5

Celt Manufacture, Context, and Distribution

This chapter will examine the use of nephrite on the British Columbia Plateau through the analysis of nephrite artifact attributes and a review of the contexts in which nephrite artifacts have been recovered. The first section focuses on the choices that prehistoric Interior groups made concerning the materials and manufacturing methods used in celt technology. The second section is an analysis of the context and distribution of nephrite on the British Columbia and Columbia Plateaus.

Prehistoric Celt Manufacture on the British Columbia Plateau

Observations were made on 84 different groundstone artifacts from the Interior of British Columbia, as well as several from the Lower Fraser area and the Coast. The sample of artifacts was taken from collections stored at the Museum of Ethnology and Archaeology at Simon Fraser University and the Department of Anthropology and Sociology at the University of British Columbia. When selecting the artifacts for study, my aim was to explore the manufacturing aspects of celt technology, regardless of material type. Along with this, I also undertook an examination of various types of artifacts (beyond celts) that appeared to be made out of nephrite. There was no attempt to examine other groundstone artifact types (i.e., mauls, sculptures, pipes) where nephrite did not appear to have been used. An explanation of the types of measurements and attributes recorded, as well as the data collected, are found in Appendix 1. No effort was made to classify the objects beyond a functional level.

Most of the artifacts examined were celts (Table 5.1). Other types of artifacts included celt blanks, chisels, knives, manufacturing debris, sawn boulders, and miscellaneous ground fragments. In addition, a gouge and a celt rejuvenation fragment were examined.

In total, 55 celts were analyzed. Most were complete, followed by distal, medial and proximal fragments (Table 5.2). The average dimensions for all the celts are listed in Table 5.1. Looking only at the complete celts, the largest specimen was 290 millimeters long and the smallest 40.1 mm long. As seen in Figure 5.1, most of the celt lengths are below the mean of 121.2 millimeters.

The majority of the sample came from private collections that were donated to the museums. Some of the artifacts have a specific site provenience, but others can only be attributed to a general area within the Interior of British Columbia (Table 5.3).

Celt Blank Manufacture

From the attributes present on the celts, and the accompanying manufacturing debris from the British Columbia Plateau, it is evident that flaked blank, sawn blank and possibly pebble modification were utilized. Of the methods noted, clearly the majority of celts were made using sawing techniques, followed distantly by flaking. No positive identification of modified pebble celts were made, but several of the indeterminate celts had characteristics could possibly be ascribed to this type of celt (i.e., oval cross-section, cortex).

Most of the flaked blank celts were crude in their appearance. Some celts were little more than a bit ground on some fortuitously detached flakes of nephrite. Only a limited amount of attention was given to shaping their overall form (i.e., SFU 93-1-993, 93-1-113, 4519). Others, however, were well shaped by flaking and grinding procedures (i.e., SFU ElRn 13:3; UBC EfRl 258-428).

The sawn blank approach to manufacturing celts was the dominant reduction method used in the sample. Based on the manufacturing evidence left behind on the celts, sawn boulders and other manufacturing debris, it is possible to determine four methods used to make celts by sawing. These methods are as follows:

Method 1. The simplest form of the sawn blank celt. As illustrated in Figure 5.2, this method involves only one saw cut near the exterior of a cobble/boulder. If the stone is of correct size and shape, it is possible to create a fully functional celt with a minimal amount of additional grinding after the initial sawing.

Using this method there is no necessity to snap the blank out of the boulder if the cut is made through the entire thickness of the cobble. The celt produced typically has a cortical

Table 5.1. Numbers and Average Dimensions of Observed Artifact Types.

Artifact Type	Number		Length	Width	Thickness
Celts	55	Mean(All):	103.2	44.2	13.4
		Complete - mean:	121.2	47.5	14.1
		- σ	68.6	9.8	4.4
Unfinished Celts(Celt Blanks)	6	Mean (All):	137.0	42.0	19.4
		Complete - mean:	126.2	47.1	16.4
		- σ	37.8	14.5	8.7
Chisels	2	Mean (All): - mean	41.9	17.0	3.7
		- σ	3.3	3.8	1.2
Celt Rejuvenation Fragment	1		34.3	29.3	8.1
Gouge	1		46.0	20.1	4.6
Knives	2	Mean (All):	65.3	29.7	5.4
		Complete - mean:	72.2	32.8	4.9
		- σ	7.9	20.9	0.14
Manufacturing Debris	9		120.2	43.4	20.0
Miscellaneous Fragment	3		84.3	36.6	11
Sawn Boulders	5	All -	233.9	97.6	62.2
		Complete - mean:	321.5	130.8	77.7
		- σ	99.2	45.8	14.7

Table 5.2. Celt Portions Analyzed.

Portion	Number	Percent
Complete	31	56 %
Distal (pole missing)	13	24 %
Medial (pole and bit missing)	5	9 %
Proximal (bit missing)	4	7 %
Bit Fragment	2	4 %
Total	84	100%

Table 5.3. Artifact Provenience.

Provenience	Number	Provenience	Number
Bostok Ranch, Tranquil	1	EfQv 1	2
Cache Creek	1	EfQv 2, Little River	3
East Lillooet	2	EfQv 9	1
EbRj 1 (Lytton)	2	EfRl 253	1
EbRj 92 (Lytton)	1	Egmont *	1
Lytton	17	ElRn 14	2
Lytton ?	1	FaRn (Williams Lake area)	1
EdRk 3 (Lochnore Locality)	2	Interior	1
EeQl 3	1	Interior ?	1
EeQs 1	1	Lillooet	15
EeQw 1 (Chase)	3	Nicola	2
EeQw 3, S. Thompson River	3	Nicola Valley	1
EeQw 5 ?, Little River	2	North Lytton	3
EeQw 6, S. Thompson R	2	North Lytton, Burial 2	1
EeRl (Lillooet Area)	4	Pitt Meadows *	1
EeRl 19, Fountain Site	1	South Thompson (EpSi1?)	1
EeRl 7 (Lillooet)	3	Tsawwassen *	1
EeRm (Seton Lake)	1	Unknown (probably Interior)	1

*Not from the Interior

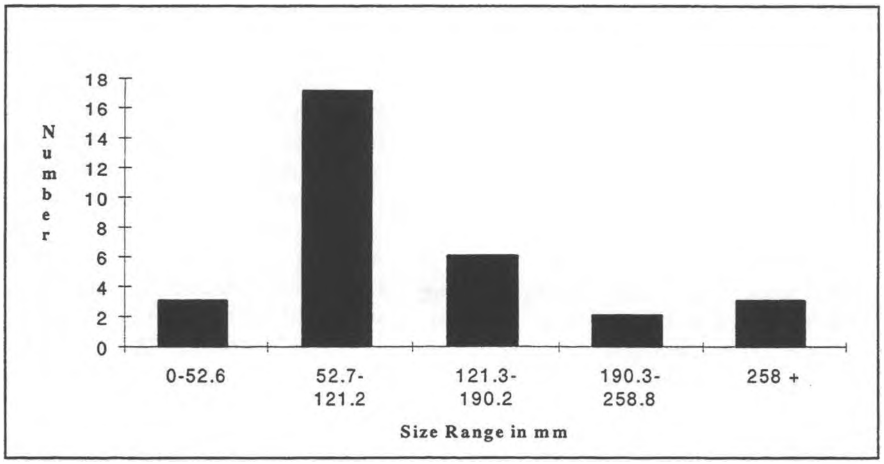

Figure 5.1. Size Ranges for Complete Celts.

Table 5.4 - Celt Blank Types (including unfinished celts and chisels)

Blank Type	Number	Percent
Sawn Blank	44	72%
Flaked Blank	8	13%
Indeterminate	9	15%
Total	61	

rind over one face and evidence for sawing on the other. An example of this type of celt was found at Keatley Creek (SFU #5534&5524). Several other examples, including an abandoned sawn boulder, were also observed in the assemblage from the Flood site in the Lower Fraser Valley.

It should be noted that multiple celts can be removed from an appropriately shaped cobble/boulder. However, the advantage of the method is lost with secondary celt removal because of the need to grind bits onto the ensuing blanks.

Method 2. This second method of sawing was described by Emmons (1923:22-23) for large, irregular boulders. In this procedure (Figure 5.3), two parallel grooves are sawn into a boulder, with the depth of each groove depending on the desired thickness of the celt. At this point, Emmons (1923:22) records that wedges were placed into the groove. With equal pressure, these wedges were driven into the grooves in order to snap out the celt. The results varied and at times Emmons (1923:22) documents that there were failures. (i.e., the celt was only partially freed from the boulder). There is one instance on a sawn boulder now at UBC (EeRl-x:12) where a partial celt fragment is still present between two grooves. However, there appears to have been variation in the method to minimize the risk involved in removing celt blanks. In some instances, there appears to have been a third groove placed perpendicular to the other two grooves. This was created to decrease the distance to be snapped (see Figure 5.3) and therefore minimize the chance of breakage. It is probable that this method was used to produce some of the longest celts because of the lowered risk. Celts manufactured in this fashion often have the remnants of the snap area remaining on one margin, unless it has been ground away.

Once the initial celt has been removed from a boulder using this method, subsequent celt removals can be accomplished with less effort. On one of the sawn boulders I examined there is evidence for the removal of multiple celts (SFU 2815). It is conceivable that such a sawn boulder could have had considerable value.

Method 3. This method is used to reduce flat boulders/cobbles of nephrite. It too was described by Emmons (1923:22-3) and is quite similar to the Maori method for sawing nephrite (Best 1974:73). In this approach, a nephrite boulder/cobble is cut by sawing grooves in each face of the rock (Figure 5.4). After sawing was completed, the central rib is broken and the blank removed. Celts made from this blank form usually have a distinctive snap scar on at least one face, instead of the margins, unless it is ground away. Depending on its size, a number of celts can be removed from this type of boulder.

Method 4. This is an alternative method used to reduce flat boulders/cobbles. As demonstrated in Figure 5.5, this technique involves sawing three grooves to create a blank -- two parallel grooves on one face and a centrally cut groove on the other face of the rock. If the central groove is wide enough, there may not have been the need to break the celt from the boulder. Some celts have deep grooves in their margins (e.g., UBC EeQw 1:41) which suggests this type of removal. Similar to the other methods, after one celt has been removed from a boulder, others can be removed more easily.

Celt Blank Modification

After a blank has been sawed from a boulder/cobble, usually further modification has to be performed to make the celt functional, including grinding the bit and shaping the margins. There is a possibility that the bit may be ground on a blank before its removal by altering the shape of the cutting grooves. If the bit is not added in this fashion, it must be installed by either pecking or grinding. There is some evidence that the bit may be ground before the margins are finished. Some celt blanks were noted to be too wide to be functional for woodworking, yet a partial bit was present.

Shaping the margins of a celt could take up to two additional saw cuts. The margins of the celt can be shaped by removing the cortical area on the external side of the celt and the

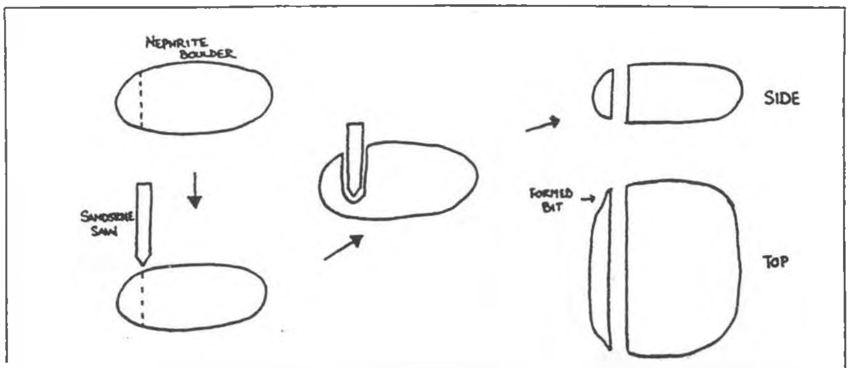

Figure 5.2. Method 1.

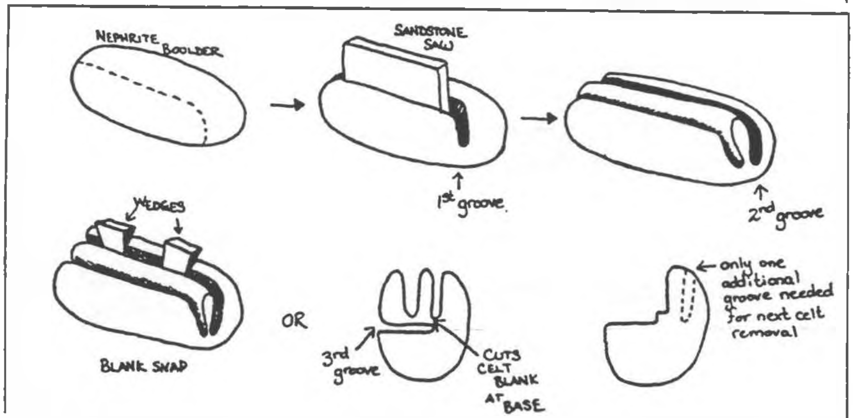

Figure 5.3. Method 2.

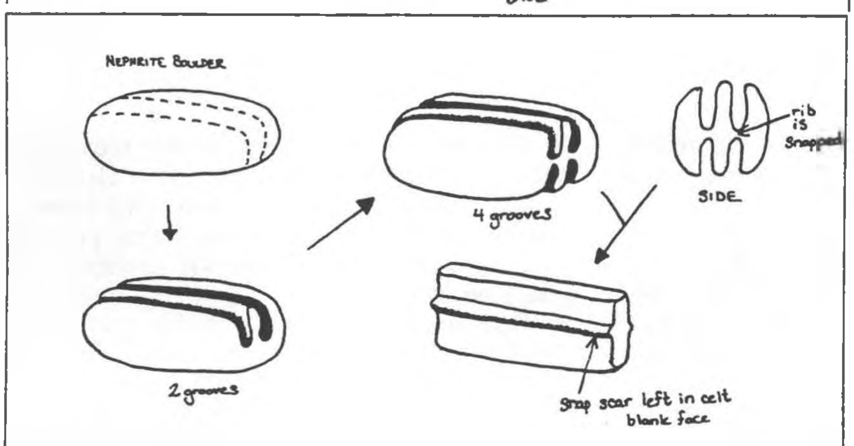

Figure 5.4. Method 3.

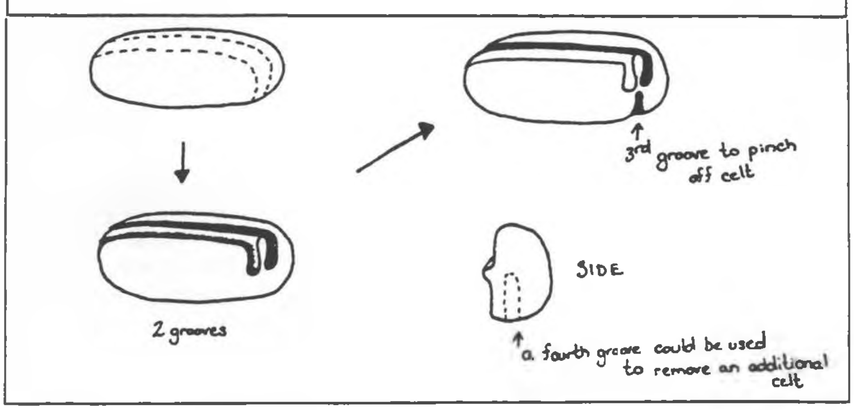

Figure 5.5. Method 4.

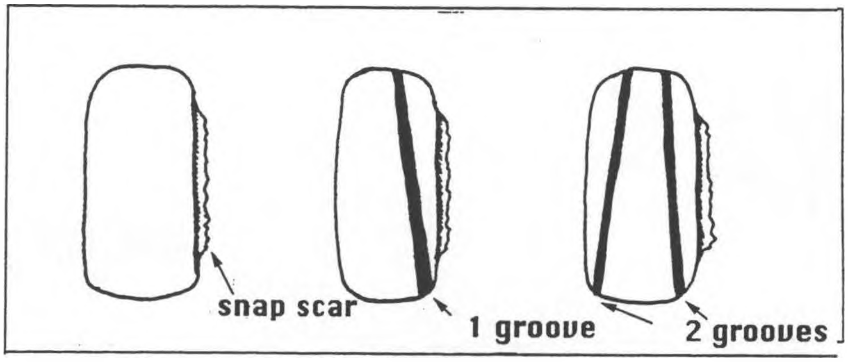

Figure 5.6. Celt Blank Modification.

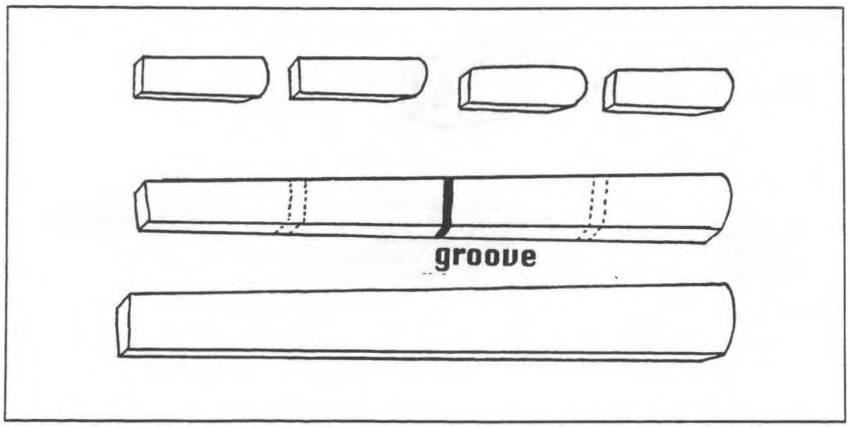

Figure 5.7. Larger Celt Sectioning.

snap area from the internal margin (Figure 5.6). Further modification was typically undertaken on thecortical surface of the celt. Depending on its intended function, the celt was either tapered from the bit to the pole, or given a rectangular shape. Similar approaches were taken during the construction of some Maori celts (Brailsford 1984:27) and for British Columbia Coastal celts (Smith 1909:370).

Other modifications to celts could include squaring or rounding the pole and grinding the margins flat. Of the finished celts examined 27 % displayed some form of manufacturing evidence (e.g., a groove or a snap scar in the margin or face). Many of the remaining 73% of the celts appear to have had most of this type of evidence ground away. Some of the different variations in the modifications undertaken on celt blanks probably related to the intended function of the celt. This, however, was not investigated.

Interestingly, I did not observe any evidence for reduction through pecking. No artifacts displayed dimpled or pocked surfaces indicative of the technique. It is possible that the evidence for this method was removed by subsequent grinding. However, it is also possible that the technique was too risky to warrant its use during the manufacturing process (e.g., M'Guire [1892] broke his nephrite celt during pecking).

One last modification possibly performed was the sectioning of a larger sawn blank into several smaller celts. Evidence for this comes from a celt from EeQw 1-50 (UBC) where a saw cut is present on the proximal end of a celt, suggesting it was likely sectioned from a larger blade (Figure 5.7). This might be a time saving option. My sawing experiments (Chapter 4), indicated that a long groove can be sawn nearly as fast as a short one. In a cost-benefit analysis, this would be a desired option because two or possibly three usable celts could be partially manufactured at one time. If each of these celts were individually cut, the process could take 2 or 3 times as long to produce the same results. I could not determine the frequency with which this sectioning method was used from the present sample. It is possible that any evidence would be ground away.

Material Type Identification

Ultimately, the best way to determine the exact mineralogical nature of any rock is to perform both chemical and microscopic petrological tests. Nephrite cannot be positively identified without the use of thin sectioning to confirm the presence of tremolite (Leaming 1978:7). As this technique (along with chemical testing) is destructive, alternate methods should be used to conserve artifacts when possible. There are procedures that will allow tentative identification of mineral specimens, through the determination of physical properties, that cause only minimal impact to an artifact. The primary attributes of nephrite determination are color, hardness, specific gravity and resistance to breakage (Leaming 1978:7).

