of archaeological sites within a 5 km radius of a stream and the number of salmon produced today in that stream. In the Bella Coola area only a slight correlation showed between the salmon spawning streams and the several site types. Hobler attributed the correlation not to the presence of salmon alone, but to the limitation of suitable settlement areas because of the nature of the valley's terrain, and to the ooligan run occurring several months after the salmon runs have ended.

In the Bella Bella region to the west, a similar test was run. Here the terrain is flatter, and ooligan do not run. The results of this analysis showed only a very slight correlation, and in some cases a slight negative correlation between archaeological sites and the number of salmon in a stream. These results suggest to Hobler that, "when other factors are held constant, immediate proximity to salmon spawning streams was not an important determinant of site location (ibid.:154 -155).

A few additional points should be brought out concerning Hobler's study. First, there is a strong bias in the archaeological record of this area for sites located along waterways. Sites in other habitats are not well represented. That no correlation showed up in the Bella Bella case between salmon and sites is even more suprising when this is taken into consideration.

The gross level at which Hobler conducted his statistical study may have affected his results. Hobler simply correlated number and kind of site with salmon numbers, but did not make any division according to site size.* We would not expect a very small midden site to correlate with salmon numbers in the same way as a large site of seemingly same type. That no correlation was evident in the analysis, although salmon was certainly a very important resource to the Central Coast people is somewhat suspicious, and would suggest that the analysis needs to be refined, or that other variables are more important in this case.

Also working in the Bella Bella area, Pomeroy (1980) attempted to correlate both the number and yearly variation in abundance of salmon present in each ethnographic group territory of the Bella Bella. Using numbers from modern salmon fisheries, Pomeroy found that:

> "from year to year each ethnographic group, with the exception of [ ] two groups... would have sufficient resources, but probably not at the same rivers or streams each year. This is particularly significant when observing the relatively high CVs [variation], indicating possible yearly variation in salmon in the Bella Bella streams.... The people would have been aware of this and compensated by using rivers or streams alternatively, based on their knowledge of which ones in particular year were most productive" (ibid.:89).

Given the numbers produced in his analysis, Pomeroy examined the association of the yearly abundance of salmon in each stream to archaeological sites. Pomeroy's analysis indicated that midden sites

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* I appreciate the discussion with Dr. D. Aberle concerning this point.

were evenly distributed around streams with both low and high abundance and variablility from year to year. The size of the midden itself also shows no correlation to length or size of run. The results do indicate, however, that fish trap sites are more numerous around smaller streams with limited numbers of species.

That Pomeroy's analysis shows little correlation between site type and salmon stream is not suprising. Like Hobler's study, Pomeroy's site classification needs to be refined. In addition, the selection of sites themselves may not be entirely random. A portion of Pomeroy's sites were located by informants; the others were located through an "intensive survey" (ibid.:93). Unfortunately, all Pomeroy's informants were men, which may have biased the site inventory according to male-dominated activities (ie. fishing). Moreover, he does not describe his survey techniques, and we are left wondering which areas were surveyed and why they were chosen. The most apparent site type in the Central coast region is a site with shell midden remains. Shell middens are characteristically winter occupation sites on the Northwest Coast, and therefore may have little relation to the location of the summer and fall fisheries. That fish traps are more numerous around smaller, less productive streams is expected if more traps enable a more efficient harvest of the salmon run. Multiple traps may not have been necessary in more abundantly- producing areas.

Salmon Studies - Summary

To be useful to the study of Northwest Coast settlements the methods employed in each of these studies needs to be broadened to include the influence of cultural constraints. With the exception of Kew's work, none of the other studies reviewed here takes into account accessibility of the salmon resource. Accessibility of salmon is somewhat analogous to the concept of time-distance discussed earlier. It is not enough to record salmon numbers available for harvesting without considering ease of harvesting. Size of the labor force as well as the available technology should also be considered in studies of this kind.

Also with the exception of Kew, no other researcher attempts to determine how the salmon streams have been altered over time by environment and/or cultural disturbances. Kew tries to compensate for these changes by adjusting the figures to represent more accurately precontact times. As we do not know the exact methods which were employed, it is difficult to evaluate its success. Regardless, the attempt is noteworthy, and similar studies should also be aware of possible changes in salmon numbers through time.

In each of the case studies reviewed here attempts were made to relate a priori critical resources, namely salmon, to settlement patterns. The results are not as conclusive as one might expect. In the Fraser River and northern California studies, the correlation between salmon and settlement is partially confirmed, but the correlation is much weaker in the central coast area. Several reasons (ie. sample bias, inappropriate site classifications, small sample size, etc.) may partially be responsible for the minimal correlation. More likely, however, the failure of these studies to include other cultural factors limits their value as predictive models of settlement patterns.

Summary of Settlement Studies Method and Theory

In sum, if settlement studies are to be meaningful, there are several points which must be considered. The researcher must recognize that a number of determinants influenced the settlement pattern observed archaeologically. Variables from both the natural and cultural environment must be examined, and each should be examined within a cultural context. Information on which elements are likely to have played an important role can be found in written ethnographies and through ethnographic fieldwork. When these sources of information are not directly available, information from other similar environments will prove useful. The researcher should be cautioned against deciding beforehand what is the sole influencing factor on settlement location. The results of the analysis should be used to determine which factors are influential.

An underlying assumption of all settlement studies is the notion that people will try to minimize effort in all economic activities. This will be manifested in settlements by minimizing distance to important resources. Efforts involved in extracting resources, encompassed in the notions of work effort and risk described above must be considered when evaluating minimization of effort. However, since economic activities are only one aspect of behavior which governs settlement decisions, the relationship between important resources and settlement will rarely be so simplistic; other decisions will begin to mediate the relationship between the two.

Additional guidelines are necessary for analyses which do consider resources as possible determinants. In studies of this kind extrapolations from the present-day environment back to the past are often necessary. In order to accomplish this, a detailed understanding of the ecology of the study area must be achieved. This includes a knowledge of changes in the environment through time -- both natural and human-induced.

Methods used to determine availability of resources in the past need not yield absolute figures of resource abundance. Because of environmental change, and perhaps several other unknown factors, it is virtually impossible to determine past distributions with this kind of accuracy. Given these limitations, the results should be interpreted as a relative representation of the past situation. A relative ordering of resource availability according to location is sufficiently informative without stretching the data beyond its limits.

Using the parameters outlined above, the Nuxalk ethnographic data are reviewed in detail in the following chapter. Specific socio-economic information, such as resource use, socio-economic relations, and information concerning the Nuxalk settlement patterns specifically, are highlighted. A review of the Nuxalk environment as it would have been at the time before European contact is presented in Chapter III. The combination of the ethnographic and ecological information will form the data base for the analysis of the settlement system of the precontact Nuxalk.

Chapter II

THE NUXALK: ETHNOGRAPHIC DATA

Introduction

This chapter summarizes the ethnographic data relevant to a discussion of the settlement system of the Bella Coola valley Nuxalk in the late pre-contact/early contact era. Information has been compiled from historic accounts, ethnographies, archaeological data and Nuxalk consultants living on the reserve today. Detailed information on settlement patterns, the socio-economic structure within and between villages, direct resource acquisition, and resources acquired through exchange, and relations with neighbouring groups, are discussed.

Ethnographic Background

Before the arrival of Europeans on the Northwest Coast, the Nuxalk people occupied the entire Bella Coola valley and the surrounding valleys off the Dean Channel, North and South Bentinck Arms, and Kwatna Inlets (McIlwraith 1948). The term Nuxalk is used here to describe those people living in each of the areas described below, although it is derived from the term used traditionally to describe only those people inhabiting the Bella Coola valley. At the time of contact the Nuxalk had established villages throughout this area. Much of the surrounding terrain was utilized for resource exploitation. The Nuxalk did not have a single name for all inhabitants of the valleys, suggesting that they did not see themselves as a single unified group. Within each valley people were known by a collective name, a fact that indicates socio-economic unity. The inhabitants of the Bella Coola valley were known as the Nuxalkmx*, those from South Bentinck as the Talyumx, the Dean Channel people were called the Sucłmx, and those from Kwatna Inlet were the K'wałnamx (McIlwraith 1948:13; Kennedy and Bouchard 1976: 8-9).

The Bella Coola valley is located at the end of a long inlet more than 120 km from the sea, in the central coast region of British Columbia (figure 1). The valley, which runs east to west, is bounded to the north, south and east by tall, steep mountains, some of which rise over 2000m. The valley floor is transected by the Bella Coola River, which flows along its entire length, and several smaller river and streams. To the extreme east, the Bella Coola River flows from the Atnarko and Talchako tributaries, which emerge from narrow, rugged canyons. To the west, the Bella Coola River opens out into North Bentinck Arm, which in turn flows into Burke Channel before reaching the open sea.

Similar to much of the British Columbia coast, the Bella Coola valley is classified by Krajina (1970) as Coastal Western Hemlock biotic zone. The valley is characterized by the usual coastal weather patterns, however the western end of the valley is somewhat milder than the eastern end. Toward the west the winters are rainy, but do not get very cold. Further up the valley there is less rain (about 25 inches per year as compared to 54 inches at the western end; Canada, Atmospheric Environmental Service 1967:5,38), but the weather is generally more severe.

Lieutenant Johnstone of Capt. Vancouver's crew was, in 1793, the first white man to visit the Bella Coola valley. His mission was to explore Burke Channel, North and South Bentinck Arms, Labouchere Channel

* Orthography of Nuxalk words from Bouchard and Kennedy 1976, unless otherwise noted.

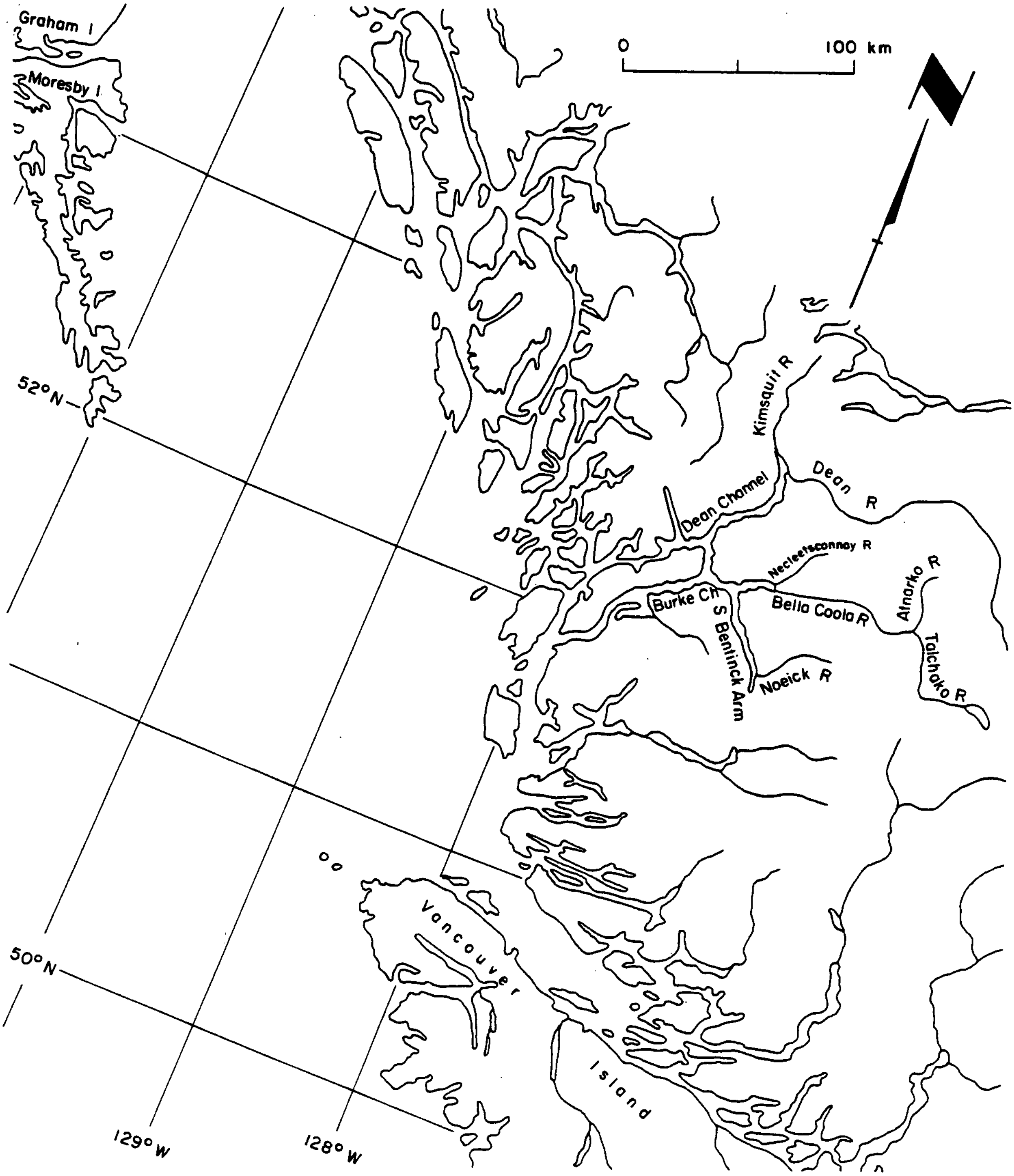

Figure 1. Location of the Bella Coola Valley in the Central Coast

and the head of the Bella Coola valley in June 3 of that year. He stayed only long enough to trade with people living in the village at the mouth of the Bella Coola (Q̓umq̓uƚs), before heading back to the sea. Although Johnstone was the first white man actually to visit Bella Coola, there is little doubt that news of the white men had already reached the Nuxalk; Captain Cook and his men had reached the west coast and Vancouver Island 15 years earlier, and the maritime trade for sea otter pelts had begun.

Only one month after Johnstone's visit, Alexander Mackenzie arrived at the upper end of the Bella Coola valley in search of an overland route to the coast. Mackenzie made his way down the valley stopping and trading at various villages. Once he reached the opean sea, he turned around and went back. Mackenzie's journey in the Bella Coola valley took less than three weeks.

Contact with the white man was minimal among the Nuxalk for the next 40 years, until the Hudson's Bay Company set up forts on the British Columbia Coast. Fort McLoughlin was established in Bella Bella in 1833 and closed in 1843 (Kopas 1970:53,139). Three small trading posts were set up in Bella Coola some time after this, which introduced an European influence in the valley. Notably the establishment of a Hudson's Bay post in Bella Coola in 1867 had considerable influence. It was later abandoned in 1882 (Kopas 1970:139,140).

By the mid 1800's much of the Nuxalk traditional way of life had been severely disrupted. This was a result of an outbreak of smallpox as well as a steady supply of liquor from the traders to the Nuxalk. In the late 19th century and even in the early part of this century, several missions were established in Bella Coola. Villages broke up and became deserted. People from all over the Bella Coola valley gradually moved to the settlement at the mouth of the river while inhabitants of the other valleys moved to other "main" villages. Some villages were still occupied seasonally at least to the time just prior to the turn of the century, to procure various resources (Boas 1891:48; Hawthorn 1949-55). In the 1920's the remaining inhabitants finally moved to the Bella Coola valley settlement (McIlwraith 1948:16). Many people at this time took employment with one of the canneries operating in the Bella Coola valley or Kimsquit (Willie Hans, Nuxalk elder, personal communication).

It is difficult to determine population figures for the Nuxalk prior to European contact. McIlwraith (1948:5) suggests that the population must have been "in the thousands". Duff (1964:39) estimates there were approximately 2,000 people in 1835, prior to the drastic decline in numbers as a result of introduced diseases. Very early accounts by the explorers suggest that the number of Nuxalk inhabiting this area may have been even greater than the records indicate. Unfortunately, since most early contact was concentrated in the Bella Coola valley, we are left with population estimates only for the Nuxalkmx of the Bella Coola valley. Mackenzie estimated that 200 people lived in the village of Nusqalst (Mackenzie 1962:223). Lt. Johnstone, who visited Qumquts at the mouth of the Bella Coola River, suggested a figure of 300 people for that village (Vancouver 1967:272). Assuming that these villages are at the large end of the scale, we can conservatively estimate an average figure of 100 people per village in the valley. If we multiply this by 27, the number of villages recorded by McIlwraith for the valley, we attain a population figure of 2700 for the valley alone.

In my research, however, I have collected data on almost double the number of villages estimated by McIlwraith in the Bella Coola valley. Although I am unable to determine contemporaneity for many of them, I believe that 27 is a somewhat conservative estimate for the number of villages at any one time. McIlwraith (1948:11) states that the original settlers to the valley established 45 separate villages which would almost double the population estimate. Regardless, the figure of 2700 does not take into account the inhabitants of the other areas occupied by the Nuxalk, and must be considered a conservative estimate.

Settlement Data

There is a good deal of fragmentary data on Nuxalk village settlement patterns at the time of contact and in the period following (eg. McIlwraith 1948; Tolmie 1963; Boas 1898; Boas 1891; and Smith 1920-1924). Unfortunately these referencs are simply lists of where villages were located. To date, there exists no comprehensive account of why they were located where they were. Nuxalk villages were undoubtedly an impressive site to any traveller in the area. Yet, unfortunately people did not record other aspects of the settlement system. Specific functions of specialized sites (e.g. resource processing sites) were likewise ignored. This gap in information is particularly apparent when the Nuxalk data is compared to that of other Northwest Coast groups. Futhermore, since the ethnographers worked only with the Nuxalk who were living in the Bella Coola valley, the data may be heavily biased in favor of the valley. This is exemplified by the fact that over one half of the recorded Nuxalk villages are located in the Bella Coola valley alone, while the other half are scattered over North and South Bentinck Arms, Kwatna, and the Dean Channel.

The archaeological record for the Bella Coola region is of little value in determining pre-contact settlement patterns in the area. Since most data result from surveys that were conducted offshore (ie. from a boat), the site distribution may be heavily biased not only towards coastal sites, but towards those sites with high visibility, for example, where shell middens occur. Figure 2 illustrates the distribution of known archaeological sites in the Bella Coola region. Excavations have been conducted at both Kwatna and Kimsquit, however comprehensive reports have not yet been published (see Hobler 1970 for preliminary report).

In the absence of extensive archaeological investigations in all areas traditionally occupied by the Nuxalk we will never know how closely the pattern described here represents the past. This study, however, focuses predominantly on the Bella Coola valley itself, the area most thoroughly documented.

Table I lists all the Nuxalk villages and camps recorded by early and present-day ethnographers. Their locations are plotted on figures 3 and 4. Although the list is quite extensive, it is far from complete. Smith (1920-24) states that "there were possibly three to four hundred named places between the mouth of the Bella Coola River and Stewie, of which only a few have been recorded". Of this total the majority of places were probably used for resource procurement. This is where the data are most severely lacking, as all but a few of the named places collected here are village locations. Finally, as many authors did not record the time at which the villages were occupied, definition of contemporaneaous patterns is difficult. We can assume, however, that in the case of the very early observers (Mackenzie, Tolmie, and Palmer), they recorded

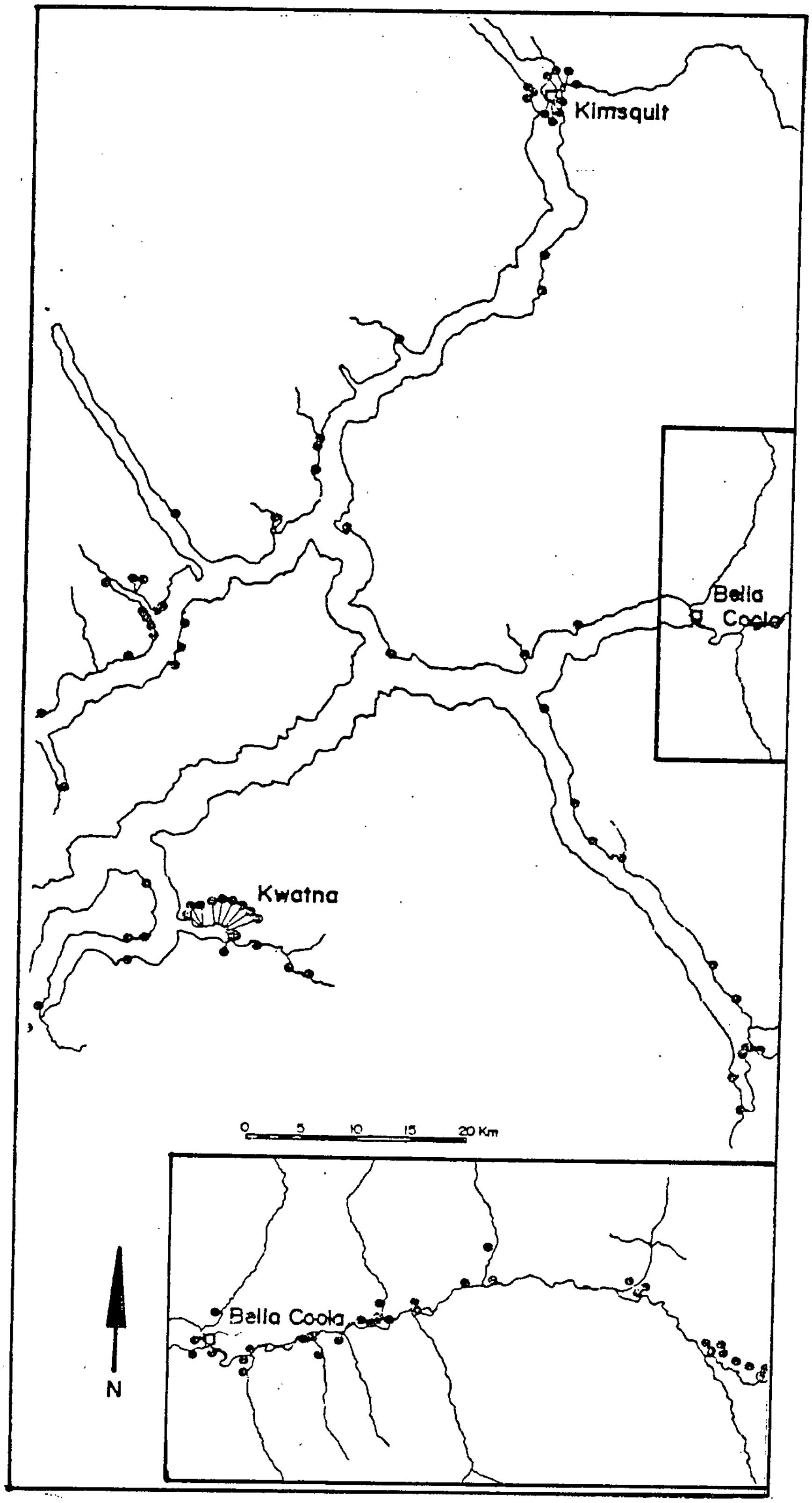

Figure 2. Known Archaeological Sites in the Bella Coola Region.
From Hobler 1982:4

TABLE I
LIST OF NUXALK VILLAGES AND CAMPS
(from east to west)

Village*	Meaning**	Reference(s)**	Comments**
BELLA COOLA VALLEY VILLAGES			
1. SlaaxL	not known	6	McIlwarith (1948:12) states that he never heard of this village
2. Name not known	not known	5	People shorter than the Nuxalk lived here. They were called Sahalie in Chinook, which means "way up"(5).
3. Snuƛlał	"place of the falls"(3) "apparently-blocked area"(11)	3,4,5,6,7,9,11	
4. Qʷliyuł	"place of herbage"(3) "low vegetation only"(11)	3,4,11	
5. Stwix	not known	3,4,5,6,7,9,11	The largest of the upper river towns (3,4,5); occupied at the time of Mackenzie (3), and still occupied in the late 19 century (7).
6. ƛaya·ł or twina·ł	"black bear footprint"(11) "visible footprint"	11	
7. Name not known	not known	5	This place was a great fishing ground; there were many camps there and possibly a village on the south side of the river (5).
8. Nuƛli·x̣ʷ	"where there are no falls(3,11)	3,4,5,6,7, 8,9,10,11	Mackenzie (1962:214) saw one large house surrounded by several small huts on stilts. On his return trip five additional houses had been built (p.254); McIlwraith (1948:10) suggests that this is because this village's weir survived a flood that other villages did not. Tolmie (1963) saw six houses at this village.

Village*	Meaning**	Reference(s)**	Comments**
9. Numc̓	"sound of berries being crushed"(11)	11	
10. Nuxnu·x̨skani	"place of many soapberries" (11)	11	
11. As'q'neaLh (4) or Asc̓ani	(from asc "spray")	4,5,11	Smith (1920-24) records a village in the same location, but he dose not give a name. He says it is occupied by both Interior and Nuxalk people.
12. Nusq̓alst	"the place of sqalstutl"(3) (a stone used for tools)	3,4,5,6 7,9,10,11	This village was made up of four elevated houses and seven built on the ground. The population was approximately 200 people (10).
13. Nunutwinm	"visible inter-mittenly"(11)	5,11	Smith (1920-24) is not sure whether this is a village or a place name. If it is a village it is very old.
14. Assanani	"the concave town" or "Bay town" (3,4) (assan "in the corner")	3,4,5,6 7,8,9,11	Reported to have had five(8), or six (5) houses. Occupied at the time of Mackenzie (3).
15. anneolekootsi(5)	not known	5	There is question if this is a village (5).
16. Name not known	not known	5	Smith was unable to locate this village.
17. Salmt	not known	11	
18. Tlatlekeytoch(8)	not known	8	Reported to have had five houses (8).
19. Nukic̓	"where there is a whirpool" (3,4,11)	3,4,5,6, 7,8,9,11	Reported to have had four houses (8). Abondoned in the first half of the 20th century (3). Occupied at the time of Mackenzie (3).
20. Uq̓mik	"hunched over"(11)	3,4,5,11	
21. Snut̓li	"place of dog salmon" (3,4,5,11)	3,4,5,6, 7,11	Occupied at the time of Mackenzie(3). There may have been two large villages here (5).

Village*	Meaning**	Reference(s)**	Comments**
22. Tsxoaxqa'ne (6)	not known	6,7	McIlwraith (1948:12) states that he never heard of this village.
23. Nuqa·x̣mac	"where there are many lady ferns" (3,4,11)	3,4,5,6,7,11	This was a very large town (4,5). It was a very good spot for trapping (5).
24. C̓lkt	"bald eagle"(11)	3,4,5,11	This was a small village (5).
25. Nuʔi·x̣maq̓ʷs	"place of foul water"(3,4) "place of mud smelling of rotting fish"(11)	3,4,5,11	This was a very large village (3,4,5).
26. Snuʔunikʷlx̣s	"on the point"(3,4,11)	3,4,5,9,11	This was a large town (5).
27. Cumu·ƚ	"where river is deep enough to cover stones, but shallow enough for rapids" (3). or "obstructions in the water"(11)	3,4,5,6,7,8,11	Reported to have had six houses (8). Occupied at the time of Mackenzie (3).
28. Squmaƚ	not known	3,4,5,11	There were many houses here (5). Occupied at the time of Mackenzie (3)
29. Snx̣ƚ	"sunny" or "fallen sun" (3,4,11)	3,4,5,6,7,11	This was a fairly large town (3,5). It was abandoned early on the 20th century (4), and occupied at the time of Mackenzie (3).
30. Qbutz (4) or TcixtcixwtELpa'ts	not known "where there is much tcixtcixwlelp" a hollow stemmed plant (3)	3,4	This is a very old town (3).
31. Usʔusq̓ʷp	"The treeless place"(3) or "bare place"(11)	3,4,5,11	A very old town (4).
32. Aƛq'lax̣ƚ	"stockaded (fenced) place (11)	4,11	Where most of the valley inhabitants were living in the early 1900's until the flood of 1936 (11).
33. Klisheooalletoch (8)	not known	8	Eleven houses were located here (8).
34. Name not known	not known	5	Smith noted many houses in this location(5).

Village*	Meaning**	Reference(s)**	Comments**
35. Nusmałłayx	(from sma "legend"; 11)	5,11	
36. C̓wankus	"cold spring of water" (11)	11	
37. Name not known	not known	5	
38. Numu·k	(from muk "red"; 11)	11	
39. Name not known	not known	5	
40. Q̓umq̓ut̓s	"salty" (3,4)	3,4,5,6,7,8,9,10,11	This was a very large village, with many slaves and chiefs (3,4). Six (10), eleven and thirteen houses (8,13) were located here at different times. It was still inhabitated in the 1920's.
41. Sc̓ki·ɬ	"what has been divided"(3,11)	3,4,5,6,7	Occupied at the time of Mackenzie(3).
42. T'satŁ m (4)	not known	4	This is a very old village.
43. Aima'ts	not known	3,4	A small town. Possibly occupied at the time of Mackenzie (3).
44. Anucquc	"labretted" (3,11)	3,4,5,11	A very large town (4).
45. Assa·qta	not known	11	
46. Saqta (6)	not known	6	McIlwraith (1948:12) states that he never heard of this village.
47. Selkuta (6)	not known	6	ditto.
48. Txeixtskune (6)	not known	6	
49. OsmaxikeLp (6)	not known	6	ditto.
50. Tłoqo tŁ	"small mound" (3)	3,4	

Village*	Meaning**	Reference(s)**	Comments**
51. AŁq̓lax̣Ł	"fenced place"(3,4,11)	3,4,5,6,8,11	This town had seven houses (8); it was stockaded (3). It was inhabitated until 1870, and was occupied during Mackenzie's time (3).
52. T'itsal (5)	not known	5	
53. T̓saŁ	"short feet" (3,4) or "salty feet" (11)	3,4,5,11	The houses were built on piles because of flooding (4,5). This is the winter village for the people living at no. 55 (3,4)
54. Qameix	not known	3	This was probably a hunting spot, not a village (3).
NORTH and SOUTH BENTINCK ARM VILLAGES			
55. Numamis	"place of flies"(3,5,11)	3,4,5,11	See comment no. 53.
56. Nusx̣iq̓	(from nusx "clover; 4)	3,4,5,6,11	This is a very old village; it was deserted before Mackenzie's time (4).
57. Qoalna (6)	not known	6,7	
58. SaŁya	not known	3,6,11	Food for this village was obtained from an ocean trap (3).
59. TsoaLtmem (3)	not known	3	ditto. Occupied at the time of Mackenzie (3).
60. Qnklst	island (3)	3,11	In the summer the inhabitants of this village lived here in order to be near their fish trap; they moved to a fortified village at the base of a mountain for the winter(3).
61. Name not known	not known	5	
62. Kxdis (3)	not known	3	It is not certain if this is a town or the fishing camp for the people of no. 63 (3).

Village*	Meaning**	Reference(s)**	Comments**
63. Nuik	not known	3,4,5,6,7,11,12	This was a populated town, occupied at the time of Mackenzie (3); a few people still lived here in the early 20th century (12). Kennedy and Bouchard (1976) call this town <u>Axeti</u> (meaning "mound"). As this village is located on a mound, and is located in the same spot on the map as <u>Axeti</u>, <u>Axeti</u> is place name given by informants for a village in the Dean, I think that the informants may have recalled the name incorrectly, and that these villages are the same.
64. Talyu or Tqwantos (3)	"facing" (ie. no. 63)	3,4,5,6,8,11	Reported to have had four houses (8), also a double stockade made of split trees (4). Willie Hans (personal communication) says this is the largest of the South Bentinck villages. People still lived here in the early 20th century (12).
65. Asi·x̣ʷ	"end of inlet" (11) or "at the head" (3)	3,4,5,6,7,11	A large population; occupied at the time of Mackenzie, and deserted in the early 20th century (3,4).
66. Kʷapx̣	not known	3,4,6,7,11	The name may be in the Rivers Inlet language. A fairly large town, deserted long ago (3,4) Willie Hans (personal communication) says a people still lived here in the early 20th century.
67. Name not known	not known	5	
KWATNA VILLAGES			
68. InuŁkEmitL (4) or Sinalk (4)	"where it all spoke" (4)	4	
69. ŁixŁixk̓uŁank	"big boulder" or "big "bellied person (11)	11	

Village*	Meaning**	Reference(s)**	Comments**
70. K̓nc AqEt'q (4)	"any whale" (11) not known	4,11	McIlwraith (1922-24) and Kennedy and Bouchard 1976) recorded very different names for this village, but the location is the same.
71. Pákwana Anu'tzeixLLx (4)	"big" (11) not known	4,11	This is the largest of the outside villages (4). See comment for village no. 70.
72. AnuŁxu·mxʷmi Anuq(owlst) (4)	"undergound sound caused not known	4,11	See comment for village no. 70.
73. Wáx̣was	not known	4,11	
74. Nu'tLltLiqolEnk (4)	not known	4	
74. Sinuxm'x (4)	not known	4	
76. Q̓ussálq	not known	11	
77. C̓iqʷi	not known	11	
78. Cu'sila	not known	11	
DEAN CHANNEL VILLAGES			
79. SiŁ̓tmtimut	"appears suddenly"	11	
80. Ałƛliqʷ	"crevasse pattern criss-crossed in rock" (11)	11	
81. Umƛum	"sound of small waves splashing on shore"	11	
82. Name not known	not known	5,11	
83. Sxʷaxʷilk	not known	11	
84. Name not known	not known	5	
85. AskŁta (3)	not known	3	

Village*	Meaning**	Reference(s)**	Comments**
86. Siwalos (3)	"where canoes are left" (3)	3	Together with sutkelta ("winter trail"), which was located opposite it, it may have been a a single village, or just a camp (3).
87. Ixwcnk (3)	not known	3	This may not have been a village (3).
88. Nusqapts (3)	"place of many spring salmon" (3)	3 3	Occupied at the time of Mackenzie (3). It was a very large town (3).
89. Axati	"occupied mound" (3) or "mound (11)	3,11	A small town (3).
90. Nucqʷalst	"many spawning sockeye salmon" (3)	3,11	Occupied during Mackenzie's time (3).
91. U'tsea (4)	not known	4	
92. Name not known	not known	4	
93. Nuƛl	"canyon" (3,11)	3,4,7,11	This was a large village occupied at the time of Mackenzie(3). McIlwraith (1922-24) does not give a name for this village, but the location is the same. It was still occupied in the late 19th century (7).
94. Usʔusq̓ʷp	"no trees" (4) or "bare place (11)	4,11	
95. AnutL'l'x (4)	not known	4	Occupied during Mackenzie's time (3).
96. Txaƛsik	"behind the village" (11)	11	
97. SotsL (6)	not known	6	
98. Sackʷ	not known	3,4,6,11	A large and important village, occupied at the time of Mackenzie (3), and still occupied in the late 19th century(7).