A key part of my analysis was an attempt to determine the hardness and specific gravity for each artifact. Color was also recorded. Hardness determinations were made using scratch tests with minerals for each increment of the Mho hardness scale. Using this method, usually only a range could be determined (e.g., 4 to 5 on the scale). With permission from the SFU Museum, hardness tests were performed on a number of artifacts. Because hardness determination is destructive, scratch tests were only performed on artifacts in areas that were exposed by breakage or covered in cortex. Artifacts that did not have these types of areas were not tested. No artifacts from UBC were scratch tested. The hardness values determined on the artifacts may be under estimated because of the locations in which they were taken. Cortical areas tend to be softer due to weathering, and broken areas tend to give lower hardness ratings than polished surfaces (Leaming 1978:7). The hardness of nephrite is usually listed between 6 to 6.5 (Turner 1935; Brandt et al. 1973).

Specific gravity was determined for most of the artifacts from the SFU Museum by obtaining weights of artifacts in and out of water and calculating the following formula:

$$\text{Specific Gravity} = \frac{1}{1 - \frac{\text{Weight in water}}{\text{Weight in air}}}$$

Specific gravity was not measured for the UBC artifacts. I found during my analysis that small objects could not be reliably measured because of problems in suspending them in water, and insufficient accuracy of the scale beyond 0.05 of a gram. As reviewed in chapter 2, the specific gravity of nephrite usually varies between 2.95 and 3.04 (Fraser 1972:43; Leaming 1978:7).

Colors were recorded for all the artifacts. I made an effort to record general colors for each specimen, but no chroma chips were used. Nephrites are usually green in color and fall in the yellow-green hues of the Munsell color chart (Leaming 1978:7). With many nephrite specimens, there were variations in the hues of green present and difficulty would have been encountered when trying to assign a Munsell code. As color is often an unreliable criterion for identification of minerals, its use was not stressed.

Table 5.5 presents the results of specific gravity, hardness, and color identifications. Artifacts for which specific gravity was not determined are not included. Using these criteria, 62.3 % of the sample is tentatively identified as nephrite. Another 15 % is also likely nephrite but the recorded attributes are not conclusive. Twenty-two percent of the sample is probably not nephrite -- based on low specific gravity in some instances and the occurrence of flake scars indicative of a conchoidal breakage pattern in others.

Several of the non-nephrite samples may have been serpentine or greenstone. The specimens with lower specific gravity fall into the serpentine range (2.5 to 2.8), but the hardness values are high for this mineral (see Foshag 1957). Two celts in particular, with specific gravities of 2.98, and hardnesses of 6-6.5, were either a green metamorphosed silicified siltstone or a volcanic greenstone. They did not have a nephritic texture and displayed a conchoidal fracture pattern.

Time Estimates for Manufacturing Celts

Using rates for sawing nephrite derived from experiments in Chapter 4, it is possible to make estimations of the time needed to manufacture different types of nephrite celts. In Table 5.6 there are estimations for the time needed to make celts using the methods discussed in Section 5.1.2. None of these estimations include the time for the additional grinding or polishing that undoubtedly was performed. Because of this, all the time calculations are probably under estimated, and more time would realistically be needed to complete the celts. Despite this, there is still a considerable amount of variation in the estimated time between the reduction methods.

Table 5.5. Nephrite Determination.

Artifact Type	Specific Gravity	Hardness	Material Color	Tentative Nephrite Identification
Celt	2.59	5-6	spinach green	No
Celt	2.6	6-6.5	medium green	No
Celt	2.64	n/a	greenish beige	No
Celt	2.85	n/a	black with brown striations	No
Celt	2.86	5-6	spinach green	No
Celt	2.86	4-5	mottled gray brown	No
Celt	2.87	5-6	medium green & white mottles	No
Manufact. Debris	2.9	6.5-7	spinach green	Possible
Celt	2.91	6	black/spinach green	Possible
Celt	2.91	n/a	dull reddish brown	Indeterminate
Celt	2.92	n/a	off-white (chicken bone white)	Possible
Celt	2.92	6-6.5	lawn green	Possible
Celt	2.92	5-6	black to dark spinach green	Possible
Celt	2.94	6-6.5	spinach green	Yes
Celt	2.94	6-6.5	emerald green	Yes
Celt/Chisel	2.94	6-6.5	emerald green	Yes
Celt	2.94	6-6.5	light green	Yes
Celt Blank	2.94	6	medium green	Yes
Celt	2.94	6-6.5	emerald green	Yes
Celt	2.95	6-6.5	emerald to medium green	Yes
Manufact. Debris	2.95	5-6	emerald green	Yes
Celt	2.95	6-6.5	emerald green	Yes
Celt	2.95	6-6.5	spinach green	Yes
Manufact. Debris	2.95	5-6	emerald to spinach green	Possible
Celt	2.95	6-6.5	medium green	Yes
Celt	2.96	6-6.5	emerald green	Yes
Celt	2.96	6-6.5	spinach green	Yes
Knife	2.96	n/a	emerald to spinach green	Possible
Celt	2.96	6-6.5	black and beige	Indeterminate
Celt	2.96	6-6.5	spinach green	Yes
Celt	2.97	6-6.5	emerald green	Yes
Knife	2.97	n/a	emerald green	Possible
Celt	2.97	5-6 *	emerald to light green	Yes
Celt	2.97	6-6.5	emerald green	Yes
Manufact. Debris	2.97	6-6.5	lawn green	Yes
Celt	2.98	6-6.5	emerald green	Yes
Celt	2.98	6-6.5	mottled emerald green	Yes
Celt	2.98	6-6.5	spinach green	Yes
Sawn Boulder	2.99	6	light green	Yes
Celt	2.99	6-6.5	emerald green	Yes
Celt Blank	2.99	6-6.5	spinach green	Yes
Manufact. Debris	2.99	6-6.5	mottled medium green	Yes
Celt	2.99	5-6	medium green	No
Sawn Boulder	2.99	6-6.5	emerald green	Yes
Manufact. Debris	3.00	6-6.5	emerald green	Yes
Celt	3.00	6-6.5	emerald to lawn green	Yes
Celt	3.00	n/a	spinach green	Yes
Sawn Boulder	3.00	6-6.5	spinach green	Yes
Celt	3.01	6-6.5	medium green	No (Fractures Conchoidally)
Celt Blank	3.02	6	spinach green	Yes
Celt	3.03	6-6.5	dark spinach green	Yes
Celt	3.05	6-6.5	dull dark green	No (Fractures Conchoidally)
		* On Cortex	YES Possible Indeterminate No	33 62.3% 8 15.1% 2 3.8% 10 18.8%

Using the fastest sawing method to manufacture a practically functional celt (Method 1), one must spend 34.4 hours just to produce the blank. A celt of this type without further modification would have irregular margins. On the other extreme, the manufacturing of a large well-formed celt blank using Method 2, would take between 130.0 and 145 0 hours. The time needed to cut such a blank may be reduced using Method 3, but a large amount of time would subsequently be needed to grind the snap scar from the faces of the celt.

For Methods 2, 3, and 4, the primary celt sawn from the boulder is the most costly in terms of time. When removing a secondary celt at least one side of the celt is already sawn.

Table 5.6. Time Estimates for Manufacturing Nephrite Celts.

	Hypothetical Celt Size	Amount of Sawing Distance	Rate mm per hour	Estimated time *
Method 1 without additional celt blank modification	Length 10 cm Width 5 cm Thickness 1.5 cm	1 cut 50 x 1 50 mm	1.455	34.4 hours
Method 2 without additional celt blank modification	Length 40 cm Width 5 cm Thickness 1.5 cm	3 cuts 65 x 2 30 x 1 160 mm	1.455 or 1.31	110.0 hours 122.1 hours
Method 2 with additional celt blank modification	Length 40 cm Width 5 cm Thickness 1.5 cm	5 cuts 65 x 2 30 x 1 1.5 x 2 190 mm	1.455 or 1.31	130.6 hours 145.0 hours
Method 3 without additional celt blank modification	Length 30 cm Width 5 cm Thickness 1.5 cm	4 cuts 22.5 x 4 90 mm	1.455	61.8 hours
Method 4 with additional celt blank modification	Length 20 cm Width 5 cm Thickness 1.5 cm	5 cuts 55 x 2 30 x 1 15 x 2 170 mm	1.455	116.8 hours

This eliminates approximately 34 hours of sawing time in the case of a celt 50 mm wide. Using either Method 3 or 4, if there has been sufficient pre-planning in the arrangement of the grooves, only one major saw cut is necessary to remove a secondary celt.

According to my estimates and experiments, about half the amount of time would be needed to manufacture the same celts out of serpentine. For example, making a long celt out of serpentine using Method 2, would take approximately 59.9 hours. This is as opposed to the 130 to 145 hours needed to make a nephrite celt. About 75.4 hours would be needed to create the same celt out of greenstone. This, however, is drastically over inflated because greenstone blanks can be effectively produced by flaking (e.g., Damkjar 1981).

It was not possible to determine which sawing method was used more frequently from the present sample. Due to the grinding and regrinding that was carried out on the celts after their initial removal. Abrasion, unlike flaking, leaves little in the way of recognizable evidence. Mackie (1992) experienced similar problems when he attempted to create a typology of celts for the British Columbia Coast because the original form is usually ground away.

Celt Use Wear

Another attribute I investigated was any indications of use. No microscopic studies were undertaken, but some forms of use wear were visible to the naked eye. I did not attempt to determine what was responsible for the use wear patterns observed, although microscopic use wear analysis would be very informative on this aspect of nephrite use. However, the issues surrounding use wear analysis of nephrite artifacts in themselves are beyond the scope of this thesis and time could not be spent on this aspect of the technology. For this study, only macroscopic indications of use were recorded.

Of the 46 celts that retained bits, 83 % exhibited possible signs of use -- mainly in the form of striations and damage to working edges. The striations, that may be from use were oriented perpendicular to the cutting edge. The use wear was broken down by severity and is presented in Table 5.7. The relative frequency of specimens with heavy, medium, and light use wear levels were fairly similar. Interestingly, 17.0% of the celts displayed no macroscopic evidence of use.

Thirty-one of the complete celts were examined to determine whether certain sizes of nephrite artifacts were used more frequently. There appears to be slight differences in the utilization of various celt sizes (Table 5.8). Even though the largest celts have the second lowest ratio of utilized to non-utilized bits, the sample is too small to make strong conclusions.

Summary

From the examination of the sample, there are several conclusions that can be made concerning the manufacturing use of groundstone tools in the Interior:

1. The most laborious method of celt manufacture, the sawn blank approach, was predominantly used on the British Columbia plateau. Both the flaked blank and pebble modification approaches were used much less frequently. Furthermore, the materials reduced using the sawn blank technique tended to be harder types of stones. As seen in Table 5.9, over 65 % of the sample was equal to, or harder than a 6, on the Moh Hardness scale.

2. Concurring with the use of the sawn blank approach and the hardness data, the dominant type of material used was nephrite. Both hardness and specific gravity tests indicate that serpentine was not used in the sample group as a replacement for nephrite. Furthermore, most of the sawn blank celts (70%) can be tentatively identified as nephrite (Table 5.10). This is also the case for the 4 sawn boulders that were analyzed, which all had hardness and specific gravity readings within the nephrite range.

3. The different methods used to saw blanks vary substantially in the amount of time needed to produce a usable celt. The effort needed to make a strictly functional celt is considerably less than that needed to manufacture a well-formed celt. It appears that the majority of celts were significantly altered after being snapped from their original boulders because 72% had most of their manufacturing evidence ground away. Even celts that had remnants of manufacturing features (snap scars and grooves) usually had those marks at least partially smoothed. Unfortunately, this makes it difficult to determine the predominant method of boulder reduction.

There are indications that some shortcuts were taken to produce strictly utilitarian celts.

In a number of instances, celts were expediently manufactured on flakes of nephrite - not much effort was expended to create a regular form. In several instances the celt was little more than a bit ground on a semi-polished flake.

4. Most celts display some possible evidence of utilization and this is not restricted to any one size of celt. Even the largest celts in the sample have some evidence of use in the form of striations or edge battering. The origin of use wear was not determined.

Context and Distribution

The following section examines the context and distribution of nephrite artifacts on the British Columbia and Columbia Plateaus, as described in published and unpublished archaeological reports in and around the study area. My discussion will focus on: 1) theoretical issues behind exchange studies; 2) the nature of the sample and the types of data collected; 3) changes in nephrite technology throughout time; 4) the distribution of nephrite within the study areas and; 5) context of nephrite artifacts in the study area.

Table 5.7. Observable Use Wear Damage on Celt Bits.

Type of Wear	Number	Percent	
Heavy			
Heavy Striations on Bit	4	8.7	
Heavy Striations + Edge Damage	4	8.7	
Severe Edge Damage	4	8.7	
	Total Heavy Wear		25.5%
Medium			
Medium Striations on Bit	6	10.9	
Medium Striations + Edge Damage	6	13.0	
Dulled or Rounded Bit	1	2.2	
	Total Medium Wear		27.6 %
Light			
Minor Striations on Bit	4	8.7	
Minor Striations + Edge Damage	1	2.2	
Minor Edge Damage	9	19.6	
	Total Light Wear		29.8 %
None			
None Observable	8		17.0 %
Total	47		100 %

Table 5.8. Possible Use Wear on Complete Celts.

Length	H eavy Wear	Medium Wear	Light Wear	Total with Use Wear	No Use Wear
0-50 mm	1	-	-	1	2
51-100 mm	3	5	2	10	2
101-150 mm	1	3	3	7	1
151-200 mm	1	3	1	4	-
201-250 mm	-	2	-	2	-
251-	1	1	-	2	1
Totals	7	12	6	26	6

Background to Exchange Studies

From her study of historical accounts of the stone axe trade in New Guinea, Phillips (1975:109) concluded that the most useful way to analyze axe exchange was to examine the contexts of production, acquisition, and consumption. Figure 5.8 demonstrates possible factors for celt exchange on the British Columbia Plateau. Unfortunately, many of these cannot be seen in the archaeological record. Within the context of production, we can only interpret the results of manufacturing. We can recover evidence on burial practices, resource processing, woodworking, accidental loss and possibly potlatch behavior pertaining to context of production. It is not possible, however, to directly examine the consumption of celts in ceremonial exchange, puberty ceremonies, and warfare. Virtually no archaeological evidence is available to determine any of the contexts of acquisition.

An artifact, from the time it was originally manufactured until the time in which it was finally deposited, can go through an almost infinite number of exchanges -- all of which are invisible to the modern investigator (Elliott et al. 1978). This is especially the case with artifacts that have long use-lives, that can undergo a series of transformations through their lives that obscures their original form (see Mackie 1992 for coastal celts). The way in which an artifact moves across the landscape from its manufacturing point to its final deposition is known as the 'random walk' (Sherratt 1976:558; Elliott et al. 1978:81). Artifacts, of course, do not move themselves and dispersion of material over an area is not a random process. An artifact's final location of deposition does reflect the system in which it was exchanged (Sherratt 1976:558).

Table 5.9. Hardness of Tested Specimens

Moh Hardness	Number of Instances	PerCent
4 - 5	1	3.4%
5 - 6	7	17.9%
6	2	6.9%
6 - 6.5	19	65.5%

A dynamic trade network was present on the British Columbia and Columbia Plateaux at the time of contact (Hayden et al. 1985; Galm

Table 5.10. Tentative Nephrite Identification for Sawn Blanks.

Tentatively Nephrite	Number	Percentage
No	6	18.2 %
Possible	4	12.1 %
Yes	23	69.7 %
Total	33	100 %

1994). Although housepit villages were largely self-sufficient, there is ethnographic evidence that trade was necessary at times to provide food supplies in years of shortage (Hayden and Spafford 1993; Cannon 1992). This necessity was also present in the past as natural salmon run fluctuations could have resulted in poor harvests (Kew 1992). In conjunction with needs extending to other localized products (e.g., stone resources), the trade in salmon likely created an inter-village exchange system that operated to reduce the vulnerability of local groups to short term disaster (Cannon 1992). Along with material trade relations, village interactions probably also included the exchange of people -- mainly as marital partners (Teit 1900:322-5, 1906:590-1, 1909:269), but also as slaves (Teit 1906:221).

In describing exchange networks in the European Neolithic, Sherratt (1976:558) suggests that, for the manufacture of every type of product there, is a distribution channel comprised of a source, production zone, direct contact zone and an indirect supply zone. The source is where the raw material for the product is found. The production zone is the area where local settlements around the source are involved in the exploitation of the material. The area surrounding the production zone, where face to face contact occurs between supplier and consumer, is the direct contact zone. In this case, "effective supply" of the product is the "result of close kinship links" (Sherratt 1976:558). The indirect contact zone are where settlements do not have direct access to production zones.

Typically, most villages in such a system can produce a similar range of subsistence products. Unless catastrophe or famine befalls a local group, there is no major impetus to maintain a production of goods strictly for trade. However, communities in the indirect supply zone, which require an essential product from a distant production zone, could experience shortages because of supply problems (Sherratt 1976:559). Rarely in stateless economies are there direct supply and demand situations. Rappaport (1968:106) found in the New Guinea highlands that the production of commodities is more a factor of needs in the direct contact zone than those of the indirect contact area. If there is no necessity for a product in the direct contact zone, it may not be manufactured for indirect contact groups. To avoid economic

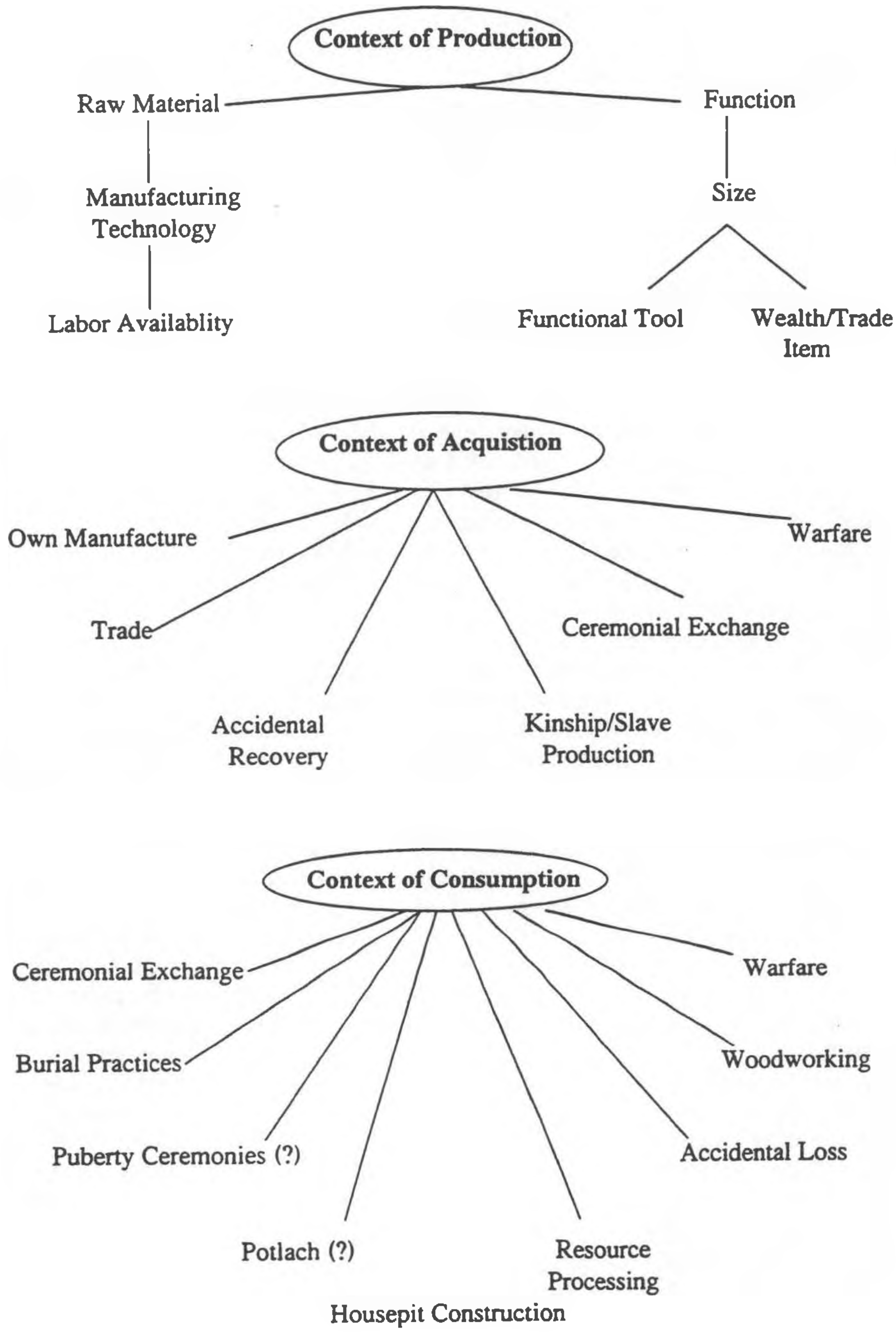

Figure 5.8. Contexts of Celt Production, Acquisition, and Consumption for the British Columbia Plateau (after Phillips 1975).

stagnation, Sherratt (1976:559) hypothesizes that usually an exchange network of non-utilitarian objects will develop that act as a "fly-wheel" to keep the system operating. These non-utilitarian objects are produced in times of surplus and traded to ensure continuity in the exchange system, and have been referred to as 'primitive valuables' (Dalton 1975; 1977).