Village*	Meaning**	Reference(s)**	Comments**
99. Nux̣ʷlst	not known	3,4,11	Occupied at the time of Mackenzie (3).
100. QalLcik	not known	4	
101. Snuwapataʼx̣	"closed at the mouth of the river"	11	

* All spellings of villages are from Kennedy and Bouchard (1976) unless otherwise indicated.
** Numbers refer to references below.
3. McIlwraith, T.F. (1948); 4. McIlwraith, T.F. (1922-24); 5. Smith, Harlan I. (1920-24); 6. Boas, Franz (1898); 7. Boas, Franz (1891); 8. Tolmie, William F. (1963); 9. Palmer, H.S. (1963); 10. Mackenzie, A. (1962); 11.Kennedy, Dorothy and R. Bouchard (1976); 12. Willie Hans, Nuxalk elder, personal communication; 13. Schoolcraft (1855)

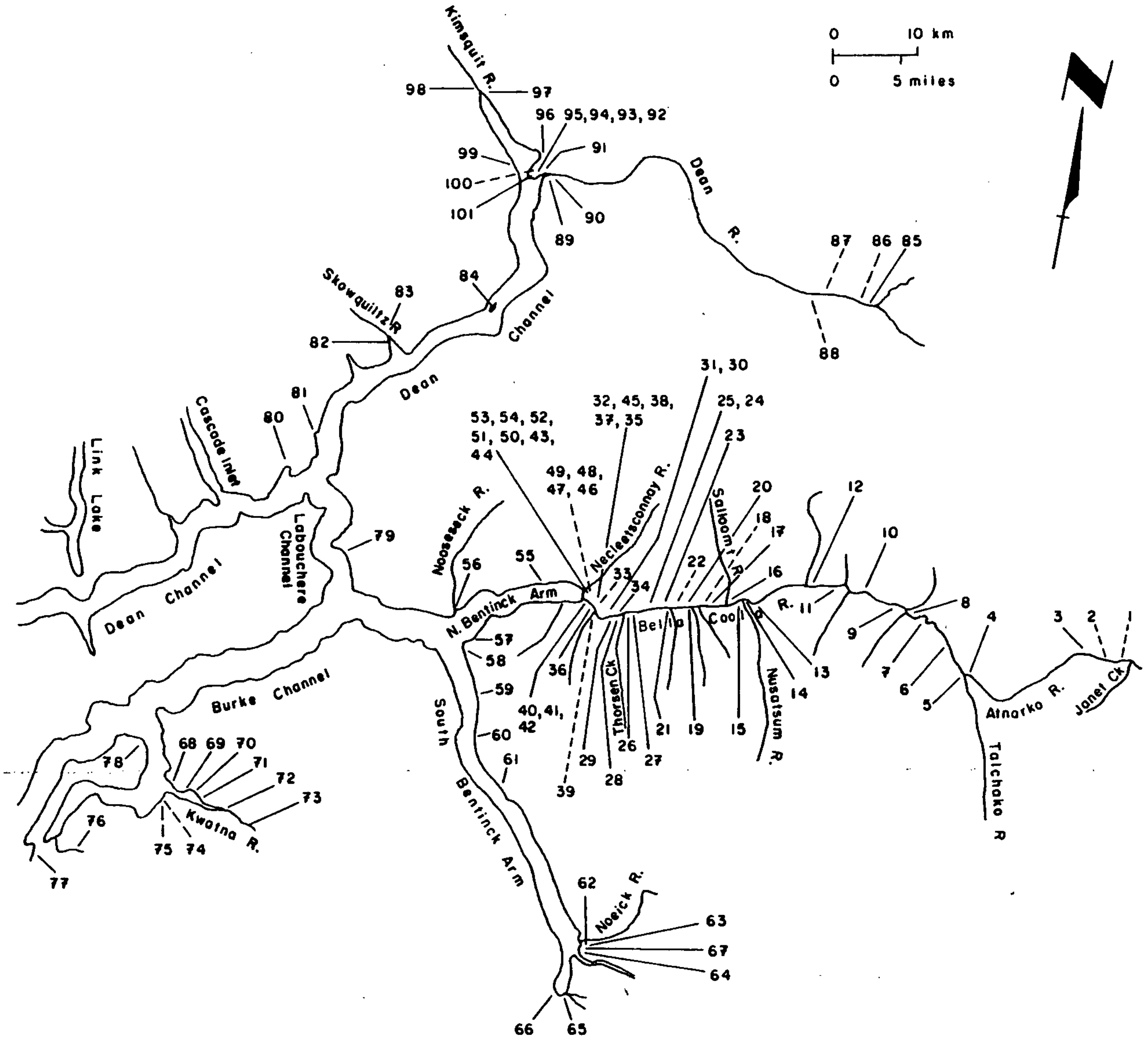

Figure 3. Locations of Known Nuxalk Villages and Camps
Compiled by author.

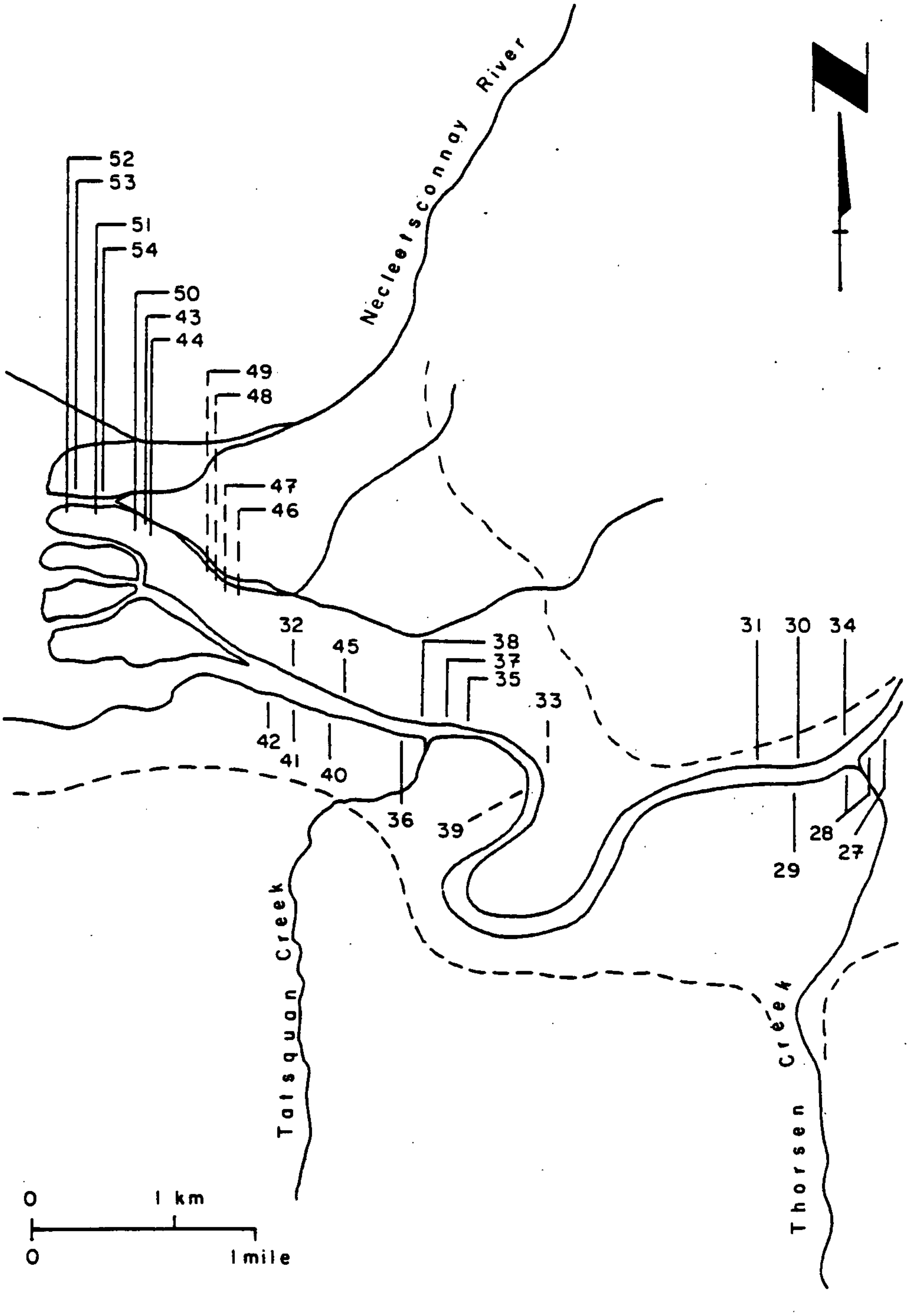

Figure 4. Locations of Known Nuxalk Villages and Camps in the Lower Bella Coola Valley

Compiled by author.

villages that were then occupied, as they were not attempting reconstruction. This becomes more of a problem with the later ethnographers (McIlwraith, Smith, Kennedy and Bouchard, Boas), but McIlwraith's attempts at showing the temporal relationships of settlements are of some help (McIlwraith 1948:6-17).

The village location maps illustrate variable distributions of villages throughout the Nuxalk territory. Although villages were scattered through the outer channels, the heads of the channels (Kwatna, Kimsquit and the head of South Bentinck Arm) were much more densely populated than the channel arms. In the Bella Coola valley, villages were densely distributed along its entire length; the valley's mouth, however, was much more heavily populated, indicating that it was the preferred area for settlement within the valley.

Contact Between Villages

The relationship between Nuxalk villages is not well documented. That inhabitants within a valley share a common collective name suggests that they are more connected to one another than to the Nuxalk living in other areas. McIlwraith (1948:17) stated that "they had common interests that threw them into contact with one another". Presumably, he meant intervillage trade, intermarriage, and occasionally aid in raids. That such a relationship did exist is illustrated by a recorded instance when the salmon weir at the village of Nuƛłix̣̌ survived a flood that those of other surrounding villages did not (see Table I, comment no.8). During this time of potential crisis, members of other villages were able to share the resources of this village. The Nuxalk rarely engaged in raids on one another (McIlwraith 1922-24).

Travel between villages would have been easy. Water travel was presumably the preferred mode of travel and would only have presented a problem when the water was exceptionally turbulent. Normally, it took approximately 2 1/2 hours to travel eight miles downstream in a canoe (cf. Mackenzie 1962:218), and about 6 1/2 hours to make the same trip upstream (Willie Hans, Nuxalk elder, personal communication). With villages being on an average distance of one to two miles apart (Hawthorn 1949-1955), access to the neighbouring village would have been easy.

Physical Nature of the Village

Much information can be put together concerning the physical nature of the Nuxalk village. McIlwraith (1948:17) records that the village was comprised of anywhere from two to thirty longhouses built in rows along the banks of the river or ocean. All other early ethnographers, however, do not record even the largest villages as having more than thirteen houses (cf. Palmer for the village of Q̓umq̓uts, or Mackenzie for the village of Nuçq̓ʷalst). These houses termed suitl* (Smith 1920-24), varied in size, measuring about 100-120 feet in length by 40 feet in width (Mackenzie 1962:222-223; Smith 1920-24 records them as being only 50 feet by 40 feet). Houses of poorer minmints were generally smaller, measuring approximatley 20 feet by 25 feet (Smith 1920-24). Several of the villages had some or all of the houses built on stilts, sometimes up to 25 feet from the ground (ibid.:230). This was to prevent flooding, and to offer support againsts attacks from neighbouring groups (Smith 1920-24; McIlwraith 1948:17). Inside the houses there was either a

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*This spelling of this term and all others from Smith 1920-1924 are taken directly from the original field notes. No attempt has been made to change them into modern orthography.

central fire place with a smoke hole in the roof (McIlwraith 1948:142; Felicity Walkus, Nuxalk elder, personal communication), or a series of three to five hearths which lined the center of the building. Around the fire, along both sides of the house and across the back were four to eight sidewall partitions which formed the bedrooms and storage space of each family (Smith 1920-24). Mackenzie (1962:223) described the arrangement in this manner:

> "The whole length of the building on either side is divided by cedar planks into partitions of apartments of seven feet square, in the front of which are boards about three feet wide...."

The floor in these smaller partitions could also be moved in parts in order that small fires could be built for cooking for the family (McIlwraith 1948:142). The back of the longhouse was occupied by the "chief" and family (Mackenzie 1962:214); a small room was also located along the back which held dance paraphenalia (Smith 1920-24). Beams running across the ceiling were used for storage and drying (Mackenzie 1962:233). The roofs of the longhouses were sloping (McIlwraith 1948:17). At one end of the structure was a large door, which opened out to a wooden sidewalk extending from one end of the settlement to the other (McIlwraith 1948:17). The outside of the houses were sometimes painted, "especially those of the chiefs and medicine men" (Palmer 1863:6). Interior storm houses (<u>oopuata</u>, Smith 1920-24) were sometimes built in the center of the house for protection against snow storms. Multi-level houses called <u>alnucha</u> (Smith 1920-24), which were similar to these structures may have also been present at some settlements.

In addition to the longhouses (called smokehouses by the Nuxalk elders today), several other structures made up the village settlement (see Table II). Mackenzie noted "a considerable number of other buildings or sheds which are used as kitchens and places for curing their fish

(Mackenzie 1962:222). Light framed temporary houses were termed tchaltwhantl, while those specifically for drying salmon were called anewspanyesta (Smith 1920-24). Mackenzie describes one of these structures at the village of Nuxlxw in detail as follows:

> "large building in the middle of the village, which at first I took for the half finished frame of a house. The ground plot of it was 50 feet by 45 feet, each end is framed by four stout posts, fixed perpendicularly in the ground. The corner ones are plain, and support a beam of the whole length, having three intermediary props on each side, but of a larger size, and eight or nine feet in height. In the area of the building there were the remains of several fires" (ibid.:224).

Mackenzie visited the Bella Coola valley in July, the height of the subsistence procurement season. The structure described above may have functioned for a shared subsistence activity by the village members, or as a temporary work area set up for the neighboring villagers who came to this village as a result of the flood.

Another habitation structure that was used in the past is the tsi'pa,* or underground house (Bouchard 1971-1977; McIlwraith 1922-24; Smith 1920-24). Tsi'pa were supposed to be very common around the Nuxalk territory (Bouchard 1971-1977); they have been recorded at the extreme eastern end of the Atnarko River, near Assannay Creek (McIlwraith 1922-24), on the west side of Thorsen Creek, at Stewie, Newskultz (Smith 1920-24), at the present village site (Felicity Walkus, Nuxalk elder, personal communication; Smith 1920-24), and at Kimsquit (McIlwraith 1948:341). Little is known about the structure of these houses, except

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*Randy Bouchard (Native Indian Language Project, personal communication) pointed out that the term tsi'pa comes from the Interior Salish word for underground storage, that is cipwa. It is not related to the word for pithouse. This may suggest their use as a storage facility. In fact, the Tsimshian people are reported to have used them for root storage (Drucker 1950:252).

that they had earth-covered roofs which slanted towards the ground with a small portion of the sides of the structure visible above ground. Tsi'pa usually measured 20 by 15 feet in size. The doorway to the house was similar to that of an above ground house, but it also was set a few feet below the ground surface, with a couple of steps leading down to it. There was a central pit for the fire, which is surrounded on all sides by stagings, presumably for sleeping and storage (Bouchard 1971-1977; McIlwraith 1948:341; Smith 1920-24).

Little is known about the function of the tsi'pa. A consultant working with Bouchard suggested only rich people lived in the regular smoke-houses all winter as they had furs to keep themselves warm (Bouchard 1971-1977; cf. Smith 1920-24). Perhaps tsi'pa were used during the coldest months for sleeping. These structures have not been used for a very long time. They may have dropped out of use before Mackenzie's visit, as he does not record their presence. Without further data, it is difficult to fit tsi'pa into the overall settlement system. Table II lists the other structures recorded to have been used by the Nuxalk.

The Village Unit

The number of inhabitants at any Nuxalk village can only be estimated. Anywhere from two to three to ten families may have lived in a single house (McIlwraith 1948:142; Alice Tallio, Nuxalk elder, personal communication). Tolmie (1963:306) in 1835, recorded 25 inhabitants in each of the 13 houses at the village of Qumquts, giving a total population of 325 for that village. The average household composition at the time would have been approximately 14 adults and 8 children.

TABLE II. HOUSES AND SHELTERS USED BY THE NUXALK
(from Smith 1920-1924)

Structure*	Description
suitl	large habitation structures located at the villages, measuring 20-50 feet by 15-40 feet
oopuanta	interior storm houses built in the center of suitl as protection against winter snow storms
alnucha	similar to suitl, except without a foundation, and sometimes having as many as four levels
tsipa	a semi-subterranean house, possibly used during the cold winter months - they are approximately 3 feet into the ground, and 20 by 15 feet in size
tcheltwhantl	a temporary light frame house made of cedar
newspanyesta	same as above, but used to smoke salmon
qualsantl	a commonly used structure which was covered with conifer boughs - it varied in size from 10 to 15 feet long
okoxk'antl	a house which was covered by skunk cabbage leaves
skimnamtl	a house which was covered by moose skins. It was not very common, and was only used when timber was in short supply.**
tapelst	a dry rock shelter used for temporary camps and shelters - drying racks for mountain goat meat may have been kept at such locations

*Spellings of structures are taken directly from Smith's original field notes. No attempt has been made to change them into the modern orthography.
**Moose entered the Bella Coola area after the 1940's. Another type of skin was probably used prior to this time.

In theory, a single village was made up of descendants of the "first people", that is, the original Nuxalk settlers to come to the area (McIlwraith 1948:4). It is believed that the first people formed a village community with hunting grounds in the vicinity. These were preferably small valleys opening up onto the main Bella Coola valley. Each group also possessed "a suitable part of the river for the salmon weir" (ibid.:18). An ancestral family also shared various non-material prerogatives, such as dances, names and generally the status of the group (ibid.:141).

McIlwraith (1948:20) and Boas (1891) both suggest that in order to keep prerogatives within the ancestral family (or <u>minmints</u>), village endogamy was preferred. The ideal mate then, being from the ancestral family of your father or mother (McIlwraith 1948:374), thus perpetuating the notion of a single family per village. Rossman and Rubel (1971:116), however, after studying McIlwraith's field notes, state that such endogamous marriages were in fact rare. Instead, such marriages were more often used to "renew [ ] relations between households after those links had grown weak with time" (ibid.:117). In economic terms it is more profitable to create a marriage alliance with other households, as an individual's options are thus broadened. This is exemplified in the case of the flooded villages mentioned earlier. Without some kind of social tie, the surviving village would not have been required to give aid.

Marriage with people who themselves were prospering appears to have been a common means of securing and maintaining prestige among the Nuxalk. Generally, it was believed that the more wives a man had, the greater his wealth and fame would be (McIlwraith 1948:335). This, however, is not simply a result of the fact that polygamous marriages are inherently prestigious, but because it is the woman's family who aids a husband in accumulating wealth to potlatch and feast. Futhermore, after a marriage, a man has access to all the belongings of his wife's family (ibid.:393). If the husband ever feels that he has over-indebted his wife's family a "ceremonial marriage" is arranged between a young girl in his family to a fictitious husband from the wife's group. In this way the wife's family will receive gifts from the marriage, while the husband's family will have renewed its ties with this family. According to McIlwraith (1948:425), "ceremonial marriages [are] one of the many methods used by the Bella Coola to enter into financial dealings with an influential chief".

The creation of marriage alliances with prospering villages to gain access to a broadened economic base is also documented in Nuxalk mythology. According to the origin myth of the village of Stwix, when the village was prospering as a result of an abundance of salmon, "people came from far and near to pledge their daughters to the fishermen" (McIlwraith 1948:311). Similarly, in the origin myth of the village of Snutli, it is written that people were able to move to Stwix because "a number of their daughters had married [their] chiefs" (ibid.:313).

Rossman and Rubel also disagree with McIlwraith as to the role of the village as a socio-economic group. McIlwraith states that it is the village that is the most important political unit (ibid.:141). Rossman and Rubel (1971:110), however, suggest that "the household is the most significant unit of social structure operative in economic assistance and potlatching". They claim that the village, on the other hand, "is characterized by a singular absence of group solidarity" (ibid.:110).

Probably, the truth lies somewhere in the middle. That a village functions as an economic unit is evident from the fact that it shares hunting and gathering grounds. Ceremonies shared by the village unit also served to bond the members of the group (Stott 1975:7). Although a village as a whole may not be the potlatching unit, there was most certainly social and economic cooperation between houses.

Nuclear family units were of little social or economic importance among the Nuxalk. Within a household a nuclear family may have cooked its meals or done other domestic chores, such as gathering food or firewood, separately from the remaining families (McIlwraith 1948:147). Ultimately, however, there would have been few distinctions. As other members of the household are those with whom the family would potlatch and feast, there would have been much sharing of tasks and resources.

As mentioned earlier, the minmints held access to all strategic resources. Hunting and collecting grounds, termed sol'loam or slxsnlmsta ("food supply"; McIlwraith 1948:131). were claimed by the "First People" in the vicinity of the village they settled. Rights of access to these plots were by membership, or association through marriage to the minmints. These plots would not have been practically important, and were therefore seldom used. Rights to such land holdings were difficult to maintain, but may have become an issue of pride (ibid.:132), since it is believed among the Nuxalk that "a person who lacks hunting grounds is little better than a slave, whereas one who has much land is important" (ibid.:132).

In addition to sol'loam, fishing sites were also owned by the ancestral family. These locations included stretches of the river for salmon weirs and ooligan nets, as well as rocks from which fish could be caught with scoopnets (ibid.:135). Unlike the land holdings, the number of people using these locations was limited, as only a certain number of traps could be placed along the weir. Because they were limited in number, these sections, as well as the ooligan net locations, were operated by certain individuals within the minmints (ibid.:136).

Resource Ownership and Rank

Rank among the Nuxalk, as with most Northwest Coast groups, was expressed by the use of food and wealth resources, which in turn were distributed among the population as an affirmation of status. McIlwraith (1948:141) in his published works states that, unlike most other coastal groups, rank among the Nuxalk was not strictly hereditary. Several men in each village could be of equal wealth, and therefore of equal status. In such cases there was no dominant figure. In his unpublished notes, however, McIlwraith writes extensively about the tyi or hereditary chief (McIlwraith 1922-24; cf. Rossman and Rubel 1971:114-115). Although there was no fixed rule of primogeniture, the "chiefly" or tyi position would have been limited to a very small number in each village. In fact, when Mackenzie (1962) travelled down to the Bella Coola valley in 1793 he continually met at each village a single man of wealth to whom people paid deference. Unfortunately, the use of the term "chief" in the early accounts and ethnographies for anyone who is wealthy, makes it difficult to interpret their actual role in the socio-political system. Slaves were also a part of the Nuxalk social hierarchy. They may have made up as much as 30-40% of the total Nuxalk population (McIlwraith 1948:58). Both poor people and tyi lived together in the same household (McIlwraith 1922-24).

It is not well understood what connection chiefs (or tyi) had with the production of resources. McIlwraith (1948:16) states that chiefs were responsible for acquiring their own foods. Mackenzie reports seeing a chief trawling for salmon with a crew of men (Mackenzie 1962:248). Slave ownership would mean direct participation was not necessary. In fact, chiefs were known to trade slaves to commoners for salmon (Smith 1920-24). Mackenzie (1962:222) noted that, "before the door of the chief's residence, [were] four heaps of salmon, each of which consisted of between three and four hundred fish. Sixteen women were employed in cleaning and preparing them." He goes on to say:

> It is on this river alone that one man appears to have an exclusive and hereditary right to what was necessary to the existence of those associated with him. I allude to the salmon weir, or fishing place, the sole right to which confers on the chief the arbitrary power. Those embankments could not have been formed without very great and associated labor; and as might be supposed, on the condition that those who assisted in constructing it should enjoy a participating right in the advantages to be derived from it. Never the less, it evidently appeared to me, that the chief's power over it and the people, was unlimited and without control. No one could fish without his permission, or carry home a larger portion of what he had caught, than was set apart for him. No one could build a house without his consent; all his commands appeared to be followed with implicit obedience. The people at large seemed to be on a perfect equality....(Mackenzie 1962:259-260).

This suggests extensive control by the chief over the production of resources, and similarly, greater access to these resources than the remainder of the populace.

Food and wealth goods collected by "chiefs" were distributed among the populace in a number of ways. Potlatches, which receive so much attention in Northwest Coast literature, probably only played a minor role in this function. Among the Nuxalk, potlatches were uncommon, and were restricted to a single month of the year (McIlwraith 1948:1830). However, when they did occur, they were seen as "one of the ways in which a chief helps poor people of his village" (ibid:195).

More common were a series of feasts which occured in the early fall or spring. During that time chiefs made trips to neighbouring groups, especially the Bella Bella, to bring them food and to receive presents in return. Any prestige that was brought to the chief through this display of wealth was presumably shared by members of the household. It would therefore be in the interest of the lineage members to aid the chief in acquisition of surpluses so that the household as a whole could elevate their social standing.

Finally, there were a series of dances and feasts that occurred throughout the year except during the height of the salmon season (McIlwraith 1948:288). Little is known about these events; they were probably less spectacular than the potlatch and other special feasts recorded by ethnographers. Food was distributed at these gatherings, probably by the chiefs or other wealthy members of the household, to commoners. These events probably were an important mechanism for redistributing food collected by the chiefs.

In addition to these large public displays involving chiefs, sharing of food and produce between commoners occured on a daily basis. Fishermen, for instance, who had rights to certain locations, were obligated to share their catch with whomever asked. Similarly, when a net was being pulled out of the river, a passerby who helped to carry the net might take a portion of the yield. This practice still occurs in Bella Coola today. If someone wants ooligan grease they need only to "help as much as they can" and they will receive grease in return (Hawthorn 1949-1955). When a large number of steelhead were caught, they were distributed to many families (Willie Hans, Nuxalk elder, personal communication; Hawthorn 1949-1955). Hunted resources, too, were shared in the past in a similar way. If hunters caught several mountain goats, or other large game, they were expected to invite their neighbours to a feast (McIlwraith 1948:286). Such acts served both to increase the status of the provider, as well as more evenly distribute the resources among the population. This form of reciprocal exchange was probably the most significant method whereby food was shared in the community.

Settlement Patterns and Resource Use

Although there are many gaps in the data, the general nature of the Nuxalk settlement system can be described. The main Nuxalk villages functioned both as resource processing sites as well as permanent settlements. Most villages were situated near the river or in the inlets in order to facilitate access to various fish resources. Small excursions were made from the main village to obtain other resources that were not readily accessible. Small temporary camps would have been located at different resource extraction and processing sites within each minmints territory for such trips that required over-night stays. These camps were utilized as resources became seasonally available and/or as they were needed. Processing of the resources collected during such excursions was accomplished both at these smaller sites, and at the main villages (Margaret Siwallace, Nuxalk elder, personal communication).

Although temporary camps played a critical role in the Nuxalk settlement system, very little is known about them (see Table I, nos. 7, 54, 55, 60, 62 for a list of known campsites in the Nuxalk territory). Where these sites were located, or if they were used at all, must have depended on the nature of the resource and its distance from the main settlement. If a resource was located very close to the village, as was the case for many of the plant resources, daily trips could be made to collect it, without wasting too much effort in travel each day. It is important to remember, however, that distance is most accurately measured in terms of "time-distance"; this is an especially important concept for the rough and densely forested terrain of the Nuxalk territory.

Ultimately, the length of stay at a resource extraction site may have been limited by the ease with which that resource could be transported. For very heavy or bulky resources it may have been more efficient to set up a temporary camp so that processing could be done partially at the site. In this way, a greater amount of the resource could be brought back to the village in fewer trips.

Most Nuxalk fishing required little traveling from the main village. The salmon weir and the ooligan location were within easy access to those Bella Coola valley settlements situated along the main river. Those groups that did not own weirs may have had to travel some distance to various dip-netting locations. Other fish resources may have also required longer distance travel. In the early 1900's trips were made to Stewie from the the location of the present-day settlement to fish for steelhead. It took at least one day's travel to reach the destination. Once there, two full days would be spent fishing (Willie Hans, Nuxalk elder, personal communication; Hawthorn 1949-1955). The Nuxalk may have travelled as far as Charlotte Lake in the Interior to set up traps for lake bound trout (Lane 1953:107).

When the time to collect plant resources approached, a group of teenagers was sent to investigate readiness for harvesting. When the resources were located, the group would return to the village to gather people to collect the resource. Elderly people and very young children would not go on these trips; the composition of work groups depended on the resource being collected. No women would go out alone (McIlwraith 1922-24). Generally women were more involved than men in the gathering of plant resources, but this was by no means a hard and fast rule. Again, whether or not people would camp at the resource spot depended on the nature of the resources, and the distance to the village. Once the resource was collected it was brought back to the village where the elderly people would process it (Margaret Siwallace, Nuxalk elder, personal communication).

Excursions lasting longer than a single day were most certainly made to procure the majority of animal resources. Access to suitable hunting spots for mountain goats, which were found at high elevations, sometimes required a walk of three or more days. Approximately three men would participate in such an expedition (Willie Hans, Nuxalk elder, personal communication). Overnight camps would be made along the way. Once the final destination was reached a structure was built for protection against the rain consisting of a flat roof of cedar boughs supported against a tree. Each year, if they returned to that spot, fresh boughs would be used. Hides, sewn together and stretched flat over several sticks were also used as protection (ibid.; see nos. 7,9, Table I). Once an animal had been killed it was partially dried on a rack over a large fire; in this way the meat could be carried down to the village more easily (ibid.).

Approximately four days would be spent at a single hunting location at any one time. Once the meat was partially dried the crew would return to the village where the meat could be further processed. Trapping and hunting for other animals continued on the trip home. Once at the village, the hunters would rest for four days before heading out again (ibid.). During the height of the hunting season (early fall) the village served as a home base for the hunters.

Hunting trips which required travelling greater distances from the village were probably not very common, but did occasionally occur. The Nuxalk are reported to have travelled as far as Kleena Kleena valley at the head of Knight Inlet to hunt beaver (Lane 1953:108), and to the interior uplands to hunt waterfowl on the lakes there (McIlwraith 1948:3).

Long distance excursions also occured for special non-subsistence resources. Obsidian, for instance, was obtained by the Nuxalk from Anahim Peak in the Interior. According to two Nuxalk elders, since the peak belonged to the Algatcho Carriers, the Nuxalk may sometimes have had to sneak up to the peak at night to obtain the stone (Clayton Mack, Willie Hans, Nuxalk elders, personal communications). Apparently it depended on the state of current relations with the Algatcho. On other occasions permission was first obtained.

One additional comment should be made concerning the use of temporary resource extraction sites by the Nuxalk. Although it is difficult to determine with such a small sample, it seems that the Nuxalk who lived outside the Bella Coola valley may have had a more mobile seasonal round than the Bella Coola Valley Nuxalk. That is, there are three recorded instances in the data (villages nos. 60, 62, 55, Table I) of people occupying a temporary camp during the salmon season, and moving to a more permanent settlement in the winter months. All of these instances occur outside the Bella Coola valley. Archaeological investigations in the area may some day clarify this point.

Resources Received Through Trade

Several resources were not procured directly by the Nuxalk, but were acquired through trade with neighbouring groups. Patterns of Nuxalk exchange were not well documented. References are sparse, and most explicit references are from the literature of the Interior people. Published sources do suggest that trade between the Nuxalk and surrounding groups to the east and west was an important and established part of the Nuxalk socio-economic system. Trade between the Nuxalk and the northern peoples, however, was very rare. In fact, mountain sheep spoons are the only item recorded in the literature that was traded from a northern group to the Nuxalk (Smith 1920-24).

Trade between the Nuxalk and neighboring groups prospered in part because of the geographical location of the Nuxalk, of whom it was said,:

> "They, by reason of their positon, have held the most important natural pass and trade route through the Coast Range, from the ocean to the Interior, which exists between the Skeena River and the Fraser, a distance exceeding 400 miles...It has induced them to engage in intertribal trade" (Wilson, introduction to Boas 1891:407).

When the fur trade began on the coast the Chilcotin were forced to trade through the Nuxalk because the Nuxalk prohibited passage to the coast (Palmer 1863:19).

Although the mountains separating the interior and the Bella Coola valley were formidable, they were frequently traversed by native people. Several trails connected the two regions, but one route in particular seems to have been most heavily used. This path went through the Bella Coola Valley, "thence northward to Salmon River, and then along the north side of Blackwater River to the Upper Fraser". The Chilcotin Indians of the Interior called this the "grease trail" because the most valued item received from the coast was ooligan oil (ibid.:162).

The Chilcotin were not the only group to use the grease trail prehistorically. It was "not uncommon for them [the Indians] to come [from] as far as the Peace River country" (Smith 1924:49). It is never mentioned in the literature that the Nuxalk used this trail to trade. In fact, with the exception of trips made to the Bella Bella region, exchange involving the Nuxalk seemed to have most frequently occured within the Bella Coola valley itself.

It is not clear from the ethnographies who was actually involved in these trading ventures. McClellan (1981:388) suggests that much of the east-west trade in British Columbia "was actually structured as a kind of reciprocity system between real or fictive kin...that could be linked through kinship or marriage." Among the Tlingit "men often married women of the interior tribes for the sole purpose of securing greater trade advantages" (Olson 1916:219, quoted in Lane 1953:115). A similar situation seems to have existed for the Nuxalk and the Interior peoples (cf. Lepofsky 1982). The nature of the exchange between the Nuxalk and the coastal peoples, however, is much less well understood.

Nuxalk chiefs seemed to control much of the exchange that took place. It was the wealthy among the Nuxalk who were able to accumulate goods for trade, as they had the aid of slaves and other commoners within the minmints. This is evident in Vancouver's accounts of the Nuxalk where the presence of a chief was noted during each trading venture (Vancouver 1967:279,281).

The time of the year when trading occurred is not well documented. Several ethnographies state that such visits occurred at least once a year (eg. Farrand 1899:645; Smith 1924b:49), but the season is not exactly clear. It seems that trading most often took place at the height of the Nuxalk harvest of the salmon and ooligan. Indeed, these would have been very important items of trade. For Interior people, the time of the ooligan run in spring would have been profitable for trade, since their food supplies were greatly reduced after a long winter. Trading parties to the Nuxalk have also been recorded during the fall, winter and summer (Smith 1920-24; Mackenzie 1962:237-238).