The concept of primitive valuables refers to the use of certain objects by lineage or clan leaders, or "big men", to underwrite social and political transactions. Those include "death compensation, payments to allies, bridewealth, and, occasionally, for 'emergency conversion'" (Dalton 1977:198). They are not 'primitive money' and do not operate in the same way that currency acts in western society. Rather than a mechanism of material gain, primitive valuables are spent and valued in terms of social and/or political action (Dalton 1977:198). Although they are not equivalent to cash, this does not mean that they are any less valuable. Dalton (1977:198) explains how the Trobrianders in New Guinea risked their lives by crossing open seas in canoes to acquire primitive valuables such as kula shells. Similar risks were taken by Northwest Coast groups to acquire dentalia shells (e.g., Barton 1994).

It is possible that a trade system like the one described above was present to some extent in British Columbia. Although this system may not have been as elaborate as those in those Neolithic Europe or New Guinea, Hayden et al. (1985) and Hayden and Schulting (1997) have speculated that primitive valuables were exchanged amongst Plateau groups in British Columbia. Artifacts they record as potentially being primitive valuables include:

> shell beads; copper artifacts; elaborately carved stone bowls, pestles, and bone ornaments and other bone tools (Stryd 1981); *nephrite adzes*; hard to obtain animal and bird parts (claws and wings); finely flaked obsidian objects; molybdenum and other metallic ochres; steatite pipes; stone spindle whorls; whalebone clubs; mauls; quartz crystals; turquoise (Grabert 1974); and numerous other perishable items. (Hayden et al. 1985:190, emphasis mine)

Nephrite celts, particularly large specimens, may be classified as primitive valuables for a number of reasons. First, they take a large amount of time to manufacture. This in itself does not make a nephrite celt a primitive valuable. However, one must take into account the time manufacturing such an implement draws away from subsistence activities. This is where the risk lies. Thus, it is possible that nephrite manufacturing occurred in times of surplus food supply rather than in situations of shortage. Second, ethnographic accounts (Teit cited in Emmons 1923) suggest that large celts were made specifically for wealth or trade purposes. Third, large nephrite celts can be cut into smaller utilitarian celts. An example of this was found during my celt analysis (see section 5.1), where a celt (UBC EeQw-50) displays a groove that suggests that it was cut from a larger blade.

Anthropologists can see many facets of an exchange system in a living cultural context. Archaeologists, on the other hand, can only glean some of the contexts of production and consumption (e.g., Phillips 1975). Many different methods have been used to examine exchange systems in the archaeological record and good reviews can be found in Hodder (1982) and Chappell (1987). The approach taken in this thesis to examine nephrite exchange on the Plateau may be labeled a contextual approach in Hodder's (1982) terminology. It is based partly on the work of Hodder and Lane (1982) who investigated stone axe exchange in Neolithic Britain.

In their investigations, Hodder and Lane (1982:217-219) compare the distribution of different sizes of stone axes to four hypothesized models of axe exchange:

Model 1. Larger axes should be found at greater distances from the production area than smaller axes because of their high non-utilitarian value as prestige items. Based on Sherratt's (1976:567) observations of large axes in northern Europe, this model predicts smaller axes being replaced at greater distances from their source by other material types because of their lesser value.

Model 2. This model draws on the earlier work of Elliott et al. (1978) and predicts that all axes will decrease in size from their source because of use, curation and breakage. As the celts pass through more hands, the more likely they are to decrease in size. Large axe blades in this situation, will be pulled out of circulation at the source and reserved for display purposes in the area of production.

Model 3. Hodder and Lane (1982) predict that there will be a lack of size changes in axes over the landscape. In this situation, bulk exchanges and middleman traders would have transported a multitude of axe sizes at one time. In this model some small scale contact may have occurred even for groups at a distance. However, "direct contact [with the source] would not result in the chain of axe reduction and retention becoming associated with a gradual decrease in size with distance. The chain of reduction would occur equally in all locations" (1982:218).

Model 4. Hodder and Lane (1982:218) anticipate that direct contact access to the source by all groups would be associated with a decrease in size of axes over distance from the source. The decrease in size is attributed to greater curation because of the increased value of the material the further away from its source.

Hodder and Lane (1982:218) also note that models 2 and 4 have the same expectation in size differences of axes over a landscape.

In undertaking their analysis, Hodder and Lane (1982) designed their investigations to work around the poorly known contexts of celts in Britain. Most of their axes were chance finds. In British Columbia, however, there is much more contextual information available for nephrite artifacts. This opens up an opportunity to expand interpretations of nephrite exchange beyond those that Hodder and Lane could undertake with their sample.

There are numerous ways an artifact can become deposited in the archaeological record. It can be accidentally lost, broken or exhausted and then discarded, placed in burials, placed in storage and then forgotten, or ritually deposited in some feature. The manner and location in which an artifact enters the archaeological record reflects some information about the people who deposited it. Barring accidental loss, all other forms of deposition have some form of *intention* behind them. Although not directly observable and often disturbed because of site formation processes (Schiffer 1976:12), the location of artifact deposition does reflect the intentions behind the act. For instance, the intention behind depositing a celt in a burial context is different from the intention behind discarding an exhausted celt in a midden. The division here is between ritual and non-ritual space. Levy (1982:ch. 3), in an ethnographic cross-cultural study of hoarding behavior, found that most groups draw divisions between ritual and ordinary space and the types of objects that are usually placed in them. As the reasons behind ritual acts are often connected with legitimization of power or wealth in society, the value of artifacts used in such affairs is usually greater than those used for non-ritual purposes (Hodder 1982:207; Levy 1982). For hoarding behavior, Levy (1982:22) found that special objects (such as ornaments, weapons, cosmologically significant items) were usually placed in ritual hoards. The content of non-ritual hordes tended to be more utilitarian tools, raw material and usable fragments of tools (Levy 1982:24).

Burial sites represent some of the more productive areas for information concerning social systems. Investigation of mortuary practices in the interior is beyond the scope of this thesis, and has been recently undertaken by Schulting (1995). What is important to this study is defining what the placement of objects in ritual contexts reflects about their value on the Plateau. Schulting (1995:28-9) chose to define his values for objects based on preconceived notions of the value of artifacts on the Plateau following guidelines proposed by McGuire (1992). While these notions of artifact value may have some legitimacy, this sort of weighting scheme is premature, because the contexts of most ranked items have not yet been thoroughly investigated in Plateau sites. For instance, how many chipped eccentrics are found in burial/ritual contexts in comparison to non-ritual contexts? What are the differences between the artifacts found in burials versus those in housepits?

When dealing with artifacts like nephrite celts, which have an incredible amount of manufacturing labor invested in them, differences in size, condition, and context can reflect differences in the values originally attached to them. For instance, placing a large nephrite celt into a burial context represents the consumption or expenditure of a large amount of effort in terms of manufacturing costs. This is also true for smaller celts that are still practically functional. On the opposite end of the spectrum, the deposition of exhausted, damaged, or fragmented celts into burial contexts does not represent the same expenditure because of the limited utility of such items. Inversely, if large nephrite celts are found more frequently in non-ritual space, it is probable that such items were not valued as greatly as in ritual contexts. The relationships between context and celt attributes are demonstrated in Figure 5.9.

Based on the theoretical considerations discussed above, the following parameters will be investigated to determine the nature of nephrite exchange and the range of economic and social roles nephrite celts may have played on the British Columbia Plateau:

1. The distribution of nephrite artifacts only related to manufacturing will be identified. In doing this, it should be possible to distinguish the production zone (Sherratt 1976). Artifacts such as sawn boulders should theoretically be found near sources.

2. The distribution of nephrite celts in relation to the source of the material will be determined in order to establish the density of nephrite artifacts away from the source. This should indicate where the majority of nephrite exchange occurred.

3. The size of nephrite celts in relation to the distance away from the production areas will be calculated. Following the four models reviewed by Hodder and Lane (1982), it should be possible to determine the nature of the types of nephrite celts being exchanged.

4. The types of sites in which nephrite is found will be identified, to ascertain the contexts of deposition for such artifacts. Following Levy (1984) and Hodder (1982), attention will be directed at calculating the number of artifacts found in ritual versus non-ritual areas. To fully investigate this, it will be necessary to include an examination of sites where nephrite has not been recovered. This analysis may also indicate where nephrite artifacts were primary used.

5. The types of nephrite artifacts found within different site contexts will also be analyzed. Again following Levy's (1984) division, often artifacts found in ritual contexts are different from those found in utilitarian areas. If differences in the types of nephrite artifacts can be observed for ritual versus non-ritual areas, it should be possible to make conclusions on the values attached to the different forms.

6. The changes in nephrite use through time will also be discussed. It is important to trace the chronological development of nephrite exchange patterns to differentiate any changes in function or value that may have occurred.

The Data Set

The sample was gathered from the British Columbia Heritage Sites (BCHS) files and library resources. The BCHS files were systematically searched for all excavations undertaken in the interior of British Columbia. As the BCHS files are constantly growing, reports were reviewed up to the latest available dates (ca. 1993 to 1994). In addition to the excavation information, some review of survey reports occurred in cases where sizable artifact collections were made. The only reports not generally examined were those for non-permit excavation, which were not available on microfiche. The material from the Columbia plateau came from published sources only.

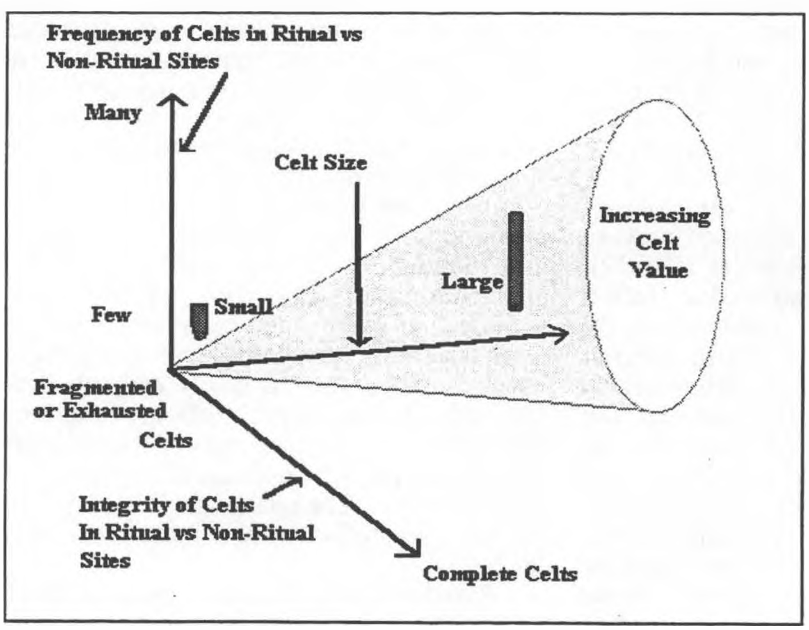

Figure 5.9. Parameters of Celt Value in Ritual versus Non-Ritual Sites.

My research focused on recording any artifact made out of nephrite and all celts (regardless of material) recovered in archaeological investigations on the Plateau. When I found such artifacts, I attempted to record the following information:

1. Site Designation
2. Artifact Type.
3. Material Type
4. Artifact Length
5. Artifact Width
6. Artifact Thickness
7. Celt Shape.
8. Celt Blank Type
9. Bit Shape
10. Side Shape
11. Artifact Condition
12. Manufacturing Evidence
13. Artifact Context
14. Site Type
15. Feature Type
16. Time Period
17. Associated C14 dates
18. Environmental Zone
19. Number of Meters2 Excavated
20. Investigation Level
21. Number of Associated Formed Tools

The data for these categories are found in Appendix 2 and 3.

I found during my investigations that it was not possible to collect data on some of the attributes. This was typically due to the quality of excavation and survey reports. In many instances, celts or other artifacts would be listed as being present but virtually no information concerning dimensions, material types, contexts, or time periods would be included. Unfortunately, this left gaps in an already small database. In situations where specific data were unavailable for an artifact, they were left out of any calculations.

The emphasis of this research was to record each artifact in terms of: 1) where it was found, 2) the type of site and feature in which it was recovered, 3) the time period with which it was associated, and 4) the amount of excavation associated with its recovery.

The site types used in the investigation are roughly based on Mohs (1980a,b). The following are definitions used to classify each site:

Housepit. any site where semi-subterranean house depressions are present. Examples of this type of site are the Keatley Creek and Bell Sites (Hayden and Spafford 1993; Stryd 1973) where multiple housepits are present.

Burial. any site where the primary features are associated with the deposition of human remains.

Campsite. any site where no permanent dwelling structures are present. Artifacts found at the site relate at least partially to domestic activities (e.g., hearths, fire broken rock, and faunal remains.

Lithic Scatter. any site where only lithic artifacts are found. No evidence for domestic activities is identified.

Resource. any site that is associated with the exploitation of resources. This may include fishing stations, plant processing camps (usually with roasting pits), quarry sites, hide processing sites, and storage sites (with cache pits).

In addition, some sites had to be listed as being 'unknown' because of a lack of reported information.

It is important to note that a site would only be designated as a burial site when most of the features of the site were associated with human interment. Examples of this are the Chase Burial Site (EeQw 1) and the Texas Creek Burial Site (EdRk 8) (Sanger 1968a,b). In situations where human remains were associated with other types of features (like housepits), the site would be designated by the major feature type rather than by the burial. Examples of this are the Bell Site (Stryd 1972) or EdRk 9 (Sanger 1970) where burials were associated with housepits.

Temporal data corresponded with the horizon designations made by Richards and Rousseau (1987) for the Plateau Pithouse tradition. Although not descriptive of cultural occupations on the Columbia Plateau, the same system was used for the area to standardize the data set. If an artifact could not be associated with any time period (as was often the case) it was listed as unknown.

An attempt was made to calculate the amount of excavation performed at each site. This was undertaken in order to quantify the rate per square meter at which nephrite artifacts occur at different types of sites. Ultimately, the volume of excavation would have been the most ideal form of data because some cultural occupations are deeper than others. It was found, however, that even determining the number of square meters excavated (let alone volume) from the reports was one of the most

Map #	Site	Reference	Map #	Site	Reference
1	DgQo 1	Barlee 1969	38	EeRn 11	Wales 1974
2	DgQo 2	Freisinger 1979	39	EfQs 1	Fladmark 1969
3	DgQo 3	Freisinger 1979	40	EfQu 3	Sendey 1971
4	DhPt 1	Bussey 1981	41	EfQv 1	Fredlund and Tucker 1971
5	DhQv 34	Copp 1979	42	EfQv 2	Fladmark 1969
6	DhQv 48	Copp 1979	43	EhRn 17	Wilson 1983
7	DhQx 10	Copp 1979	44	Kamloops	Smith 1900
8	DiQm 4	Turnbull 1977	45	Lytton Burial	Smith 1899
9	DkQm 3	Turnbull 1977	46	Nicola Lake	Smith 1900
10	DkQm 5	Turnbull 1977, Mohs 1977	47	Nicola Valley	Smith 1900
11	DlRi 6	Arcas Associates 1985	48	CO 47	Caldwell 1954
12	EbRc 6	Wyatt 1972	49	CO 93	Caldwell 1954
13	EbRi 7	Skinner and Copp 1988	50	GbSk 1	Borden in Sanger 1968a
14	EbRj 1	Rousseau et al. 1993	51	45-DO-214	Miss et al. 1984a
15	EbRj 92	Muir et al. 1992	52	45-OK-250	Miss et al. 1984b
16	EcQk 3	Turnbull 1977	53	45-OK-4	Miss et al. 1984b
17	EdQs 32	Arcas Associates 1985	54	45-OK-58	Grabert 1968
18	EdQx 20	Blake 1976	55	45-OK-78	Grabert 1968
19	EdRk 1	Sanger 1968b	56	UC43	Collier et al. 1942
20	EdRk 3	Sanger 1970	57	Little Dalles	Collier et al. 1942
21	EdRk 4	Sanger 1970	58	45-FR-42	Combes 1968
22	EdRk 5	Sanger 1970	59	45-BN-15	Crabtree 1957
23	EdRk 7	Sanger 1970	60	45-DO-176	Galm et al. 1985
24	EeQl 3	Mohs 1977	61	45-KT-28	Nelson 1969
25	EeQw 1	Sanger 1968a	62	45-LI-6	Rice 1969
26	EeQw 3	Fladmark 1969	63	Crab Creek	Sprague 1967
27	EeQw 5	Fladmark 1969	64	DlQv 39	Rousseau 1984
28	EeQw 6	Fladmark 1969	65	Lytton	Emmons 1923
29	EeRb 10	Richards and Rousseau	66	10 miles N of Lytton	Emmons 1923
		1982, Wilson 1980	67	Mouth of Thompson	Emmons 1923
30	EcRg 4b	Stryd and Lawhead 1983	68	6 miles S of Lytton	Emmons 1923
31	EeRh3	Whitlam 1980	69	5 miles S of Lytton	Emmons 1923
32	EeRk 4	Stryd 1973	70	7 miles N of Lytton	Emmons 1923
33	EeRl 19	Stryd and Hills 1972	71	Captain John Creek	Spinden 1915
34	EeRl 192	Wigen 1984	72	Kouse Creek	Spinden 1915
35	EeRl 22	Stryd 1970	73	Dalles:Maybe II	Butler 1959
36	EeRl 30	Stryd and Hills 1972	74	Indian Well	Butler 1959
37	EeRl 7	Hayden and Spafford 1993	75	Wahluke	Krieger 1928
			76	45-GR-131	Crabtree 1957

Figure 5.10. Sites with Nephrite on the British Columbia and Columbia Plateaus.

Table 5.11. Site Types Reviewed from British Columbia Plateau.

Area	Burial	Campsite†	Housepit	Lithic Scatter	Resource *	Campsite/ Burial	Unknown	Total
British Columbia	29	68	101	23	26	3	8	258
Columbia Plateau	13	6	6					25
Total	42	74	107	23	26	3	8	283

* Includes Roasting Pits, Cache Pits, Fishing Stations, and Quarry Sites
† Includes 2 rock shelters in British Columbia

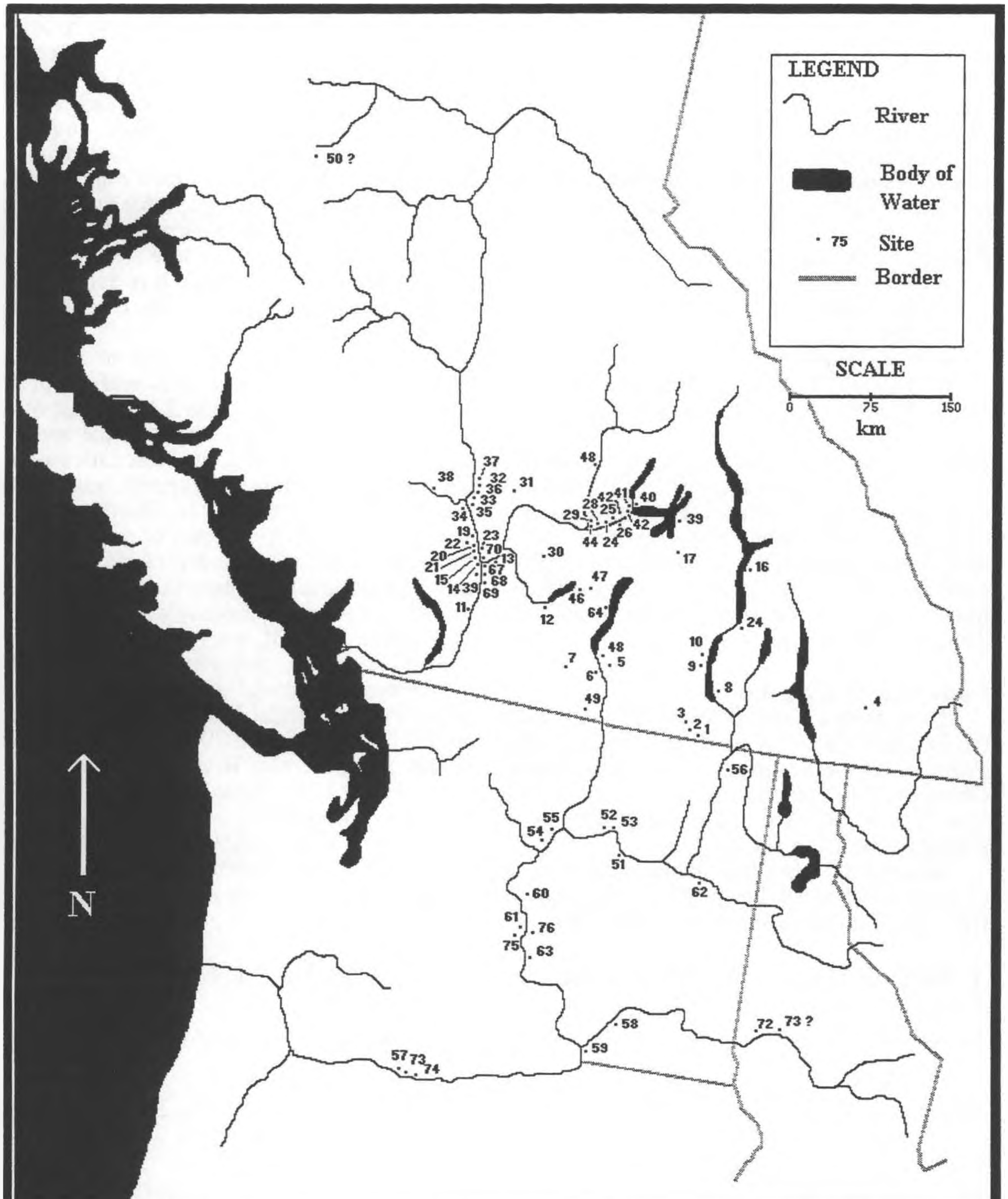

Figure 5.10. Sites with Nephrite on the British Columbia and Columbia Plateaus.

difficult tasks of the literature review. Even obtaining this data was troublesome because it often had to be derived from excavation areas illustrated on site maps. These data should, therefore, be considered an estimate rather than an absolute value.

Also included in the research was a review of all the sites where nephrite artifacts were not present. Working with excavated sites only, the type of information collected was similar to the nephrite bearing sites. This included:

1. Site Name
2. Site Type
3. Time Period
4. Number of Meters2 Excavated
5. Number of Formed Tools Recovered

This information was only collected for sites in the British Columbia interior. Sites without nephrite on the Columbia Plateau were not recorded. The decision not to collect this information was based on the lack of access to sufficient literature for the area and time considerations. The data for sites without nephrite is listed in Appendix 4.

Context and Distribution

Data were compiled from 283 sites from the British Columbia Plateau and the Columbia Plateau. Of these sites, 258 were from British Columbia and 25 were from the Columbia Plateau. The breakdown of the different types of sites reviewed is in Table 5.11.

Seventy-six sites had nephrite artifacts -- 57 from the British Columbia Plateau and 19 from the Columbia Plateau (Figure 5.10). A total of 171 nephrite artifacts were present at these sites. The majority were celts, followed by significantly fewer frequencies of other artifact types (Table 5.12). Thirteen of the sites only reported an 'unspecified' number of celts.

Only one recorded artifact could be thought of as ornamental. A 'jade pendant' was reported at a burial on the Columbia Plateau 45-FR-42 (Combes 1968), but there was no further material identification available. Because artifacts such as these are not present for areas around the source, it is doubtful that this item is jade or nephrite. The other artifacts were all utilitarian forms.

In addition to items made of nephrite, information was gathered on 24 artifacts of different material types (Table 5.13). Most of the material identifications made by the report's authors were on visual characteristics of the material type. Rarely were specific gravity and hardness tests performed to identify material types, along with other forms of mineral identification. This undoubtedly resulted in some mis-identification of material,but overall this probably does not seriously affect the results. It is quite evident, even with a 20% mis-identification rate, that nephrite would still be the dominant material used for celts. Anthophyllite is a material identification often used by Collier et al. (1942:70) for sites excavated in the mid-Columbia River region. They list the mouth of the Kettle river as a possible source or alternatively, the Fraser/Thompson River area. It is possible that this material is simply a form of nephrite. It is not identified in sites other than those investigated by Collier et al. (1942).

Table 5.12 -Reported Nephrite Artifacts Types for the British Columbia and Columbia Plateaus.

Artifact Type	BC	CP	Total
Celts	112	17	129
Chisels	3	-	3
Sawn Boulders	9	-	9
Celt Blank	1	-	1
Knives	7	-	7
Misc. Worked Fragments	15	4	19
Hammerstone	1	-	1
Unmodified Pebble	1	-	1
Pendant ?	-	1	1
Total	149	22	171

Changes in Nephrite Technology Though Time

As discussed in Chapter 3, nephrite artifacts have been present on the British Columbia Plateau from the Shuswap horizon ca. 3000 BP. Of the sample of nephrite artifacts, 124 (73%) had an assigned time period. The presentation of the number of artifacts and the size of celts associated with each horizon is in Table 5.14.

Considering the frequency of nephrite artifacts in the three horizons, there appears to have been an intensification in the use of the material over time. Looking strictly at the number of nephrite artifacts, the largest fraction is associated with the Kamloops horizon. This is followed by the Plateau and Shuswap horizons respectively. However, rate of occurrence based on the estimated amount of excavation carried out for each horizon indicates there is a slightly greater rate of nephrite artifacts associated with Plateau horizon deposits. This may be partially due to a large number of the Kamloops horizon artifacts coming from 'potted' burial contexts and excavations where the number of square meters excavated was not recorded.

Regardless of the number of artifacts associated with each horizon, the intensification of the nephrite industry can be seen in the dramatic increase in celt sizes over time. The average length of a nephrite celt in the Kamloops horizon is over twice the size of one from Plateau times (Table 5.13). Shuswap celts are also on average smaller than Plateau celts. Further evidence comes from the size range of the celts in each horizon. As is evident in Figure 5.11, celts in the Shuswap and Plateau horizon have a fairly limited size range in contrast to the Kamloops celts, which are very large in comparison.

Richards and Rousseau (1987:89) also note that an intensification in nephrite use occurred through time. They observe that small celts are present from the Shuswap horizon onward and that large celts develop in the Plateau horizon. They do not define what constitutes a small celt versus a large one, and it is not clear whether really 'large' celts were present before the Kamloops horizon. Richards and Rousseau (ibid.) likewise list celt blanks as a development in the Kamloops horizon and infer that a trade in unfinished celts then existed. During my review of the excavation reports, I found this artifact type was present in Kamloops horizon sites (e.g., EdRk 1, Sanger 1968b). They were not, however, very numerous.

Beyond the elaboration of celt forms, there was very little development of other types of nephrite artifacts on the British Columbia Plateau. During the Plateau horizon, ground nephrite knives appear at the Bell Site (Stryd 1973). Unfortunately, most of the knives come from unknown time periods and none were directly attributable to the Kamloops horizon. They, like celt blanks, never became very abundant. Because there is only a limited number of non-celt nephrite artifacts, very few conclusions can be made as to their function or value. There is also a lack of strictly ornamental objects made of nephrite.

The Distribution of Nephrite Artifacts

The overall distribution of nephrite artifacts on the British Columbia Plateau and the Columbia Plateau is presented in Figure 5.11 and includes sites that do not specify the number of nephrite artifacts. Major clusters occur in the Lillooet, Lytton, and Shuswap Lakes area. Smaller concentrations appear in the southern Okanagan Lake region, around the Arrow Lakes, the Grande Coulee/Chief Joseph Dam and Wanapum Dam areas, and the Dalles. These clusters, undoubtedly, are related to areas where more extensive archaeological investigations have been undertaken. In the following analyses, efforts will be made account for this bias to the sample. The interpretations offered are based on the current data available and future investigations may influence the results. The most distant artifacts occur in the Burns Lake area to the north (Borden in Sanger 1968a), the Kootenays to the East (Bussey 1978), and the Snake River in Idaho to the Southeast (Spinden 1915).

Celts have the broadest distribution pattern (Figure 5.12) and are found throughout the Interior. Knives and miscellaneous fragments were also recovered in various regions on the Plateaus (Figure 5.13). The only artifact class that had a very restricted distribution were sawn boulders. These items occur only in the Lytton and Lillooet region, corresponding with the sources of nephrite along the Fraser River. Because sawn boulders are usually the main debitage associated with nephrite manufacturing, these areas can be considered the production zone, using Sherratt's (1976) exchange system terminology.

There appears to be a general drop off in the frequency of nephrite items away from the source area (Figure 5.14). Most of the artifacts occur within 50 kilometers of the source. Using Lytton as a boundary for the eastern extent of nephrite sources, progressively fewer artifacts are found with increasing distance. One exception is the 100-150 km zone where there is a surge in frequency. The distribution of nephrite is affected by the location of mountain ranges and the courses of major rivers. Examining the distribution over time, some variation is present. During the Kamloops horizon, there are almost the same number of artifacts present in the 100-150 km zone as in the source area. In the Plateau horizon, most celts only occur in the 0-50 km area. Interestingly, only one Shuswap period celt was recovered in the Fraser River area, whereas, most were found a considerable distance away. The sample size for this time period, however, is so small it is difficult to make strong conclusions based on the limited data.

In Figure 5.15, the province of British Columbia is divided into sections based on 0.5 degree of latitude and 1 degree of longitude and the frequency of artifacts is plotted within this grid. Examination of the distance data in this format indicates a similar variation in the distribution of nephrite items is observable. The main concentrations occur in the Lillooet and Lytton Areas (squares F12 and F13) and by the Shuswap Lakes. Beyond these regions, the artifact numbers are more sporadic. The same trends are reflected when adding in the location data for the artifacts examined in section 5.1 of this chapter (artifacts that overlap between the two samples were removed). These artifacts appear most frequently in the Lillooet, Lytton and Western Shuswap Lakes areas. The range in which nephrite artifacts occur also stretches slightly northward.

The frequency of artifacts in any location is largely a product of the amount of investigation performed in the region. For instance, areas that have had more develop-ment usually have had more archaeological examination in order to meet cultural re-source management guidelines. In such regions, the number of artifacts present can be over-represented compared to areas with less development. To overcome this bias, one has to calculate the rate at which artifacts occur rather than an overall frequency. Only controlled excavations are amenable to

Table 5.13. Artifact Material Types.

Material	Celts ‡	Knives	Misc. Frag	Sawn Boulders	Hammer-stone	Pendant	Unmodified Pebble	Totals
Nephrite	90	4	19	3	-	-	1	117 61.2%
Nephrite/ * Serpentine	27	-	-	2	-	-	-	29 15.2%
Jade *	11	3	-	4	1	1	-	20 10.5%
Anthophyllite	6	3	-	-	-	-	-	9 4.7 %
Greenstone	5	-	-	-	-	-	-	5 2.6 %
Quartzite	3	-	-	-	-	-	-	3 1.6 %
Indurated Siltstone	1	-	1	-	-	-	-	2 1.1 %
Slate †	1	-	-	-	-	-	-	1 0.5%
Basalt	-	-	1	-	-	-	-	1 0.5 %
Unknown	4	-	-	-	-	-	-	4 2.1%
Total	147	10	21	9	1	1	1	191

‡ Includes Celts, celt blanks, and chisels

* For the purposes of this thesis, both jade and nephrite/serpentine classifications are all considered to be nephrite

† Slate knives are also occasionally found on the British Columbia Plateau. Because of the focus on celt technology, information on these artifacts was not collected.

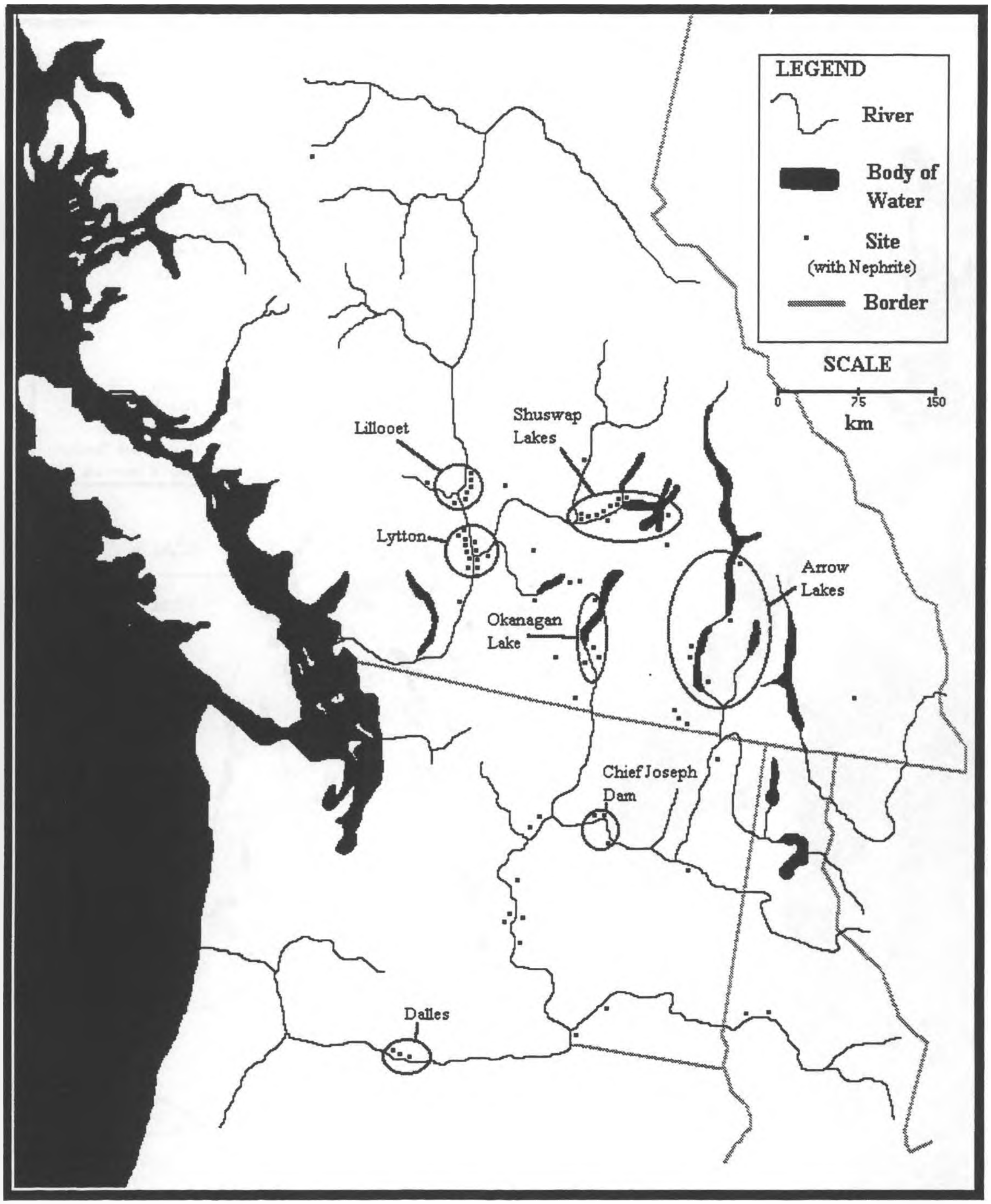

Figure 5.11. Nephrite Artifact Distribution.

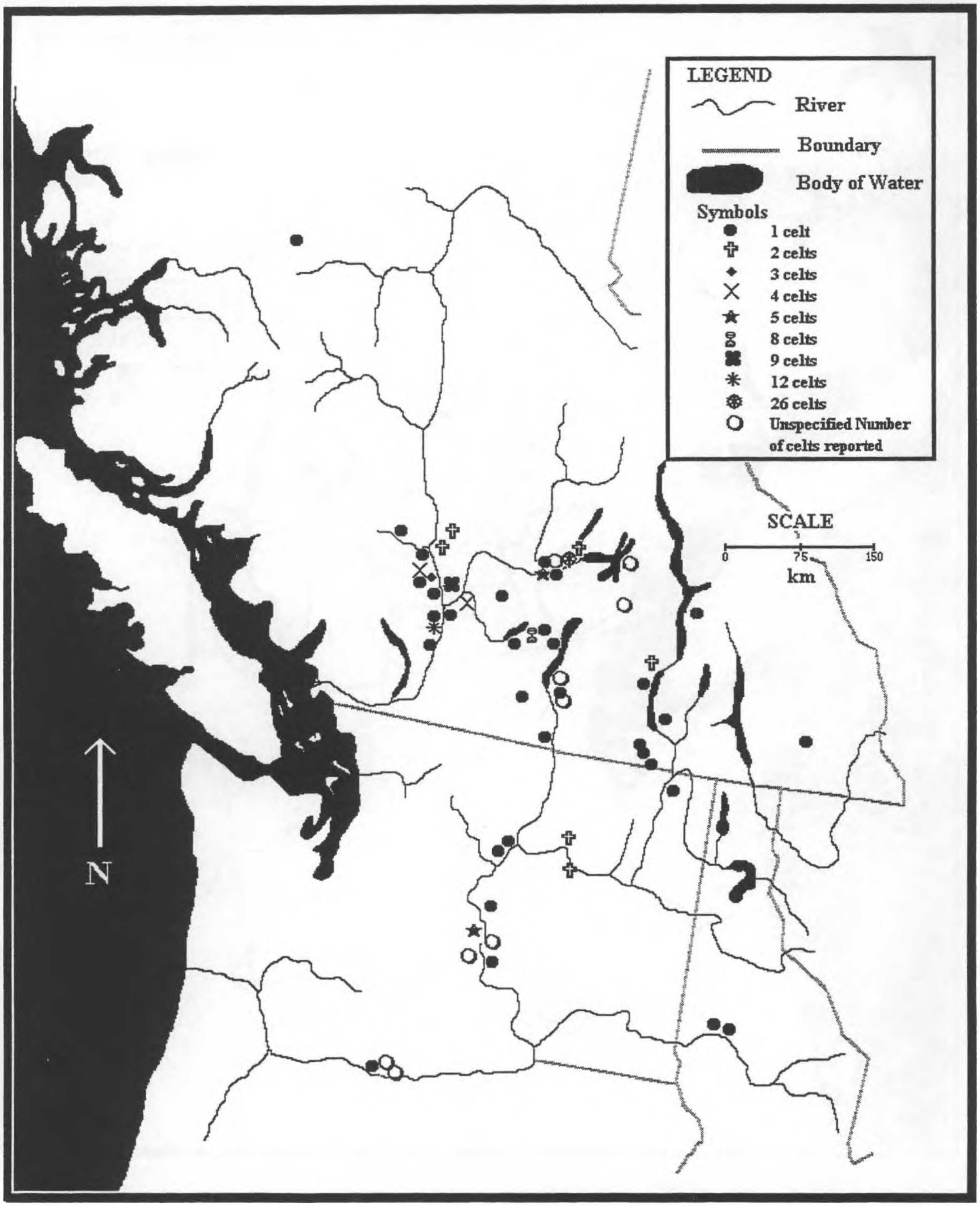

Figure 5.12. Celt Distribution on the British Columbia and Columbia Plateaux.