I have compiled from the available literature a list of almost 50 commodities which moved back and forth in the Nuxalk exchange system (see Table III). Although the list is by no means complete, several generalizations concerning the nature of goods moved can be made. The majority of items passing from the Nuxalk eastwards were typically subsistence goods. In fact, dried salmon is most often mentioned in the literature as an item traded to the Interior. Goods moved to the coast from the Interior were largely non-foods. Berries, bulbs, and caribou meat are exceptions. Since saskatoons, several types of blueberries, soapberries and large mammals occur in the Bella Coola valley in varying abundance, traded items may have only been minor supplements to the diet, or occasional exotic and special foods. The remaining items, dyes, hides and hide products, are most certainly non-food items. In fact, several of these goods were highly valued among the Nuxalk (McIlwraith 1948:392). Trade between the Nuxalk and other coastal people appears to have been more evenly balanced in terms of the movement of utilitarian versus non-utilitarian items.

Relationships with Other Groups

In addition to trading relations, the Nuxalk interacted on other levels with their neighbours. The Chilcotin and Carrier were often in contact with the Nuxalk, particularly those who occupied the upper valley. During the winter months when supplies were low among the

TABLE III
TRADE ITEMS OF THE NUXALK*

Kwakuitl (Ft. Rupert, Rivers Inlet)	Bella Bella	Nuxalk	Carrier +/or Chilcotin	Shuswap
dried seaweed (8)			→	
sea canoes (15)		→		
highbush cranberries(8)		→		
crabapples(8)		→		
food boxes, inlaid with opercula (15)		→		
boxes of yew wood (15)		→		
	herring eggs (5,7,14)		→	
	dried seaweed (8,9,13,14)		→	
	highbush cranberries (8,9,13)		→	
	crabapples (8,9)		→	
	cedar bark (5,7)		→	
	mussels (10,12)		→	
	dentalia (2,6,10,15)			→
	abalone (6)		→	
	copper (3,6,7,10)		→	
	←	salmon roe (5,7)		
←		dried salmon (3,5,6,7,9,14,15)	→	←
	←	salmon (6,14)	→	←
		salmon oil (15)	→	
	←	ooligan grease (3,6,9,14)	→	
	←	sorrel (7)		
←		hemlock cakes (4,5,7,15)	→	
←		elderberries (15)		
←		highbush cranberries (8,15)	→	
←		crabapple (8,15)	→	
←		yellow lichen (15)		
←		dyed mountain goat wool (15)	→	
		red cedar bark (15)	→	
		dyed alder bark (15)	→	
		blankets (15)	→	
←		mineral paints (3,6,15)	→	
		boxes and dishes (6)	→	

Kwakiutl (Ft. Rupert, Rivers Inlet)	Bella Bella	Nuxalk	Carrier +/or Chilcotin	Shuswap
		<-------------	blueberries (8,9,13)	
		<-------------	saskatoons (6)	
<-------------	-------------	-------------	soapberries (5,6,7,8,14,15)	
		<-------------	avalanche lily corms (9)	
		<-------------	caribou meat (6,14)	------------->
		<-------------	caribou skins (1)	------------->
		<-------------	beaver skins (15)	------------->
		<-------------	goat skins (6)	
		<-------------	furs (6; contact?)	
		<-------------	snowshoes (6)	------------->
		<-------------	caribou sinew (15)	
		<-------------	white paint (15)	
		<-------------	yellow lichen (15)	
<-------------	-------------	-------------	obsidian (3,10,11,15)	------------->
		<-------------	slaves, women (1,3)	

* Numbers in parentheses refer to references listed below. Arrow lines indicate the direction of trade from the source location. Although there is not complete data, it is assumed here that all items stop at all groups for which arrow lines pass through.

References. 1. McIlwraith 1948; 2. Teit 1909b; 3. Lane 1953; 4. Vancouver 1967; 5. Kopas 1970; 6. Teit 1909a; 7. Mackenzie 1962; 8. Turner 1975; 9. Turner 1978; 10. Ham 1975; 11. Wilmeth 1973; 12. Wilmeth 1978; 13. Turner 1973; 14. These goods are still traded today; Sarah Saunders, Nuxalk consultant, personal communication; 15. Smith 1920-24.

Interior people it was not not uncommon for many of them to move to the Bella Coola valley to live with "friends" (Lane 1953:113; Goldman 1940:352). The Nuxalk, however, "seldom ventured far from their homes on the sea coast or on the lower reaches of the rivers; and they seem (according to Teit, [1909a:761]), to have a great deal of awe of entering the forbidden and unknown vastness of the mountains".

Relations between the Nuxalk and the Interior peoples were quite amicable; they rarely engaged in raiding or war with one another. In fact, the Chilcotins were even known to join the Nuxalk in support of Nuxalk raids (Lane 1953:116). Further ties between the two groups were formed through intermarriage, especially with the upper valley Nuxalk (Lane 1953:192; Smith 1920-24). According to Lane (1953:192), the Interior people also "sold" their women to the Nuxalk. The Nuxalk occasionally invited Interior peoples to their winter ceremonials (McIlwraith 1948:18).

Relations with groups to the west and north were somewhat more strained. Those Nuxalk groups living close to other tribes had fairly regular interactions in much the same way as the upper valley Nuxalk had with the Interior people. South Bentinck Arm inhabitants lived within walking distance of the Rivers Inlet people; consequently the two groups often intermarried (Willie Hans, Nuxalk elder, personal communication ; McIlwraith 1948:22). Likewise, the Kitlope of Gardner Channel had more interaction with the people of Kimsquit, and often married them (McIlwraith 1948:17). The further away from the Nuxalk territory, however, the more strained the relations seem to have been. The Bella Bella only maintained a tenuous relation with the Nuxalk (McIlwraith 1948:171). This was in spite of the fact that they were involved in a trade relation with the Nuxalk, and often married the people of

Kimsquit. Relations with southern groups were minimal, but amicable (Stott 1975:107). Any real threat of attack came from further west, from the Kwakiutl and Kingcome Inlet people*, as well as further to the north, from the Kitkatla and the Haida (McIlwraith 1948 II:339; McIlwraith 1922-24; Palmer 1863:6).

The threat of raids was much more severe for the outer Nuxalk groups than for the people occupying the Bella Coola valley. Several villages had stockades made of vertical cedar boards. The people of Talyu, the village most frequently attacked, built a large double stockade made of:

> "vertical logs tightly lashed together on the inside of which a platform ran around near the top from which defenders had a vantage point. There was a water gate through which canoes could come at high tide" (Kopas 1970:182).

In spite of occasional hostilities, the Nuxalk engaged in ceremonial activities with many of these people. McIlwraith (1948:338) states that during the winter months such "enemies" were invited as guests to some dances. Indeed, the Nuxalk are reported to have potlatched in post contact times with the people of Alert Bay, Fort Rupert, Knight Inlet, Bute Inlet and Rivers Inlet (McIlwraith 1948 I:22; Willie Hans, personal communication).

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*Boas (1966:110-116) gives a lengthy account of a Kwakuitl-Nuxalk war.

Chapter III

ECOLOGICAL DATA

Introduction

The Nuxalk utilized a wide range of food and non-food resources throughout the year. Each was harvested and exploited in a manner particular to that resource. This section describes those resources and processes. Scientific names for each of the plant, animal and fish species mentioned in this chapter are listed in Appendices I and II.

Aquatic Resources

Unless otherwise indicated, the folowing data concerning the fish and shellfish specific to the Bella Coola region were supplied as personal communications from the Fisheries and Ocean personnel in Bella Coola.

Salmon

Pacific salmon (Oncorhynchus spp.) are among the most important fish resources to the Nuxalk economy. Prior to extensive change in the Bella Coola valley, all five species of Pacific salmon including even and odd runs if pink, ran in great numbers in the Bella Coola River (Aro and Shepard 1967:317). If the present-day distribution reflects the past, salmon were available to the Nuxalk all along the stretches of the main river. Multiple spawning populations of each species, each with its own spawning ground, comprised the runs. Today the different salmon species enter the Bella Coola River each year from the spring through the end of fall. Catches in side streams were usually limited to no more than three of the five species (chinook and sockeye usually kept to the main waterways). Even those catches were far smaller than those from the main river. Salmon could be harvested in the Bella Coola valley any time after entering the river system, and before they spawned.

Chinook, or spring salmon, are the first salmon species to enter the Bella Coola River system in the spring, usually sometime in May. Once in the Bella Coola they proceed directly to their spawning grounds. Few of the Chinook population spawn in the lower Bella Coola River tributaries; the majority travel up to the Atnarko to spawn. Chinooks migrate slowly, and may take over one month to reach their destination. Actual spawning starts in August, and continues as late as November, with peak time in mid September. Springs are the largest of the Bella Coola salmon, weighing on average, 20 pounds*.

Summer and early fall runs of sockeye and coho enter the Bella Coola. Sockeye are a small salmon, weighing on average 4 pounds. This species spawns far up the Atnarko tributary, even as far as Lonesome Lake. The spawning season is shorter than for other species, beginning in mid-September, reaching a peak soon after, and ending in November. Sockeye are common in the Bella Coola River today; according to Nuxalk myths they were relatively rare in the past (McIlwraith 1948:87). Coho spawn late in the season, beginning and peaking sometime in October, and continuing as late as February. The tributaries of the lower Bella Coola River are the preferred location for spawning. The average weight of this species is approximatey 10 pounds.

Pinks and chums run in the Bella Coola system as early as July. Both

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*Salmon weights are provided from Dan Wagner, Fisheries and Oceans, Bella Coola, personal communication.

odd and even year pinks run in the Bella Coola-Atnarko system (Aro and Shepard 1967:282). Pinks spawn from mid-August to October, with the peak time being around September. For at least the past 40 years (the duration of recorded Fisheries and Oceans estimates), pinks have been the most abundant salmon species in the Bella Coola River. This may be as a result of under-exploitation of this species in the cannery days when other species were preferred (Nuxalk elder, personal communication). Only 15 to 20% of this species spawns in the tributaries of the Bella Coola River; the remainder travel up the Atnarko. Pinks are the smallest Bella Coola salmon, weighing approximately 3 pounds.

In contrast, chum salmon are fairly large salmon, weighing on an average, 14 pounds. Chums typically spawn close to salt water; in the Bella Coola system, they concentrated in small tributaries and creeks in the lower 20 miles of the valley. Spawning times are from August to November, with peak time being at the end of August. After pink salmon, chums are the most common species in the Bella Coola River today. Again, this may be due to underexploitation. They were the least favored of the salmon species among the Nuxalk (McIlwraith 1948:337), and may have likewise been less preferred by the early salmon industry.

Salmon were caught by the Nuxalk in a number of ways. The most common and productive method employed a large dam built across the river at each Nuxalk village site on the Bella Coola River. These dams, more often referred to as weirs in the literature, were usually built at rapids (Smith 1920-24). Dams spanned the river; they were as much as 50 feet in breadth, and 14 to 15 deep on the upriver side (Berringer 1982:107). The middle third of the dam, constructed of large trees, rose over 4 feet above the water level. Fish traps, "into which the salmon would fall as they attempted to jump over the falls" (Mackenzie 1962:358), were placed all along both sides of this section of dam. The outer two thirds of the construction was a secondary dam, which rose up to 6 feet above the water level; passages through this barrier led the salmon right into traps placed on the other side (ibid.:358; Smith 1920-24). It was these traps that were owned by individual fishermen.

The position of some traps was more productive than others (Berringer 1982:107); perhaps the more productive ones belonged to the chiefs. Finally, dipnetting was conducted at these dams at the point where the water passed over them (Mackenzie 1962:358).

Several other methods were used by the Nuxalk to harvest salmon, depending on the specific location of the harvest (see Berringer 1982 for a more detailed account of the following summary). Toggling harpoons were employed in areas where the fish could be easily seen, such as estuaries where salmon congregate, river bars, confluences, and clear shallow streams. Such streams would have been owned by the minmints. Trawl nets, towed between two canoes, were also used on the Bella Coola and Atnarko Rivers. This technique was especially used for chinook and sockeye in July. Tidal traps, constructed of stones, were located in the inter-tidal zone at some of the inlet villages. Berringer (ibid.:72) suggests that either these sites were owned like other fishing village sites, or they were a common resource for all neighbouring villages. The latter seems less likely, as these traps would have required much labor to construct. Without a single chief to monitor the work, it is difficult to imagine how such a construction would have been built. Weirs were also used by the Nuxalk in tributary streams of the Bella Coola River. These, however, "were less productive (presumably) than the large river traps of the area" (ibid.:78). These devices were used for summer and fall runs. The weir, and associated tributary could have been owned by each minmints. Traps were also placed in the smaller streams owned by each minmints. One additional large style trap may have been used on the Bella Coola River, but this type is not well known (ibid.:108).

Once the salmon was caught it was brought directly to the village (or camp, depending on village accessibility to the salmon stream) to be processed. Temporary "salmon houses" without side walls, were set up near the village in order to process spring salmon only. Only men were allowed at these structures as there was a strong taboo forbidding women and children from processing this particular species (Smith 1920-24).

All the parts of the salmon, except the innards, were used by the Nuxalk. Each part, including the bone, was smoked over an alder fire. Troughs were placed under the fire to collect oil which was rendered as a result of this process. Roe from the salmon were also processsed and eaten fresh. The smoked salmon was eaten immediately, or stored for later use (McIlwraith 1948:226; Kuhnlein 1983:6).

Other Fish

Ooligans, a tiny fat-rich fish, were a very important component of the Nuxalk diet (cf. Kuhnlein 1982). Ooligans run in great numbers in the early spring, predominantly in the Bella Coola River, but also in Necleetsconnay River to the north, and in small numbers in the side streams to the south of Necleetsconnay. These fish were probably harvested only in the main river and in Necleetsconnay as the other runs would not have yielded a significant harvest.

Ooligans arrive in Bella Coola waters some time in late March or April. At first, a few stragglers will appear in the river. These were traditionally caught with dip-nets by fishermen (McIlwraith 1948:758). Women were not permitted near the river at this time (Smith 1920-24). Later in the season, ooligan appear in very large numbers for over one month. Spawning occurs in the side streams in the lower four miles of the river (Tony Karup, conservation officer, Bella Coola, personal communication). Traditionally, large nets were fixed where the river was approximately 3 feet deep and had a fairly strong current. The net locations were owned by the minmints thereby restricting access to the lower valley villages. Large quantities of ooligans could be caught with these nets, a "single net will sometimes take several thousand fish" (McIlwraith 1922-24).

Once caught, the fish were carried in baskets from the canoes to large pits, in later times replaced by large bins (Kuhnlein 1982) owned by each minmints. These pits were located 10 to 15 feet from the bank, and were 3 to 4 feet deep. The fish were kept in the pits for ten days to 2 weeks to putrify, at which time they were rendered for grease. Ooligan not processed this way was dried whole. Both the dried fish and the grease were important foods throughout the winter months (McIlwraith 1922-24).

Ooligan harvest, because of its importance and intensive use of labor, took priority over other economic functions for a significant portion of the economic cycle. Concerning this point, McIlwraith 1922-24 records that:

> "During the olachen run, and especially during the time of refining, almost all other activities are suspended, and men, women and children alike share in the work at the river. If putrefaction [sic] is too advanced much of the greases [sic] is lost, while unless a sufficient time is allowed to elapse before boiling, the fish is not

soft enough. Warm weather hastens the rotting, and if this combines with a heavy catch of fish, everyone is forced to take part in order to complete the refining at the proper time..."

Even today, villagers start positioning their nets into the river at the end of March, and by the time they "are carrying grease home, it has been a good month's work" (Hawthorn 1949-1955).

Another species which formed an important part of the Nuxalk diet is the steelhead trout. Average steelhead weight is 30 pounds. There are two runs of steelhead in the Bella Coola River. Both runs spawn in the Atnarko. The "summer run", which begins in late May or early April, is sexually immature, and stays in fresh water holding pools in the upper Bella Coola River to mature. This is the prime location to harvest them.

> "They don't come down [from Stewie] and we have to go up. We try to fish down here and don't catch anything, and that's the only way is for us to go up there, and then we get the fish" (Willie Hans, Nuxalk elder, personal communication).

The second run begins in October or November and continues throughout the winter months; these species continue to spawn until May. Steelhead also spawn today to a much smaller extent in a few side creeks of the Bella Coola River -- Tatsquan Creek, Nuxalk Creek, a small channel to the south of Necleetsconnay River, two unnamed creeks west of Snootli Creek, East and West Airport Creeks, Fish Creek, and Hagensborg Slough.
Although not always in large numbers, (there are a few thousand in the Bella Coola-Atnarko today; Tony Karup, conservation officer, Bella Coola, personal communication), fresh steelhead would have been available in the river year round. Like salmon, the only time they are not good for harvesting is after they spawn. Steelhead were taken with spears, hook and lines, and nets (Smith 1920-24). Access to the bulk of steelhead resources would not have been restricted by minmints ownership, as they were taken in the main Bella Coola River, and this was not an owned

locality.

Coastal Cutthroat trout are also present in the Bella Coola River, and were harvested by the Nuxalk. They are much smaller than their steelhead relative, weighing on average 4 pounds. Preferred holding and spawning areas for this species are in the Atnarko River. Cutthroats also spawn in fewer numbers in side creeks in the spring. Specific spawning locations include Tatsquan Creek, East and West Airport Side Creeks, Snootli Creek, Fish Creek, Hagensborg Slough, Salloomt River and Noosgulch Creek. They were taken prior to spawning with spears and nets (Smith 1920-24), probably at the mouth of the minmints-owned streams. The Atnarko spawners would have been accessible to all. As cutthroat occurred in much greater numbers in the Bella Coola system in the past than they do today, it is difficult to determine their traditional importance in the diet. Dolly Varden trout also occur in the Bella Coola River in small numbers. Like cutthroat, their preferred spawning area is the Atnarko. It is not documented, however, whether these fish were exploited by the Nuxalk.

Several other fish species were of minor importance among the Nuxalk. Herring were available in small numbers (they are no longer available in the area today) in the Bella Coola estuary two times per year (Smith 1920-1924). Herring spawn along the north and south shores of North Bentinck Arm from Bachelor's Bay eastward, along the mouth of South Bentinck Arm south to the middle of the inlet, and along the east and west sides of Burke Channel, from the mouth of Kwatna Inlet southwards (Cheston et.al. 1975). The first run lasts only 15 to 20 days, during March. They were taken by the Nuxalk by means of a dip-net at this time. The fish were roasted, boiled and smoked as well as processed to render what little oil they have at this time of year. Eggs of the herring were also collected on hemlock boughs. The second run, sometime in September, was harvested with fish traps constructed on the tidal flats on both sides of the mouth of the Bella Coola River. These herring are "rich in oil like eulachon" and were processed for that purpose (Smith 1920-24). Presumably both dipnet and trap locations at the river's mouth, as well as locations for boughs to collect herring eggs were most likely owned by the minmints at the mouth of the river.

Other fish species utilized by the Nuxalk include starry flounder (Kennelly 1982), rock and ling cod, halibut (Willie Hans, Nuxalk elder, personal communication), and various species of perch and sole (Kennedy and Bouchard 1976:30). A few starry flounder have been found in the tidal flats around Bella Coola, but the majority of them would have been at sandy beaches around Kwatna and Restoration Bay (Alice Tallio, Nuxalk elder, personal communication). These fish were harvested in unowned, open waters, but were more accessible to the villages at the river's mouth. Rock cod are located near the head of South Bentinck Arm and eastwards, in the shallow waters along the shoreline. A few stray species may occasionally be found closer to Bella Coola. Ling cod, which are a deep water fish, are common in the Labouchere Channel area. Halibut were taken by the Nuxalk at Namu, Kwatna, and Kimsquit. They were eaten fresh or dried (Smith 1920-24). Both halibut and ling cod are deep water fish which stay close to the gravel bottoms. Both of these species were taken by the Nuxalk in the past with wooden hooks (Smith 1920-24; Willie Hans, Nuxalk elder, personal communication). With the exception of rock cod, which may have been more profitably speared from specific locations in South Bentinck, access to these resources would not have been restricted by minmints ownership.

Seafood and Sea Mammals

Several types of shell fish were part of the Nuxalk diet, although some of the nearest locations of these resources were 50 miles away. Exploited bivalves include little-neck clams, butter clams, mud clams and cockles (Smith 1920-24). The closest sources of clams for the Nuxalk was in Bella Bella territory at Restoration Bay, at the head of Kwatna Inlet, and various locations near Namu. Large shell mounds recorded by Smith at Elcho Harbour suggest that clams were harvested there too (Smith 1920-24). Clams were said to be most easily gathered at the time of a big tide, during a full moon (McIlwraith 1922-24). They were eaten both raw and cooked, and were sometimes dried (Smith 1920-24). The large California mussel, also gathered by the Nuxalk, were located in small numbers at Tallio cannery (ibid.), Kwatna (Alice Tallio, Nuxalk elder, personal communication) and Fischer Channel and points westwards. The shells of these animals were valued among the Nuxalk as knives to cut and clean salmon (Mackenzie 1962:258; Smith 1920-24). Mussels were most often gathered while visiting or trading with the Bella Bella (Smith 1920-24). Clams and mussels were considered to be poisonous for approximatley "one week during the first two moons of warm weather each year" (Smith 1920-24), presumably because of red tide danger. The ethnographic accounts state that abalone was not eaten in the past by the Nuxalk as it was located too far away, but some Nuxalk eat it today (Kuhnlein 1984:795). Traditionally, its shell, which was acquired through trade, was highly prized for making bracelets. Dentalium, which were also valued by the Nuxalk for their shell, were taken by use of a spear (Smith 1920-24). Various species of crabs were collected by the Nuxalk at Kitlope and Kwatna (McIlwraith 1922-24; Alice Tallio, Nuxalk elder, personal communication), using a spear from a salt water canoe (Smith 1920-24).

Several other sea creatures were collected by the Nuxalk. Sea urchins, located at the head of North Bentinck Arm, were taken with scoop nets and eaten raw within one to two days (Smith 1920-24). Sea cucumbers, which were located in South Bentinck Arm and near Bella Bella, were taken by the Nuxalk with a dipnet or spear, at low tide and then boiled for food. Octopus and eels, and barnacles were eaten by the Nuxalk when in the Bella Bella region and further westwards (Smith 1920-24).

The above mentioned fish and seafoods, with the exception of salmon, ooligan and the trout species, probably played only a minor role in the diet of the Nuxalk inhabiting the Bella Coola valley. Since most species were located quite some distance from the valley, catches would have been largely opportunistic. None of these resources were located in the area commonly used (and therefore owned) by the Bella Coola villages. Permission to collect these resources (that is, those that were not collected on the open sea), must have come from other Nuxalk people, such as those living in Kwatna, or from their Bella Bella neighbors living further westward.

Sea mammals, although only occasionally used by the Nuxalk, were highly prized. Hair seals and northern sea lions were seasonally available in the Bella Coola River system as they followed the herring and the ooligans inland in the spring. Both seal and sea lions will travel quite close to the river mouth, and sometimes a little way up the river (Cowan and Guiget 1956). Both species were killed with harpoons in open, unowned waters (McIlwraith 1948:272; Kennedy and Bouchard 1976:30). Kwatna is reported to have been a prime harvesting area (Alice Tallio, Nuxalk elder, personal communication). Migrating seals (and possibly sea lions) may also have been caught by means of a tidal trap set in the bays to intercept them (Mackenzie 1962:242). Skins of both animals were used for making moccasins, blankets and sacks. The stomachs were used for containers (Willie Hans, Nuxalk elder, personal communication; Smith 1920-24; Kennedy and Bouchard 1976:30).

Sea otters were also taken by the Nuxalk in relatively small numbers. Sea otters will not travel past the mouth of the river. They were taken with bow and arrow, spears, or clubs. They were prized among the Nuxalk for their pelts and possibly for their meat (Smith 1920-24). Access to sea mammals seems not to be restricted by ownership of the hunting area, but by ownership of the profession itself (McIlwraith 1948:272). In this way, access was limited to a priviledged few. Traps set at the river's mouth were likely owned by the villages situated there.

Water and Land Birds

Several kinds of water fowl were used by the Nuxalk. Although waterfowl were not available in the Bella Coola valley in large numbers, there were areas of concentration where these species could be harvested profitably. Migratory waterfowl passed through the Bella Coola area, stopping at the estuaries and wetlands in the winter, fall and spring. Changes in the wetlands through time as a result of changes in the river, and recent decline in numbers of waterfowl (Tony Karup, Conservation Officer, Bella Coola, personal communication), make it difficult to determine pre-contact numbers and distribution of these species. Ducks and geese are reported today near the mouth of Snootli Creek, approximately one mile east of the mouth of Salloomt River, and at wet areas to the east of the mouth of the main river, and on the tidal flats. Although it cannot be determined how this relates to the past, it is known that the tidal flats were the prime area for harvesting waterfowl. The tidal flats at South Bentinck and Kwatna are reported to have large numbers of ducks (especialy mallards), geese and swans. Greater numbers of waterfowl tend to nest at South Bentinck than Bella Coola where only geese and a few ducks nest (Rick McKelvey, Canadian Wildlife Service, personal communication).

The prefered time for taking water fowl is in the winter, as they "taste like fish" in the summer months (James Hans, Nuxalk guide, personal communication). Ducks and geese were taken with a bow and arrow (Smith 1920-24). Geese were also captured at night with large nets operated by men in canoes (McIlwraith 1948:271). Another method used to capture ducks was by setting a large net on the tidal flats. This required the effort of at least four men working together; several ducks at a time could be caught with this method (Willie Hans, Nuxalk elder, personal communication; cf. Edwards 1979:8-10). Both ducks and geese were boiled and eaten fresh or dried for later use. Eggs from these species may have also been collected from the flats (Willie Hans, Felicity Walkus, Nuxalk elders, personal communications).

Restrictions on hunting waterfowl, like sea mammals, may be related to ownership of the profession itself. McIlwraith (1948:271) records that goose hunting with large nets may have been thus controlled. Perhaps it was the net which was actually owned; this could also have been the case with the large duck nets described above. If access was not restricted, the villages located closest to the tidal flats would have been best situated to harvest waterfowl. Other harvesting locations along the river may have been controlled by the minmints.

The Nuxalk utilized several other types of water and land birds in their diet. Eagles are common throughout the Bella Coola valley bottomlands, wherever there is food for them to eat. They are most concentrated in the lower reaches of the river, where the fish first enter. Eagles were taken with snares, and the meat eaten in late fall. The feathers and other parts were ceremonially important (Smith 1920-24). Snare locations were probably owned by the minmints. Herring gulls, which were common in the lower 10 miles of the Bella Coola valley (Tony Karup, Conservation Officer, Bella Coola, personal communication), were caught with bow and arrow during the summer and winter time. There would have been no restriction by the minmints on the harvesting of the gulls. Ruffed grouse were once quite abundant in the Bella Coola forests; these species were taken fairly frequently with bow and arrow in the fall and winter time. It is recorded that the Nuxalk also ate puffins (Smith 1920-1924), but this must have only ocurred on trips to the outer coast. Trips to the interior to hunt would have yielded common loons and possibly other waterfowl. These species were abundant on these lakes during the summer nesting months, at which time they were easily taken with a bow and arrow (Smith ibid.). Access to these and other birds which were hunted by bow and arrow do not seem to have been restricted by minmints ownership.

Mammals

Of the larger animal foods, mountain goats were the most economically important to the Nuxalk. Mountain goats are very rare in the Bella Coola valley today, but elders say they can remember a time when the local mountains were "covered" with goats (Hawthorn 1949-1955). They were reported to travel in packs sometimes as large as 25 to 30 animals (Clayton Mack, Nuxalk elder, personal communication). Goats were heavily harvested in the 1930's in the Bella Coola valley (ibid.). As they can only survive a harvest of 2 to 5% to maintain their population, their numbers were drastically reduced. In addition, they are quite easy to over-exploit as they are very trusting animals (Tony Karup, Conservation Officer, Bella Coola, personal communication). Goats live high in the mountains at or above timberline, coming down to lower elevations in the winter months to escape the snow (Cowan and Guiget 1956). Some actually come down to sea level, but most will travel to the southern slopes of the mountains (Tony Karup, personal communication).

Mountain goats were traditionally hunted throughout the year for several purposes. The peak season for meat was during the fall when they are the fattest. During this time, bow and arrows, snares and dogs were used to catch them (McIlwraith 1948:272; Smith 1920-24). Snares were set in the paths commonly used by goats. This device could capture up to 19 animals at any one time. This method would have involved larger hunting parties to process the meat and carry it home. Smaller hunting parties of three men used the bow and arrow . On these occasions only a single goat was taken. Once the animal was killed it was skinned and partially dried by smoking to facilitate transport. The skin was used as a device to carry the meat home (Margaret Siwallace, Nuxalk elder, personal communication; Smith 1920-24). During colder months the meat was often cached in the snow (Clayton Mack, Nuxalk elder, personal communication). Mountain goat meat and tallow were highly prized, and considered to be food for "tihees, nobles and important persons" (Smith 1920-24).

All parts of the mountain goat, except entrails, were used. Goats hunted from January to April were considered to produce relatively poor meat, but the wool was highly valued. In winter the wool was long and thick. A lance was used to capture them at this time in order not to damage the wool. Wool was later woven into blankets. Mountain goat horns were used to make spoons and barbs for catching spring salmon; the stomach was used as a container for ooligan grease.

Black tailed deer and mule deer were also regularly hunted by the Nuxalk. The black tailed deer is found in South Bentinck and in the lower stretches of the Bella Coola valley. The mule deer occupies the territory east of this, beginning at Stewie. Both species spend the summer at the tops of mountains, but come down in early winter when the snow makes it impossible to feed. They occupy deciduous forests where they can find food; in addition, black tailed deer are often seen on the tidal flats at this time of year. It was during early winter that deer were hunted (Clayton Mack, Nuxalk elder, personal communication).

Deer were taken with much the same methods as mountain goat. That is, with bow and arrows, in snares, or with clubs or knives after being cornered by dogs. As with goats, the meat was dried and stored for later use. The skins were used for bedding, moccasins, leggings, and the bones were used for simple points for arrows (Smith 1920-24).

Like all hunting grounds, places where deer and goat were hunted were owned by the minmints. However, hunting may have been restricted to high status people. The capture of these animals certainly brought increased status. In 1862 it was recorded that Chief "Pochlass" [Pootlass] shot 20 deer at a single time for some white men (Barret-Lennard 1862:216). This would have affirmed the chief's status to the group.

Other large and small game were utilized by the Nuxalk in much smaller quantity. Appendix II lists these animal resources and the various parts which were used by the Nuxalk.

Plant Resources

The Nuxalk utilized plants for food, medicine, and a wide variety of functional items (cf. Turner 1973; Smith 1928; Smith 1920-24). Rights of access to these resources depended on minmints membership. Collecting plant resources was predominantly a woman's task, although men and children also participated. These positions were not restricted, and all women participated. The prerogative involving plant resources was that of the "first picker", a position which belonged to one woman per village, presumably a woman of high status (McIlwraith 1948:265). Once she had picked the first fruit, all people could participate in the harvest.

Plants were processed in a number of ways. Berries were consumed as fresh fruit or either sun-dried or smoked for later use. Certain fruits were also stored in water or grease for later use . Root foods were steamed and eaten fresh or stored. Inner bark from trees was both eaten fresh and processed for storage. Greens of certain plants were eaten fresh each spring. Teas were harvested and stored for later use.

Appendix I lists the plant resources utilized by the Nuxalk. The habitat in which each plant is most likely to be found, the various parts utilized, and their purpose, are included.

Mineral Resources

Other than the plant and animal parts used for tools (ie. large mammal bone points, mussel knives, goat horn spoons, crabapple wood digging sticks, etc.), the Nuxalk also utilized several minerals. The most commonly used, and probably the most prized, was a green stone. It is reported in the ethnographies that this stone could only be collected from Newskultz Mountain (Mt. Nusatsum) on the north side of the river behind the village of Nusqalst (no. 12, Table I). On the north side of this mountain was a narrow precipice into which people were lowered to mine the stone (Felicity Walkus, Nuxalk elder, personal communication; Smith 1920-24). Another quarry was discovered on an archaeological survey about one mile down the Salloomt River, approximately 75 miles above the base of the mountain. Various tools, including adzes, cylindrical hand hammers, and chisels were made of this rare stone. Remains of these tools have been found throughout the valley. It is not documented if this resource location was common land or owned by a particular minmints. If the latter is the case, it is likely that the village of Nusqalst and the unnamed village at the mouth of the Salloomt River had rights over the resource.

Red and black-colored pigments were used by the Nuxalk for paints. Source locations for the red pigment include a spot near the village of Snxt, near Thorsen Creek, above Burnt Bridge in the Bella Coola valley, and in Kwatna (McIlwraith 1922-24; Smith 1920-24). This pigment was highly prized and in demand; it is one of the items of trade between the

Kwakiutl from Fort Rupert and the Nuxalk (Smith 1920-24). An unidentified black paint (it may simply be a charcoal paint) is reported to be very common the valley, and was used to paint pictographs (Felicity Walkus, Nuxalk elder, personal communication). Sandstone, probably from the river bed, was used for grinding and sawing (Clayton Mack, Nuxalk elder, personal communication; Smith 1920-24). Clay, probably from the river bed, was used to seal boxes (Smith 1920-24).

The Nuxalk Seasonal Round

The timing of activities undertaken by the Nuxalk throughout the year was closely tied to the seasonal procurement of resources. This is apparent in the Nuxalk traditional calendar: (assembled from McIlwraith 1922-24 and Drucker 1958)

January	"what weeps away food" "angry moon"
February	"facing both ways (ie. to summer and winter) "moon when there is nothing"
March	"when herring spawn"
April	"time for making salmon weirs" "ooligan net time"
May	"time for making hand nets for ooligans" "spring salmon moon"
June	"time for eating spring salmon" "solstice moon"
July	"time when sockeyes arrive"
August	"time for eating dog salmon"
September	"time for eating cohoes"
October	"time for gathering squalm (a fern root) "moon when they begin to dance"

November	"time for <u>kusuit</u>" "time when they play games"
December	"sit down" (ie. when the sun rests) "time when the dancing ends"

As resources became seasonally available they often had to be harvested and processed within a very short time. This required carefully timed movements to the different resource locations. Locations of prime resources utilized by the Nuxalk are given in Appendices I and II. Harvest times are given in Table IV.

<u>Summary</u>

The discussions included in the two preceding chapters outline relevant aspects of the socio-economic system, as well as the known settlement data of the Nuxalk. The functioning nature of the Nuxalk village, both within the settlement itself and to its surrounding natural and cultural environment, has been discussed. Specific attributes of the natural environment have also been evaluated. This information will form the basis of the analyses in the following chapter, which are designed to clarify the relationship of possible determinants to Nuxalk settlement patterns.