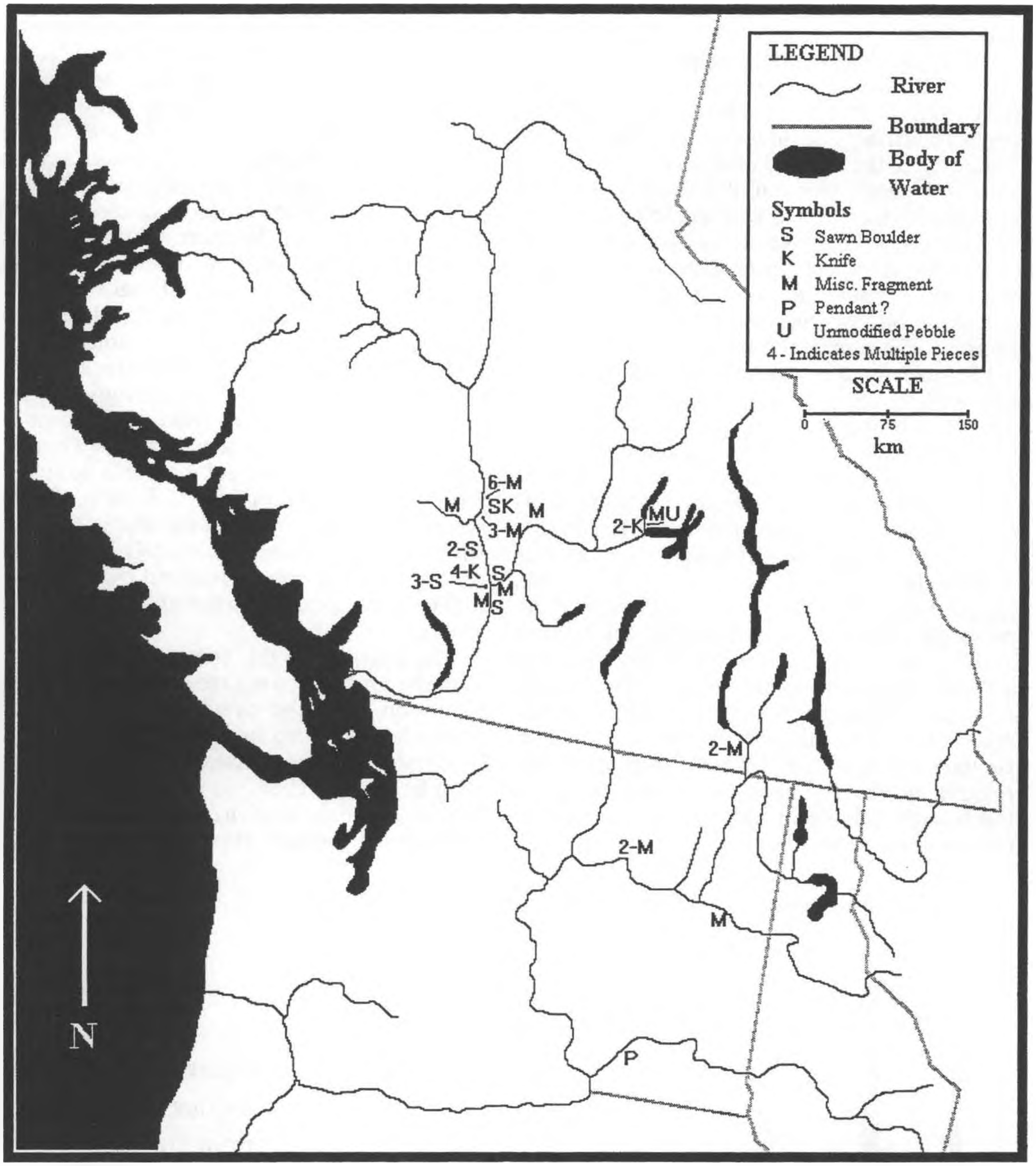

Figure 5.13. Distribition of Non-celt Nephrite Artifacts.

this type of archaeological research. Traditional surface survey, unless some controlled testing is involved, cannot account for spatial dimensions.

Because the number of square meters excavated at every site was recorded when possible, it is feasible to look at the "rate" at which nephrite artifacts occur in certain regions. In Figure 5.16, the number of square meters excavated per geographical unit and the number of nephrite artifacts found within controlled excavations are listed. No items recovered from non-excavation contexts (e.g. survey finds) and from sites where the amount of excavation could not be obtained were included in these figures. The number of square meters excavated for each area was determined for sites with and without the presence of nephrite. Results from this procedure seem to confirm the pattern seen with the uncontrolled frequency data with one exception, recovery rates in areas west of the Arrow Lakes region (I 10 and I 11) are greater than those for most of the Fraser Canyon. This may reflect some fortuitous discovery. In sector I 10, one site in particular, DgQo 1, has three pieces of nephrite that are probably attributable to one broken celt (Barlee 1968). However, even when taking this into account (the rate lowers to 0.026), there is still a greater frequency of nephrite artifacts in the area based on the amount of excavation. Beyond this anomaly, the same increase in the relative numbers of nephrite artifacts occurs in the western Shuswap Lakes area as with the raw frequency data.

Interestingly, very few nephrite artifacts appear north of the Lillooet region despite considerable investigation in some areas (Figure 5.17). This suggests that nephrite utilization in these areas was probably very low. It also appears that there was very little use of alternate materials for celt technology in the northern Interior and the Columbia Plateau. When looking at the distribution of artifacts associated with non-nephrite celt production, there are just as many of these artifacts recovered in the Lillooet (F13) and Western Shuswap Lakes (H13) area distributed in others. The celts found in the northwest are all made of greenstone. Again, on the Columbia Plateau, the main non-nephrite material is anthophyllite (Collier et al. 1942). The overall lack of alternative stone types in celt technology suggests alternate methods were used to accomplish woodworking tasks in these areas. This may indicate that nephrite celts were a luxury of sorts, particularly on the Columbia Plateau where they occur in small numbers. One celt, for example, recovered at 45-DO-176 (Site 60 on Figure 5.10) was considered by its excavators to be not practically functional (Galm et al. 1985).

In examining the spatial distribution of nephrite artifacts over time, there is only slight deviation from the overall pattern. Clearly from the Shuswap horizon onwards (Figure 5.18) nephrite trade occurred widely. Richard-sand Rousseau (1987:30) indicate this as being the only real evidence for inter-plateau exchange at the time. However, the small num-

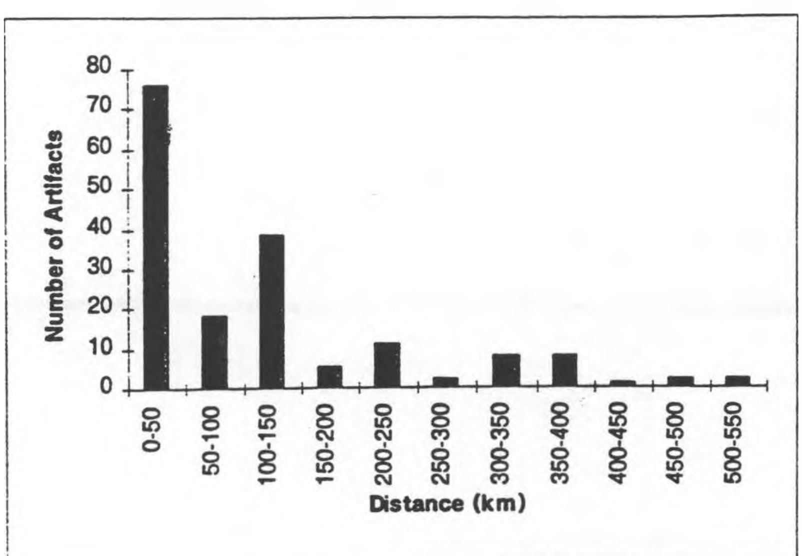

Figure 5.14. Nephrite Artifact Frequency from Source.

bers of celts attributable to this period are insufficient to make more specific conclusions. During the Plateau horizon (Figure 5.19), the results suggest that there was an elaboration of nephrite exchange as artifact numbers increase. Most of the nephrite artifacts associated with this period appear in the Lillooet area (F13). While this may be partially due to the large amount of investigation in this area, other sectors (except for I 10), have lower rates of nephrite recovery. This possibly corresponds with the proposed development of complex societies during this horizon (Stryd 1973; Hayden et al. 1985). From the location and abundance of nephrite artifacts related to the Kamloops horizon (Figure 5.20), nephrite exchange was probably at its zenith.

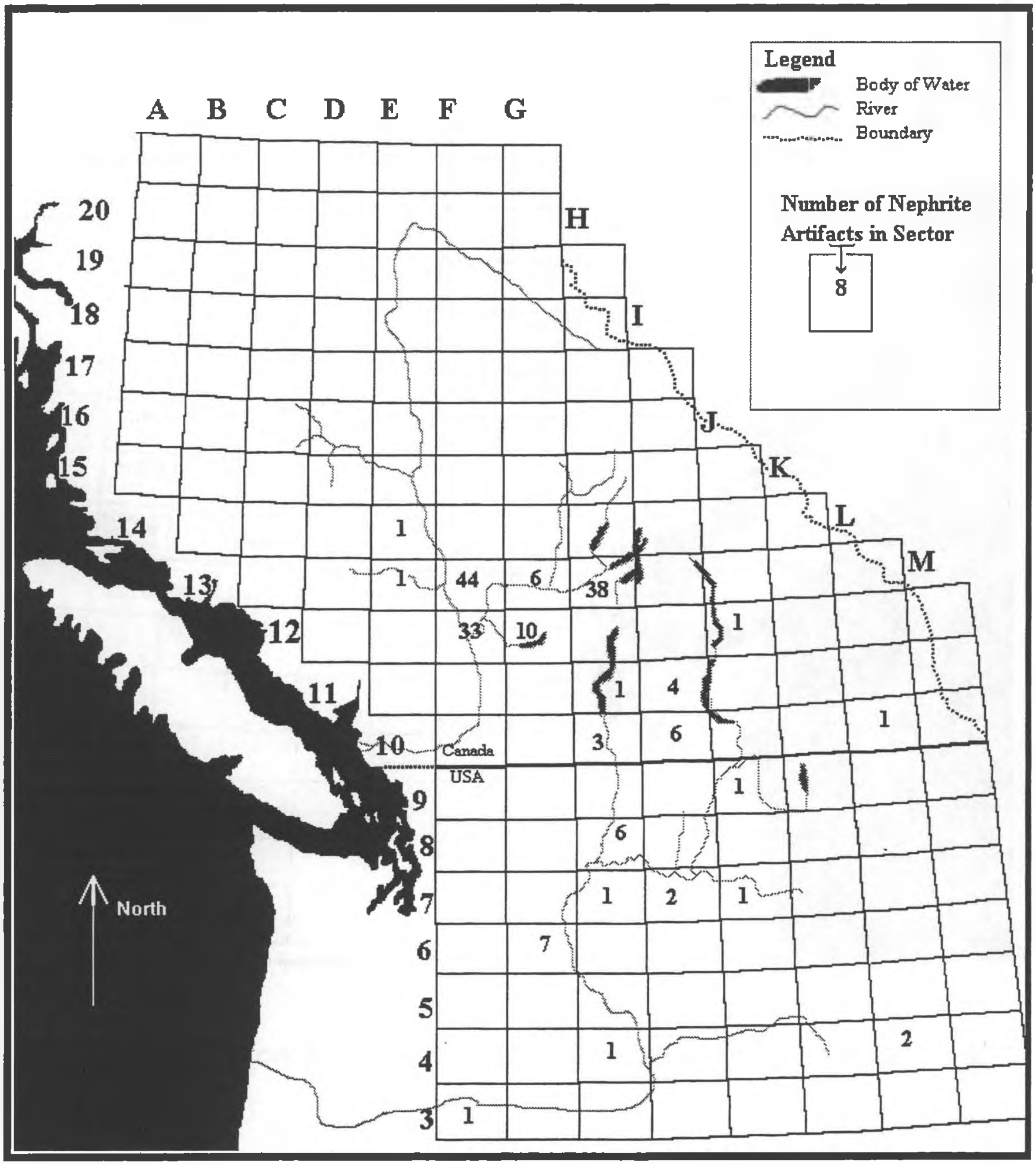

Figure 5.15. Nephrite Artifact Distribution by Grid Zone (literature review only).

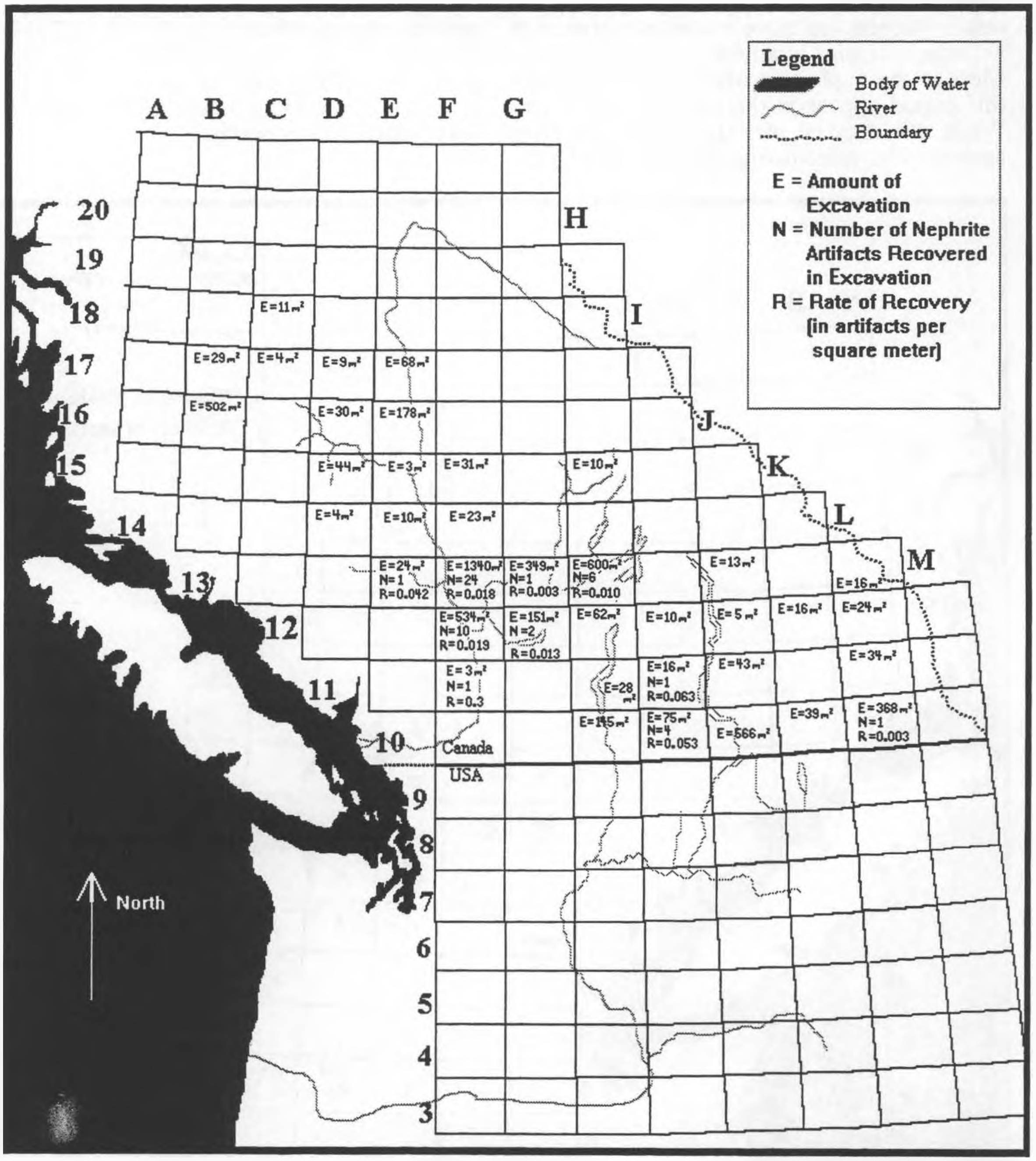

Figure 5.16. Nephrite Artifact Rates (artifacts/m^2) for Grid Zones.

Celt Sizes Over Distance from the Source.

Celt sizes do not decrease in a single linear fashion with increasing distance from the source on the British Columbia and Columbia Plateaus. Quite unexpectantly, average celt sizes increase with distance for the first 150 kilometers (Figure 5.21). For both the 50-100 and 100-150 km zones, the average length of a celt is over 180 millimeters. At a distance of 200-250 km from the source, the average celt size drops below that for the source area. Unfortunately no data were available for 150-200 km zone. Interestingly, there is no substantial decrease in celt size after this distance. Although there is a slight drop in size between 250-300 km, lengths increase again in the 300-350 and 350-400 km zones. After this distance no data is available until 500-550 km from the source where, suprisingly, two celts were recovered on the Snake River each measuring approximately 225 millimeters in length (Spinden 1915) (these celts are averaged with one celt from the Dalles region).

When examining the same data using the grid system, the same pattern exists (Figure 5.22). The largest average celt lengths in British Columbia occur in the Nicola Valley (G12) and the Western Shuswap Lakes regions (H13) and not along the Fraser River. In the Northern Arrow Lakes region (J12) only one celt was recovered during survey that measured 187 millimeters (Turnbull 1977), which may inflate the average size for that sector. Again, the averages for areas in proximity to the source are lower. On the Columbia Plateau, celt dimensions tend to be slightly greater than those recovered in the Okanagan.

To gain more insight into the nature of celt dimensions over the Plateaux, I examined the distribution of different celt lengths (Figure 5.23). For each sector, percentages were calculated for celt length increments of 50 millimeters. Some grid areas were combined because of small sample size. The distribution of sizes in the Lillooet (F13& E14) and Lytton areas (F12&F15) reveals that the percentage of small sized celts was greater in these regions than in the Nicola Valley (G12) and Western Shuswap (H13). Most of the celts in the Nicola valley are larger, whereas they vary in size in the Shuswap area. In both areas, large celts are far more frequent than along the Fraser River. In the Okanagan and Arrow Lakes area (J12&I11&I10), there is an increase in the percentage of small celts. No celts were over 200 millimeters in size in these regions. Similarly, in the mid Columbia River, area no celts over 200 millimeters were recovered. Half of the sample from this region was under 100 millimeters in length but no celts under 50 millimeters were recorded. Areas not included in Figure 5.23 include the Dalles (F3), the Snake River (L4) and the upper Columbia River in Washington (J9), because of small sample size.

Unfortunately, examination of these patterns over time is problematic due to minimal data prior to the Kamloops horizon. Average celt lengths from the Kamloops horizon reflect the same pattern of increase as noted for the entire assemblage (Figure 5.24). The average size of celts in the Nicola Valley (G12) and the Lillooet areas (F13) substantially increases in size from the Plateau horizon, whereas the average size is reduced in the Lytton area. The celts in the Western Shuswap Lakes area remain relatively the same, as do the averages on the Columbia Plateau. Data available for the lengths of Plateau and Shuswap phase celts are not substantial enough to make any conclusions about the spatial range of celt sizes during these time periods (Figure 5.25). Only three grid zones for Plateau celts (F13, H8 and I7) and only four for Shuswap celts (H8, H11, I 10, and I 11) have information available on artifact dimensions.

Summary of Distribution and Size

Comparison data obtained from the British Columbia and Columbia Plateaus to the four models presented by Hodder and Lane (1982), indicate a close match to the first model (postulated by Sherratt 1976). It appears that larger celts were traded to distant communities more often by producers (in the Lillooet and Lytton areas) because of their value as sociotechnic items (Binford 1962). This is demonstrated by the high percentage of large celts compared to smaller celts in the Nicola Valley and Western Shuswap Lakes region. Smaller celts appear to have been retained more often in the Lillooet and Lytton areas for local woodworking requirements.

In the Okanagan and Arrow Lakes regions, a high frequency of smaller celts were also recovered, and a similar ratio is present for the rest of the Columbia Plateau. It is unclear if there is a decrease in the number of nephrite artifacts over space because frequency data and the rate calculations indicate different levels of use of the material in the Okanagan and Arrow Lakes area.

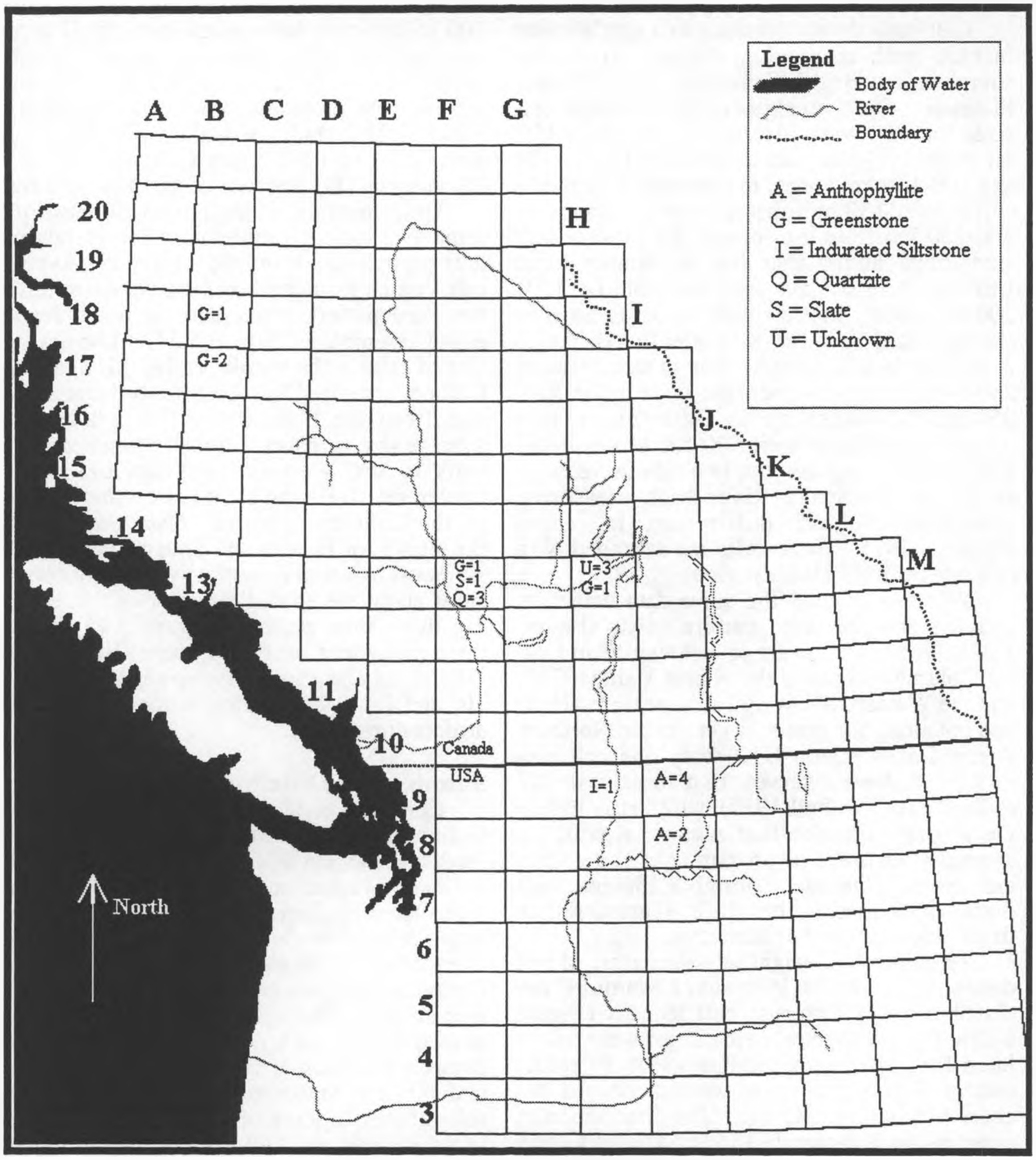

Figure 5.17. Distribution of Non-Nephrite Celts.

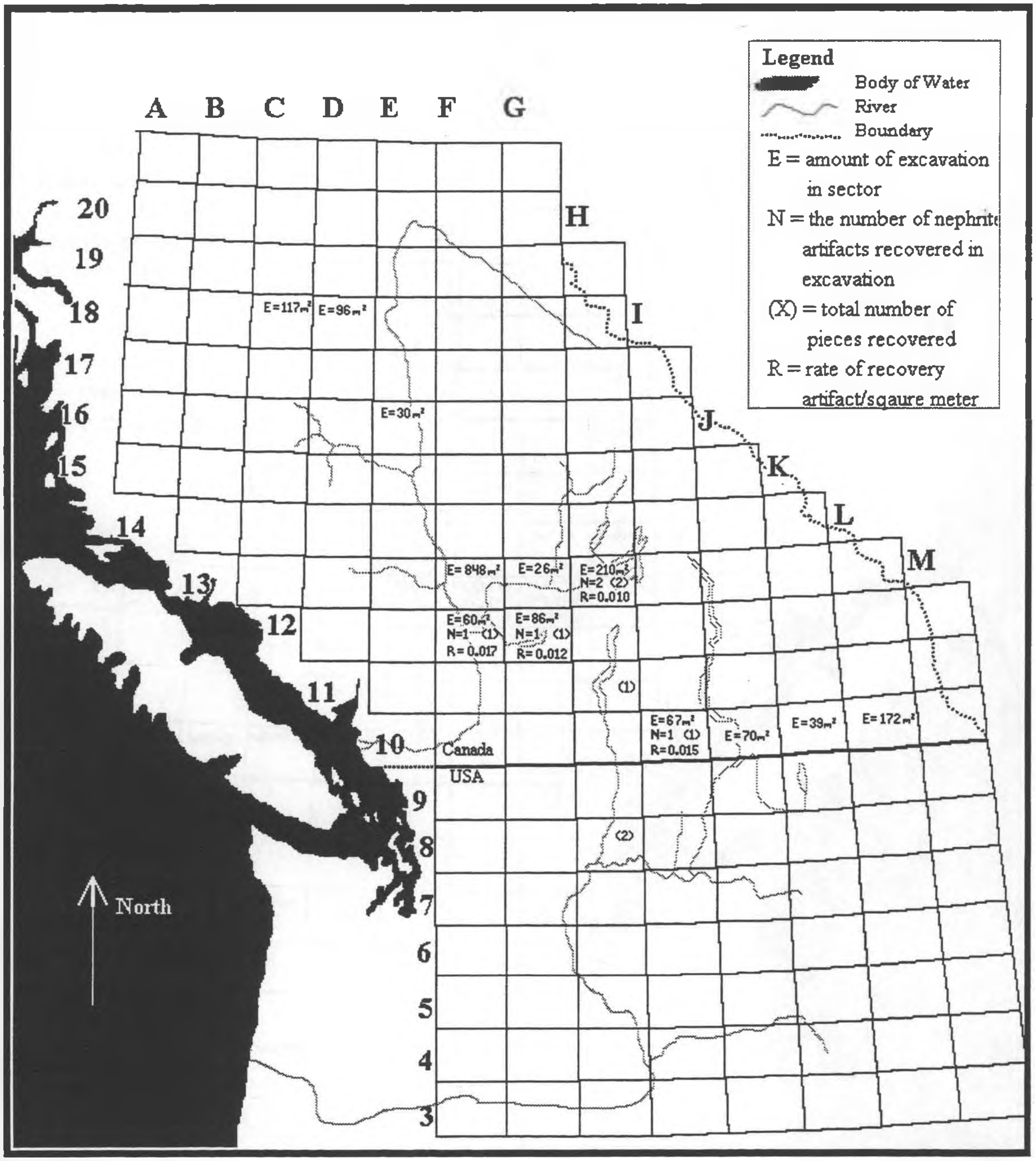

Figure 5.18. Distribution and Rates of Nephrite Artifacts in the Shuswap Horizon.

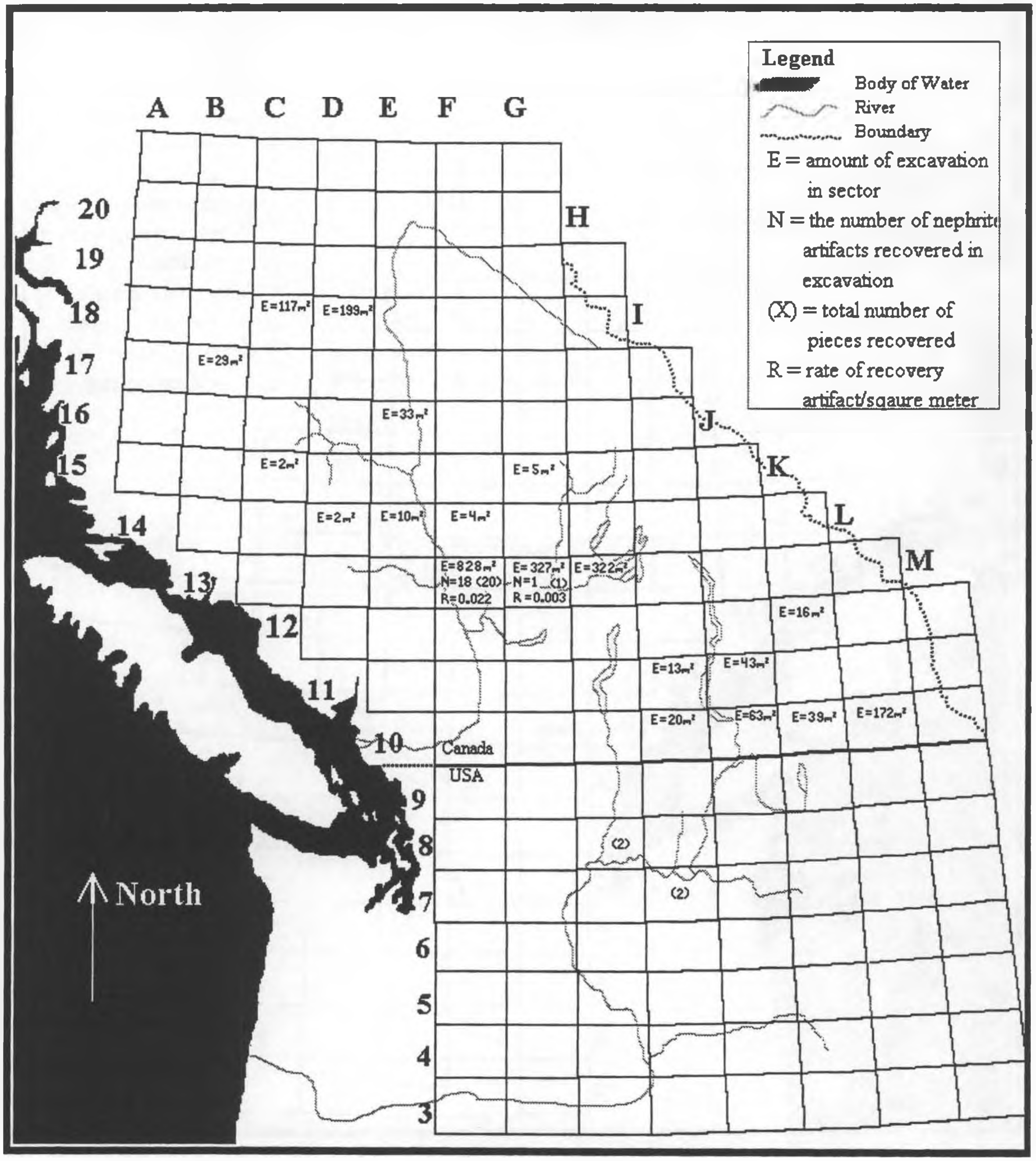

Figure 5.19. Distribution and Rates of Nephrite Artifacts in the Plateau Horizon.

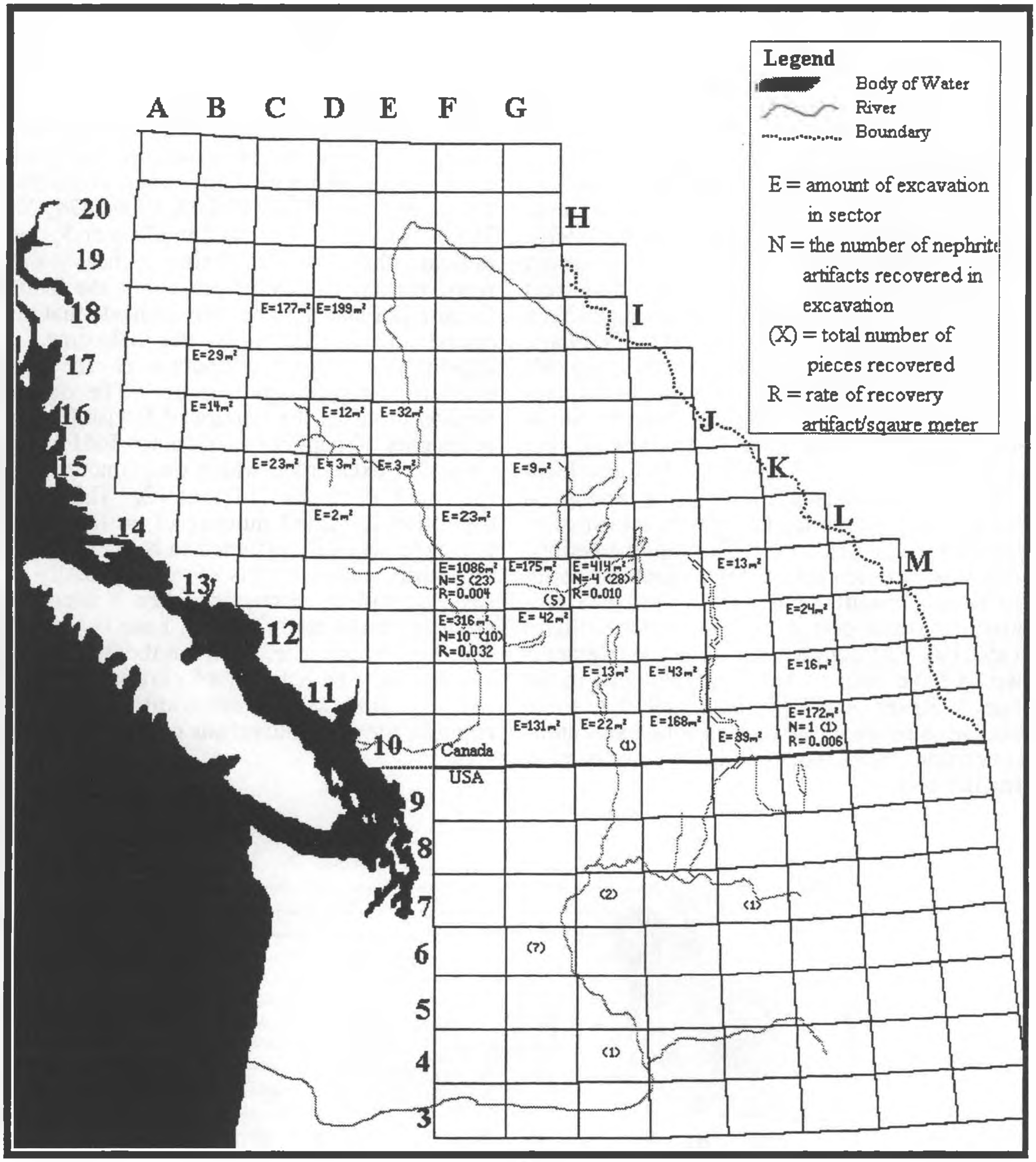

Figure 5.20. Distribution and Rates of Nephrite Artifacts in the Kamloops Horizon.

Change in the size distribution for nephrite celts in the Okanagan Valley, Arrow Lakes and Columbia Plateau regions possibly indicates the structure of a nephrite exchange system. Indicated by sawn boulder distributions, the production zone associated with nephrite manufacture is in the Lillooet and Lytton areas (Figure 5.26). Moving away from the production zone, the Nicola Valley and Western Shuswap Lakes areas comprise the direct contact zone (terminology following Sherratt 1976: 558). The Okanagan Valley, Arrow Lakes and Columbia Plateau areas are all in the indirect contact area. These zones are defined partly on geographical location but also on the dramatic differences in nephrite artifact density and celt size seen within them. These variations suggest that the Nicola Valley and Western Shuswap Lakes regions were secondary staging areas for the trade of nephrite. In these locations, it is possible that groups acting as 'middlemen' sectioned larger celts into smaller pieces for southern trade. A similar relationship was recorded for the Yir Yoront in Australia where 'middlemen' were a part of a prehistoric stone celt exchange system (Sharp 1952:19). Although some larger implements would have been traded (e.g., two celts in the Snake River Area [Spinden 1915]), most exchange between the direct contact and indirect contact zones would probably have been in smaller celts.

The only aspect of Sherratt's (1976) model that was not detected on the Plateaus was the replacement of nephrite by other stone materials for smaller celts in areas away from the source. As discussed previously, there was relatively little use of alternate materials for celts other than nephrite, suggesting that woodworking tasks were not primarily performed using celt technology. Ethnographic data from Teit (1900:183, 1906:203-204, 1909a:474, 709, 715, 1917:29), as reviewed in Chapter 3, does indicate that alternate forms of heavy duty woodworking tools were present on the British Columbia Plateau. This may indicate that any access to nephrite tools was a luxury. It appears that nephrite artifacts were rare items even in the production zone. The overall recovery rate for the Interior of British Columbia is only 50 nephrite artifacts for 5661 square meters of excavation which only amounts to a rate of 1 item per 111 meter2. This is an exceptionally small number of artifacts for a tool type generally assumed to be possessed by all family groups. This seems especially the case, as will be discussed, when it is considered that most nephrite celts have been recovered in burial contexts. Even though this low number may be a factor of curation, the evidence seems to suggest limited access to nephrite for most individuals on the Plateau.

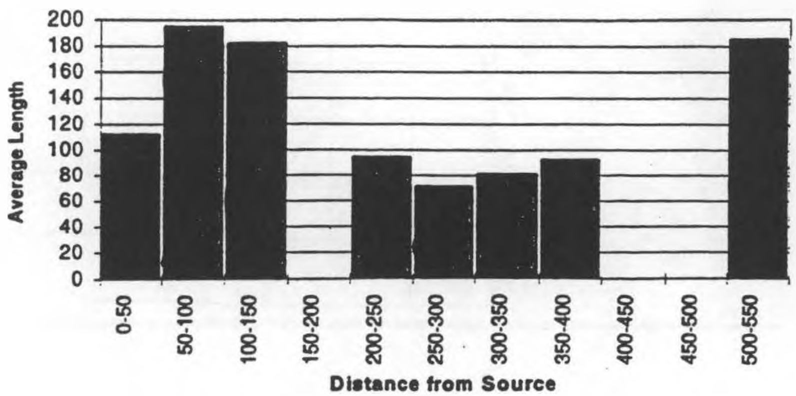

Figure 5.21. Average Celt Length (mm) versus Distance (km) from Source.