TABLE IV
YEARLY HARVESTING CYCLE OF NUXALK PLANT AND ANIMAL RESOURCES*

Resource	J	F	M	A	M	J	J	A	S	O	N	D
Salmon												
chinook				—	—	—						
sockeye						—	—	—				
coho									—	—	—	
pink						—	—	—				
chum								—	—	—		
Other Fish												
ooligan			—	—	—							
steelhead trout	—	—	—								—	—
coastal cutthroat trout	—	—	—	—	—	—	—	—	—	—	—	—
herring			—	—								
starry flounder	—	—	—	—	—	—	—	—	—	—	—	—
rock and ling cod	—	—	—	—	—	—	—	—	—	—	—	—
halibut	—	—	—	—	—	—	—	—	—	—	—	—
sole and perch	—	—	—	—	—	—	—	—	—	—	—	—
Seafood and Sea Mammals												
clams	—	—		—	—	—	—	—	—	—	—	—
sea urchin	—	—									—	—
sea cucumber	—	—	—	—	—	—	—	—	—	—	—	—
hair seal			—	—	—				—	—		
northern sea lions			—	—	—				—	—		
Water and Land Birds												
ducks, geese and swans											—	—
eagles											—	—
gulls	—						—	—	—	—	—	—
grouse											—	—
common loon							—	—				
Mammals												
mountain goat	—	—	—	—	—	—	—	—	—	—	—	—
deer	—	—	—	—	—						—	—
bear			—	—	—	—						
lynx **	—	—	—	—	—	—	—	—	—	—	—	—
rabbit	—	—	—	—	—	—	—	—	—	—	—	—
porcupine **	—	—	—	—	—	—	—	—	—	—	—	—
beaver **	—	—	—	—	—	—	—	—	—	—	—	—
marmot **					—	—	—	—	—			
wolverine, martin, mink, cacoon, red fox, coyote, otter, skunk, weasel, fisher, muskrat	—	—									—	—

Resource	J	F	M	A	M	J	J	A	S	O	N	D
Trees												
red cedar	—	—	—	—	—	—	—	—	—	—	—	—
sitka spruce	—	—	—	—	—	—	—	—	—	—	—	—
lodgepole pine	—	—	—	—	—	—	—	—	—	—	—	—
douglas fir - wood	—	—	—	—	—	—	—	—	—	—	—	—
inner bark						—	—					
hemlock - wood	—	—	—	—	—	—	—	—	—	—	—	—
inner bark						—	—					
maple	—	—	—	—	—	—	—	—	—	—	—	—
alder	—	—	—	—	—	—	—	—	—	—	—	—
birch	—	—	—	—	—	—	—	—	—	—	—	—
cherry	—	—	—	—	—	—	—	—	—	—	—	—
crabapple - wood	—	—	—	—	—	—	—	—	—	—	—	—
fruit										—		
cottonwood - wood	—	—	—	—	—	—	—	—	—	—	—	—
inner bark						—	—					
Shrubs												
elderberry - wood	—	—	—	—	—	—	—	—	—	—	—	—
fruit							—	—	—			
highbush cranberry								—	—	—		
red osier dogwood	—	—	—	—	—	—	—	—	—	—	—	—
soapberry								—	—			
salal							—	—				
false azalea	—	—	—	—	—	—	—	—	—	—	—	—
alaska blueberry								—	—			
mountain bilberry									—	—		
oval-leaved blueberry							—	—	—			
red huckleberry								—	—			
stink currant							—	—	—			
wild gooseberry								—	—			
swamp gooseberry								—	—			
wild blue currant								—				
saskatoon - wood	—	—	—	—	—	—	—	—	—	—	—	—
fruit								—	—			
nootka rose										—	—	
wild rose										—	—	
wild raspberry							—	—	—			
blackcaps							—	—				
thimbleberry - fruit							—	—	—			
shoot			—	—	—	—						
salmonberry - fruit						—	—					
shoot			—	—	—	—						
Herbs												
horsetails - shoots												
root**			—	—	—	—	—	—				

Resource	J	F	M	A	M	J	J	A	S	O	N	D
spiny wood fern												
bracken fern	—								—	—	—	—
skunk cabbage - leaves**				—	—	—	—	—	—	—	—	
fruit										—	—	
riceroot	—	—	—						—	—	—	—
lily-of-the-valley									—	—		
star-flowered solomon's seal										—	—	—
hemlock parsley**	—	—	—									
water parsnip**	—	—	—									
cow parsnip			—	—	—	—						
sweet cicely			—	—	—							
spreading dogbane	—	—	—	—	—	—	—	—	—	—	—	—
sarsaparilla					—	—	—	—				
bunchberry						—	—	—	—			
kinnikinik								—	—			
blue lupine	—	—	—	—	—	—	—		—	—	—	—
wild clover	—	—	—	—	—					—	—	—
fireweed		—	—	—	—							
western dock		—	—	—	—							
strawberry					—	—	—	—	—			
silverweed	—	—	—	—	—					—	—	—
nettles - fibre									—	—	—	
greens			—	—	—							

Moss

Resource	J	F	M	A	M	J	J	A	S	O	N	D
"yellow moss"**	—	—	—	—	—	—	—	—	—	—	—	—

* From Kuhnlein 1984 and expanded
** No explicit data exist which state the time of year these resources were taken; harvest season is inferred here from the nature and distribution of the resource itself.

Chapter IV
THE RELATIONSHIP BETWEEN DETERMINANTS AND NUXALK SETTLEMENT

Introduction

In this chapter I examine the relative importance of several determinants of the suitability of settlement locations in the Bella Coola valley at the time of European contact. The idea being examined is that the presence of a range of resources and other cultural factors will determine the suitability of an area for settlement. The goals of the analysis are twofold -- to attempt to define both the minimum requirements for settlement locations, and the determinants of more preferred localities. Minimum requirements are those that are both necessary and sufficient for settlement (see page 13). Determinants from both the natural and cultural environment, which stand out in the ethnographies as being important to the Nuxalk socio-economic system, are considered.

Methods

Defining Determinants

The determinants considered in this analysis have been grouped into like categories, depending on both the nature of the determinant itself, and the available data concerning it. Eight determinants, or groups of determinants, are examined: salmon species, other aquatic resources, plant resources, animal resources, mineral resources, trade, protection from raiding, and shelter from the elements.

The analysis presented here is intended to assess the influence of each of these determinants on Nuxalk village location. An assumption made in this analysis, as in other settlement studies, is that a site will be located closest to those determinants that have the greatest influence on its socio-economy. The presence or absence of a determinant, and when applicable, its overall and seasonal abundance at village locations throughout the Bella Coola valley, is discerned. Each village location is then ranked according to access to each determinant. The total of each of these rankings for each village location provides a means whereby settlement localities throughout the valley can be compared to one another. In this way, a rank order of village locations according to accessibility to all determinants, can be produced.

It is my expectation that those locations having access to the greatest number and kind of determinants will be preferred areas for settlement. This proposition is tested in the Bella Coola valley by comparing the rank order of sites according to the accessibility of all determinants to the known area of prefered settlement -- the lower valley. If the proposition is confirmed, those sites in the lower Bella Coola valley will have access to or be influenced by the greatest range of determinants.

Minimum requirements for settlement in the Bella Coola valley are a bit more difficult to distinguish. Uniformity of access and/or influence of a determinant among all settlement locations is not a sufficient measure. Such uniformity can be found with determinants which are clearly extraneous and had little overall effect on settlement. A more meaningful measure of the determinants is to compare their distribution with that of settlements. This is the approach taken in this thesis.

Methods for measuring the eight determinants are not identical for each. For some there are reliable data which permit quantitative comparison and analysis, but others (e.g. protection from the elements) can only be qualitatively discussed. Among the determinants which are natural resources, variation in available data also requires that the test be unique for each. Furthermore, inherent differences in the resources themselves necessitate different measurements for each. For example, degree of mobility may be an important factor in an analysis of animal resources, but it will have little relevance to plants. Procedures followed for assessing each determinant are presented at the start of the analysis of each.

Although the details of the analyses are not the same, some basic steps are included in each. First, the specific character of each determinant is discussed and all quantifiable or qualifiable elements are outlined. Particular attention is paid to the location of each determinant, and its abundance. For resources, this refers specifically to quantifiable abundance, but for other attributes, it is a question of presence or absence.

Defining Village Units

For the purposes of this analysis, villages have been grouped into what I have termed "village units". In areas of high site density (i.e. the lower valley), a village unit is comprised of several villages which cluster in a single geographical area. That is, villages that are situated closer to one another than to others adjacent to them are considered "village units". In the upper valley, where villages are more dispersed, village units often include only a single village. Sites for which only approximate locations are available (indicated by a broken arrow on the maps) are not included in the analyses. Twenty "village units" have been delineated in this study (see figures 5 and 6).

This methodological step was taken because contemporaneity of villages and precise village location are difficult to determine accurately. Contemporaneity of sites is difficult to determine largely because information was collected at several points in time. McIlwraith,

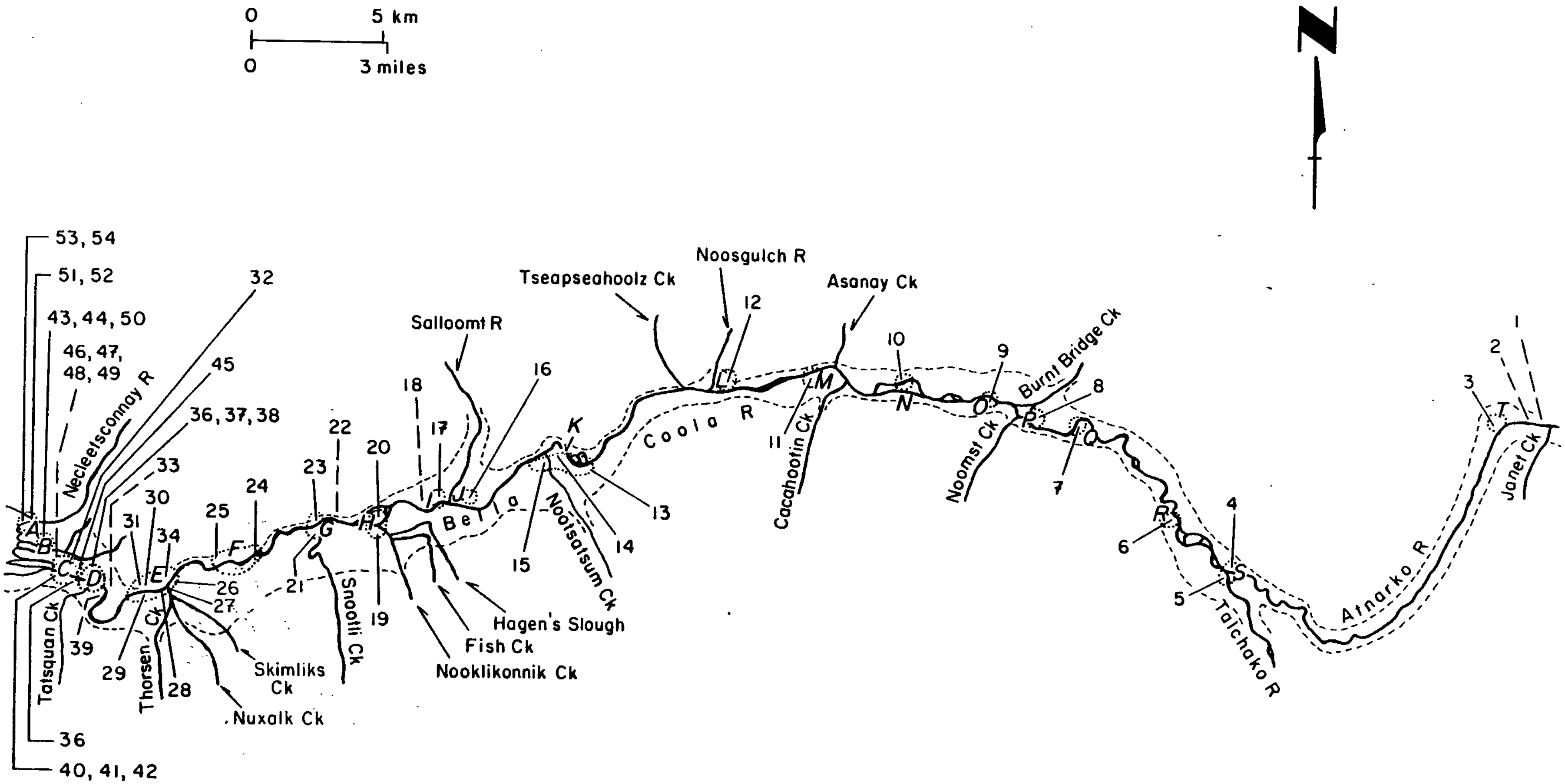

Figure 5. Bella Coola Valley Village Units, indicated by letters A to T.

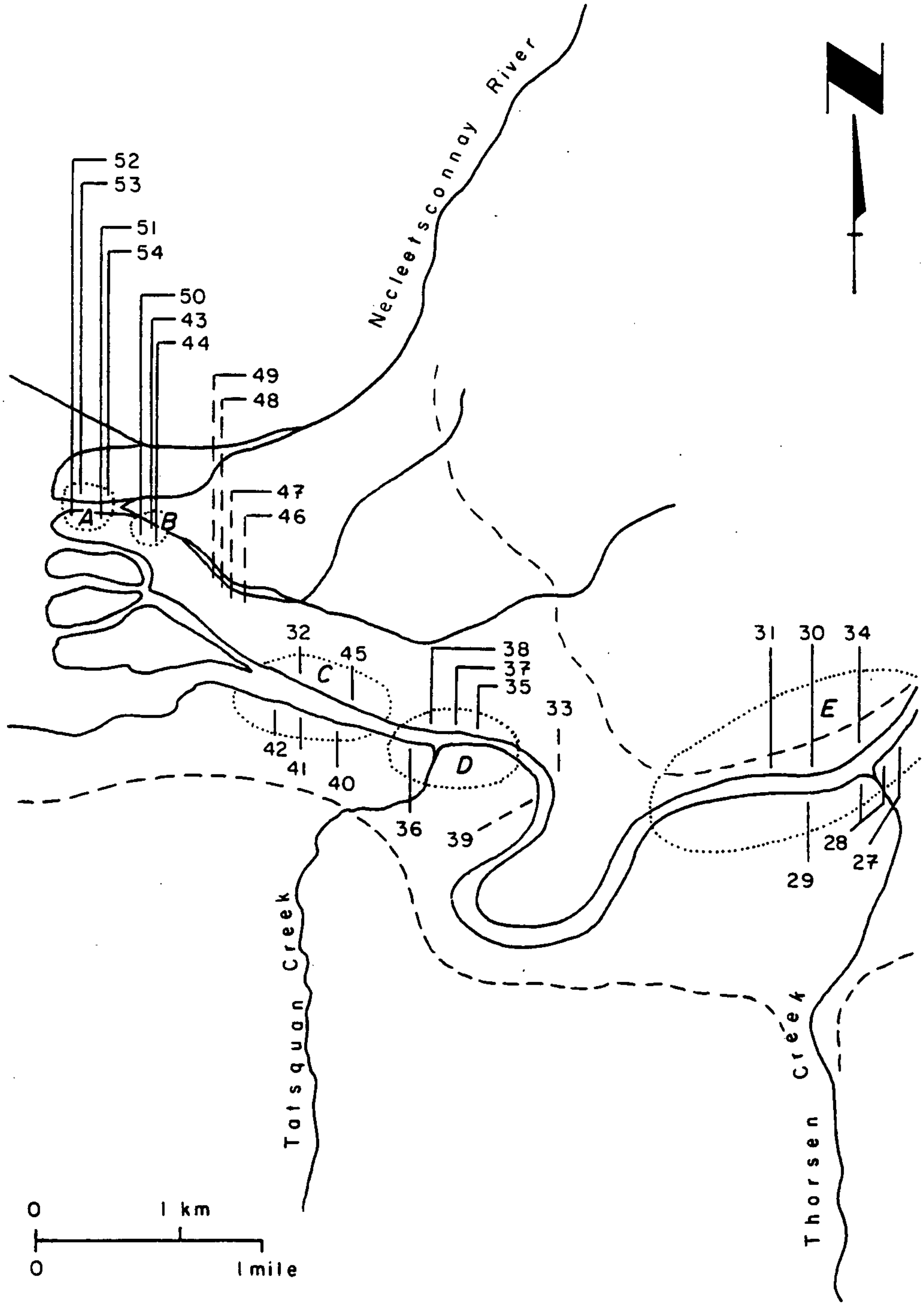

Figure 6. Lower Bella Coola Valley Village Units, Indicated by letters A to E.

however, did note several villages that were occupied at the time of Mackenzie. For other sites, for which comparable data do not exist, it can be assumed that they were also occupied during Mackenzie's time and/or a time just prior to that, as informant recall of the past is limited, and few new sites were created after the time of population decline.

There are two major reasons why it is difficult to locate village sites. First, ethnographic information is not precise. Descriptions of site locations such as, "four miles from the last village" or "ten miles from the mouth of the river" are clearly just estimates by the ethnographer or informant. It is rare that a more exact location is given, and often those (eg. "at the base of Newskultz Mountain") are also inexact. The second problem with locating villages results from major changes in the Bella Coola River and surrounding landscape over time. The river is fast flowing and meandering; its course has drastically changed even in the memories of the elderly people living in the valley today. The mouth of the river itself, for instance, is said to have moved eastward almost one mile since the turn of the century (Baer 1973:13). Perhaps the most severe change to the river and surrounding terrain in recent history occurred in 1936 after a very large flood. As a result of this flood, and other subsequent changes in the river's flow, many of the old settlement sites have been washed away. No doubt others will be similarly destroyed in future.

The problem of locating villages more accurately was resolved in a number of ways. In many cases there are from three to nine different ethnographic references to a single village, which served to reduce error. In a few instances Smith (1920-24), however, recorded village locations with reference to the river (ie. to the north of, to the south of) which differed from all other ethnographers. In these instances, I have assumed that Smith's locations were incorrect. Finally, the location of villages at the confluences of the Bella Coola River and small streams is more definite, because although the river has changed location significantly in parts, the streams are more stable.

By defining village units, determining exact village location or contemporaneity becomes less important. Instead, the focus is upon determining the suitability of a given area, with a given set of attributes, for settlement. The clustering of sites in specific locations delineates such units geographically. By defining village units we can be reasonably confident that the settlement data as presented here are sufficient to represent accurately the settlement patterns of the late pre-contact period of Nuxalk history.

Finally, it should be noted that the analysis used in this thesis differs methodologically from other settlement studies discussed earlier. Salmon-settlement studies examine the importance of a single resource at several sites. Site catchment studies, on the other hand, most often investigate the relative importance of several resources at a single site. In this study, I combine methods from these two approaches, as well as introduce new methods, in order to examine the importance of several determinants, both food and non-food, on several sites.

Determinants of Village Location

Relevant attributes of the possible determinants of village location are discussed below.

Salmon species- Data on salmon abundance in pre-contact times were derived from present-day fisheries publications (Fisheries and Oceans n.d.; Manzon and Marshall 1980). Destruction of spawning grounds as a result of logging and other human-introduced ecological disturbances as well as commercial fishing have greatly affected the numbers of salmon in the Bella Coola valley today. The elders report that the number of salmon has been drastically reduced. It is said that the river was "black with fish" and that when the salmon ran "it was difficult to paddle the canoe without hitting the fish". This is clearly not the case today.

To overcome difficulties with the data, I have gone to the earliest recorded data for spawning populations in the Bella Coola valley streams. Unfortunately, there are often fewer than thirteen recorded years for each of the smaller streams. Nonetheless, data were averaged over this entire period to obtain trends and relative stream capacities. The Department of Fisheries and Oceans has recorded drastic changes in stream capacity in recent years enabling more accurate comparisons of today's figures with those of the past. The Department of Fisheries and Oceans data appear to be good indicators of relative salmon abundance by stream in the past.

In addition to abundance, other factors affected village access to salmon. Within the main river itself large catches were obtained with "weirs" (see Chapter III) set at intervals along the river. The lower valley villages would have had the first chance at procuring these fish, but the majority of fish would have reached the upper valley in only a few days time. Theoretically the upper villages would have had fewer fish available to them as villages harvested the resource along the length of the river. However, salmon were so abundant in the days before the canneries that relative differences in salmon abundance along the Bella Coola may not have translated into differential salmon catches by the different villages.

Salmon which reached the upper parts of the river contained less food energy as fat. Salmon cease to feed once they enter fresh water and their source of energy is stored body fat which they use up as they make their ascent upriver to spawn (Idler and Clemens 1959, from Kew 1976). The upper valley villages, then, would have been harvesting fish that were lower in total body fat, and therefore probably offered fewer calories per fish. If salmon were sufficiently abundant in the upper river, the loss of food energy could be compensated by consuming greater numbers of fish. Their taste, however, may have been inferior, due to hormonal changes in spawning salmon. Unfortunately, there is no documentation specific to the Bella Coola valley salmon concerning the degree of fat loss (and therefore reduction of food value) as a result of the migration. The relatively short length of the Bella Coola River, as compared to the Fraser, however, suggests that the problem would have been much less severe in the former case.

Other Aquatic Resources - Detailed data similar to those available for salmon are not available for other aquatic resources. As the analysis involving each of these resources is similar, these resources will be analysed together. The resources include all other riverine and marine fish species, other marine invertebrates, water birds and water-associated birds, and sea mammals.

Like the salmon resource, abundance and distribution data for this set of resources are extrapolated from present-day knowledge. Unfortunately data do not allow as full reconstruction as that applied to salmon. Qualitative data on abundance and distribution of present-day fish resources, marine invertebrates, and water-associated birds assumed to parallel closely those of the past, since there is no documentation available which suggests exceptionally heavy impact on these resources. Extrapolations to the time of contact seems warranted. Data on availability of sea mammals also come largely from today's knowledge of the behavior of these animals. Although their numbers are greatly reduced today, their habits have probably remained unchanged. The sparsest data exist for water fowl species. Changes of wetlands create different distributions of these species, but given some knowledge of riverine habitats in the past, we can speculate as to areas of past concentration of these resources.

Plant Resources -Plant species from a variety of habitats will be dealt with in a single analysis. Only those plants which were used as a food or raw material resource are included in the analysis (see Appendix I). This distinction was made as it was felt that medicinal plants would have had little to do with the location of a village settlement. Medicinal herbs would not have been used with any regularity by the majority of the population. Excursions by a small group or single person to procure particular medicines would have sufficed to meet the needs.

In order to assess the significance of plants, attempts were made to reconstruct original plant distributions in the valley. A detailed history of logging in the valley enabled me to determine the recently disturbed locations (British Columbia, Ministry of Forests, n.d.). For those areas that were logged, information was available on the type and age of the trees logged. Through a knowledge of local forest succession I was able to utilize this data to determine the general nature of the pre-contact environment.

Animal Resources -The analysis of animal resources includes a variety of large and small mammals from riverine and forest habitats. Animals used for both foods and raw materials are included.

Animal numbers have been drastically reduced in recent years in the Bella Coola valley. This is most dramatically illustrated in the case of mountain goats. These animals were once plentiful in the local mountains (Smith 1920-24), however, they are rare today. Similar declines in numbers are probable for the majority of animal resources traditionally exploited by the Nuxalk.

As with the analysis involving plant resources, reconstructions of original animal distributions in the valley were attempted. Each species was categorized according to the habitat in which it was most commonly found. By using the habitat designations resulting from the plant analysis, it was possible to reconstruct a plausible distribution for these resources. Unfortunately, it is impossible to determine absolute abundances, as sufficient data do not exist. Relative abundance, however, measured by accessibility of habitats, is discernable.

Mineral Resources -This small set of highly prized resources is reconstructed in a manner similar to that used for animal resources. That is, after reconstructing original resource locations in the valley, the accessibility and therefore relative local abundance of these resources is suggested.

Trade - Since trade items played an important role in the Nuxalk socio-economy, access to trade routes may likewise have affected the Nuxalk settlement system. Unfortunately, precise data on quantity of goods moved is impossible to obtain. It is possible, however, to judge from ethnographies which villages were more likely to have been involved in trading ventures as a result of their location, social affiliation, and/or access to prized goods.

Protection fron Raiding - Obtaining measurable, quantifiable data concerning pre-contact warfare is quite difficult. Threat of attack no doubt played a part in determining village location. Archaeologists and ethnographers are able to note the presence or absence of fortified sites and protected sites, but their value is not clear, for data on warfare is scanty (see also Trigger 1968:66). We can go no further than a few general statements about what is likely to have applied within the Nuxalk territory.

Shelter from the Elements - Protection from storm and flood was no doubt an important determinant of permanent Nuxalk settlement location. Certainly, village sites throughout the Nuxalk area were affected in different ways by the natural elements. Through knowledge of the Bella Coola valley topography and climatic patterns, some general statements on the degree to which areas are protected, can be made.

Accessibility of Resources

As mentioned earlier, distance is an important element in determining accessibility of resources to a given population. How distance is measured, however, may differ from group to group, given the available technology and cultural and physical environment. In the Nuxalk case as with all northern Northwest Coast groups, travel is much easier on water than land. The land is rough and the forests are dense. Without well maintained paths for foot travel, the ability to transport resources by land is limited. Even with maintained paths, which presumably did exist in areas which were owned and commonly used by members of the minmints, travel would have been greatly hampered by new growth appearing each season. It has been suggested that a strong man could carry about 100 pounds through the Bella Coola valley terrain (Smith 1920-24; this is approximately equivalent to the weight of one dressed goat).

On the water, however, much greater distances could be travelled and much larger loads carried, with less effort. Travel by canoe frequently occurred on both the main river and its outer channels. Travel in the outer channels was facilitated through knowledge of the daily tides. In fact, the Nuxalk are said to have travelled as far as Victoria in their sea canoes (Willie Hans, Nuxalk elder, personal communication). Clearly, aquatic resources at much greater distances from a settlement than terrestrial resources, could have been regularly exploited by the Nuxalk.

Access to resources by the Nuxalk was also affected by minmints ownership. For the most part, minmints harvesting areas were located within the general vicinity of the village. It is not clear, however, what the rules of ownership were for the more distant resources, or for resources which were not directly adjacent to any village (eg. the tidal flats in relation to upriver villages). Unfortunately, it is impossible to answer such questions today. It must be asssumed that in general, resources were owned by the village community nearest to that resource.

Limitations of Data

Change in local landscape and resources is a problem with all ecologically related studies, and the Nuxalk case is no exception. Extensive change in the Bella Coola valley since European contact has greatly altered the number and kind of resources available in the valley. Knowing this, I have dealt with each aspect of the environment separately. All recorded changes in the valley's environment have been noted and taken into account when reconstructing past resource availability. The data presented here represent, as close as is possible, the pre-contact situation.

Additionally, it should be noted that this list of resources utilized by the Nuxalk is not complete. Most ethnographers were working in the Bella Coola valley after some very severe changes had taken place in the local socio-economic system (see Chapter II). The presence of the canneries, and the heightened involvement in the fur trade quickly altered the traditional economic pattern. This is particularly a problem when determining precontact use of animals. Some animals which supplied pelts only, may not have been exploited as often in the past as those animals which supplied both food and skins, because the return on the energy expended in the hunt would be relatively greater for such animals. In contrast, changes in the use of other resources was certainly characterized by a decrease in species exploitation as less accessible and/or less preferred species were no longer harvested. It is assumed, however, that the most critical species to the Nuxalk in pre-contact times were those that continued to be used with some regularity in later times.

The Relationship Between Salmon and Settlements

Introduction

The Bella Coola-Atnarko system is unique among British Columbia rivers because of the number and variability of salmon species (see Chapter III, pp.76-80). The sheer numbers of salmon travelling up the Bella Coola meant that there would have been little variability in numbers of available catch along the length of the river. However, because the majority of coho and chum spawn on the lower reaches of the river, the upper villages only had direct access to three salmon species. Another major difference in salmon availability was between the side tributaries. For the inhabitants living at the tributary mouths these streams would have been an important source of easy to harvest salmon.

Method

In this analysis I examine the variation in number and kind of salmon in several tributary streams along the Bella Coola River as a means of differentiating accessibility to salmon among the village units. Only those tributaries which had villages situated at their mouths are included, since minmints ownership of tributaries which were situated in between villages would be impossible to determine. Data on spawning numbers were collected from Fisheries and Oceans count for the Bella Coola valley (Canada, Fisheries and Oceans n.d.; Manzon and Marshall 1980). Because food availability of each species is more important than actual numbers, the average weight (in pounds) of each species is multiplied by its yearly counts to arrive at a relative estimate of the amount of food supplied by that run per year. This figure is then averaged over several years individually by species, as well as for all species. Resultant values from these calculations are termed mean weight (MW) and total mean weight (tMW). Comparisons of the degree of variation both within a stream between years, and between different streams for all years, were made after calculating the standard deviation (SD) and coefficient of variation (CV) respectively, for each stream.

Results- Availability of Salmon

The total annual mean weight (MW) of each stream for each species is presented in Table V (see Appendix III for yearly MW for each stream). The majority of side streams have only three species of salmon present, coho, pink and chum. Chinook are present in only three side streams, and even these are in small numbers. Unfortunately, separate figures for the Bella Coola and Atnarko Rivers are not available. By far the greatest number of salmon reaching the Atnarko would be the pinks, chinook and sockeye, as the other species spawn mainly in the lower valley. The lower four miles of the Atnarko is the preferred spawning and holding area for chinook.

Table VI lists the total mean weight (tMW) values for all salmon producing streams and tributaries in order from greatest to smallest total mean weight. Standard deviation and coefficient of variation values are also given. The village units which have greatest access to these streams (i.e. are located closest to) are also presented in this table. This supplies a rank order of village units according to access to salmon found in side tributaries.

In Table VII the relationships between settlement size and both salmon abundance (determined by adding total mean weight values of all tributaries in a village unit) and stability of the resource over time

TABLE V
MEAN ANNUAL POUND WEIGHT (MW)* BY SPECIES OF SALMON PRODUCING STREAMS
AND TRIBUTARIES AND NEAREST VILLAGE UNIT**

Stream (from west to east)	coho	Pink	Chum	Chinook	Sockeye	Nearest Village Unit
Bella Coola/Atnarko Rivers	332,076	1,748,471	609,247	358,529	200,529	C-T
Necleetsconnay River	9,980	20,866	43,729	-----	-----	A,B
Tatsquan Creek	103	1,511	2290	-----	-----	D
Thorsen Creek	1,232	13,902	25,577	-----	-----	E
Nuxalk Creek	130	1715	4,550	-----	-----	E
Skimliks Creek	40	120	525	-----	-----	E
Snootli Creek	1,936	19,655	12,325	-----	-----	G
Nooklikonnik Creek	233	3,623	4252	-----	-----	H
Fish Creek	1000	3,831	6,408	-----	-----	H
Hagensborg Slough	1,460	4,875	7,350	-----	-----	H
Airport Side Creek	-----	2,460	2,478	-----	-----	H
Salloomt River	4,125	15,900	37,854	1,995	-----	J
Nusatsum Creek	3,000	4,819	6,015	2,500	-----	K
Noosgulch River	550	5,963	2,692	710	-----	L
Cacahootin Creek	-----	458	1,313	-----	-----	M,N

*Fish weights used to calculate MW are: coho- 10 lbs.; pink- 3 lbs.; chum- 14 lbs.; chinook- 20 lbs.; sockeye- 4 lbs.

**Original fish counts are from Fisheries and Oceans (n.d) and Manzon and Marshall (1980). Bella Coola/Atnarko and Necleetsconnay counts are from 1947-1980; all other counts are from 1970 to 1982. Number of years for which count statistics were available range from 2 to 13 years for these streams.

Table VI

TOTAL MEAN POUND WEIGHT (tMN), STANDARD DEVIATION (SD) AND COEFFICIENT OF VARIATION (CV) OF SALMON PRODUCING STREAMS AND NEAREST VILLAGE UNIT

Stream*	tMW**	SD***	CV (%)****	Nearest Village Unit
1.Bella Coola River	3,323,085	2,282,126	70.5	C-T
2.Necleetsconnay River	70,707	61,699	87.3	A,B
3.Salloomt River	58,155	56,341	96.9	J
4.Thorsen Creek	40,521	55,073	135.9	E
5.Snootli Creek	33,618	23,011	68.4	G
6.Nusatsum Creek	11,211	10,843	96.7	K
7.Fish Creek	11,085	4,229	38.2	H
8.Noosgulch River	9,105	8,849	97.2	L
9.Hagensborg Slough	8,028	1,178.8	146.7	H
10.Nooklikonnik Creek	7,992	11,213	140.3	H
11.Nuxalk Creek	7,980	3,281	41.1	E
12.Airport Side Creek	4,958	3,102	62.6	H
13.Tatsquan Creek	3,859	5,427	140.6	D
14.Cacahootin Creek	1770	930	52.5	M,N
15.Skimliks Creek	665	176.7	26.6	E

* Ordered according to total mean weight values

** $tMW = \frac{\sum_1^{n_2} \sum^{n_1} MW}{n_2}$, where MW= no. of salmon species x lb. weight of species

n_1 = 3...5 salmon species

n_2 = 2...34 years

*** $SD = \sqrt{\frac{\sum MW^2}{n_2}}$

**** $CV = \frac{SD * 100}{tMW}$

TABLE VII
THE RELATIONSHIP BETWEEN ACCESSIBILITY TO SALMON AND STABLE SALMON RUNS BY VILLAGE UNITS AND SETTLEMENT SIZE

Village Units in Rank Order of Abundance of Salmon in Village Unit Tributaries* (CV of Village Unit Tributaries)	Rank Order of Size of Village Unit: by no. of villages in unit (no. of villages)	Rank Order of Size of Village Unit: by no. of large villages in unit (no. of villages)
1. A (87.3)	1. E (7)	1. E (5)
1. B (87.3)	2. A (4)	2. G (2)
3. J (96.9)	2. D (4)	3. A (1)
4. E (26.6; 41.1; 135.9)	4. B (3)	3. B (1)
5. G (68.4)	4. K (3)	3. H (1)
6. H (38.2; 62.6; 140.3; 146.7)	6. G (2)	3. K (1)
7. K (96.7)	6. H (2)	3. L (1)
8. L (97.2)	8. J (1)	8. J (0)
9. D (140.6)	8. L (1)	8. D (0)
10. M (52.5)	8. M (1)	8. M (0)
10. N (52.5)	8. N (1)	8. N (0)

* Ranking results from the sum of tMW values for all tributaries to which each village unit had access.