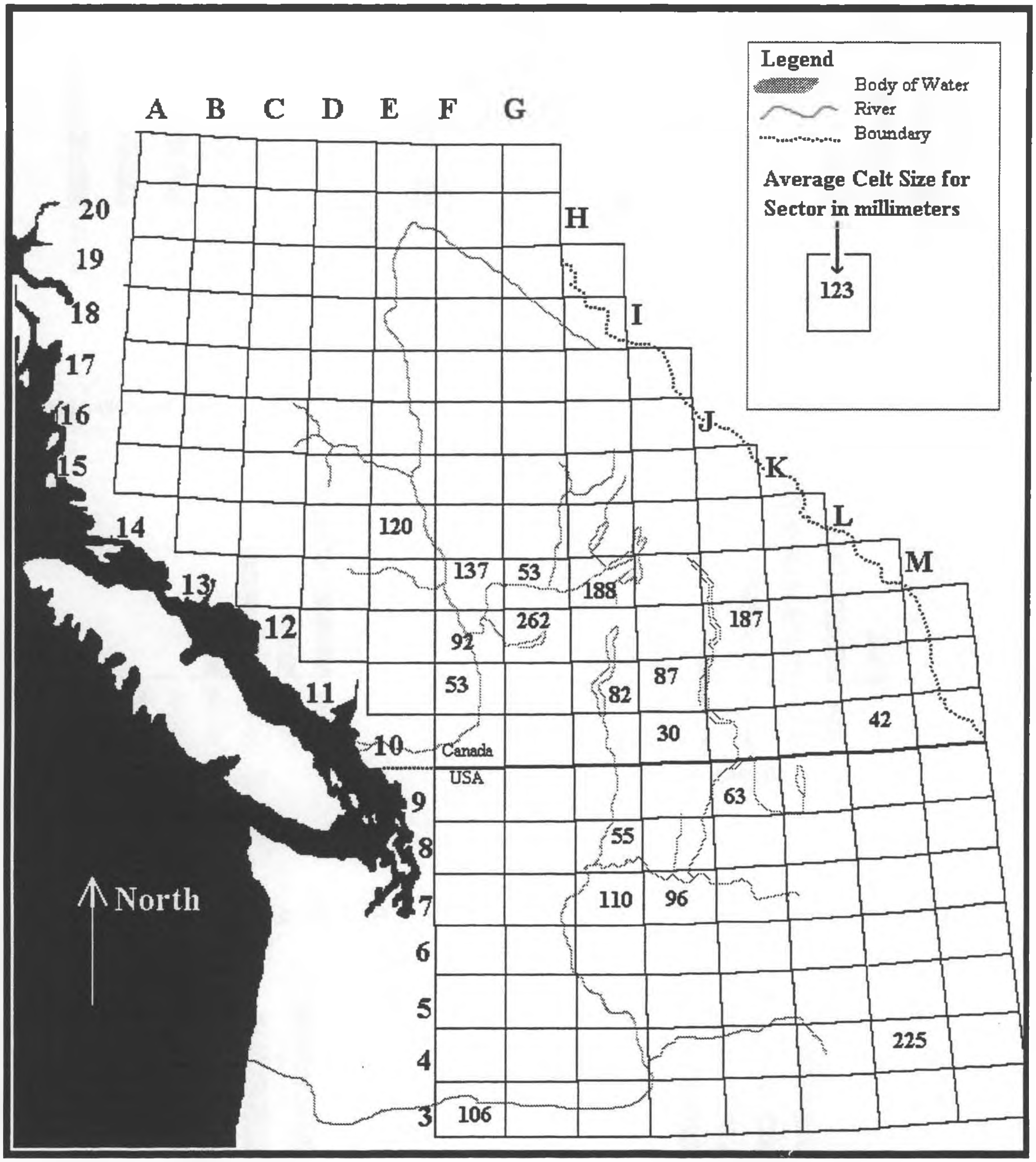

Figure 5.22. Average Celt Size in Grid Zones.

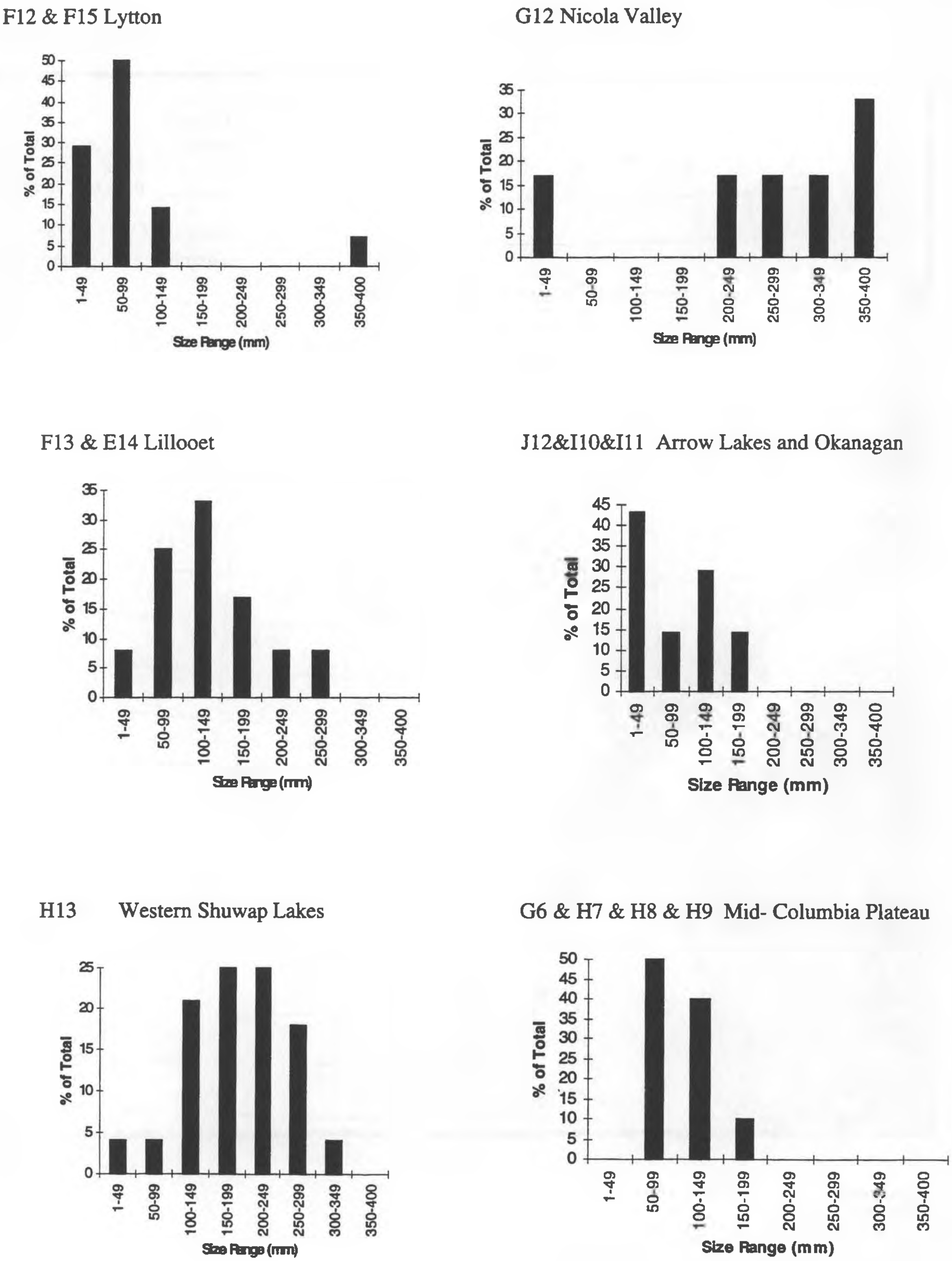

Figure 5.23. Distribution of Nephrite Celt Lengths for Areas on the British Columbia and Columbia Plateaus.

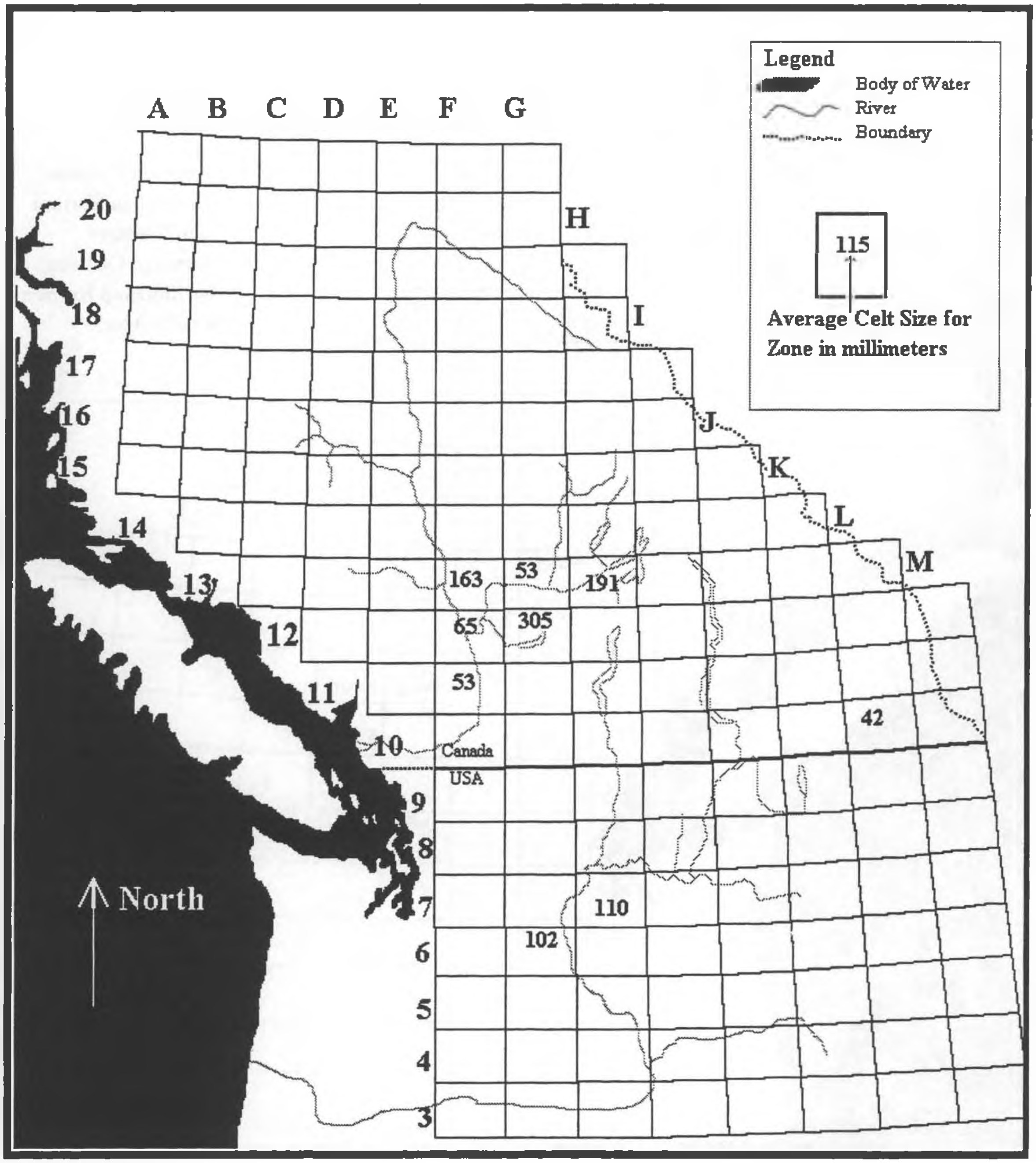

Figure 5.24. Average Celt Sizes for Grid Zones in the Kamloops Horizon.

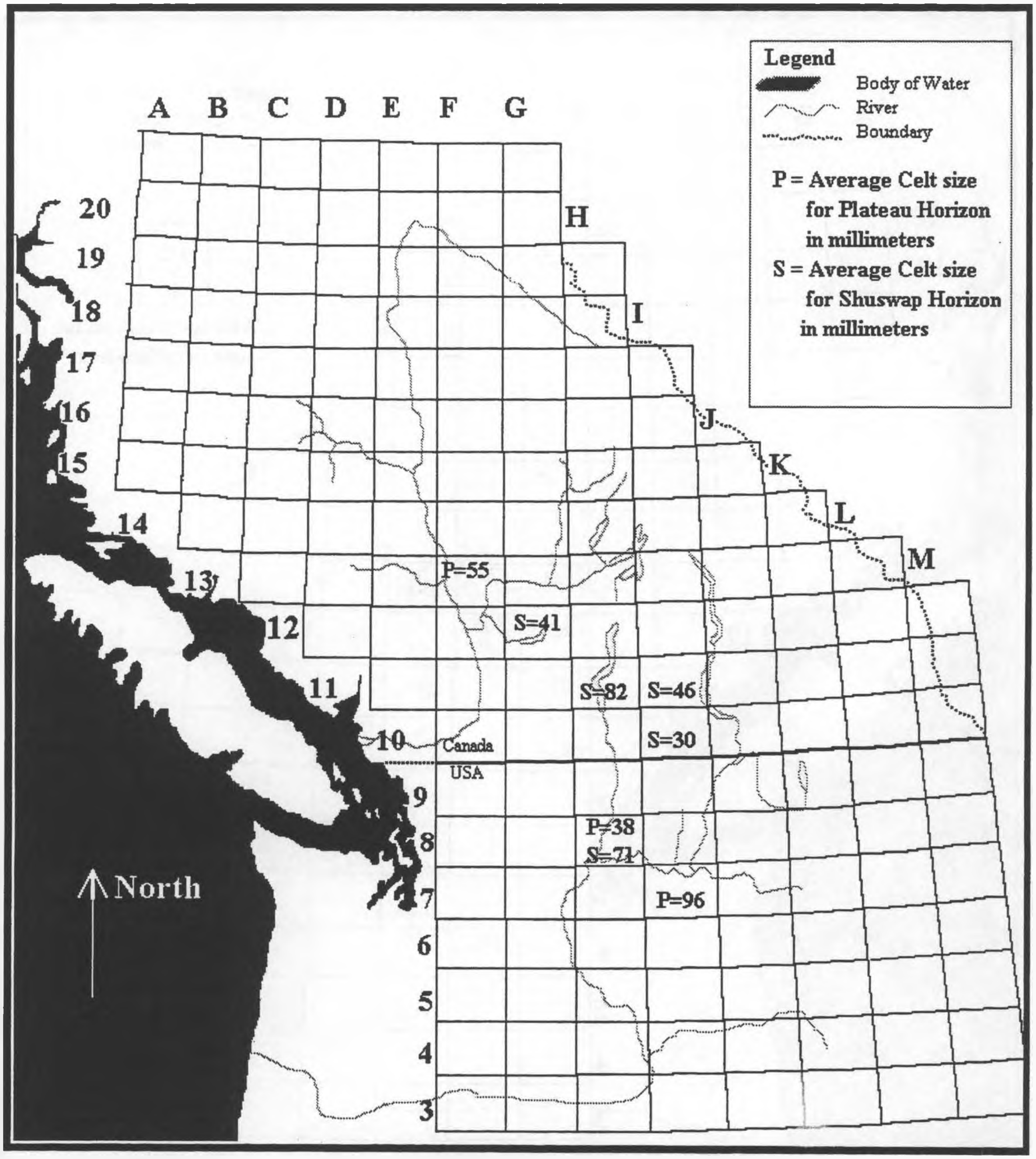

Figure 5.25. Average Celt Lengths for Grid Zones in the Shuswap and Plateau Horizons.

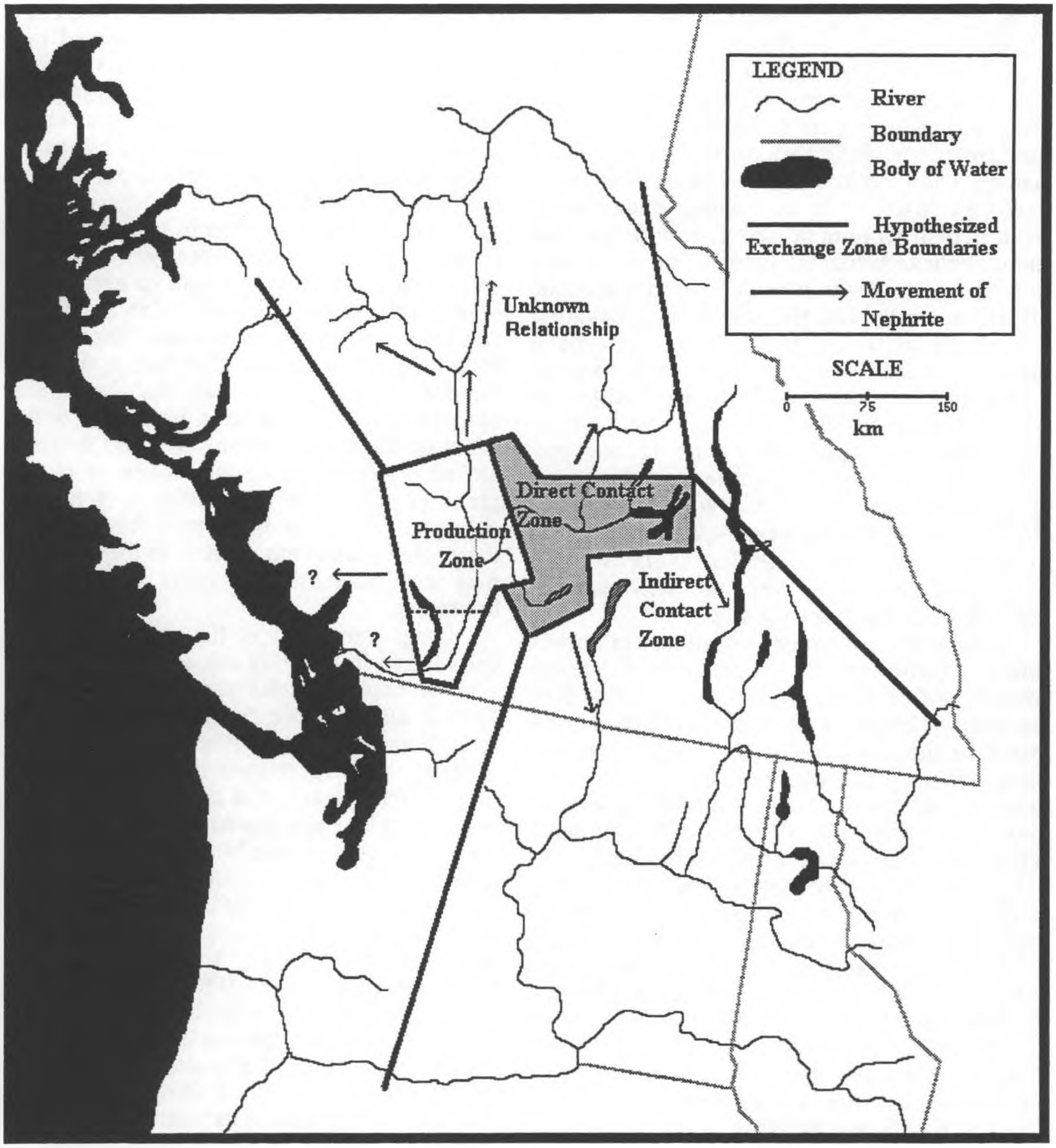

Figure 5.26. Proposed Structure of Nephrite Exchange on the British Columbia Plateau.

The Contexts of Nephrite Artifacts

The majority of excavated nephrite artifacts on the British Columbia and Columbia Plateau are found in burial contexts (Table 5.15). Of the total number of artifacts, 82 or 48% of the sample were associated with burial sites. An additional 58 or 33.9% were found in housepit sites, followed by campsites, lithic scatters and resource sites. The number recovered exclusively in systematic excavations from British Columbia, seems to indicate that more nephrite artifacts occur in housepits than in burials. However, when taking into account all sites recorded and the amount of excavation completed in the Interior, burial sites have almost 7 times the rate of nephrite per square meter than any other type of site. Although 61.5% of the excavation performed on the British Columbia Plateau has been in housepit sites, only 35 pieces of nephrite were recovered from those contexts. This equals a rate of 0.010 nephrite artifacts per square meter -- in contrast, burials have 0.067 artifacts/m^2. An even lower rate of recovery rate was recorded for campsites and resource sites.

Nephrite is also more prominent in burials when examining its overall presence or absence within sites. As depicted in Table 5.16 the ratio of burials with nephrite artifacts compared to those without is 0.83 for excavated sites. When comparing all the sites from the Interior, this rises to 1.58 -- i.e., it is more common to find a burial with nephrite than without. This ratio drops, however, when including burial features from other site types. The ratio of nephrite presence is considerably less for the other site types. Housepits only have ratios of 0.18 for excavated material or 0.25 for all sites combined. Lithic scatters, resource sites and campsites again have even lower ratios.