(expressed as coefficient of variation values) are presented for all village units having access to salmon producing tributaries. Although detailed numbers are lacking, the ethnographies do supply some information on settlement size. This, in addition to the number of villages within a village unit, indicate suitability of a location for settlement.

Finally, the length of time (in a year) that streams within each territory produce salmon (expressed in MW values) is graphically presented in figure 7. In this way, stream productivity can be compared not only on an overall yearly basis, but on a month to month basis. Presumably, streams which produce salmon for a longer period of time in significant amounts will be preferred resource harvesting areas. The presence of chinook, the first spawner in the spring, may be of particular importance in this way, as this is the time of year when other foodstuffs would be scarce.

Discussion

The results presented in Table VI illustrate several points concerning the accessibility of salmon to the Nuxalk villages of the Bella Coola valley. First, it is self evident that all village units within Nuxalk territory had direct access to a major salmon producing stream (Bella Coola-Atnarko or Necleetsconnay Rivers). Over one half of the village units also had access to side streams which produce salmon. Of the lower valley units, F and L had access only to the main river. For the majority of upper valley units, however, the Bella Coola River (and Atnarko) is the only major salmon producing stream to which they had access. Only section P of the upper valley village units had access to

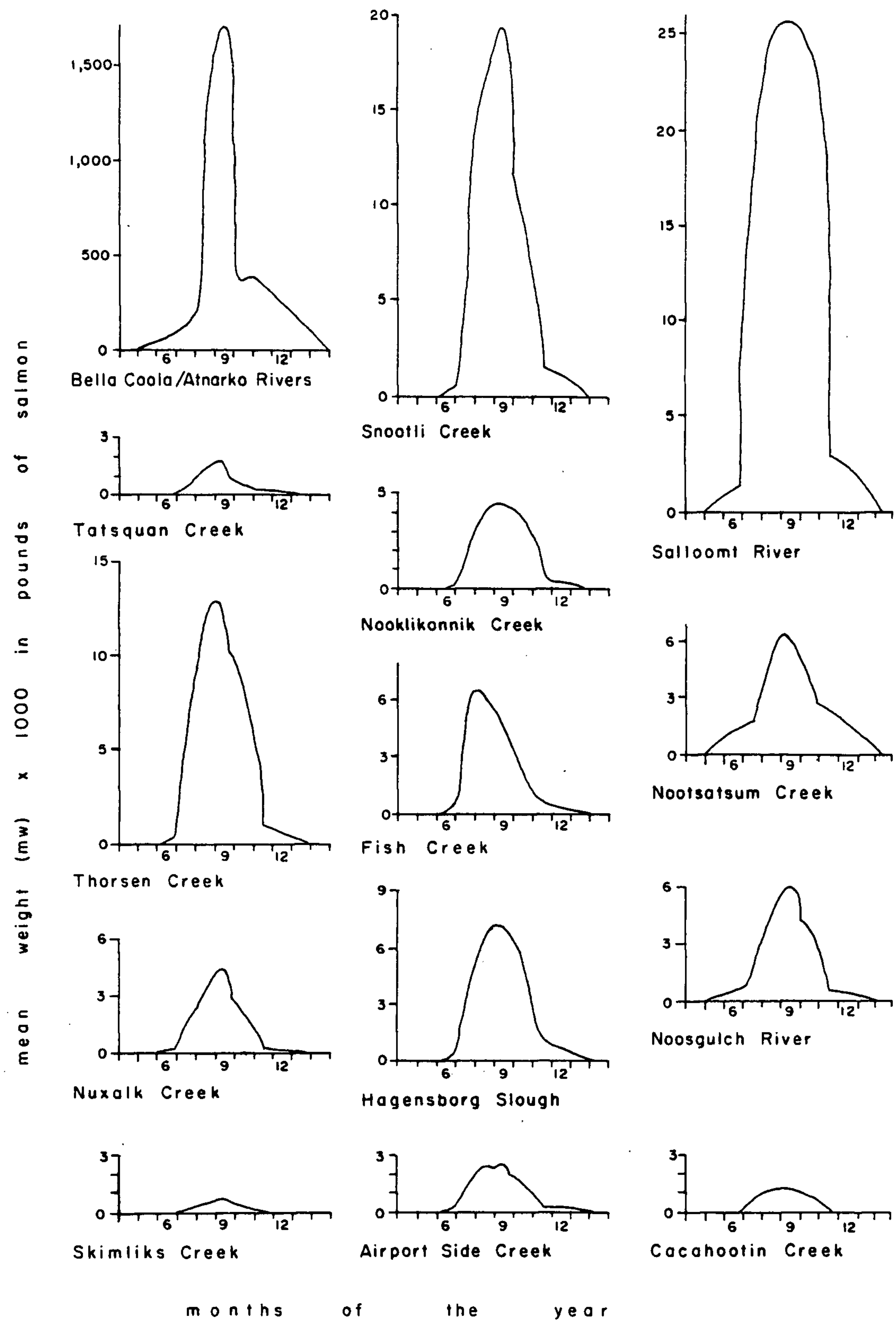

Figure 7. Monthly Mean Weight (MW) Values of Salmon Streams. Note variable scales. (6=June; 9=Sept.; 12=Dec.)

major side streams. Unfortunately, Fisheries and Oceans data for these streams are lacking. Of all the village units, only H and E have access to more than one tributary salmon producing stream.

As stated earlier, there is differential access to salmon resources on the main river itself. The upper valley villages would not have had direct access to significant harvest of either coho or chum salmon as these species tend to spawn near the lower stretches of the river. Thus, although all but two village units (A, B) had direct access to the main river, only the lower village units (C through K) could have had access to a substantial number of all five species.

Only preliminary associations between population numbers and access to salmon can be assessed (see Table VII). Both village size and number of villages within a village unit can be used as indicators of relatively larger populations and therefore preferred settlement locations. Several villages within a village unit suggest that that area was either occupied repeatedly throughout time, or if we assume comtemporaneity, large populations at a single point in time. According to descriptive information in the ethnographies (see Table I) there is at least one large village within most of the village units. Only sections E and G, which are composed of seven and two villages respectively, are reported to have more than one large village. Five of the seven villages in unit E are recorded as significant in size; both settlements in unit G are recorded as large villages. Both E and G had access to two of the more productive salmon producing streams (ranked 4 and 5). The village units having access to the most productive salmon streams, (units A, B and J), however, show no definite relationship between salmon abundance and numbers of large villages (see Table VII). Scarcity of salmon in tributaries, however, seems to be more closely associated with village unit size. Those village units having access to the least productive tributaries (units L, D, M, N; Table VII) are ranked lowest in both scales of village unit size. It is interesting to note that of the four least productive streams (numbers 12-15, table VI), two were associated with village units with no recorded large villages. The other streams, however, are associated with large settlements which also had access to more productive streams and therefore did not have to rely on the run in the less productive streams.

Standard deviation (SD) values in Table VI indicate that there is a great deal of variation around tMW values of salmon spawning populations in streams. This suggests that there is much fluctuation in spawning population numbers from year to year within a stream. By calculating CV values we are able to compare the degree of fluctuation from one stream within a village unit's territory to another.

As with salmon abundance, the scanty nature of the population data do not permit detailed analysis of the association between stability of salmon runs and settlement size. However, it is interesting to note that by far the largest village unit (unit E) had access to the most stable of the salmon producing tributaries (i.e. Skimliks, which has a CV value of 26.6). It is expected that large variations in salmon runs from year to year would be most significant in streams with low mean weight values. That is, in bad years some of the least productive streams would probably have had to look for supplements to the salmon normally procured from those localities. Salmon from those streams could not be considered a dependable source of food from year to year.

The data do show that village units having access to streams with the greatest fluctuations (i.e. units E, H, D; Table VII) have no large villages within the village unit, or they also had access to more stable streams. There is no detectable association between numbers of villages and stream fluctuation. Unfortunately, more definitive associations between salmon run size and stability and settlement size are difficult to make. We can only tentatively state that the most productive and stable side streams may have positively affected the suitability of an area for settlement, whereas the least productive and most variable streams had a slight negative effect on settlement.

A few comments can be made concerning the length of time a stream is productive in any given year. Only three of the sixteen side streams for which data exist have chinook present in their waters (Noosgulch, Nusatsum, Salloomt). The presence of chinook would have extended the salmon season into early spring, a time when other resources would have been scarce. It is expected that those streams would have been preferred harvesting locations. The data are not sufficient to determine if there is an association between length of the salmon season and number and size of villages within village units (see Table VII, nos. 3,6,8), however a casual investigation does not suggest such a relationship. It is interesting that the only upper valley unit with more than one village (unit S) is located at a prime chinook harvesting area. Perhaps chinook do not occur in sufficient numbers in the lower valley streams to have had an effect on settlement patterns.

In sum, a few preliminary conclusions can be drawn from this analysis. First, all village units within the Nuxalk territory of the Bella Coola valley had access to salmon which appears to be a minimum requirement for settlement location in the valley. Accessibility from village to village, however, decreases eastward in the valley as the number of species available, as well as the number of salmon producing side streams also decreases. In the upper valley, villages appear to be distributed evenly throughout, regardless of the presence of side streams. This suggests that access to salmon producing side streams was not essential to village location. Second, there may be a slight association between mean weight values for side streams and village size, as larger village units tend to be associated with more productive salmon streams, and smaller village units with lower producing areas. More definitive conclusions are impossible without more complete data. That there is at least one large village within most village units, however, does suggest that those locations were sufficiently "rich" in this resource to support significant populations. Perhaps, it is only very large or very small salmon numbers which tend to affect the suitability of a settlement location. Within these limits, however, other factors begin to mediate the decision to locate in a specific area.

The Relationship Between Other Aquatic Resources and Settlements

Methods

Since data comparable to those available for salmon do not exist for other aquatic resources exploited by the Nuxalk, this analysis must be less specific. Drawing from the data on preferred habitats of these species (see Appendix II), as well as more specific information available for a few of the species, the accessibility of these resources to the village units will be described.

Results- Availability of Aquatic Resources

A few of the total aquatic resource species exploited by the Nuxalk were available within the Bella Coola valley itself. Presumably other resources were obtained by the Nuxalk either by harvesting them directly in open unowned waters, or by obtaining permission from neighbouring groups in areas where resources were owned. Ooligans, trout, a few herring and starry flounder, and the sea mammals (hair seal, sea lion, and sea otter) are the only aquatic resources which were available in the Bella Coola valley itself. Of the water birds, only ducks, geese, swans, gulls and eagles are available in the valley. Table VIII lists the aquatic resources that were directly available to the Bella Coola valley Nuxalk, as well as the village units that would have access to these resources. Accessibility of each species is briefly recapped below.

Ooligan- Access to the ooligan resource would have been restricted only to the lower river villages since ooligans tend to spawn in the first four miles of the river. All ooligan net locations were carefully guarded by the minmints; the upper villages would not have direct access to this resource.

Steelhead trout- Steelhead were available to all the Nuxalk, as they could be taken in unowned waters of the upper river with a hook and line. They were most accessible, however, to the village units located in the upper reaches of the river, as they were most abundant and easier to procure in the holding pools in this portion of the river. Access to steelhead that spawned in side creeks of the Bella Coola River, was presumably restricted by minmints ownership of those streams.

Cutthroat and dolly varden trout- These species could be harvested in the greatest numbers in the upper Bella Coola and Atnarko Rivers. Access to those cutthroat which spawned in the side creeks of the lower valley would have been controlled by the minmints.

Herring- Access to those fish that did enter the Bella Coola system was probably restricted by the villages at the mouth of the river, which had control of trap, dipnets, and egg harvesting locations.

Flounder- These fish were usually harvested in unowned, open waters to the west. Those found at the river's mouth were more accessible to the villages located there.

Sea mammals- These resources were mostly caught with harpoons in open, unowned waters by those who had the privilege of hunting them. Traps, set at the river's mouth, were probably owned by the villages located closest to them.

Waterfowl- Access to the waterfowl frequenting the tidal flats, by far the prime harvesting area, would not have actually been restricted, however, the villages located in the near vicinity would have had greater access. Access to other areas in the valley was probably restricted by minmints ownership.

Herring gulls- Since gulls were taken with bow and arrow, they could be caught by all villagers. However, it was probably the lower valley

TABLE VIII
VILLAGE UNITS HAVING MOST DIRECT ACCESS TO AQUATIC RESOURCES

Village Unit	ooligan	steelhead trout	cutthroat trout	dolly varden trout	herring	starry flounder	sea mammals	mallard ducks	geese	swans	merganser ducks	herring gulls	eagles
A	*	***				**		**	**	**	**	**	*
B	*	***										**	*
C	*				*	**	**	**	**	**	**	**	*
D	*	***	***	**			**					**	*
E	*	***	***	**								**	*
F												**	
G		***	***	**								**	
H		***	***	**								**	
I		***	***	**								**	
J			***									**	
K												**	
L													
M													
N													
O													
P													
Q													
R		**											
S		**	**	**									
T		**	**	**									

* These village units likely had exclusive rights to the harvest of these resources.

** These village units did not have exclusive rights to these resources, but were most strategically located to harvest them.

*** These village units had both exclusive rights to trout harvesting locations, as well as to the main river trout, where the harvest was not restricted.

villages that most often exploited this resource because it was most abundant there.

Eagles- These are most concentrated, and presumably easiest to catch, in the lower reaches of the river. Since snaring locations of eagles were probably owned, their capture would have been largely restricted to the lower river villages.

Discussion

It is possible to distinguish certain general patterns concerning accessibility to aquatic resources. First, it is evident that the village units at the mouth of the river had by far the greatest access to this set of resources. The accessibility to ooligan by the lower five villages, and especially to the main river units (C,D,E) where ooligan is most abundant, would have been a great advantage. The arrival of these fish in the early spring when stores were low, and their value as a contributor of fat to the diet, would make them a highly prized resource. Likewise the water fowl and sea mammals, although they may not have made up a major portion of the diet, would have been valued for the welcome change they offered.

The Relationship of Plant Resources and Settlements

Methods

The methods used in this analysis are largely those applied in site catchment studies. Here, several steps are undertaken to evaluate both the overall value of plant resources to the Nuxalk economy and the accessibility of these resources to the individual Nuxalk settlements. Since the analysis involves many distinct steps, they are briefly reviewed here to ensure clarity. First, plants are grouped together according to similarity of abundances and distributions; these groupings are termed cover-types. This step is undertaken in order to make the analysis less cumbersome, as a large number of plant species is considered. Individual plants within each cover-type are then evaluated separately according to an absolute rating. The sum of these values in turn is used to rate the value of each cover-type as a whole. Because plant resources are highly seasonal, cover-type values are also determined on a monthly basis to indicate the value through a season. The final step of the analysis investigates the accessibility of each cover-type to the Nuxalk settlements to determine if different settlements do have differential access to valuable plant resources. A more detailed description of each step of the analysis is given below.

Delineation of Cover-types

Division into cover-types was facilitated by information from several sources which detail the general ecology of the valley. Researchers of the Ministry of Forests have divided the Bella Coola valley into tentative biogeoclimatic zones (Yole *et al*. 1982; Robinson and Pojar 1981). The basis of the cover-types used here are taken from these studies. Unfortunately, the plant lists supplied are not sufficiently detailed for my purposes and the description of the lower valley zone is not correct. The other major source for this analysis comes from field notes on the present-day roadside vegetation along the valley (Turner 1982). These notes in combination with the Ministry of Forests classifications, as well as personal knowledge of the valley's flora, enabled me to divide the upper valley into cover-types. Lower valley cover-types were defined following a detailed ecological study completed on the present-day Nuxalk reserve in the summer of 1982 (Lepofsky, Turner, and Kuhnlein 1985). These cover-types were extrapolated to the parts of the valley further eastward, which had similar vegetational patterns.

The plant species which characterize each cover-type are presented in Appendix IV. Species included here are only those that were utilized by the Nuxalk either for food and/or raw materials and only those species that occur with regularity in each cover-type (approximately 10-20% abundance) are included in the descriptive lists. It was felt that plants that occur only rarely in a cover-type would play only a minor role in the economy since the effort needed to locate them would negate the value of the resource. Obviously, this is particularly important in the case of plant foods.

Once the classification of cover-types was completed, the pre-contact vegetation patterns of the valley as a whole were determined. Logging reports and maps which document the earliest logging in the valley (beginning in the late 1940's) were essential here (British Columbia, Ministry of Forests, n.d.). These reports not only supplied information on the types of trees, but also the age of the trees that were logged. Given the cover-type classifications, I was able to determine the forest types in each area prior to logging. The age of the trees (most of them being over 250 years), enabled me to determine what stage of succession characterized the different areas at the time before European contact.

The second growth cover-types are resultant successional stages after a forest has been cut down or burned. These zones offer a wide variety of species not available in mature forests. It is known that the Nuxalk, like other coastal groups, did intentionally burn down portions of the forest to increase plant productivity (Nuxalk elder, personal communication). Unfortunately, it is impossible to determine where these plots would have existed in the past. Presumably such practices were undertaken by each minmints, as plant gathering zones were owned and used by each village unit. For the purposes of this analysis, it is assumed that the Second Growth New cover-types (SGNw and SGNd) were located in the area surrounding each village settlement. (This is partially confirmed by logging reports). Older second growth areas (SGO) seem to have existed in extremely wet areas in the lower valley. Other than a few localities indicated by the logging reports, the pre-contact distribution of this cover-type in the upper valley is largely unknown. The Cottonwood cover-type (Cot) is common throughout the valley along the Bella Coola River.

Assigning Values for Cover-types

The next step of the analysis involved assigning relative economic values to each of the plants which characterize the cover-types. This was accomplished by evaluating each species according to eight attributes: 1. abundance; 2. people needed for harvest; 3. affect of harvest; 4. processing to utilize; 5. storability; 6. yearly reliability; 7. ease of harvest; 8. uses (see Table IX). The attributes are intended to encompass both the restrictions of the plant itself, and the cultural restrictions involved in its utilization. Unfortunately, only scanty information exists on the nutritional values of the plant foods. No doubt taste and energy value, as well as the presence of essential nutrients, were important factors in determining the regular use of plant foods by the Nuxalk. Energy value is partially represented in attribute 8, which distinguishes food and non-food resources. In the absence of more information, it was decided not to include any assessments of the nutritional contribution of each species.

Another factor which is notably absent from this analysis is the social or prestige value of the specific plant resources. Again, it is difficult to get consistent data concerning this attribute. Jochim (1976:26) has suggested that a resource is more prestigious the lower its density, and the higher its weight, fat content and non-food yield. I am reluctant to adopt this idea, however, because although these attributes may certainly be related to prestige, it is not clear exactly how, and in what proportions. Furthermore, Jochim's definition seems more applicable to animal resources than plants. Without more detailed ethnographic studies, prestige value will have to be excluded from the analysis.

Values for food and non-food utilized plant parts have been calculated separately in this analysis, as if they were separate species (i.e. instead of taking an average of the values of each). This was done because, in most cases there is little temporal overlap in the availability of the two utilized parts. To the gatherer, then, it was as if they were completely different resources.

In assessing the values of plant species, as many relevant attributes for which data were available were included in this analysis, and standardized judgements were made. Still, it is impossible to control for all biases. Much greater emphasis may have been placed traditionally on the storability of resources rather than ease of harvesting. Without sufficient information along these lines, it was necessary to weigh all attributes equally. That there are many attributes with which the plants are measured somewhat reduces the likelihood that the wrong emphasis on any single attribute will greatly influence the results.

The values of each cover-type as a whole were calculated according to the dominant utilized species, as well as the seasonal availability of the plants found within. This was accomplished by adding together the plant values for each month in which they were harvestable. This step of the analysis was undertaken as it is assumed that cover-types which offer resources (particularly food resources) for a longer season ultimately will be of greater value to the economy. That is, if the harvest times for most plants cluster around several weeks of the year, cover-types which offer plant resources at other times will presumably be more valued.

Accessibility of Cover-types to Settlements

The final step of the analysis involves determining the accessibility of the settlements to each cover-type. This was accomplished by delimiting the "catchment area", or the area that would have been most often used by the village inhabitants, around selected village units. As cover-type distributions tend to be relatively homogeneous in large areas in the valley, it was decided that select village units would be representative of others in a similar environment. Village units were selected in order that changes in cover-type distribution throughout the valley be adequately represented, and the distribution maps would not be unnecessarily congested. For the most part, at least every other village unit was used. 10 Village units, of a total of 20, were thus selected.

The shape of the catchment was decided upon according to time-distances from the center of the village unit to a maximum distance of half way to the next village unit. This method assumes that each village unit would have utilized (owned) approximately the same areal extent surrounding it. Clearly, this is a very rough estimate of village land use. In fact, villages located in the densely populated lower valley would have had much less land available to the east and west of the settlement than the villages further up the valley. However, since detailed data on land use and contemporaneity of sites are not available, a visual representation had to suffice. It is important to remember, however, what we are most concerned with here is determining the relative suitability of an area for settlement. That goal is not compromised although the analysis is necessarily gross.

During survey work conducted in the valley in 1982 (Lepofsky et al. 1985), experiments in the field showed an average walking time of 2/3 km per hour through thick underbrush in the valley's forest. In areas with less dense underbrush, a greater walking speed was possible. The time required to climb the steep mountains surrounding the village units was also determined. Given the travel times estimated in the field, 1, 2, and 3 hour time contours from the center of the village unit could be delineated. In areas where time contours overlapped with the boundaries of the adjacent village unit, time contours were drawn only to the north and south.

Following this, the yearly index value for each village unit could be calculated. This step of the analysis was accomplished by summing the index values for each village unit according to the cover-type within each catchment area. Seasonal values (i.e. winter: dec.,jan.,feb.; spring: mar., apr., may; summer: jun., jul., aug.; fall: sep., oct., nov.) for each cover-type were also calculated. Within a season, a minimum and maximum index value was determined.

Results and Discussion

Delineation of Cover-types

The pre-contact distribution of cover-types as designated in the analysis is illustrated in figure 8. Several points should be made concerning the cover-type designations used in this analysis. First, the classification system is highly simplified. Rarely can one draw sharp divisions between cover-types, unless there is a drastic and sudden change in the landscape (e.g. a sharp elevational change). For these reasons, no lines are drawn delimiting the cover-types. In addition, there are several cover-types that are purposefully excluded from this analysis. These include areas such as swamps, bogs, scree slopes, and transitional forest cover-types. Locating these areas precisely was not possible given the available data. Furthermore, cover-type zones of small extent were not likely to have played a significant role in the economy (see p. 19 of text, Chapter I). They have been included in the larger cover-types into which they fall.

The cover-type classification presented here represents the various successional stages of the forest, as well as the riverine-associated flora, of both the upper and lower valley. The significantly drier environment in the upper reaches of the valley is reflected in the number and kind of floral species available throughout the valley. Thus, floral resources available to the upper valley inhabitants would not necessarily be available to the lower villages, and vice versa.

Assigning Values for Cover-types

The results of this portion of the analysis, involving the individual plant index values and the values of each cover-type as a whole for all plant species and broken down by month, are presented in Table IX, and

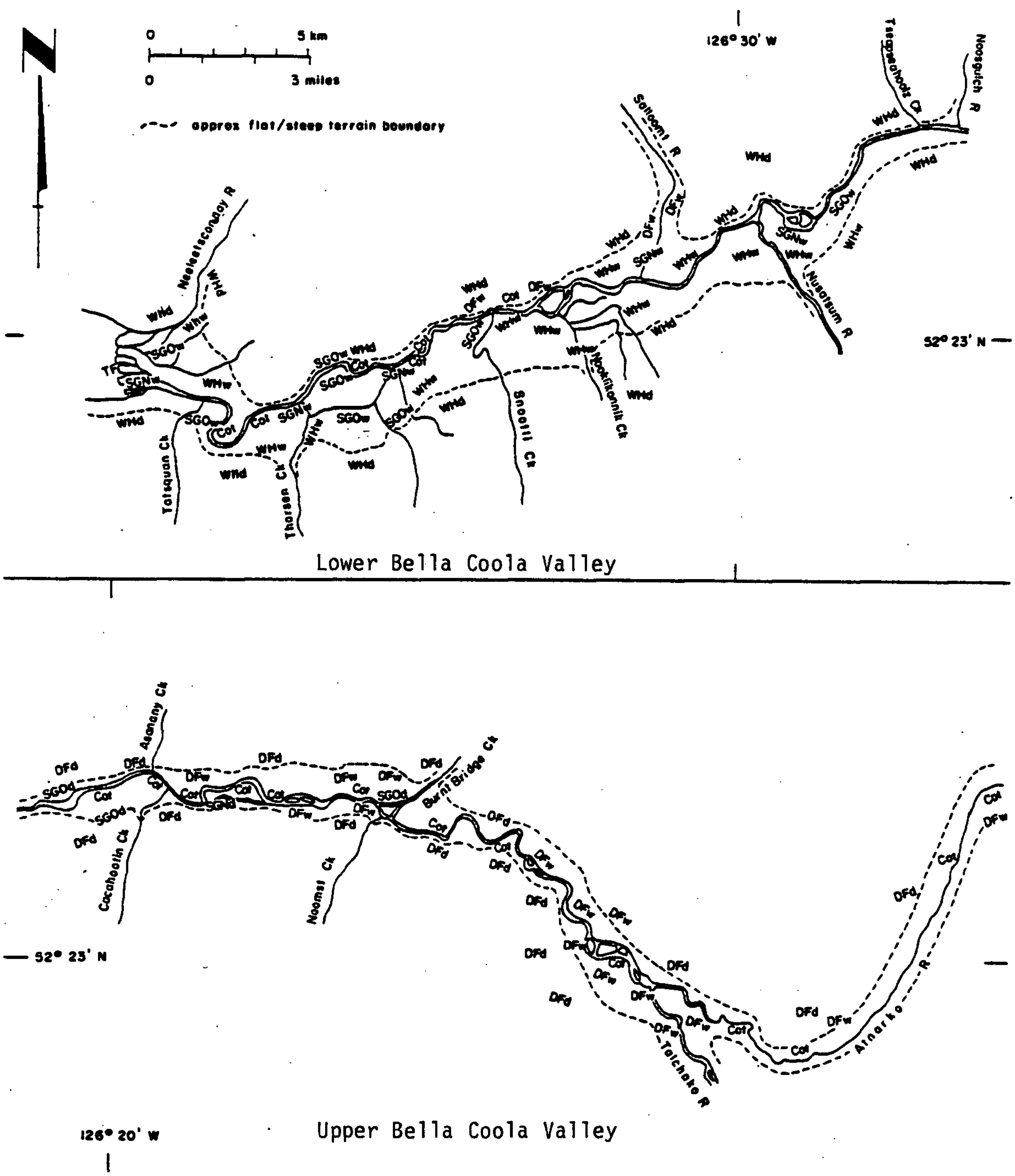

Figure 8. Pre-contact Distribution of Cover-types
Key: SGNd- Second Growth New-dry; SGOd- Second Growth Old-dry; Cot- Cottonwood; DFw- Douglas Fir-wet; DFd- Douglas Fir-dry; SGNw- Second Growth New-wet; SGOw- Second Growth Old-wet; WHw- Western Hemlock-wet; WHd- Western Hemlock-dry; TF- Tidal Flat

TABLE IX
INDICES OF PLANT VALUES*

Species:	Index of Value by Attribute** 1	2	3	4	5	6	7	8	Sum of Indices
TREES									
Red cedar	4	1	1	1	3	3	1	1	15
Sitka spruce	2	1	1	2	3	3	1	1	14
Lodgepole pine	1	1	1	2	3	3	1	1	13
Douglas-fir wood	3	1	1	2	3	3	1	1	15
inner bark	3	1	1	1	3	3	1	2	16
Western hemlock wood	3	1	1	2	3	3	1	1	15
inner bark	3	1	1	1	3	3	1	2	15
Douglas maple	3	1	1	2	3	3	2	1	16
Red alder	3	1	1	2	3	3	2	1	16
Paper birch	3	1	1	2	3	3	2	1	16
Bitter cherry	1	2	1	2	3	3	2	1	15
Pacific crabapple wood	3	2	1	2	3	3	2	1	17
fruit	3	2	2	2	2	3	2	2	18
Black cottonwood wood	3	1	1	2	3	3	1	1	15
inner bark	3	1	1	1	1	3	3	1	13
SHRUBS									
Red elderberry wood	4	2	2	2	3	3	3	1	20
fruit	4	2	2	2	3	3	3	2	21
Highbush cranberry	3	2	2	2	3	2	3	2	19
Red-osier dogwood	4	2	2	2	3	3	3	1	20
Soapberry	2	2	2	2	3	2	3	2	18
Salal	3	2	2	3	3	2	3	2	20
False azalea	4	2	1	3	3	3	3	1	20
Alaska blueberry	4	2	2	3	3	2	3	2	21
Mountain bilberry	3	2	2	3	3	2	3	2	20
Oval-leafed blueberry	4	2	2	3	3	2	3	2	21
Red huckleberry	4	2	2	3	3	2	3	2	21
Stink currant	2	2	2	3	3	1	3	2	18
Wild gooseberry	3	2	2	3	3	2	3	2	20
Swamp gooseberry	2	2	2	3	3	1	3	2	18
Wild blue currant	1	2	2	3	3	1	3	2	17
Saskatoon wood	3	2	2	2	3	3	3	1	19
berry	3	2	2	3	3	2	3	2	20
Nootka rose	4	2	2	2	1	3	3	2	19
Wild rose	2	2	2	2	1	3	3	2	17
Wild raspberry	3	2	2	3	3	2	3	2	20
Blackcap	3	2	2	3	3	2	3	2	20
Thimbleberry	3	2	2	3	3	2	3	2	20
shoots	2	2	2	3	1	3	3	2	18
Salmonberry	4	2	2	3	3	2	3	2	21
shoots	2	2	2	3	1	3	3	2	18
Spirea	4	2	1	2	3	3	3	1	19
Willows	4	2	1	2	3	3	3	1	19
HERBS									
Horsetail stalk	2	2	2	2	1	3	3	1	16
root	2	2	2	2	1	3	2	2	16
Spiny wood fern	4	2	2	2	3	3	2	2	20
Bracken fern	4	2	2	1	3	3	1	2	18
Skunk cabbage leaves	2	2	2	3	1	3	2	1	16
fruit	2	2	2	3	1	3	2	2	17

Attributes:	1	2	3	4	5	6	7	8	Total
Riceroot	1	2	1	2	3	2	2	2	15
Lily-of-the-valley	2	2	2	3	1	1	3	2	16
Star flowered solomon's seal	2	2	2	3	1	1	3	2	16
Hemlock parsley root	3	2	2	3	1	3	2	2	18
Water parsely root	3	2	2	3	1	3	2	2	18
Cow parsnip	3	2	2	3	1	3	3	2	19
Sweet cicely root	3	2	2	3	1	3	2	2	18
Spreading dogbane	4	2	1	3	3	3	3	1	20
Sarsaparilla root	3	2	2	2	1	3	2	2	20
Bunchberry	2	2	2	3	1	2	3	2	17
Kinnikinnik	3	2	2	3	3	2	3	2	20
Blue lupine	4	2	2	1	1	3	2	2	17
Wild clover	4	2	3	2	3	3	2	2	21
Fireweed shoots	4	2	2	3	1	3	3	2	20
Western dock	3	2	2	3	1	3	3	2	19
Strawberry	2	2	2	3	1	1	2	2	15
Pacific silverweed	4	2	3	2	3	3	2	2	21
Stinging nettle fibre	3	2	2	1	3	3	3	1	18
green	3	2	2	2	1	3	3	2	18
MOSS									
"yellow moss"	4	2	1	2	3	3	3	1	19

*See Apppendix I for scientific names.
**Attributes:

1. Abundance of usable part(s):
   1. very rare
   2. somewhat common
   3. common
   4. abundant

2. People needed for harvest:
   1. several people; men +/or women
   2. one woman, or a small group of women

3. Effect of harvest:
   1. takes several years to replace
   2. no effect on overall abundance
   3. increases abundance of future harvests

4. Processing to utilize:
   1. much processing
   2. some processing
   3. no processing

5. Storability:
   1. cannot (was not) stored
   2. stored with difficulty (involves much labor)
   3. stored easily

6. Yearly reliability:
   1. variable, not dependable
   2. +/- dependable
   3. reliable

7. Ease of harvest:
   1. difficult
   2. average
   3. easy

8. Uses:
   1. raw material
   2. food

figures 9 and 10 respectively.

Results presented in Table IX show that there is a wide range of index values of plant resources utilized by the Nuxalk (ranging from a value of 13 to 21). Clearly, some plants were much more valuable than others and might have had an influence on settlement location. It is unfortunate that the data are not sufficiently detailed (in terms of more quantifiable attributes and more specific locations of plant species) to examine the direct relationship between individual plant species and settlements.

Values of the cover-types as a whole (figure 9) are also quite variable. The cover-type with the highest value rating by far is Second Growth Old-wet (SGOw). With the exception of the Douglas Fir-dry (DFd) cover-type, the remaining cover-types cluster around similar values, with a relatively small margin.

Although all plant resources were included in the graphs in figure 10, only the seasonal availability of plant foods is discussed here. It is important to measure which plants would have been available at times of stress in the seasonal round. Non-food plant resources, on the other hand, are usually available year round and/or their use is usually less urgent. In those instances where certain raw materials may be critical, it would have been possible to store sufficient amounts to have them available at all times.

The graphs in figure 10 illustrate that there is a great deal of seasonal variation in availability of plants. The majority of plant foods available to the Nuxalk cluster around the months from June to October. Second Growth Old-wet (SGOw), Second Growth New-wet (SGNw), and especially the Tidal Flat (TF) zone are notable exceptions to this pattern. Both second growth cover-types have plant foods available in varying abundances throughout the year. The peak harvest time in the TF zone, in contrast to

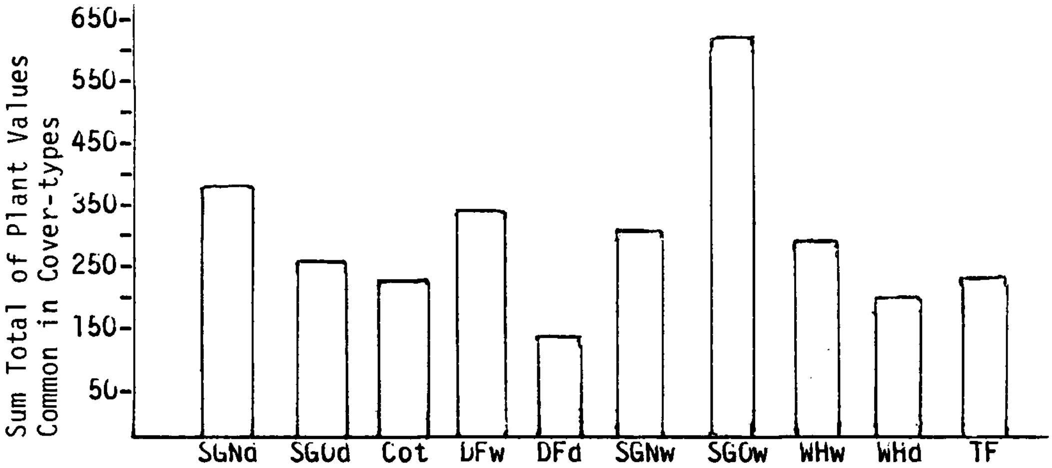

Figure 9. Summary Index Value by Cover-Types
Key: SGNd- Second Growth New-dry; SGOd- Second Growth Old-dry; Cot- Cottonwood; DFw- Douglas Fir-wet; DFd- Douglas Fir-dry; SGNw- Second Growth New-wet; SGOw- Second Growth Old-wet; WHw- Western Hemlock-wet; WHd- Western Hemlock-dry; TF- Tidal Flat

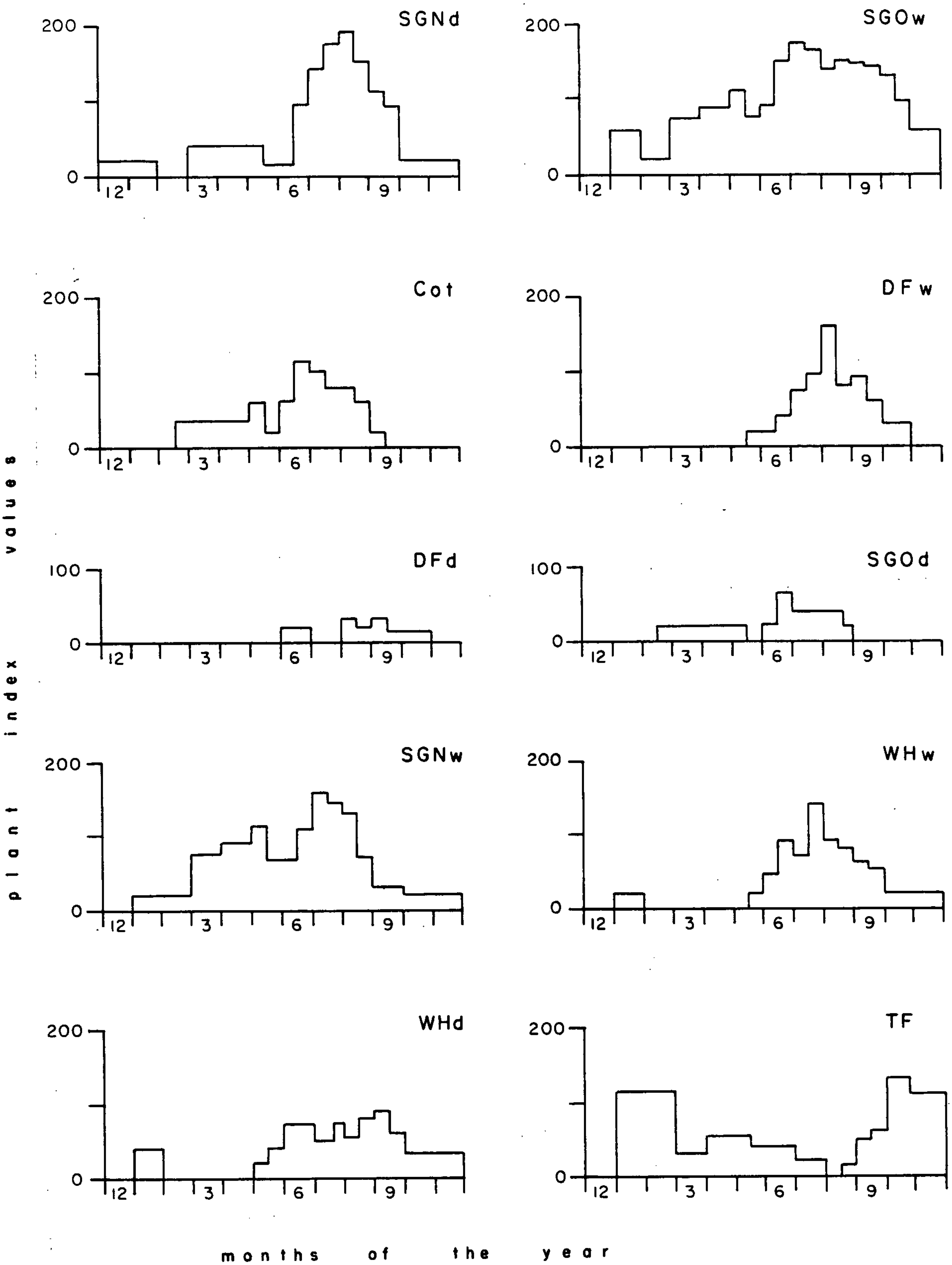

Figure 10. Monthly Index Value for Cover-types (12=Dec.; 3=March, etc.)

other zones, is during the fall, winter and early spring months. Certainly, the presence of plant resources during these months would have been a welcome change in times of plenty, and a highly valued back-up mechanism in times of scarcity, particularly in the late winter and spring.

Accessibility of Cover-types to Settlements

The relationship of each cover-type to the catchment of each selected village unit is illustrated in figure 11 and Table X. The seasonal and total abundance of plant resources in each select village unit are represented in Table XI and figure 12.

Drawing catchment limits around the village units illustrates several points concerning traditional resource use. First, it becomes apparent that land is highly restricted in the lower valley. Members of the lower valley villages (A through E) could walk no more, and sometimes much less, than one hour from the limits of the village unit before entering an area presumably owned by a neighbouring village. This suggests that for lower valley villages, most land owned by the minmints would be north and/or south of the village unit, in the Western Hemlock-dry (WHd) cover-type of the adjacent mountainside. The harvesting area of the village units at the river's mouth (A and C, and perhaps B) could also be extended westward, to the Tidal Flat (TF) zone, as well as onto the mountainsides. It is not clear, however, how the plants on the tidal flats were owned. It is documented that other groups (the Kwakiutl and Nootka) divided clover patches into regular beds which were owned by families or individuals (Curtis 1915:43; Drucker 1951:57). No such system is recorded for the Nuxalk, however, and the location of the lower valley villages suggests that they had extensive (if not exclusive) right over this resource area.

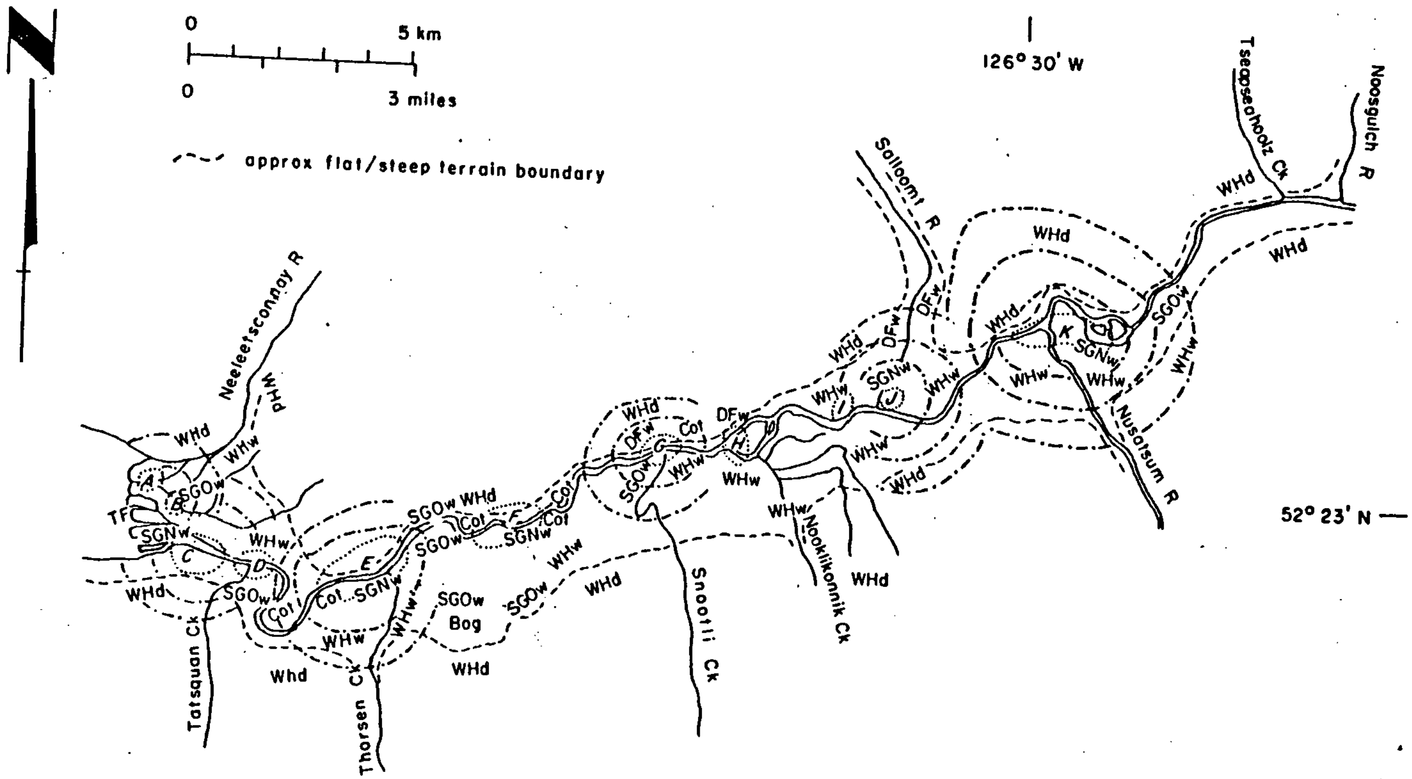

Figure 11a. Time Contours from Select Village Units, Lower Valley
(see figure 11b for key)

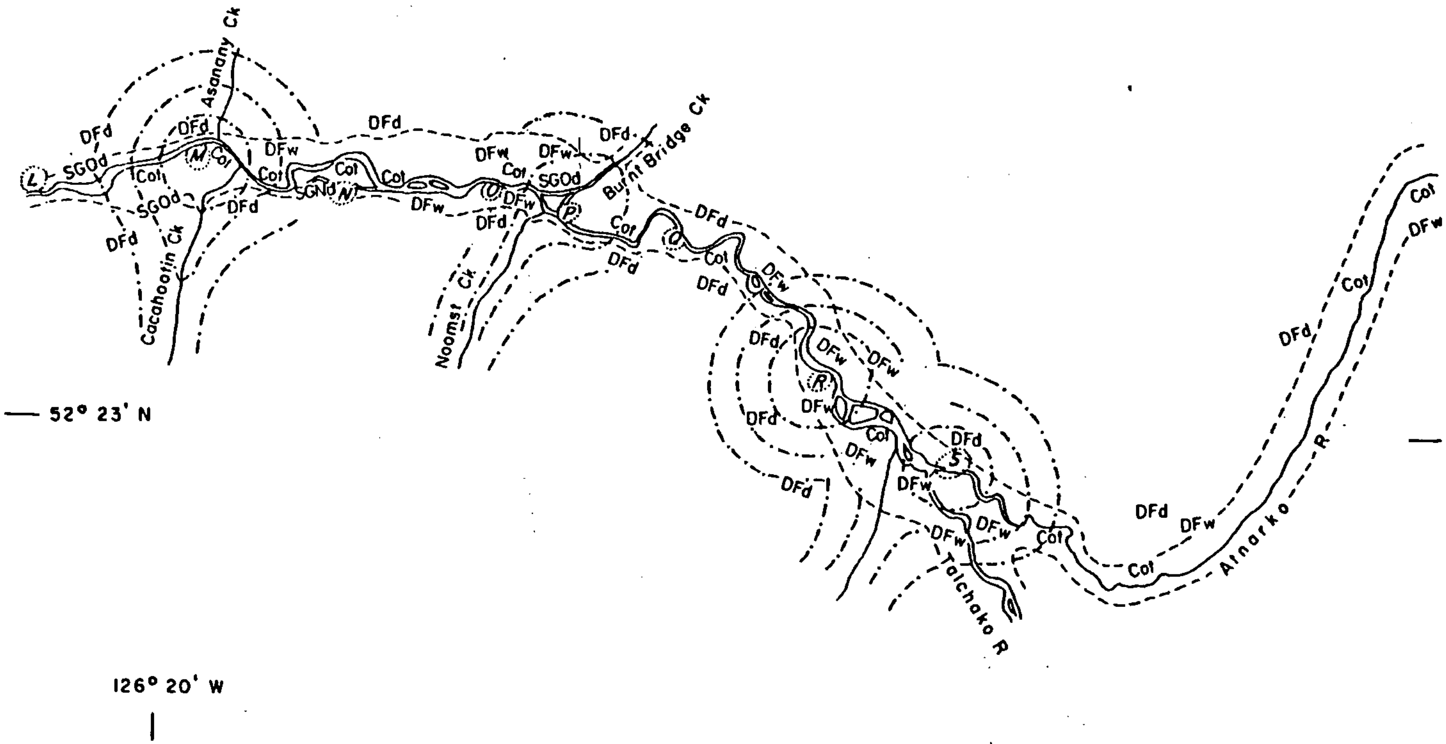

Figure 11b. Time Contours from Select Village Units, Upper Valley
Key: SGNd- Second Growth New-dry; SGOD- Second Growth Old-dry; Cot- Cottonwood; DFw- Douglas Fir-wet; DFd- Douglas Fir-dry; SGNw- Seond Growth New-wet; SGOw- Second Growth Old-wet; WHw- Western Hemlock-wet; WHd- Western Hemlock dry; TF- Tidal Flat. -·-·-·- indicates one hour time contours.

TABLE X
COVER-TYPES PRESENT IN VILLAGE UNIT CATCHMENTS

Village Unit		Cover-types in Time Contours: 1 hour	2 hours	3 hours
B	major:	TF, SGOw	TF, WHd, WHw	WHd
	minor:	---	SGOw	---
C	major:	WHw, TF	WHd, WHw, TF	WHd
	minor:	SGOw, WHd	SGOw	---
E	major:	Cot, WHw, SGOw, WHd	Cot, WHw, SGOw, WHd	WHd
	minor:	---	---	---
G	major:	DFw, SGOw, WHw, WHd	DFw, WHw	WHd
	minor:	Cot	SGOw, Cot	---
J	major:	WHw	WHw, DFw	WHd, DFw
	minor:	Cot	Cot	WHw
K	major:	Cot, WHw	WHd, WHw	WHd, WHw
	minor:	WHd	Cot	Cot
M	major:	DFw, DFd	DFw, DFd	DFw, DFd
	minor:	Cot, SGOd	Cot, SGOd	Cot
P	major:	SGOd, DFw, DFd	DFW, DFd	DFd
	minor:	Cot	Cot	---
R	major:	DFw	DFd	DFd
	minor:	Cot	DFw, Cot	Cot
S	major:	DFw, DFd	DFw, DFd	DFw, DFd
	minor:	Cot	Cot	Cot

* See figure 9 for key to cover-types.

TABLE XI
MINIMUM AND MAXIMUM SEASONAL ABUNDANCE AND YEARLY INDEX VALUES OF PLANT RESOURCES IN SELECTED VILLAGE UNITS

Selected Village Unit	Winter	Spring	Summer	Fall	Yearly Total**
		(minimum/maximum)*			
B	0/225	90/220	170/420	160/288	1373
C	0/225	90/220	170/420	160/288	1373
E	0/145	90/220	225/495	120/295	1374
G	0/145	90/240	245/625	150/385	1730
J	0/90	20/130	165/455	90/255	1112
K	0/90	20/110	145/325	60/165	756
M	0/50	20/11	95/330	50/140	981
P	0/50	20/100	95/350	50/140	981
R	0/30	20/80	75/270	50/140	729
S	0/30	20/80	75/270	50/140	729

* Calculated by adding together low (or high, in the case of the maximum values) seasonal index values for each cover-type to which a village unit had access.

**Calculated by adding sum totals of index values for each cover-type to which a village unit had access.

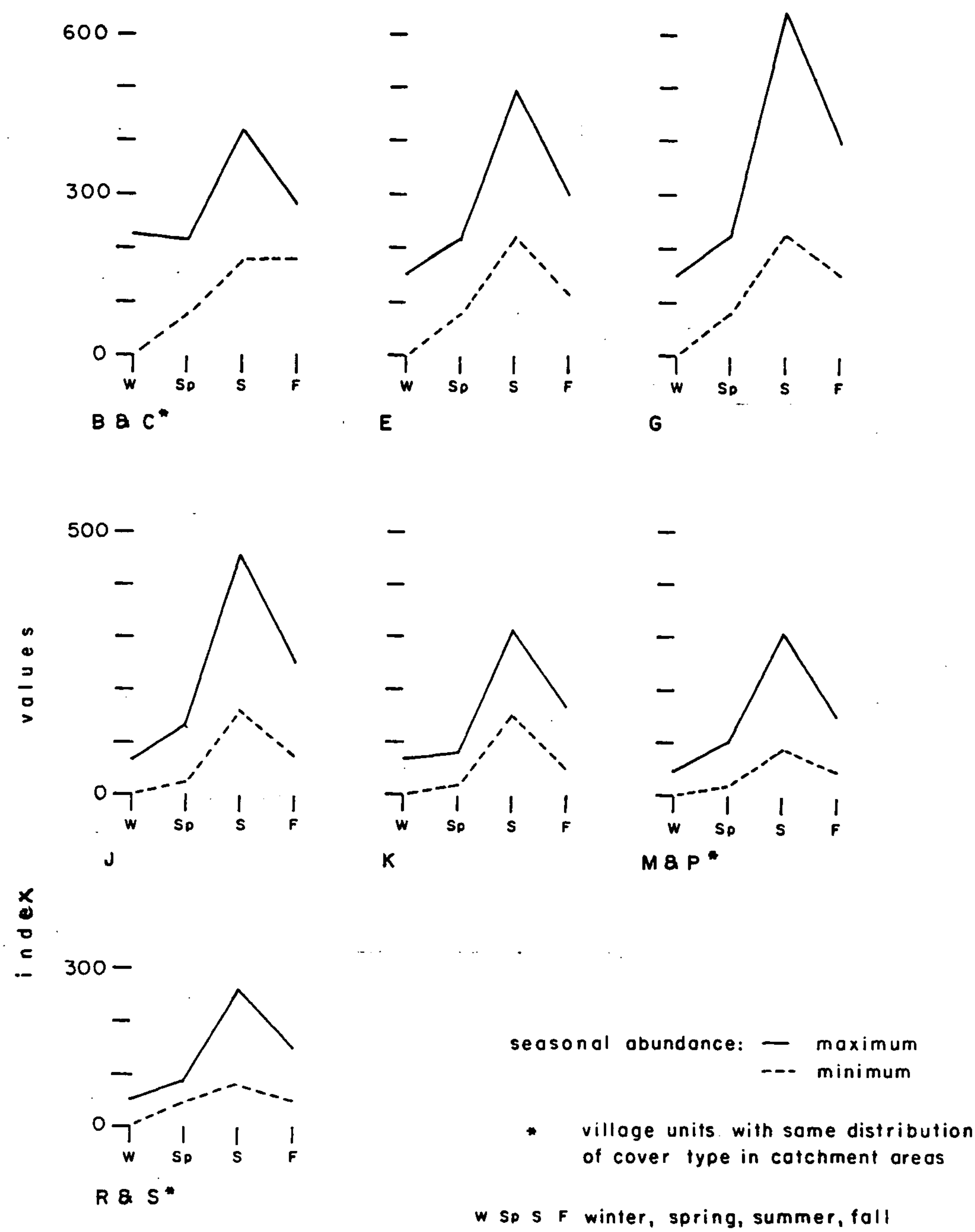

Figure 12. Minimum and Maximum Index Values of Plant Resources in Selected Village Units

In the upper valley villages there is less of an apparent conflict over plant collecting areas as a result of limited space. Villages in the upper valley tend to be spread much further apart than the lower valley villages. Not only is the actual time in which a person could walk from his or her village before crossing another village's collecting area greater here, but the distance that could be covered in this time is also greater because of the relatively sparse forest understory.

Greater accessibility to bottomland vegetation (predominantly Douglas Fir-wet [DFw] zone) by upper valley village units, does not neccessarily translate into a greater overall availability of plant resources. The cover-types of the upper valley are generally composed of a lesser abundance of plants within them than those in the lower valley. Total value scores for all cover-types indicate that the lower valley has a greater abundance and/or diversity of plants utilized by the Nuxalk. This is partly because of the presence of the Tidal Flat (TF) zone in the lower valley. However, even if the score for the TF zone is not included, the lower valley has a much higher rating (i.e. the sum of cover-type indices; 1939 with the TF score, or 1705 without it, as compared to 1354 in the upper valley). Greater accessibility to DFw, which is among the most valuable of the cover-types in the upper valley, may somewhat compensate for the lower availability of its plant resources.

It is evident from the catchment areas that the cover-types are available to each village unit in varying abundance. There appears to be no relationship between distance to cover-type and village location (see Table X). All villages appear to have access to each of the cover-types located within their general region. Accessibility to the SGN cover-type is not included in the results presented in Table X. It is assumed that each village had access to this zone at least in the area surrounding the site. The absence of Second Growth Old (SGOw and SGOd) zones around certain village units is likely to be the result of incomplete data.

It is interesting to note that the SGN habitats throughout the valley, and the SGOw zone in the lower valley are the cover-types with the highest overall value ratings. Because these zones are humanly created,through man-land interaction, they should not be considered as factors in determining initial village location. However, we do know that the plants within these cover-types played an important part in the economy. The Nuxalk encouraged earlier stages of succession in the forests by burning in order to increase plant yields, presumably in areas more distant to the village. Easy access to these high yield succession cover-types in the immediate vicinity of an established village suggests that they played an important role in the local economy.

Table XI and figure 12 illustrate some other points concerning the relationship between plant resources and individual village units. Access to plant resources appears to decrease steadily eastward in the valley. Although there are only incremental differences in values between adjacent village units (with the exception of J and K), there is a large difference between scores at both ends of the valley. Compared in this way, the village units at the mouth of the valley had access to much greater number and kind of plant resources. Although we cannot draw definitive conclusions concerning the relationship between high index values and suitability of individual settlements, it is interesting to note that the only two village units composed of more than one large village (village units G and E) are located in the lower valley in areas with the highest yearly abundance of plant resources.

The graphs in figure 12 suggest much variation in seasonal availability of plant resources in each village unit catchment. All village unit catchment areas reach their peak harvest in summer and their low in winter and spring. The catchment associated with the village units at the mouth of the river (B, C, E and G) have by far the greatest index values for the winter and spring months. Even the seasonal lows during spring are much higher in these catchment areas. Access to a reliable source of plant foods during this time, when other stores were low, was certainly advantageous.

Summary

The previous analysis suggests that the lower valley villages had greater access to plant resources than those in the upper valley. This is evidenced by the higher index scores for the sites in the lower valley, which indicates both higher productivity and greater diversity. Furthermore, those zones which offer plant resources at potentially critical times in the subsistence round are located only in the lower valley. In comparison, plants available at these times in the upper valley are quite rare.

Finally, of the lower valley villages, those villages located at the mouth of the river were best situated to harvest plant resources. Although these villages were most restricted in area, access to harvesting areas to the north and/or south, as well as the highly valued, and easily reached Tidal Flat (TF) zone to the east offered a wide variety and year round supply of floral resources.

The Relationship Between Animal Resources and Settlement

Methods

The methods used here are similar to those used in the analysis of plant resources. All land mammals utilized by the Nuxalk and available in the Bella Coola valley, are included in the discussion (see Table XII). Detailed information on the habits of each animal (taken largely from Cowan and Guiguet 1956), enabled me to identify each species with the cover-types in which they are most likely to be found (Table XII). From the distribution of cover-types presented in the previous analysis (Figure 8), and the distribution of animals within each cover-type it was possible to determine which animal resources were most available to the Nuxalk settlements.

Unfortunately, quantitative details on the distribution of each species in the valley has not been gathered. Because of the lack of quantitative data on animal distribution within the valley, it is impossible to determine the relative importance of animal resources to one another. Had more detailed information been available it would have been possible to evaluate different attributes of each resource in a manner similar to that used for the plant resources. For instance, usable weight of the animal is an important factor in determining the relative importance of a resource. In addition to offering greater food value (more meat per catch), the non-food by-products will also be proportionally greater. Without detailed quantitative data we are unable to carry this portion of the analysis to its completion. Seasonal availability of animal resources can be evaluated, however, and this is presented in Table IV (p.97).

The catchment areas drawn in the previous analysis are also used here. Although actual minmints-owned hunting grounds may not be distributed as suggested by the catchment boundaries, the catchment areas help one to visualize which areas were most accessible to the village units. This is not to suggest that only areas of the closest proximity were used to harvest animal resources, but it is likely that they were owned and used by the closest minmints. The same ten village units considered in the plant analysis are used again here.

Results and Discussion

Table XIII lists the animal resources that would have been available within a 1 to 3 hour distance from select village units. The distribution of animal resources within each catchment indicates that generally there are no preferred areas within the Bella Coola valley to harvest animal resources. Both the upper and lower valley offer roughly the same number and kind of animal resources. That no distinction can be made may be a factor of scanty data. If we assume that the relatively even distribution of animal resources is in fact representative of the actual distribution, it is imposible to determine if access to animal resources was a significant factor in determining village location within the valley. That is, the presence of animal resources may have been intrinsic to settlement, or may have had little effect. Without differential distribution of resources, it is not possible to determine this. Since each village unit had access to a range of animal resources, differences in attributes of each animal (i.e. weight, non-food yield, etc.) are also not relevant to this analysis.

TABLE XII

COVER-TYPES IN WHICH ANIMAL RESOURCES WERE FOUND*

Animal Resource	Cover-type** Most Likely Found Within
Ruffed grouse	WHw, SGOw, DFw, SGOd
Mountain goat	WHD, DFd
Coast deer	WHD, SGOW, WHW, TF
Mule deer	DFd, SGOd, DFw (beginning at Stewie)
Black bear	WHw, SGOw, DFw, SGOd
Grizzly bear	WHw, WHd, DFw, DFd
Lynx	DFw, DFd, SGOd
Rabbit	WHw, SGOw, DFw, SGOd
Porcupine	DFw, DFd
Beaver	WHw, SGOw, DFw
Marmot	DFd
Wolverine	WHd, DFw, DFd
Marten	WHd, WHw, DFd, DFw
Mink	Cot, SGOw, WHw, DFw, SGOd
Racoon	WHw, SGOw, DFw, SGOw
Red Fox	WHw, DFw, DFd
Coyote	DFd
Otter (river)	Cot, SGOw, WHW
Skunk	SGNw, SGOw, Cot
Weasel	Cot, SGow
Fisher	SGOw, SGOd, DFw
Muskrat	Cot, SGOw

*Scientific names listed in Appendix II
**See figure 11 for key to cover-types.

TABLE XIII
ANIMAL RESOURCES AVAILABLE TO SELECTED VILLAGE UNITS

Village Unit	ruffed grouse	mountain goat	coast deer	mule deer	black bear	grizzly bear	rabbit	lynx	porcupine	beaver	wolverine	marmot	marten	mink	racoon	red fox	otter	skunk	coyote	weasel	fisher	muskrat
B	*	*	*		*	*	*			*	*		*	*	*	*	*	*		*	*	*
C	*	*	*		*	*	*			*	*		*	*	*	*	*	*		*	*	*
E	*	*	*		*	*	*			*	*		*	*	*	*	*	*		*	*	*
G	*	*	*		*	*	*	*	*	*	*		*	*	*	*	*	*		*	*	*
J	*	*	*		*	*	*	*	*	*	*		*	*	*	*	*	*		*	*	*
K	*	*	*		*	*	*			*	*		*	*	*	*	*	*		*	*	*
M	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*		*	*			
P	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*		*	*			
R	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*		*	*			
S	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*		*	*			

The Relationship Between Mineral Resources and Settlements

There are few mineral resources commonly used by the Nuxalk that would have not been readily accessible to all the Bella Coola valley people. Sandstone, black pigments, clay, and river cobbles, were accessible and abundant in all parts of the valley bottom. Only two minerals available in the Bella Coola valley were most likely restricted in access. These were, the red pigment and "greenstone" discussed earlier (obsidian, which was also highly prized among the Nuxalk, was not found in the Bella Coola valley).

If it is assumed that the ownership of these resources was the privilege of the nearest minmints, then accessibility to these resources was restricted. If this were the case, then village units J and L had sole access to "greenstone", and village units E and P only, had access to the red pigment. The presence of greenstone tool fragments at several archaeological sites in the valley, as well as the known importance of the red pigment in trade, suggests that access to these resources by these village units, would have been a significant economic advantage.

The Relationship Between Trade and Settlements

The discussion presented here examines the likelihood that village units were differentially involved in trade. Since no empirical information exists explicitly relating the involvement of each village in trade, the analysis must rely on data concerning the relationship between location of villages and trade items (see Chapter II). This data is used as an indicator of access to trade goods, both within the minmints territory, and through neighbouring groups.

The village units which had access to the various trade goods

TABLE XIV
VILLAGE UNIT ACCESS TO TRADE GOODS ORIGINATING FROM THE BELLA COOLA VALLEY

Village Unit	salmon and salmon products	ooligan grease	hemlock cakes	elderberries	highbush cranberries	crabapples	"yellow moss"	dyed mountain goat wool	red cedar bark	blankets	mineral paints (red pigment)	boxes and dishes
A	*	*	*	*	*	*		*	*	*		*
B	*	*	*	*	*	*		*	*	*		*
C	*	*	*	*	*	*		*	*	*		*
D	*	*	*	*	*	*		*	*	*		*
E	*	*	*	*	*	*		*	*	*	*	*
F	*		*	*	*	*		*	*	*		*
G	*		*	*	*	*		*	*	*		*
H	*		*	*	*	*		*	*	*		*
I	*		*	*	*	*		*	*	*		*
J	*		*	*	*	*		*	*	*		*
K	*		*	*	*	*		*	*	*		*
L	*			*	*		*	*	*	*		*
M	*			*	*		*	*	*	*		*
N	*			*	*		*	*	*	*		*
O	*			*	*		*	*	*	*		*
P	*			*	*		*	*	*	*	*	*
Q	*			*	*		*	*	*	*		*
R	*			*	*		*	*	*	*		*
S	*			*	*		*	*	*	*		*
T	*			*	*		*	*	*	*		*

originating within the Bella Coola valley are presented in Table XIV (see Table III, Chapter II for the complete list of trade goods). Because the list of trade goods originating from the Bella Coola valley is so small, it is difficult to draw definitive conclusions concerning exchange patterns. However, given the available data, it appears that the lower valley village units did have slightly greater access to these goods. This becomes more apparent if we remember that the lower river salmon was of better quality (and perhaps more abundant) than that of the upper River. Since salmon and its by-products are some of the most highly traded items, especially to the Interior peoples, having access to better quality fish would be a great economic advantage. Furthermore, access to the ooligan resource only by the lower villages, would have also been an important economic advantage, as this resource was sought by both the Bella Bella, and Interior peoples.

Relationships with neighbouring groups, as well as physical location, were important elements in determining the role of a village unit in trade. Physical proximity and close relationships between upper valley people and Interior people would have given the upper valley Nuxalk villages greater access to Interior goods and resources. Certainly, greater access to obsidian from the Interior would have been important to the Nuxalk. That the Chilcotin and Carrier peoples often intermarried with, and resided among, the upper valley Nuxalk, suggests that a reciprocal economic relationship existed between Coast and Interior groups. It is not documented that the Interior peoples travelled to the lower valley to acquire ooligan. More likely, the upper valley Nuxalk first acquired it through exchange with the lower valley villages, and in turn traded it to the Interior people.

As a result of their geographical location, the Nuxalk of the lower Bella Coola valley had little regular contact with neighbouring groups, other than through trade and occasional feasts. Villagers in this part of the valley were more likely to intermarry with the Nuxalk people living in Kimsquit or South Bentinck Arm than with people from other language groups. Village units at the mouth of the river were probably most active in trade with coastal groups coming to the valley, simply because they were the first villages that would have been approached. This, in addition to their control of the ooligan resource, suggests that Nuxalk trade with coastal peoples was largely centered in villages of the lower reaches of the valley.

In sum, although all Nuxalk village units had access to resources that permitted them to be involved in trade, the lower valley villages appear to have had an advantage. Access to ooligan enabled them to exchange with upper valley groups for goods originating in the Interior, and with coastal people coming to the valley. Relations between the Interior people and the upper valley people were critical to the latter for obtaining goods which the lower valley villages could not obtain directly via their own trade routes.

The Relationship Between Protection from Raids and Settlements

Similar to the discussion of trade, no empirical data exist concerning village units and protection from raids. Information in the ethnographic literature do suggest that threat of raids among the Bella Coola valley Nuxalk was not enough of a major concern to deter settlement. Attack from the Interior peoples was a very rare ocurrence; in fact, the Interior people were known to ally themselves with the Nuxalk in their wars. Attacks from the west were certainly more common, but only the outermost valley villages were thus threatened. The village of Aƛq̓ax̣ƛ, located at the mouth of Necleetsconnay River is reported to have had a large stockade around it for protection against raids. The village of Tsaɫ, directly to the north of Aɫq̓laxɫ, was built on piles. This may have also been a protective measure against raids as well as flooding. Both of these villages are located within village unit A. The village of Q̓umq̓uts, located at the mouth of the Bella Coola River (in unit C), was also partly built on piles which may have had a dual function here, too. There is no evidence to suggest that the Nuxalk villages located further east of this point were ever bothered by raiding.

Although the westernmost villages took precautions against raiding, there is no indication that it was a constant menance to the village inhabitants. The presence of a stockade, and perhaps elevated houses, may have been sufficient protection from invaders. Warfare does not seem to have had a significant effect on village location in the Bella Coola valley.

The Relationship Between Shelter from Elements and Settlements

Although the Nuxalk of the upper and lower valley faced different environmental conditions, there appears to be little overall difference of the effects on the settlements. The upper valley people faced a colder and more severe winter than the inhabitants of the lower valley, however, there is no suggestion that this presented a deterrent to living there. Presumably, the houses offered sufficient warmth during the coldest months at which time outside activity would have been minimal. Flooding, however, was apparently a problem for all villages in the valley. In fact, people are reported not to have lived on islands or near to the river banks for fear of floods (Smith 1920-24). To cope with flooding, several villages built houses on piles. Such structures are reported from the villages of Q̓umq̓uts and Tsaɫ at the mouth of the River, and Nusq̓alst and Nuλɫi·x̣ʷ in the upper valley. Problems of flooding were not restricted to these villages, however, as evidenced by a story which relates a time when the village of <u>Nuƛ̓ɬi·x̣ʷ</u> survived a flood in which neighbouring villages did not fare as well.

Thus, there do not appear to be significant differences in exposure to the elements to the Bella Coola valley villages. Where the elements could offer a deterrent to settlement, the presence of piles and sturdy structures seem to have offered adequate protection.

Summary

In the previous analyses I have attempted to examine the possibility that the presence of a <u>range</u> of resources and other cultural factors will determine the suitability of an area for settlement. Specific goals of the analysis were to define both the minimum requirement for settlement and the determinants of more preferred locations in the Bella Coola valley in the late pre-contact era. Eight groups of determinants, each of which were identified in the ethnographies as important factors of Nuxalk life, were evaluated to determine their relationship to Nuxalk settlement. In keeping with the parameters outlined in Chapter I, both cultural and environmental determinants, as they would have been in pre-contact times, were considered. The determinants were assessed quantitatively or qualitatively, depending on the nature of the data set, to determine the degree of influence on location of Nuxalk villages.

Minimum requirements for settlement locations, that is, those that are both necessary and sufficient, are difficult to determine. Nonetheless equal access to animal resources, and main river salmon, for all village units suggest that these are among the minimum requirements of a suitable settlement location. Since these determinants occur relatively homogeneously throughout the valley it is not possible to investigate their influence on any particular settlement site. Accessibility to salmon in side tributaries, however, does not appear to be a minimum requirement. This is suggested by the presence of village units both away from side streams and at very unproductive streams. Shelter from the elements and protection from raids are also among the minimum requirements for settlement location as indicated by the effort taken by certain village units to shield themselves in this way. Also included in the minimum requirements are accessibility to aquatic and plant resources by the village units. Scanty data concerning the presence of mineral resources and trade items make their importance to the settlement system difficult to assess.

Assessments of the determinants of more preferred settlement locations can be made by examining the rank order of all village units according to the accessibility to all determinants. Preferred settlement locations (i.e. the heavily populated lower valley) should be those having access to and being influenced by the greatest number and range of determinants. The ranking of village units according to their relationship to each determinant is presented in Table XV. Access to main river salmon, animal resources, protection from raids, and shelter from the elements are not included in the table since their influence on settlement is relatively homogeneous throughout the valley.

The overall ranking of village units, according to their relationship to all determinants is presented in Table XVI. The ranking of village units suggests that the lower valley villages have access to the greatest number and kind of determinants. Of the lower valley villages, the villages at the mouth of the river (A-E) were best situated to gain access to these resources. Access to a greater number and better quality of salmon (in the main rivers and tributaries), ooligan, sea mammals, and

TABLE XV
RELATIONSHIP BETWEEN VILLAGE UNITS AND DETERMINANTS*

Village Unit	Salmon	Aquatic Resources	Plant Resources	Mineral Resources	Trade Items	Total
A	3	3	(3)	-	3	12
B	3	2	3	-	3	11
C	0	3	3	-	3	9
D	1	3	(3)	-	3	10
E	3	2	(3)	+	3	11+
F	0	1	(3)	-	2	6
G	3	2	3	-	2	10
H	2	2	(3)	-	2	9
I	0	2	(3)	-	2	7
J	3	1	2	+	2	8+
K	2	1	1	-	2	6
L	2	0	(2)	+	1	5+
M	1	0	2	-	1	4
N	1	0	2	-	1	4
O	0	0	(2)	-	1	3
P	0	0	2	+	2	4+
Q	0	0	(2)	-	1	3
R	0	1	1	-	1	3
S	0	1	1	-	1	3
T	0	1	(1)	-	3	

* Access to animal resources, protection from raids, and shelter from elements are not included here since their distribution in the valley does not differentially influence settlement locations. The relationship of each of salmon, aquatic resources, plant resources and trade items with each village unit is calculated according to overall abundance of each determinant within each village unit. A scale of 0, 1, 2, 3 was used to indicate absent, low, medium and high abundance. Presence or absence of mineral resources is indicated by a (+) or (-), respectively. Values with the parentheses correspond to village units for which an analysis was not conducted; their values are extrapolated from adjacent village units.

TABLE XVI
OVERALL RANK ORDER OF VILLAGE UNITS ACCORDING TO THEIR RELATIONSHIP TO DETERMINANTS

Village Unit	
1.	A
2.	B
3.	E
4.	D
4.	G
6.	C
6.	H
8.	J
9.	I
10.	F
10.	K
12.	L
13.	M
13.	N
13.	P
16.	O
16.	Q
16.	R
16.	S
16.	T

water fowl, as well as products of the Tidal Flat (TF) plant zone, sets this area apart in its richness of resources. Moreover, and perhaps more importantly, access to ooligans and Tidal Flat plant resources meant that the food harvesting season was substantially longer for the villages located in this area than elsewhere in the valley. This increased security would have permitted larger numbers of people to inhabit this area. It may have also permitted a relatively more flexible seasonal round. That is, since people would have been less tied to resources temporally limited in availability they could travel farther afield to conduct other tasks, such as trade. Such resource availability would have also permitted people to remain more sedentary, as less travel was required to harvest seasonal resources.

Furthermore, access to the tidal flat root crops (clover, silverweed and riceroot) may have been important nutritionally. Since root crops might have been a source of much needed carbohydrates among these hunter-gatherers (see p. 11 of Chapter I), year round access to these easy to harvest foods would have been advantageous.

It is interesting to note that most of the resources identified in the analysis as potentially influencing settlement are those that involve the least amount of pursuit time and therefore the least risk. Animal resources in the Bella Coola valley are highly mobile; the probablility of coming home empty-handed is much greater than for the fish or plant resources. Perhaps given the relatively higher risk involved, animal resources would play a secondary role in the economy after the more stable and predictable resources, regardless of their relative abundance (unless they were so abundant that risk was effectively minimized). In the case of the Bella Coola valley Nuxalk, it may have been preferable to trade for these resources from the Interior people whenever possible.

Preference of the lower valley as an area of settlement is clearly illustrated in the valley's recorded settlement pattern. Of the total 54 known village sites in the Bella Coola valley, 43 of them are located in the lower reaches of the valley. Of the 43, 30 sites are located at the river's mouth. This corresponds to the greater availability of resources not only in the lower valley, but at the mouth specifically.

That preferred village locations were restricted to the lower valley no doubt influenced the socio-economy of the valley. One would expect that there was a preference among other valley inhabitants for securing relations through marriage with the lower valley people. Unfortunately detailed information is not available to pursue this possibility in the present context.

The proposition that the presence of a range of determinants, rather than a single determinant, will influence the suitability of an area for settlement in the Bella Coola valley, is supported. The availability of a greater number and kind of both aquatic and land resources in the lower valley made that area a preferred settlement location. This variability in resource distribution not only meant a more abundant resource base (because of higher productivity), but a more secure base over an extended time period.

Diversity in the available resource base ultimately reduces the chances of a disaster ocurring as a result of over-concentrating on a single resource. Furthermore a wider variety of resources means that different resources will be available for harvesting for a greater portion of the year. Areas like the mouth of the valley, which offers root crops from the tidal flats throughout the late fall and early winter, and ooligan in the early spring, will be considerably more attractive for settlement when stores are running low and little fresh food is available elsewhere.

Perhaps the largest gap in the analyses presented here lies in the assumptions about resource ownership and use. Because exact locations of village owned resource extraction areas are not known, I have had to assume that those resources located closest to a village settlement were owned and commonly used by that village. Areas outside the immediate catchment area of each village were probably also used extensively for resource extraction, but the lack of data does not permit inclusion of these areas in the analyses. The analyses as they are presented here are intended only to examine why the Nuxalk decided to locate their villages where they did.

As a result of the Nuxalk analysis, several questions are raised concerning settlement patterns in other areas. A cursory examination of settlement and seasonal rounds of other groups along the Northwest Coast indicate a different pattern from that observed among the Nuxalk. We know that the Nuxalk were less mobile than some of their coastal neighbours, but the implications of this are unclear. What are the determinants of the settlement system of these other groups? Are environmental differences the reason for the discrepancy, or are there other factors at play? In the following comparative chapter the settlement systems of other Northwest Coastal groups are examined in order to address some of these questions.

Chapter V

SETTLEMENT REVIEW OF OTHER NORTHWEST COAST GROUPS

Introduction

In the previous chapters I have shown that in the Nuxalk case the presence of several resources determined the suitability of a village location. A review of relevant ethnographic and ecological data was presented in order to examine the Nuxalk settlement system. Tests of the relationships between several variables of the Nuxalk settlement pattern were accomplished to determine the effect of those variables on settlement.

It is generally accepted among Northwest Coast ecological anthropologists that there is much spatial and temporal variablity in resource abundance and distribution throughout the coast, and furthermore that this variation likewise affected the various Northwest Coast cultures differentially (Suttles 1962, 1968; Riches 1979). If we accept that the availability of resources affected settlement locations among Northwest peoples, then this variation in resources is expected to be manifested in different settlement systems along the Coast.

In order to examine this notion, settlement data of five Northwest Coast groups, the Tlingit, Coast Tsimshian, Southern Kwakuitl, West Coast (Nootka) and Coast Salish, are presented in this chapter. As time would not permit as detailed an analysis as presented for the Nuxalk, only a summary review of the settlement systems of these groups is presented here. The comparison is not meant to be exhaustive, but only illustrative of patterns. Because the review is necessarily abbreviated, other non-energy (i.e. cultural) factors are not thoroughly investigated. The review of settlement patterns proceeds north to south along the Coast.

Settlement Summaries

Tlingit

The Tlingit Indians originally inhabited the coast and islands of southeastern Alaska. Their village sites were situated throughout this area. In general "proximity of good fishing grounds and safe landing places for canoes" are cited as important criteria for village locations (Krause 1956:85). "Flat, sandy beach of a bay sheltered from the tide, on quiet inlets, or at the mouth or lower course of a river" were preferred sites (ibid.:86).

According to Oberg, the Tlingit had two patterns of residence, depending on the location of settlement -- that is, on mainland rivers or offshore islands. For those groups settling on the banks of the large mainland rivers, such as the Stikine, Taku and Chilkat, village residence was more or less permanent. These large rivers offered a constant supply of fish almost year round to the residents. All five species of salmon were present in these waters at different times throughout the year. The first species began running sometime in July, and the last of the spawners remained until February. Steelhead and dolly varden trout began running about the time of the end of the salmon season and remained until April or May, at which time the ooligan entered the rivers' mouths. Thus, large villages situated on the river banks could procure various species of fish from a single location for a major portion of the year. Only in spring, during the ooligan run, would upriver groups have to migrate to the rivers' mouths (Oberg 1973:56-57).

On the islands, the distribution of resources required a more transient seasonal round among the Tlingit. Here,

> "the villages were primarily the winter residence, where the people depended upon deep sea fishing. In July, each local clan division would move to its salmon stream and not return until November. In regions where salmon were scarce, the Indians became expert seal hunters, and we find a threefold division of settlement. In March when the weather began to clear, the various clan units would go to the rocks and islets far out to the sea and spend the entire spring there, living on seal meat, deep sea fish, shellfish and sea birds' eggs. In July they would move to their salmon streams, and in November the clan divisions would be united for four months in their winter villages. These villages were usually situated in quiet sheltered spots...." (Oberg 1973:56-57).

Although Oberg paints a picture of relative sedentariness among the mainland Tlingit as compared to the island groups, all the ethnographic data do not support this. Krause states that even though the mainland Tlingit villagers had access to an abundance of fish, they fished in varous places throughout the year.

> "They have to follow the wandering schools of fish, so they first make a summer camp at the mouth of the river, later on a shallow bay and with hook and line even follow the fish out into the open sea. This often makes the canoes a second home, for weeks and even months, and in it they carry all their household possessions, as well as the gear for fishing and hunting" (Krause 1956:120).

In addition to fish, other resources, such as young shoots of plants and sea bird eggs required that the mainland villagers travelled a distance from their homes (Oberg 1973:69,70). These activities seem to have been performed by small task groups from each village. In fact, most resource collecting was probably performed by such groups, who could simultaneously be sent out from a village to exploit several resources.

The variable distribution of resources throughout Tlingit territory seems to have resulted in different notions of resource ownership among the Tlingit. Along the mainland rivers where the supply of fish resources was so great, fishing rights do not seem to have been a concern. On the small islands, however, as resources were much scarcer, streams had to be apportioned. Hunting grounds, usually consisting of the hills surrounding the watersheds, were divided among all villages -- large and small. Berry, root and clover patches as well as rocks for sealing were owned by single houses within each village (Oberg 1973:59).

Different village locations throughout the area were of variable importance in the Tlingit socio-economic system. Due to the variability in resource abundance, village population numbers were significantly greater at the larger streams rich in fish resources (ibid.:56). Villages located at the mouths of those large rivers were of greatest importance. In addition to access to year round supplies of food, these particular locations were favored as they controlled trade routes into the Interior (ibid.:11).

It would seem that Tlingit village life fell into what can be viewed as a continuum of sedentariness. On one extreme were those mainland villages located at the mouths of rivers. These people could take fish, plants, shellfish and land mammals from the permanent village locations. The upriver groups, however, would have had to send task groups, or in the case of the ooligan fisheries, the entire village, to harvest the outer coastal resources. The island dwellers were even more mobile as their resource base was less concentrated and often farther afield.

In sum, the settlement pattern of the Tlingit suggest that the mouths of the mainland rivers were the preferred location of settlement. These villagers had basically a year round supply of food stuffs within easy reach of their permanent villages. One settlement location was able to meet a bulk of their energy needs, throughout the year, with a minimum energy expenditure as compared to other localities. Furthermore, access to Interior trade routes from these locations meant that these villages had an even greater economic advantage over their neighbours.

Coast Tsimshian

The Coast Tsimshian traditionally occupied the islands and mainland coast around Hecate Strait on the Northern Coast; their village locations centered on the Skeena River, extending into the Interior, to Gitskan territory. In historic times there are reported to have been as many as 25 Tsimshian settlements (Garfield and Wingert 1951:10); there were many fewer in pre-contact times, perhaps as few as twelve (Allaire 1984:88).

Reconstruction of the Coast Tsimshian settlement system is complicated due to discrepancies in the interpretation of the traditional pattern. The disparities seem to arise from the fact that there was much movement and relocation of traditional Coast Tsimshian villages in the early historic period as a result of the mission influence and the Hudson's Bay Company. The conflicting interpretations are presented below.

Drucker (1965:115) states that several groups established winter villages "on islands flanking Maetlakatla Pass...since the winters are much milder than on the [Skeena] river." Garfield (1950:33-34), however, records that before European contact the Coast Tsimshian did winter along the lower Skeena and used the Metlakatla area only for temporary camps on their way to the Nass ooligan run in the spring. Settlement around Metlakatla is probably a post-contact development as a result of the importance that village had during historic times. In fact, Allaire (1984:88) suggests that other Coast Tsimshian groups had their traditional winter villages all along the Skeena, but concentrated especially in the upper middle Skeena River area. These villages were usually located at the mouth of a tributary.

Several criteria have been suggested which influenced the suitability of a specific settlement site.

> "A house or village site was chosen where a craft could be readily landed and beached. A level, well drained location was also necessary since houses had only earth or sand floors.... Another factor in selection of a site was the ease with which it could be protected from raiders. The Tsimshian preferred a point of land that commanded a view of water approaches, or was backed by woods and swamp that would retard or discourage enemies." (Garfield and Wingert 1951:10).

The seasonal round of each Coast Tsimshian village, like that of their Tlingit neighbours to the north, varied in degree of sedentariness. The Kitselas and Kitsumkalem, the two eastern-most Tsimshian villages are reported to have spent most of the year at their villages. The Kitselas people are reported to have left their valley only in the spring to travel to the Nass to harvest ooligan. During the winter they were able to hunt from the canyon, and during the summer they caught their year's supply of salmon there. The location of the Kitselas villages also meant that they could act as middlemen in trade between the coastal and upper Skeena people (Allaire, Inglis and MacDonald 1979:70,71). With the exception of the position relative to trade, the seasonal round of the Kitsumkalem may have been much the same as the Kitselas. This description may have also applied to some of the other upriver groups (assuming Allaire's settlement distribution is correct).

In comparison, the lower Skeena villages appear to have had a much more mobile seasonal round. Like the upper river people, spring time for these groups meant mass migrations to the Nass River for the ooligan fisheries, where they again reassembled into village units. Nolan (1977:380-81) suggests that this pattern of residence, at this particular location relates to the importance of the lower Nass as a trade location, with other tribes. That other tribes are present at the Nass at this time meant that social interactions became more important than the ooligan harvest itself.

Also at this time smaller task groups were sent to fish for halibut, hunt fur seals and collect seaweed (Inglis 1977:2, from Nolan 1977:188), and possibly fish for some early salmon (Garfield 1950:13). After this time, when the salmon began to run in May or June, individual family groups returned to the Skeena to harvest salmon and berries until the fall, at which time they returned to their winter villages (Drucker 1965:118-119).

The seasonal round of the Coast Tsimshian living on the islands and outer channels (especially Douglas Channel) to the south of the Skeena was even more transient still. Since these groups had no salmon fishing rights they had to disperse during this season for both salmon and berry harvests. Seaweeds, other plants and waterfowl were also gathered during the fall season, before the Tsimshian returned to their permanent winter village locations (Simonsen 1973:19-21, from Nolan 1977:190-191).

The settlement pattern of the Coast Tsimshian, can be summarized as follows. Before the contact period, and the time when Metlakatla area took on increased importance, the permanent winter villages of the Tsimshian seemed to cluster along the banks of the Skeena, especially in the upper middle area. Settlement in this location permitted relative sedentariness, as a range of resources were available to the villagers with minimum movement. It is interesting to note, however, that the one Tsimshian village of highest rank is located on an island off the coast of the river's mouth (Allaire 1984:91). That villages in this area were relatively more mobile than other groups suggests that this area would not have been a preferred habitation if the decision to settle were made on resource distribution and abundance alone. There seem to be other (cultural) factors at play here as suggested by the social importance the lower Nass takes during ooligan season. The overwater route to the mouth of the Nass would have been relatively easier from this village location than from other areas.

Southern Kwakiutl

The Kwakiutl were composed of several local groups occupying the mainland coast from Smith Inlet south to the northern shores of the Gulf of Georgia, and the northern tip of Vancouver Island. At least 25 local groups have been identified (Boas 1897:328-332, 199:37-41; Donald and Mitchell 1975:329). The seasonal round of each group was quite variable, depending on their location, and which resources were being sought. The movement of each group was restricted to well-defined territories within which various resources were collected (cf. Boas 1966:24-27).

Reasons for specific village location are given as follows:

> "Most of the Kwakiutl villages stand on the grassy terrace just above the beach gravel of some sheltered cove, with the tangled forest directly behind. Overlooking the water, the inhabitants were difficultly suprised by the enemy; but if per chance a sudden attack were made, they could flee through the rear of the houses into the thicket and lie hidden while the raiders pillaged and burned. Nearly every village had a fortified refuge at top of an inaccessible, rocky hill...." (Curtis 1915:9).

Generally the Kwakiutl lived in permanent villages during the winter. These were located at the mouths of inlets and rivers on the mainland, Vancouver Island and smaller islands. During this time each local group assembled for various religious and social activities. Although resource collection certainly slowed down to a minimum at this time, some activities, such as shell fish collecting and land mammal hunting certainly took place, depending on the location of the group.

When distant from the winter resources, smaller task groups from each village were probably sent out to conduct the harvesting.

Spring time marked the coming of the oil-producing fish into the Kwakiutl territory, and many people relocated to harvest these important resources. Some groups are reported to have travelled up to 35 miles to harvest herring (Curtis 1915:19). At least eleven of the village groups relocated as village units to one of the major ooligan harvesting areas. That is, they did not break into smaller family groups at these localities. For at least one village unit, located at the head of Knight Inlet, no major relocation was necessary to harvest ooligan (Mitchell 1979:100). The harvest of other food stuffs, such as sea mammals, halibut and early vegetable products and seaweeds would have required that smaller groups from each village accomplish these tasks. For groups located on Vancouver Island, the smaller islands, or the mainland coast facing Queen Charlotte Sound, halibut was particularly important; harvest by these groups did not require movement from the winter village location (Curtis 1915:25). Some spring run salmon may have also been taken at this time (Weinberg 1973:247).

Summer and fall, however, were the main salmon harvesting months. Some entire villages travelled during these seasons to harvest salmon on the eastern shores of Vancouver Island (Mitchell 1979:101-102). All local groups appear to have had access to salmon streams within their group territories (see Donald and Mitchell 1975:329) and salmon were usually taken at the mouths of streams (ibid.:327). Obviously, those groups which had their winter villages at stream mouths, would have been able to remain sedentary at this time. Family groups from other villages probably set up camps at these harvesting locations. Again, the harvest of other resources during summer and fall, such as land mammals, berries and roots and other fish would have required setting up small resource extraction camps at various localities.

In spite of the large gaps in the settlement data presented here, some general statements can be made concerning the Kwakiutl settlement system. The Kwakiutl system is characterized by much variability. There have been discussions about the different distribution of resources within the Kwakiutl territory (eg. Vayda 1961; Weinberg 1973), and this is evident in the different patterns of settlement. Each village group in each season is characterized by a different settlement pattern, ranging from several camps (in spring, summer and fall) to a single village in the winter, to several villages located in a single location (in all seasons). Furthermore, several different habitats, from ocean island to the heads of inlets were chosen for winter village locations. Resource distribution alone does not account for these differences; perhaps socio-cultural factors begin to intervene here, as they appear to have in the Nass ooligan fisheries of the Tsimshian. Regardless, the mouths of the rivers and streams seem to be the prefered location for settlement in all seasons except winter, when more sheltered areas are sought.

West Coast

The West Coast Indians traditionally occupied the western portion of Vancouver Island with the exception of both the northern and southern tips, which belonged to the Southern Kwakiutl and Coast Salish respectively. The West Coast people are generally divided into three groups according to geographical area -- Northern, Central and Southern.

The Southern tribes (Nitinat and Makah) are excluded from the discussion presented below, as their settlement system seems to differ substantially from the remainder of the West Coast groups, and the data are not complete.

The West Coast people spent the winter months in permanent villages usually located in the protected inlets, however a few groups had villages on the open coast. Settlement locations were chosen for several reasons, with shelter being of upmost importance.

> "Most winter villages were located in the upper reaches of the inlets, in coves that quartered away from the prevailing winds. A level area above the reach of winter storm tides and an open stretch of sand or gravel beach were also deemed necessities. A short steep 'bank' between the house level and the beach proper seems to have been preferred to a long gentle slope; carrying or dragging canoes up and down a short steep pitch was probably reckoned easier than making a long haul...There were a few groups who did not own an 'inside place,' but wintered on the storm-lashed outer beaches. Traditions relate their hardships, when they could not launch their canoes for weeks at a time" (Drucker 1951:67).

Typically, winter time for the West Coast people was one of relative sedentariness. Land game, water fowl, winter huckleberries, ocean fish, clams and drift whales are reported to have been taken at this time. The particular patterns of use, however, depended on the location of the winter village. For instance, inland groups at the heads of inlets depended more heavily on land game than others (Drucker 1951:36). Small groups from the main village would have accomplished these tasks.

According to the ethnographies, the coming of spring meant the breaking up of village units and movement to various locales to harvest resources. Herring, spring salmon and seaweed were ready for harvesting in the early part of this season at the lower reaches of the inlets (Drucker 1951:40-42). Some groups were able to remain in their winter village location during this season while others who had too far to travel set up temporary camps (Drucker 1965:150). Following this, waterfowl could also be taken from these locales. Harvesting halibut or various sea mammals including whales and sea bird eggs, however, required moving again to the outer beaches (Drucker 1951:43, 1965:150-51; Arima 1983:47). Young shoots of various plants were also collected at this time (Arima 1983:47). Shellfish gathering on the inlets also continued (ibid.:48).

By summer time resource collection was focused on the outer coasts.

> "Shelter was less important than water supply for these sites, for owing to the steepness of the land and shallowness of the soil many springs and smaller streams dry up in the summertime. A suitable beach was, of course, as essential as at the winter quarters... Fishing stations, of course, were located with reference to the fishing grounds. The summer villages themselves fall into this category, for they were situated so as to be convenient for sea-mammal hunting and offshore fishing." (Drucker 1951:67).

Whaling, berry and root harvests, deep sea fishing and sockeye salmon fishing, for those groups who had access to sockeye-producing streams, were all pursued at this time (Drucker 1951:57-58).

According to the ethnographies, the settlement pattern for most West Coast groups during the summer season was characterized by several small camps at various resource harvesting localities. In pre-contact times, two of the Northern West Coast groups, however, each resettled on islands off the outer coast as village units. Here, although each village retained its intregal social structure, they were joined together in a loose political organization commonly called a "confederacy" (Drucker 1965:145).

The reason for these large congregations of villages is not clear. It has been suggested that it is in part related to a need for sufficient people to be at hand to receive portions of drift whales before spoiling (Mitchell 1979:106). This explanation is not entirely adequate, as smaller, less closely related groups could have also sufficed in such circumstances. That is, such distinct groups could be invited to feast when a whale drifted ashore.

In fall, the West Coast people again broke up into small groups and moved to the inner coast. Camps were set up at fishing stations to harvest dog salmon. Waterfowl and roots were also sought during this time. After this, the groups reassembled in their winter villages.

One other site type which does not fall into the regular seasonal round are those which were used for defense in times of danger.

> "Small islands guarded by precipitous sides were thus utilized. Poor water supply, and inconvenience for food and fuel gathering prevented permanent habitancy of these places. Temporary stockades were built where there was no refuge island available" (Drucker 1951:67).

It should be noted that the pattern of settlement described ethnographically may not be entirely representative of the pre-contact situation in the West Coast area. Results of archaeological work conducted at Yuquot Sound do confirm the pattern described in ethnographies (Dewhirst 1978, as quoted in Cavanaugh 1983:34). Jim Haggarty, however, after much research on West Coast site distribution, suggests that 80-85% of the settlement system described in the ethnographies may apply only to a mid-historic pattern and not the pre-contact situation (Jim Haggarty, archaeologist British Columbia Provincial Museum, personal communication). This is supported by archaeological work conducted in Hesquiat Harbor. Sites at Hesquiat (dating to at least 1200 years ago) represent much more permanent residence patterns than that described ethnographically (Calvert 1980:262-263). Haggarty's and Inglis' archaeological work on the West

Coast also suggests long term occupation in exposed and semi-exposed areas of the coast where people could have had access to a range of resources. The inner, protected areas, on the other hand, often only offer a specific resource for a short period of time. "The pattern that emerges is one of emphasis on the outside with scheduling to exploit the inside on a seasonal basis" (Haggarty and Inglis 1983:16).

It is difficult to summarize the settlement system of the West Coast people, since there is much variation throughout (see Cavanaugh 1983:34). Winter villages (according to the ethnographies) were situated in a variety of locations -- on inlets, on the mouth of inlets, and further up inlets at river mouths. Few were recorded in this last locality (Drucker only records one). Situated near the open waters, villagers had access to a greater range of resources throughout the year. In fact, only summer and fall salmon runs would have been inaccessable from the outer coast without requiring a major relocation of village inhabitants. It seems plausible that the majority of resource collection done at a distance from the outer coast was conducted by small task groups sent from each village.

Coast Salish

The Coast Salish traditionally occupied both the east side of Vancouver Island as far north as Salmon Bay and the mainland coast facing the island territory and as far inland as Yale on the Fraser River. The Coast Salish are divided into six language groups, each of which are in turn composed of several local groups (Suttles 1978; Barnett 1955). Each of these local groups resided in separate winter villages in close proximity to other members of the same language group. Individual subsistence-settlement data for each of these groups is quite scanty. The seasonal round for each group does appear to have been quite variable. Furthermore, the seasonal round of the local groups occupying the lower reaches of the Fraser River and its tributaries (collectively called the Halkomelem) differed substantially from that of the other Coast Salish groups. Because of this difference, as well as the absence of comparably detailed data on seasonal activities of the Halkomelem, the Halkomelem will be discussed separately from the remaining Coast Salish groups.

Each local Halkomelem group, composed of several villages, claimed a stretch of the Fraser or a major tributary (Duff 1952:19). From this location five species of salmon, sturgeon, trout and ooligans (in the lower reaches of the river) could be caught. In addition land mammals and plant resources could be harvested along the river or in the adjacent mountains (ibid. 62,67,70,72,73). Almost no information is available concerning seasonal movement and establishment of temporary camps by the Halkomelem. Presumably, much of the subsistence pursuits were conducted at the main village, with occasional small task groups being sent out to procure various resources.

The winter villages of the other Coast Salish groups were located predominantly on sheltered bays or inlets; however a few were situated further inland near river mouths and further upriver. Such sites were chosen to protect from storms and strangers (Barnett 1955:18). Futhermore, "interest centered upon beach sites conveniently located with respect to gathering and hunting grounds....Winter villages are always to be regarded as the foci for such pursuits" (ibid.:19). As with other Northwest Coast people, economic pursuits were kept to a minimum during the winter months. It was not until the coming spring time that such pursuits resumed a major focus.

According to the ethnographies, for most village groups spring meant leaving the winter settlement for various resource harvesting areas. Some groups travelled to the islands to harvest halibut, sea mammals or herring, while others collected clams, sea bird eggs, camas and probably seaweed. Some also travelled inland to hunt land mammals at lakes at the heads of inlets (ibid.:20,22,29). Seven village units of the Squamish groups travelled to the ooligan fisheries at the river's mouth, while the other eight villages could harvest it from their winter village location (ibid.:31; Mitchell 1979:101). Still another group is reported to have remained sedentary during this season, and perhaps, at least part of that village, for the entire year presumably because of a relatively accessible supply of seasonal foods. (Barnett 1955:33; Mitchell 1979:101). Several of these activities were accomplished by entire villages moving to harvesting areas, while others may have been conducted by smaller groups at smaller settlement sites.

Summer activities also involved movement by most groups. Much of the orientation of the southern groups at this time was toward the salmon fisheries which were so abundant near the southern arm of the Fraser. One chum salmon fishing station has been recognized archaeologically at the Little Qualicum River site. Site location was chosen because it was:

> "[a] topographically suited location, relatively protected from the elements, easily accessible by watercraft, and at the juncture of several resource zones regularly exploited by the inhabitants....the shoreline with exploitation concentrated on the river, the intertidal zone, nearby subtidal waters, and immediately adjacent terrestrial areas (Bernick 1983:201).

Other groups harvested berries, sturgeon and clams. Hunting was also conducted. Again, several groups moved as village units and still others either remained at their winter village sites or returned to them at this time (Barnett 1955:19,22,23,27,29,31,34).

For those groups not already located at a fishing station, fall time meant another move to harvest salmon. For some groups this meant returning to their winter village locations; others returned after the season was completed. Both village and smaller units congregated at this time.

Published archaeological investigations in the area add additional information concerning the prehistoric settlement pattern of the Coast Salish. A site survey on eastern Vancouver Island yielded the remains of "a limited number of central village locations providing bases for diversified exploitation of resources accessible from those central locations. This pattern resulted in a majority of numerous small sites, and a minority of large ones" (Cassidy 1983:38). In the northern half of Vancouver island fewer small sites were found which may indicate either that a central village location served as a base more often for other activities, or that a greater number of small sites was reused repeatedly (ibid.:38). Indeed, even given the paucity of investigation undertaken thus far, it seems that in both the northern and southern portions of Vancouver Island the permanent village and satellite camps characterized much of the settlement pattern.

Some general statements concerning the Coast Salish prehistoric settlement patterns can be made. Permanent settlements other than those of the Halkomelem, appear to have been located predominately on the outer coast, both for protection from the elements, but also, and probably more importantly, to harvest the maximum number of seasonal resources from a single locality. This also seems to apply to at least two of the settlements located further inland, at the head of Howe Sound and ten miles up the Toba River. In both instances these villages had access to "out of season" resources ("winter salmon" for one group, and spring ooligan for another), which extended the harvest season from that one location beyond that of other inland localities. The Fraser River Halkomelem, too had access to an almost year round supply of resources from a single winter village location. Whether small satellite camps were set up or entire villages moved to harvest other resources not available from the winter village location, is not known. The settlement localities do seem to be chosen, however, to minimize travel (energy output) to the maximum number of resources throughout the seasons.

Summary and Conclusions

As the previous survey illustrated, there is much variation in settlement patterns both within and between groups along the coast. Because of the great diversity in terrain and resource distribution, as well as socio-cultural factors, each local group followed a unique seasonal round. Accordingly, site location and degree of sedentariness also varied considerably.

In spite of the differences, some general patterns emerge. Almost all groups had the same criteria for specific village location. A safe and easy landing place for canoes, shelter from winter storms and protection from invaders were of prime consideration. In addition to these qualifications, villages seem to have been located in order to maximize harvest to the greatest number of resources throughout the seasons. That is, by locating the permanent village in such a location, resource collection was most efficient.

Other cultural factors, beyond energy efficiency or protection from raiders, also played a part in determining settlement patterns. Village location which increased accessibility to prized commodities, such as the Nass ooligan, or trade items also seem to be preferred areas of settlement.

Patterns emerging from this review correspond closely to the Nuxalk settlement system. Fear of attack and protection from the elements were not significant factors for the Bella Coola valley Nuxalk because the valley itself offered sufficient protection. Likewise, the banks of the River were such that canoe access was probably never too much of a problem. Similar to other groups, preferred village location within the valley clearly was in those areas which offered the greatest number of resources (which may or may not include salmon) from a single location. In the few cases where primary villages were situated in other than "optimal" locations, other (cultural) factors seem to have influenced the decision to settle in a specific location.

Ecologically, the areas inhabited by the Tlingit on the mainland rivers, the Coast Tsimshian,and the Fraser River Halkomelem appear to be most similar to that of the Bella Coola valley Nuxalk. Each of these groups had access to large rivers with all five species of salmon. The presence of all five species meant that for those groups with river access, the salmon harvesting season spanned several months. This, in addition to the availability of other resources, permitted relatively greater sedentariness for these groups. It is interesting to note, however, that other groups who did not have access to such rivers (ie. the West Coast and Kwakiutl), were also able to adopt a more sedentary lifestyle in some instances. The availability of several types of resources throughout the seasons made this possible.

Clearly, there are many gaps in the settlement data presented here. Our knowledge of settlement systems on the Northwest Coast would greatly benefit from an integrated approach to studying settlement. The settlement system should be viewed in the context of the larger culture of which it was a part. Factors from several aspects of the socio-economic world of the group in question should be encompassed into all investigations. Tests should be developed which examine the association between such factors and settlement; ethnographic and archaeological information should be included in all such analyses. Only in this way can a fuller understanding of prehistoric settlement systems on the Northwest Coast be developed.

Chapter VI

SUMMARY AND CONCLUSIONS

This thesis examines the major components of the settlement system of the late pre-contact Nuxalk. The methodological and theoretical approach of this study was synthesized from other settlement studies in the current anthropological and archaeological literature. A review of the literature suggests that major drawbacks of many settlement studies stem from (1) an a priori acceptance of the energy maximization postulate, and (2) the assumption that a single factor can determine settlement patterns. Although optimization of energy does appear to be an important criterion in human behavior in general, and settlement pattern choices specifically, it is not the sole motivating force behind settlement decisions. Other determinants, from both the natural and cultural environments of a group will interact with one another to produce an unique set of settlement decisions.

Assessing which determinants are relevant to a given settlement system is a crucial and difficult first step in these studies. While models of non-human foraging behavior, and the ethnographic literature can be used to compile a set of potentially important variables, there are always unknown factors. Such unknowns may affect settlement patterns or may only have secondary influence through another variable.

Determinants which potentially influenced the Bella Coola valley Nuxalk settlement pattern were derived from the Nuxalk ethnographic literature and interviews with Nuxalk elders. The analysis focused on eight determinants: the presence of salmon, other aquatic resources, plant resources, animal resources, mineral resources, trade, shelter from the elements and protection from raids. Each determinant was examined with respect to its potential importance to the socio-economy of the Bella Coola valley Nuxalk. Bella Coola valley villages were ranked according to the influence by each of these determinants. From this, a rank order of villages according to their relationship to all determinants, was derived.

This study suggests that the presence of a range of food resources throughout the seasons was most important in determining settlement locations in the Bella Coola valley. Cultural (i.e. non-resource) factors appear to have had only secondary influence on settlement decisions. For the Bella Coola valley Nuxalk food needs were largely met by the plant and aquatic resources in the diet.

Without adequate data on energy value of these resources it is impossible to make definitive statements concerning the role of energy in food selection in the Nuxalk diet. The Bella Coola valley data suggest, however, that energy factors did play an important role in site selection. Energy output for the harvest of these species was minimized by settling at the river's mouth, where the greatest number and diversity of these resources were accessible.

The river's mouth, and the lower valley generally, were found by this study to have access to and be influenced by, the greatest number of determinants. Settling in the lower valley meant increased access to both fat-rich ooligan and carbohydrate-rich root crops in the winter and spring, when other stores were low. Additionally, access to a range of other foodstuffs throughout the year would have met other nutritional requirements. In turn, greater accessibility to these resources by the lower valley peoples influenced other aspects of the Nuxalk socio-economy, such as participation in trade and the creation of marriage alliances with others living in less "preferred" areas of the valley. In the future, more sophisticated tests than those applied here may help our understanding of the correlation and/or degree of causality of each of these factors on the settlement system.

Comparisons of settlement systems of other Northwest Coast groups during the same time period illustrate a pattern similar to that described for the Nuxalk. Non-energy factors, such as fear of attack, protection from the elements and access to trade routes, affect settlement decisions to greater or lesser degrees in different groups given the particular way those variables interact in the settlement system. In those instances where energy considerations are of greater importance, settlements are situated such that a range of resources can be harvested throughout the year from a single location. Again, attempts were made to minimize energy output by decreasing both the amount of travel to several resources and the need continually to relocate settlements.

This thesis contributes to the study of Northwest Coast settlement systems both theoretically and methodologically. The tendency in the Northwest Coast settlement literature is to focus on a single factor, usually salmon, and how its abundance and distribution affects the distribution of sites. In this study no _a priori_ assumptions are made as to the sole important factor. Instead, several potential determinants are examined to determine their affect on individual settlements and the settlement system as a whole. Methods developed in this thesis for examining these determinants are expanded from existing techniques. New field and laboratory techniques were also introduced.

Much future work is needed in the study of settlement systems on the Northwest Coast. Ideally, methods developed to analyze attributes of the settlement system will incorporate scales of measurement which are meaningful in the context of the society in question. More ethnographic research is needed to collect information concerning attributes such as taste preference, food taboos, etc. which will aid in our understanding of the relationship between resource selection and settlement patterns. Researcher's bias as to the most important factor influencing settlement patterns must be avoided. Both necessary <u>and</u> sufficient factors need to be examined. Archaeologists should view settlement patterns as the remains of a complex set of decisions all of which interact to create a larger settlement system.

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APPENDIX I
Plant Resources Utilized by the Nuxalk[1]

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Alga	Egregia menziesii[3]	Boa Kelp	food	outer coast
	Fucus sp.[3]	Sea Wrack	to make steam in pits for cooking or medicinal sweat baths	Bella Coola waters
	Nereocystis luetkeana[3]	Bull Kelp	occasionally used as a container to store ooligan grease	outer coast
	Porphyra spp.[3]	Red Laver	food	outer coast
	Rhizoclonium sp. and others[3]	Green Rock Algae	medicinal	shallow, slow water
Fungi	Fomes officinalis and others[2,3]	Bracket or Shelf Fungus	ceremonial dances; medicinal; a shelf fungus grows on hemlock used for paint, that from willow for starting fires	mature forests
	Bovista pila and and Lycoperdon sp.[3]	Puffball	spores for sores and wounds	clearing in forests
Lichens and Bryophytes (lichens, mosses, liverworts)	Alectoria sarmentosa and Usnea spp.[2,3]	-	decorate masks; medicinal	mature forests
	Lobaria pulmonaria, L. oregana and Sticta sp.[3]	-	medicinal	mature forests
	Letharia vulpina[2]	"Yellow Moss"	dye for mountain goat wool	mature forests upper Bella Coola valley (BCV)
	Hylocomium splendens, Rhytideadelphus loreus and others[2,3]	-	padding	mature forests
	Plagiomium insigne, Rhizomnium glabrescens and others[3]	-	medicinal	mature forests
Pteridophytes (ferns and fern allies) Equisetaceae (horsetail family)	Equisetum arvense, E. telmateia, and E. hyemale[2,3]	Horsetails	"bean-like objects on the roots" were eaten raw; as sandpaper	along streams and other moist areas
Polypodiaceae (Fern Family)	Athyrium filix-femina[3]	Lady Fern	medicinal	wet mature forests
	Polypodium glycyrrhiza[3]	Licorice Fern	rhizomes chewed for flavor or medicine; medicinal tea	on rocks in mature, wet forests
	Polystichum munitum[2,3]	Sword Fern	roots chewed when hungry, but not taken home	mature wet forests
	Dryopteris filix-mas[3]	Male Fern	rhizomes eaten; medicinal	higher elevations at base of snoe banks and rock slides
	Pteridium aquilinum[2,3]	Bracken Fern	rhizomes eaten	drier forests and forest edges
Gymnosperms (conifers) Cupressaceae (Cypress Family)	Chamaecyparis nootkatensis[2,3]	Yellow Cedar	inner bark for weaving, etc.; medicinal	mouth Bella Coola inlet and few high in mtns; by trade from Bella Bella, Kwatna and River's Inlet
	Juniperus communis[3]	Creeping Juniper	roots, leaves bark medicinal	higher elevations in the upper BCV and Interior
	Thuja plicata[2,3]	Western Red Cedar	branches, bark and wood for carving, weaving, arrows, houses, canoes, etc.; roots and boughs for baskets; bark and boughs medicinal	used to be common in both mtns. and bottomlands in mature forests of BCV, but of better quality (and preferred) from Talchako River and near Kwatna

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Pinaceae (Pine Family)				
	Abies amabilis[3]	Silver Fir	medicinal	higher elevations in the upper BCV and Interior.
	A. grandis[2]	Grand Fir	cambium eaten; medicinal	few in the upper parts of the lower side valley in the BCV and in upper BCV
	Picea sitchensis[2,3]	Sitka Spruce	roots used for baskets; wood used for tools; cones, cambium, bark, sap and buds medicinal; boughs ritual uses	mature forest in the lower BCV
	Pinus contorta[2,3]	Lodgepole Pine	cambium seldom eaten; roots for food [?]; roots and wood for material and fire wood; sap medicinal	few in lower BCV, many at Kimsquit, Firvale and North Bentinck Arm
	Pseudotsuga menziesii[2,3]	Douglas Fir	cambium eaten; roots for food [?] and material; wood for tools and fire wood	at Firvale and eastwards, and in side valleys of the BCV; in mtns. 15 miles down N. Bentinck Arm; large nos. in Bella Bella
	Tsuga heterophylla[2,3]	Western Hemlock	cambium eaten; boughs used to collect herring eggs; wood for tools; medicinal	mature forests thoughout the BCV, especially in the lower valley
Taxaceae (Yew Family)	Taxus brevifolia[2,3]	Western Yew	wood for tools	30 miles down the coast from the BCV and near Bella Bella and Namu
Angiosperms (Flowering Plants) Monocotyledons				
Araceae (Skunk Cabbage Family)				
	Lysichitum americanum[2,3]	Skunk Cabbage	fruit eaten; leaves for containers and lining pits; roots medicinal	stream banks, entire BCV, especially in the lower BCV
Lilliaceae (Lily Family)	Allium cernuum[2,3]	Wild Onion	bulbs eaten	rare; found at Green Bay, about 10 miles down North Bentinck Arm
	Clintonia uniflora[3]	Queenscup	roots and leaves medicinal	mature forests throughout the BCV
	Fritillaria camschatensis[3]	Mission Bells	bulbs eaten	tidal flats; few in BCV, more common on creeks up Four Mile Mtn.
	Maianthenum dilitatum[2,3]	Wild Lily-of-the-Valley	berries eaten fresh or dried	mature forests of the lower BCV
	Smilacina stellata, S. racemosa[3]	Star-flowered Solomon's Seal	juice of berries eaten	mature forests throughout the BCV
	Veratrum eschscholtzii[2,3]	False Indian Hellebore	outer root core medicinal	higher elevation throughout the BCV
Poaceae (Grass Family)	Agropyron spicatum[2]	Bunchgrass	for socks; to seperate dry berry cakes	upper BCV, middle elevation in mtns.
Cyperaceae (Sedge Family)	species unidentified[2]	"Rip-cut Grass"	lower leaf section of young plant eaten	unknown

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Dicotyledons				
Aceraceae (Maple Family)	Acer glabrum[2,3]	Douglas Maple	bark for tumplines and spoons; stems for ooligan racks; wood for spoons, mesh block, toy rattles and snowshoes	many in upper BCV, and in lower valley succession forests
Apiaceae (Parsley Family)	Angelica genuflexa[?][2,3] A. lucida ?[3]	Kneeling Angelica	stem for drinking straw and breathing tube in water; roots possibly eaten [?]	tidal flats
	Cicuta douglasii [?] or Oenanthe sarmentosa[3]	Water Hemlock Water-parsley	medicinal	tidal flats
	Conconselinum pacificum [?][2] or Sium suave [?][2,3]	Hemlock-parsley Water Parsnip	root eaten;	tidal flats
	Heracleum lanatum[2,3]	Cow Parsnip	young stem and leaves [?] eaten; roots medicinal	along creeks and disturbed wet areas in lower valley
	Ligusticum canbyi[3]	Lovage	leaves medicinal	higher elevations in upper BCV
	Osmorhiza chilensis[2,3]	Sweet Cicely	roots eaten rarely; roots medicinal	wet mature and succession forests in lower BCV
Apocynaceae (Dogbane Family)	Apocynum androsaemifolium[2,3]	Spreading Dogbane	fibre or inner bark for twine and nets	rocky places and mtns. in upper BCV
Araliaceae (Ginseng Family)	Aralia nudicaulis[2,3]	Sarsaparilla	roots for tea and medicine	late succession and mature forests in entire BCV bottomlands
	Oplopanax horridum[2,3]	Devils-club	stem and root bark medicinal	mature, wet forests lower BCV
Aristolochiaceae (Birthwort)	Asarum caudatum[3]	Ginger-root	root medicinal	shaded woods throughout BCV
Asteraceae (Aster Family)	Achillea millefolium[3]	Yarrow	leaves medicinal	tidal flats and disturbed soils throughout BCV
	Antennaria neglecta[3]	Pussytoes	leaves medicinal	dry open forests throughout BCV
	Arctium minus[3]	Common Burdock	roots medicinal [introduced]	disturbed soils throughout BCV
	Lactuca biennis[2,3]	Tall Lettuce	roots medicinal	tidal flats
	Prenathes alata[3]	W. Rattlesnake-root	roots medicinal	along streambanks, throughout BCV (?)
Betulaceae (Birch Family)	Alnus incana and A. sinuata[3]	Mtn. Alder Green Alder	cones, buds and bark medicinal	at higher elevations, along streams and avalanche runs
	A. rubra[2,3]	Red Alder	bark for dye; wood for fuel and carving; bark medicinal	succession forests through-BCV
	Betula papyrifera[2,3]	Paper Birch	bark for baskets, occassionally canoes, and for charms	rare in lower valley, more common in upper valley

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Caprifoliaceae (Honeysuckle Family)	Lonicera involucrata[2,3]	Black Twinberry	leaves and bark medicinal	wet succession forest in lower BCV
	Sambucus racemosa[2,3]	Red Elderberry	berries eaten; roots and bark medicinal; stems for pipe bowls and sights for arrows	wet succession forests and wet disturbed soil throughout BCV
	Viburnum edule[2,3]	Highbush Cranberry	berries eaten; bark medicinal	wet succession forests and mature set forests throughout BCV
Celastraceae (Staff-tree Family)	Pachystima myrsinites[3]	False Box	medicinal	?
Cornaceae (Dogwood Family)	Cornus stolonifera[2,3]	Red-osier Dogwood	branches for snowshoes and barbeque racks, bark smoked, inner bark medicinal	wet succession and mature forests throughout BCV
	Cornus canadensis[2,3]	Bunchberry	berry eaten	common in mature and succession forests throughout BCV
Crassulaceae (Stonecrop Family)	Sedum divergens[3]	Stonecrop	stalks and leaves medicinal	Kimsquit and upper BCV rocky slopes
Elaegnaceae (Oleaster Family)	Sheperdia canadensis[2,3]	Soapberry	berries eaten	upper BCV on mtn.sides, often not reaching maturity
Empetraceae (Crowberry Family)	Empetrum nigrum[3]	Crowberry	leaves medicinal	rare in BCV; possibly rocky bluffs in upper BCV
Ericaceae (Heather Family)	Arctostaphylos uva-ursi[2,3]	Kinnikinnick	berries eaten; leaves smoked	few in mtns. of lower BCV; common in bottomlands of upper BCV
	Gaultheria shallon[2,3]	Salal	berries eaten; leaves medicinal	few at higher elevations in lower BCV; west side South Bentinck Arm
	Ledum groenlandicum[2,3]	Labrador Tea	leaves for tea and medicinal	in bogs; rare in BCV
	Menziesia ferruginea[2]	False Azalea	twigs used to spread salmon	mature dry forests and streambanks, especially lower BCV
	Vaccinium alaskaense[3]	Alaska Blueberry	berries eaten	mature wet forests lower BCV
	V. caespitosum[2,3]	Dwarf Blueberry	berries eaten	Kimsquit and upper BCV
	V. membranaceum[2,3]	Mtn. Bilberry	berries eaten	higher elevation of lower BCV; upper BCV; Kimsquit
	V. ovalifoium[2,3]	Oval-leaved Blueberry	berries eaten	mature wet forests lower BCV and along bogs
	V. parvifolium[2,3]	Red Huckleberry	berries eaten	dry, mature forests, especially BCV mtn.sides

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Fabaceae (Pea Family)	Lupinus nootkatensis[2,3]	Blue Lupine	roots eaten	edge of tidal flats
	Trifolium wormskioldi[2,3]	Wild Clover	roots eaten	tidal flats
Grossulariaceae (Gooseberry Family)	Ribes bracteosum[2,3]	Stinke Currant	berries eaten; branches used; berries medicinal	stream edge in forests at lower elevations
	R. divarcatum[2,3]	Wild Gooseberry	berries eaten; inner bark, root bark and outer stem medicinal	late wet succession forest throughout BCV
	R. lacustre[2,3]	Swamp Gooseberry	berries eaten; entire plant plant medicinal	mature and late succession forests throughout BCV
	R. laxiflorum[2,3]	Wild Blue Currant	berries eaten; roots and branches medicinal	mature and late succession forests in lower BCV [?]
Lamiaceae (Mint Family)	Mentha arvensis[2,3]	Canada Mint	leaves medicinal	wet places, lower BCV [?]
	Prunella vulgaris[3]	Self Heal	plant medicinal	moist places, lower BCV
Loranthaceae (Mistletoe Family)	Arceuthobium americanum[3]	Dwarf Mistletoe	stems medicinal	parasitic on Pinus contort rare in upper BCV
Myricaceae (Sweet Gale Family)	Myrica gale[3]	Sweet Gale	branches and fruit medicinal	swamps and bogs lower BCV
Nymphaceae (Water-lily Family)	Nuphar polysepalum[3]	Yellow Pond Lily	rhizomes medicinal	ponds, lower BCV
Onagraceae (Evening Primrose Family)	Epilobium angustifolium[2,3]	Fireweed	young shoots eaten	disturbed soil throughout BCV bottomlands
Polygonaceae (Knotweed Family)	Rumex occidentalis[3]	Western Dock	young leaves eaten; roots and leaves medicinal	disturbed, moist soil, lower BCV
Ranunculaceae (Buttercup Family)	Trautvetteria caroliniensis[3]	False Bugbane	roots medicinal	moist woods and along atreams in lower BCV
Rhamnaceae (Cascara Family)	Rhamnus purshiana[3]	Cascara	bark medicinal	rare in upper BCV; common along outer coast
Rosaceae (Rose Family)	Amelanchier alnifolia[2,3]	Saskatoon	berries eaten; wood for arrows and handles; branch medicinal	disturbed soil, especially upper BCV
	Aruncus sylvester[3]	Goatsbeard	roots medicinal	throughout BCV, along small streams and moist woods
	Crataegus douglasii[2,3]	Black Hawthorn	friuts eaten; thorns for fish hooks	rare in BCV bottomlands; few in mtns of BCV

Family (or class)	Scientific Name	Common Name	use	habitat most likely found in
Rosaceae (cont'd.)	Fragaria spp.[2,3]	Wild Strawberry	fruit eaten	disturbed soil lower [?] BCV
	Geum macrophyllum[3]	Large leaved avens	roots and leaves medicinal	second growth forests lower BCV
	Physocarpus capitatus[3]	Ninebark	branches medicinal	second growth forests lower BCV
	Potentilla pacifica[2,3]	Pacific Silverweed	roots eaten	tidal flats
	Prunus emarginata[3]	Bitter Cherry	bark for weavings; bark medicinal	North Bentinck Arm; upper BCV
	Pyrus fusca[2,3]	Wild Crabapple	fruit eaten; wood for carving spoons, etc.	late succession forests and along tidal flats of the lower BCV
	Rosa nutkana and R. gymnocarpa[2,3]	Wild Rose	friut eaten	R. nutkana in clearings at lower elevations throughout BCV; R. gymnocarpa in mtns. in lower BCV, and throughout upper BCV
	Rubus idaeus[2,3]	Wild Raspberry	friut eaten	distrubed areas throughout valley, more common upper BCV
	R. leucodermis[2,3]	Blackcap	berries eaten	disturbed soil upper BCV
	R. parviflorus[2,3]	Thimbleberry	young stems eaten; berries eaten	disturbed areas entire BCV bottomlands
	R. pubescens[2]	Dwarf Red Blackberry	berries eaten	forests upper BCV [?]; in Interior
	R. spectabilis[2,3]	Salmonberry	young stems eaten; berries eaten	throughout BCV in wet, especially disturbed, soils
	Sorbus sitchensis[3]	Mountain Ash	bark, root, branches and berries medicinal	succession forests throughout BCV
	Spirea douglasii[3]	Hardhack	branches for drying salmon	bog, lower BCV; damp meadows throughout BCV
Salicaceae (Willow Family)	Populus tremuloides[3]	Trembling Aspen	bark medicinal	upper BCV bottomlands; Interior
	Populus trichocarpa[2,3]	Black Cottonwood	cambium eaten; wood for canoes; roots for fires; bark of small trees, gum and leaves medicinal	cottonwood forests along entire BCV bottomlands
	Salix spp.[2]	Willow	branches several technological uses; branches and leaves medicinal	along rivers and streams entire BCV
Saxifragaceae (Saxifrage Family)	Saxifraga ferruginea[3]	Saxifrage	roots and leaves medicinal	moist areas lower BCV
Scrophulariaceae (Figwort Family)	Castilleja minuata and C. unalaschensis[3]	Indian Paintbrush	flowers used in games	common throughout BCV bottomlands
Utricaceae (Nettle Family)	Urtica dioica[2,3]	Stinging Nettle	stem fibres for twine and nets	disturbed wet soils throughout BCV bottomlands

1. Plants for which only post-contact uses are recorded are not included here. Other footnote numbers refer to references below.
2. Smith 1920-1924.
3. Turner 1973.

Appendix II
Animal Resources Used by the Nuxalk

Common Name	Scientific name	Parts Used	Where Most Commonly Found
Fish Resources			
spring salmon	Oncorhynchus tshawytscha	whole fish	
sockeye salmon	O. nerka	" "	
coho salmon	O. kisutsh	" "	Bella Coola River (BCR),
pink salmon	O. gorbuscha	" "	side creeks and tributaries
chum salmon	O. keta		
ooligan	Thaleichthys pacificus	whole fish and oil	lower 4 miles of the BCR
stealhead trout	Salmo gairdneri	whole fish	BCR and upper tributaries
cutthroat trout	S. clarki clarki	" "	BCR and small side streams
dolly varden trout	Salvelinus malma	" "	BCR and side streams
herring	Cupea pallasii	" "	mouth of the BCR
starry flounder	Platichthys stellatus	" "	few at BCR tidal flats; Restoration Bay
rock cod	Sabastocles caurinus	" "	head of South Bentinck Arm and eastwards
ling cod	Ophiodon elongatus	" "	Labouchere Channel
halibut	Hippoglossus stenolepsis	" "	Namu, Kwatna, Kimsquit
perch		" "	unknown
soles		" "	unknown

Common Name	Scientific name	Parts Used	Where Most Commonly Found
Seafood and Sea Mammals			
little-neck clams	Prototheca staminea	meat	
butter clams	Saxidomus giganteus	"	
mud clams	Mya arenaria	"	Restoration Bay, near Namu
horse clams	Schizothaerus capax	"	and Elcho Harbor
cockles	Chinocardium nutalli	"	
mussels	Mytilis californianus	meat, shell	Tallio cannery, Kwatna and Fischer Channel and westwards from Bella Bella
abalone	Haliotis kamtchatkane	shell	outer coast
crabs	Cancer spp.	meat	Kitlope and Kwatna
dentalium	Dentalia spp.	shell	outer coast
sea urchin	Strongylocentrotus drobachiensis	meat	North Bentinck Arm
sea cucumber	Stichopus californicus	meat	South Bentink Arm, Bella Bella
eel		"	outer coast
octopus	Octopus dofleini	"	outer coast
giant barnacles	Lepas anatifera	"	Bella Bella
hair seal	Phoca vitulina	meat, skins	mouth Bella Coola River and channels
sea lion	Eumetopias jubata	" "	" " " " " "
sea otter	Erihydra lutris	" "	" " " " " "
Water and Land Birds			
mallards	Anas platyrynchos	meat	tidal flats and other wet areas in lower
canada geese	Branta canadensis	"	Bella Coola valley, Kwatna and South
whistling swans	Olor columbianus	"	Bentinck Arm
bald eagles	Haliacetus leucocehalus	"	along the Bella Coola River
herring gulls	Lanus argentatus	"	" " " " "
ruffed grouse	Bonasa umbellus	"	Bella Coola valley forests
common loon	Gavia immer	"	Interior lakes
puffin	Fraterlla arctica	"	outer coast

Common Name	Scientific name	Parts Used	Where Most Commonly Found
Mammals			
mountain goat	Oreamnos americanus americanus	meat, horns, bones, wool, stomach, skin	high elevations in Bella Coola valley, North and South Bentinck Arms
coast deer	Odocoileus hemionus sitkensis	meat, skins, bones	South Bentick Arm, lower Bella Coola valley
mule deer	O.h. hemionus	" " "	upper Bella Coola valley
black bear	Ursus americanus	" " "	open forests Bella Coola valley
grizzly bear	U. arctos horribilis	" " "	forests Bella Coola valley
lynx	Lynx canadensis canadensis	meat, skin	forests, especially upper Bella Coola V.
rabbit	Lepus americanus	" "	Bella Coola V. bottomlands
porcupine	Erethizon dorsatum nigrescens	" "	mountains upper Bella Coola V.
beaver	Castor canadensis	" "	wet areas Bella Coola V. forests
marmot	Marmota caligata	" "	Bella Coola V. mountains
wolverine	Gulo luscus luscus	skin	Bella Coola V. forests
marten	Martes americana caurina	"	" " " "
mink	Mustela vison energumenos	"	Bella Coola V. streams, forest edges
racoon	Procyon lotor	"	Bella Cooa V. forests, near water
red fox	Vulpes fulva	"	Bella Coola V.
coyote	Canis latrans incolatris	"	Bella Coola V. forests
otter	Lutra canadensis pacifica	"	Bella Coola V. streams and river shores
skunk	Mephitis mephitis hudsonica	"	Bella Coola V. clearings
weasel	Mutsela erminea	"	Bella Coola V. river banks, mixed forests
fischer	Martes pennantti columbiana	"	Bella Coola V. forests
muskrat	Ondatra zibethica	"	along Bella Coola river

Appendix III
Mean Weights (MW) per Annum for Salmon Producing Streams*

Bella Coola-Atnarko River*** - 1) 184000; 2) 112000; 3) 375000; 4) 460000; 5) 460000; 6) 500000; 7) 390000; 8) 413000; 9) 252000; 10) 508000; 11) 638000; 12) 582000; 13) 638000; 14) 1126000; 15) 800000; 16) 2358000; 17) 890000; 18) 888000; 19) 241800; 20) 720800; 21) 214800; 22) 1402980; 23) 133000; 24)638000; 25) 272000; 26) 1012000; 27) 496000; 28) 904000; 29) 126000; 30) 992000; 31) 443000; 32) 1430000; 33) 853000; 34) 743000

Necleestsconnay River- 1) 22333.3; 2) 7500; 3) 17000; 4) 11166.7; 5) 11833.3 6) 25500; 7) 41000; 8) 15916.7; 9) 3950; 10) 28833.3; 11) 47500; 12) 43500; 13) 21750; 14) 16500; 15) 21033; 16) 72500; 17) 5050; 18) 75000; 19) 3650; 20) 19500 21) 24800; 22) 90000; 23) 1512.5; 24) 54166.7; 25) 5583.3; 26) 15750; 27) 84000; 28) 28000; 29) 5583.3; 30) 28333.3; 31) 3333.3; 32) 17433.3; 33) 17666.7; 34) 33333.3

Salloomt River**- 1) 1900; 2) 13386.7; 3) 8500; 4) 6375; 5) 9250 6) 52800; 7) 8937.5; 8) 2450; 9) 14033.3; 10) 12550 11) 15000; 12)34500; 13) 41500

Thorsen Creek- 1) 3566.7; 2) 8833.3; 3) 72250; 4) 11800; 5) 5633.3; 6) 5450; 7) 15633.3; 8) 1240; 9) 16633.3; 10) 3733.3; 11) 9666.7; 12) 15233.3; 13) 11666.7

Snootli Creek- 1) 4500; 2) 6000; 3) 13666.7; 4) 4133.3; 5) 13225; 6) 4650 7) 22566.7; 8) 513.3; 9) 25600; 10) 10483.3; 11) 16333.3; 12) 15500; 13) 14466.6

Nusatsum Creek**- 1)1750; 2) 2800; 3) 3500; 4) 695; 5) 575; 6) 7066.7; 7) 2050; 8) 5333.3; 9) 2375; 10) 1916.7; 11) 7500; 12) 8600; 13) 8600

Fish Creek- 1) 4066.7; 2) 2100; 3) 3816.7; 4) 2933.3; 5) 2025; 6) 3600; 7) 5983.3; 8) 3616.7; 9) 5766.7; 10) 5266.7; 11) 2633.3; 12) 4100; 13) 4000

Noosgulch Creek**- 1) 366.7; 2) 2640; 3) 2033.4; 4) 1062.5: 5) 5670; 6) 1100; 7) 1366.7; 8) 340; 9) 5012.5; 10) 775; 11) 1675 12) 6900; 13) 5750

Hagensborg Slough- 1) 100; 2) 1000; 3) 4000; 4) 500; 5) 500; 6) 15150 7) 9300

Nooklikonik Creek- 1) 675; 2) 2366.7; 3) 2040; 4) 500; 5) 1000; 6)4050 7) 2950; 8) 1306.7; 9) 1650; 10) 550; 11) 14033.3; 12) 14033.3; 13) 5400

Nuxalk Creek- 1) 1886.6; 2)3433.3;

Airport Side Creek- 1) 370; 2) 1600; 3) 2666.6; 4) 2500; 5) 3925

Tatsquan Creek- 1) 3266.7; 2) 553.3; 3) 270; 4) 145; 5) 252.5; 6) 250 7) 4483.3

Cacahootin Creek- 1) 365; 2) 650; 3) 1125; 4) 1400

Skimliks Creek- 1) 395; 2) 270

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*All streams are calculated only with coho, pink and chum figures, unless otherwise noted. Original fish counts for the Bella Coola and Necleetsconnay rivers are from 1947-1980; all others are from 1970 to 1982.
**These streams also have small numbers of chinook spawning within them.
***Calculated with all five species of salmon.

Appendix IV
DOMINANT SPECIES IN COVER-TYPES

Second Growth New-dry (SGNd)-

Description: This zone is characterized by herbs, shrubs and very young trees. Found in recently cleared/burned areas and scree slopes in the upper valley.

Dominant Utilized Species: swamp gooseberry, wild gooseberry, highbush cranberry, wild raspberry, red elderberry, willows, spreading dogbane, thimbleberry, nootka rose, wild rose, saskatoons, bitter cherry, blackcaps, wild strawberry, bracken fern, kinnikinnik, fireweed

Second Growth Old-dry (SGOd)-

Description: This zone is characterized by mature and almost mature coniferous and deciduous trees, located in the upper valley. Little data is available on the understory of this habitat.

Dominant Utilized Species: alder, cottonwood, douglas-fir, willows, red cedar, birch, maple, spruce, red osier dogwood, thimbleberry, wild raspberry, spirea

Cottonwood (Cot)

Description: Cottonwood trees, intermediate to mature in age, and a thick shrub and layer characterize this cover-type. It is located along the entire valley bottom, along the main river.

Dominant Utilized Species: cottonwood, willows, alder, maple, red elderberry, wild gooseberry, salmonberry, thimbleberry, stink currant

Douglas-fir- wet (DFw)

Description: Mature forest in the valley bottoms in the upper Bella Coola valley

Dominant Utilized Species: douglas-fir, birch, maple, cedar, alder, highbush cranberry, soapberry, red-osier dogwood, wild rose, swamp gooseberry, wild gooseberry, mountain bilberry, red elderberry, kinnikinnik, bunchberry, skunk cabbage, "yellow moss"

Douglas-fir- dry (DFd)

Description: Mature forest on mountain slopes in the upper valley. It is characterized by an absence of cedar and very little understory

Dominant Utilized Species: douglas fir, lodgepole pine, wild rose, spreading dogbane, soapberry, kinnikinnik, "yellow moss"

Second Growth New- wet (SGNw)

Description: Recently cleared areas in the lower valley, characterized by immature trees, shrubs and herbs

Dominant Utilized Species: wild blue currant, red-osier dogwood, swamp gooseberry, wild gooseberry, wild raspberry, nootka rose, salmonberry, thimbleberry, willows, bunchberry, cow parsnip, bracken fern, fireweed, horsetail, wild strawberry

Second Growth Old- wet (SGOw)

Description: Characterized by mature and almost mature coniferous and deciduous trees, very thick underbrush, and a wide range of species diversity. Usually associated with water, in the lower valley.

Dominant Utilized Species: alder, cedar, cottonwood, crabapple, sitka spruce, highbush cranberry, red-osier dogwood, stink currant, wild blue currant, red elderberry, swamp gooseberry, wild gooseberry, nootka rose, salmonbery, spirea, thimbleberry, willows, bunchberry, spiny wood fern, cow parsnip, bracken fern, horsetail, lily-of-the-valley, sarsaparilla, skunk cabbage, star-flowered-solomon's seal, sweet cicely, water parsnip

Western Hemlock- wet (WHw)-

Description: Mature forest of the bottomlands in the lower valley. Characterized by the presence of western hemlock and devil's-club, and a heavy shrub layer

Dominant Utilized Species: red cedar, hemlock, spruce, douglas fir, alaska blueberry, oval-leafed blueberry, highbush cranberry, wild blue currant, red-osier dogwood, red elderberry, swamp gooseberry, bunchberry, lily-of-the-valley, spiny wood fern

Western Hemlock- dry (WHd)-

Description: Mature hemlock forests of the lower valley, usually on a mountainside. Characterized by the absence of devil's-club, little shrub layer, and a heavy moss layer

Dominant Utilized Species: douglas fir, hemlock, red huckleberry, wild blue currant, kinnikinnik, bunchberry, bracken fern, spiny wood fern, lily-of-the-valley, sarsaparilla, star-flowered-solomon's seal

Tidal Flats (TF)

Description: Located at the mouth of the Bella Coola River; characterized by a homogeneous herb layer and a few shrubs and shrubby trees

Dominant Utilized Species: crabapple, nootka rose, willows, clover, cow parsnip, hemlock-parsley, horestails, lupine, silverweed, riceroot, water parsnip