Examination of the contexts of nephrite over time indicates that there is some variation in the locations in which nephrite occurs. During the Kamloops horizon, nephrite artifacts are found mainly in burial contexts, using both presence or absence ratios (Table 5.17) and rates per square meter (Table 5.18). These results mirror those for the overall sample. In the Plateau horizon, the ratio of different site types with nephrite to those without nephrite changes. This ratio decreases to 1.0 (for all site types) or 0.16 when taking into account burial features found within other site types. No nephrite was recovered in excavated Plateau horizon burial contexts. No nephrite artifacts have been found in campsites, lithic scatters or resource sites in the Plateau horizon. The rate of nephrite recovery increased 2.5 times for housepits during this period compared to the Kamloops horizon. The same trends continued during the Shuswap, with the exception of one celt recovered from a lithic scatter site (Rousseau 1984). Unfortunately, information about the amount of excavation performed at this site was unavailable.

There is also variation in nephrite artifacts found within particular site types. Both celts and sawn boulders are found in greater numbers within burial contexts (Table 5.19). In contrast, miscellaneous worked fragments are found more often in housepit sites and the limited data for knives suggests that they are also more likely to be found in housepit contexts. Most of the miscellaneous worked fragments are probably debris from broken celts. The greater incidence of these artifacts in housepits suggests that celts were probably used, and therefore broken, more often in these areas. It may also indicate that celts were made in housepits.

Large variations in the nature of nephrite celts found in different site contexts exist. The size of nephrite celts associated with burial sites is almost three times longer on average than those found in housepit sites and twice as long as those recovered in campsites (Table 5.20). This is also the case when examining only complete specimens. Burial sites clearly have the largest number of associated celts (Figure 5.27). Most of the celts in burial contexts were over 150 millimeters in length. In both campsites and housepits, most celts were well under this length. The largest proportion of celts in campsites fall between 50-99 millimeters, and in housepits between 1-49 millimeters. In burials, there is an even distribution of all size classes that peaks in the 100-149 millimeter size range. I should also note, no recovery of nephrite celts over 200 millimeters in length occurred in non-burial contexts.

Beyond differences in size, variations in the integrity of nephrite celts also exist between the site types (Table 5.21). Using information available on the nature of celt breakage, it appears that complete celts are more often associated with burial sites and campsites. For burials, the ratio of complete to broken celts is 2.1 and for campsites 2.0. In housepit contexts, this level drops to 0.58 complete to non-complete celts. The other site types had insufficient data to calculate ratios.

Table 5.14. Distribution of Nephrite Artifacts during the Plateau Pithouse Tradition.

Horizon	Number of Nephrite Artifacts	Number of Celts	Number of Knives	Number of Sawn Boulders	Number of Other Artifacts	Average Celt Length (for those with data available)	Estimated Meters Excavated / Rate of Occurrence
Kamloops	86	76	0	3	7	n=55 x=160.8mm σ=90.7	3268 m^2 Associated with Excavation =22 Rate 0.007
Plateau	31	20	1	0	8	n=7 x=67.7mm σ=33.4	2450 m^2 Associated with Excavation =22 Rate 0.009
Shuswap	7	5	0	0	2	n=5 x=54.0mm σ=19.4	1824 m^2 Associated with Excavation =5 Rate 0.003
Unknown	47	25	5	5	7		858 m^2

Table 5.15. Frequencies and Rates of Nephrite Recovery.

Site Type	Total Number of Nephrite Artifacts Columbia Plateau Included		Total Number of Artifacts from Excavations in British Columbia	Estimated Number of Meters^2 Excavated in British Columbia		Ratio of Nephrite to Meters^2 of Excavation in British Columbia
Burial	82	48.0%	11	164	2.9 %	0.067
Campsite	11	6.4%	2	1652	29.2 %	0.001
Housepit	58	33.9%	35	3479	61.5 %	0.010
Lithic Scatter	4	2.3%	2	151	2.7 %	0.013
Resource	1	0.6%	1	215	3.8 %	0.005
Unknown	15		-	-		-
Total	171		50	5661		

Table 5.16. Presence/Absence of Nephrite Artifacts within Plateau Site Types.

Site Type	Number With Nephrite Including Columbia Plateau	Number of Sites Excavated with Nephrite in British Columbia	Number of Sites Excavated Without Nephrite in British Columbia	Sites With Nephrite to Without Nephrite Ratio Exca	All
Burial	29	5 (19)	6 (12) [20] †	0.83	1.58 [0.95]
Campsite	11	3 (8)	54 (56)	0.06	0.14
Housepit	25	13 (19)	71 (77)	0.18	0.25
Lithic Scatter	4	2 (4)	18	0.11	0.22
Resource	1	1	20 (21)	0.05	0.05
Unknown	6	-	-	-	
Campsite/Burial	-	-	3	0	
Total	76	24 (51)	172 (183)		

( ) - Bracketed numbers are the total for the site type, including those not found in excavation

† This number reflects the total number of burials. Because burials can occur in other types of sites, this number reflects instances where burials are associated with other types of sites and nephrite was not found in association with the burial. Sites where this occurs include EeRk 4 (Stryd 1972), EfQu 3 (Sendey 1971), FiRs 1 (Fladmark 1976), EaRd 14 (Skinner and Thacker 1988), EdRk 9 (Sanger 1971), EiRh 1 (Lawhead 1980), DjQj 1 (Mohs 1985), EeRl 19 (McLeod and Skinner 1987).

Table 5.17. Sites on the British Columbia Plateau with Nephrite compared to those without.

Time Period	B with	B with out	C with	C with out	HP with	HP with out	LS with	LS with out	R with	R with out	Total with	Total with out
Kamloops	8	5 [10]	4	20	6	47	1	8	1	15	17	95
Plateau	1	1 [6]	-	21	4	29		4	-	6	7	61
Shuswap	-	[2]	-	11	3	10	1	3	-	2	4	26
Pre-Shuswap	-	-	-	6	-	-	-	3	-	-	-	9
Unknown	10	4	4	24	6	14	2	10	-	3	22	77

† This number reflects the total number of burials. Because burials can occur in other types of sites, this number reflects instances where burials are associated with other types of sites and nephrite was not found in association with the burial. Sites where this occurs include EeRk 4 (Stryd 1972), EfQu 3 (Sendey 1971), FiRs 1 (Fladmark 1976), EaRd 14 (Skinner and Thacker 1988), EdRk 9 (Sanger 1971), EiRh 1 (Lawhead 1980), DjQj 1 (Mohs 1985), EeRl 19 (McLeod and Skinner 1987).

Table 5.18. Rates of Nephrite Occurrence in Site Types during the Plateau Pithouse Tradition.

Horizon	Burial	Campsite	Housepit	Lithic Scatter	Resource
Kamloops	n=7 m^2=133 rate = 0.053	n=3 m^2=984 rate = 0.003	n=9 m^2=2108 rate = 0.004	n=1 m^2=109 rate = 0.009	n=1 m^2=117 rate = 0.009
Plateau	n=0 m^2=0 †	n=0 m^2=608	n=19 m^2=1901 rate = 0.010	n=0 m^2=18	n=0 m^2=74.5
Shuswap	n=0 m^2=0 †	n=0 m^2=345	n=4 m^2=1406 rate = 0.003	n=0 m^2=17	n=0 m^2=55

† Burial features attributed to the Shuswap and Plateau horizons were excavated in other site types. Although listed as 0, some investigation of these features did occur. However, the amount of excavation would probably not be even close to the amount of square meters opened for Kamloops horizon burials.

Table 5.19. Frequency of Nephrite Artifact Forms in Site Types.

	Burial	Campsite	Housepit	Lithic Scatter	Resource	Unknown	
Celts†	73 55.7%	10 7.6%	38 29.0%	2 1.5%	1 0.8%	7 5.3%	
Sawn Boulders	4 44.4%	-	1 11.1%	-	-	4 44.4%	
Misc. Worked Fragment	3 15.7%	1 5.3%	13 68.4%	2 10.5%	-	-	
Knives	1 25.0%	-	3 75.0%	-	-	-	
Other	1 33.3%		1 33.3%			1 33.3%	

† This category includes chisels and celt blanks

Table 5.20. Celt Dimensions in Burial Contexts.

Site Type	n	$\sum x$	mean x	σ	Range
Burial - length (All)	53	9505	179.3	82.0	40 - 380 mm
- length (Complete)	16	2647	165.43	89.5	40 - 352 mm
- width (All)	46	2036	44.2	10.5	6 - 65 mm
Campsite - length (All)	8	752	94.0	49.1	42 - 187 mm
- length (Complete)	4	295	73.8	29.1	42 - 83 mm
- width (All)	8	357	36.5	15.5	18 - 62 mm
Housepit - length (All)	22	1457	66.2	46.7	16 - 187 mm
- length (Complete)	9	891	99.0	45.0	35 - 187 mm
- width (All)	18	654	36.3	13.8	6 - 58 mm
Lithic Scatter - length (All)	1	-	82	-	82
- width	1	-	22	-	22
Total - All - Complete	82 34				

A lack of information prevents an examination of context on a feature level. With housepit sites, it was only possible in some instances to determine the size of the depression where a nephrite artifact was recovered. Of the 56 nephrite items found in housepit contexts, only 20 had information concerning the depression size. As shown in Figure 5.28, most of these artifacts were found in depressions nine meters in size. This is mainly due, however, to the large number of celt fragments recovered in Housepit 1 at EeRk 7 (Sanger 1970). Spatial analysis of housepit sites in the British Columbia Interior is rare (for examples see Hayden and Spafford [1993] and Blake [1976]. Most reports on housepits are more concerned with chronology and site evaluation for CRM purposes. Rarely in these investigations is an entire housepit excavated.

The same lack of contextual data exists for burial sites. Because most nephrite artifacts recovered from burial sites are from non-professionally excavated collections, only 23 items can be attributed to individual burials on the British Columbia and Columbia Plateaux. According to Schulting (1995:156) a slightly higher proportion of these artifacts are associated with adult male burials with diverse burial assemblages. However the data (8 versus 5 pieces for males compared to females) is too limited to enable conclusions of this nature about artifact value. What can be seen is that the burials with nephrite present are predominantly those that are restricted to burial features away from dwelling or residential sites. Burials within other site types (e.g., EeRk 4 (Stryd 1972), EfQu 3 (Sendey 1971), FiRs 1 (Fladmark 1976), EaRd 14 (Skinner and Thacker 1988), EdRk 9 (Sanger 1971), EiRh 1 (Lawhead 1980), DjQj 1 (Mohs 1985), EeRl 19 (McLeod and Skinner 1987)) do not usually have nephrite associated with them.

Figure 5.29 illustrates the percentage of artifacts found in different site contexts over the British Columbia and Columbia plateaus. Most of the grid sectors in and around the source (E13, F12, G12, G13 and H13) have the largest percentage of nephrite in burial contexts. The only exception to this is the Lillooet sector (F13) where more artifacts are found in housepit sites. This undoubtedly is a factor of the large amount of housepit excavation in the area. In the Okanagan and Arrow Lake areas, only one zone (I 10) had the largest percentage of nephrite artifacts in burial contexts. The other sectors (H11, I 11 and J12) have nephrite only in campsites, housepit sites and lithic scatters. On the Columbia Plateau, only the grid zones furthest from the mid-Fraser have nephrite represented predominantly in burials. In most areas, either housepits or campsites, have the largest proportion of nephrite. Unfortunately, in sectors F3 and G6, the number of celts from burial sites is unspecified. This probably lowers the overall percentage of celts in burial contexts in these areas.

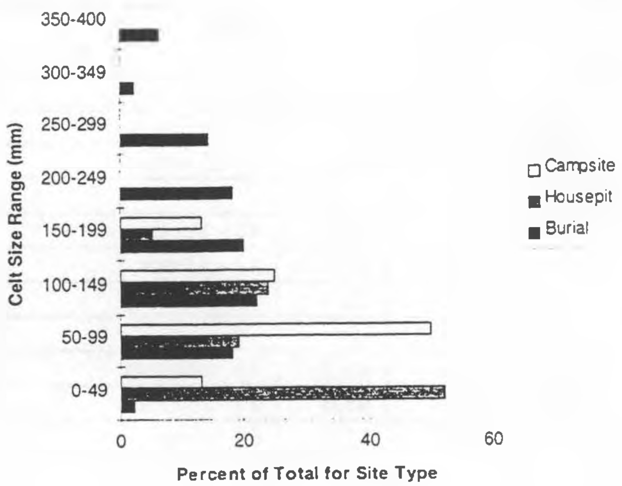

Figure 5.27. Distribution of Celt sizes in Burial, House pit and Campsite Contexts.

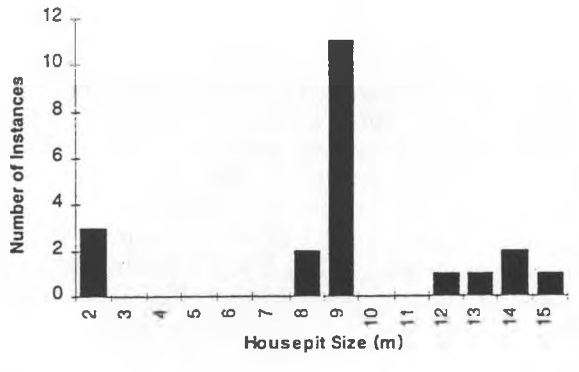

Figure 5.28. Housepit Sizes where Nephrite Celts have been Recovered.

Conclusions on Nephrite Artifact Contexts

Several conclusions can be made on the contextual data. Differences in numbers and types of nephrite celts in burials compared to other types of sites suggest that some form of special value was attached to these artifacts. This conclusion is based on the fact that nephrite celts in burials are almost twice the size of those found in other site types and they are also more often complete specimens. Since this type of intentional deposition represents an exceptional expenditure of value (especially long celts), it is likely that such inclusions were made for reinforcement of societal position rather than for any economic or personal reasons. In a strictly practical economic situation, nephrite celts in burials should be similar to celts in other site types in size and completeness (i.e., they should have been shorter and more fragmented). Many longer celts found inburials were more or less not practically functional (being over 200 mm in length). Their deposition within primarily ritual contexts probably indicates that they were never intended to be used strictly for practical purposes and were valued more for non-utilitarian reasons. As indicated by the distribution of celts in different contexts, this type of relationship is mainly found in the Lytton, Nicola Valley and Western Shuswap Lakes areas and possibly in the southern Arrow Lakes region. It may also be true for the Lillooet area.

The high percentage of miscellaneous worked fragments in housepit contexts, the overall shorter lengths, and the low ratio of complete to broken celts indicates that in this context they were probably functioned primarily as utilitarian tools that were abandoned or discarded in this context when they were no

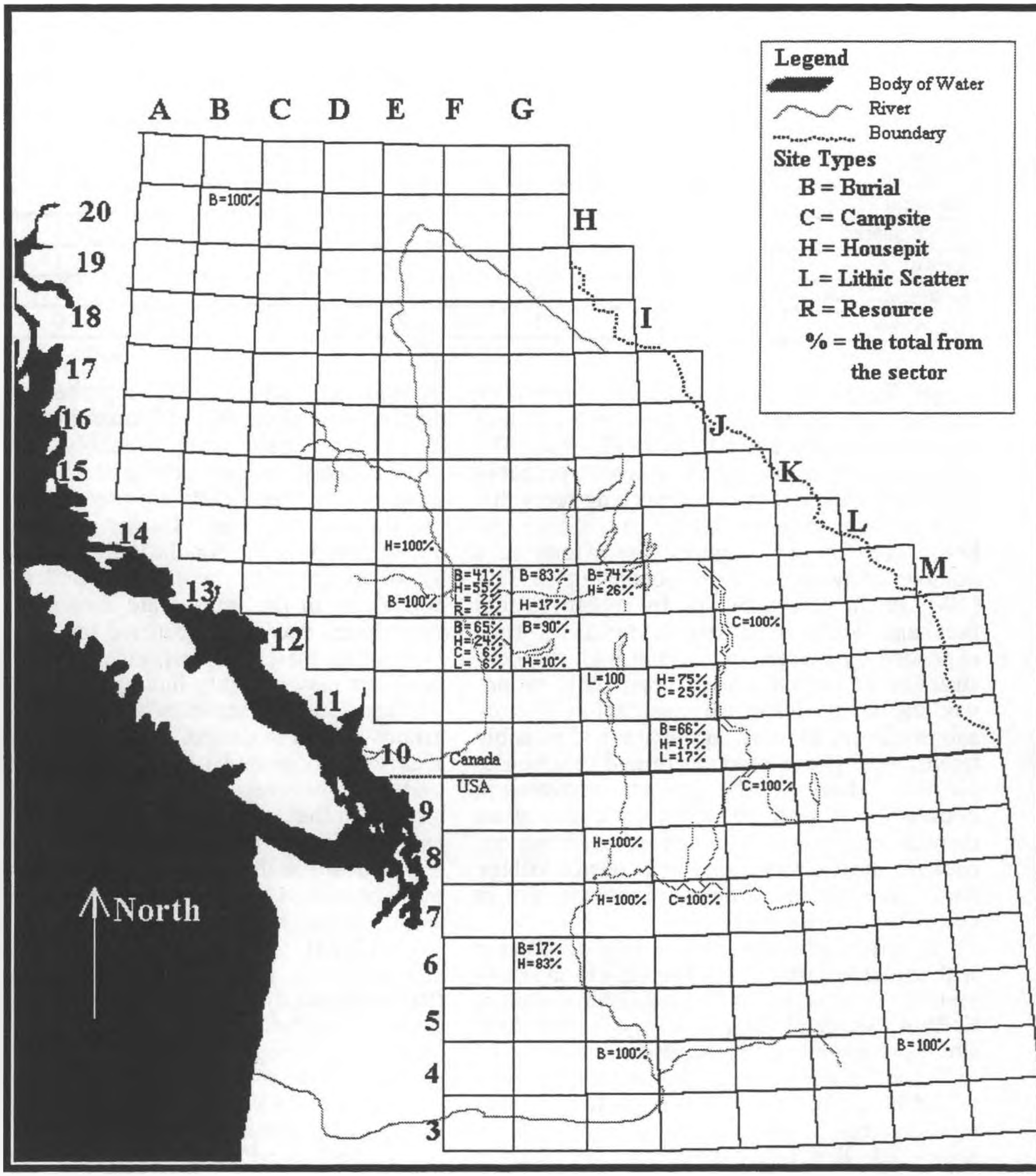

Figure 5.29 Percentage of Nephrite Artifacts in Site Types per Grid Zone

Table 5.21. Celt Integrity within Site Types.

Site Type	Complete	Broken - bit missing	Broken - pole missing	Broken - Medial	Broken - no info	Comp/ broken Ratio	No Information Available
Burial	19	1	4	1	3	2.1	41
Campsite	4	0	2	0	0	2.0	4
Housepit	10	0	4	1	12	0.58	4
Lithic Scatter	1	0	0	0	0	-	1
Resource	0	0	0	0	0	-	1
Housepit/Burial	0	0	0	0	4	-	0
Unknown	6	0	1	0	0	6	0

longer functional. A considerable amount of woodworking occurs during the construction of a pithouse structure (Teit 1900:192-196). The completion of such a dwelling would probably be aided by the use of woodworking tools that were less apt to break during use. Since pithouse construction required the efforts of a number of people (20-30 according to Teit [1900:192]), delays caused by repetitive tool breakage could be costly in terms of time expended by the group. Along with the construction of pithouse structures, other woodworking tasks, such as the manufacture of storage platforms, hunting equipment and possibly totems would have been performed near housepit sites. Most nephrite artifacts recovered in housepit sites were found in the depressions themselves. This is not unexpected, however, because most excavations in housepit village sites focus on those depressions and not in associated activity areas.

Nephrite artifacts were rarely associated with resource based sites. The only such site to yield a nephrite artifact was a fishing station, EeRk 4 (Sanger 1970), and very few of these site types have been excavated. Construction of fishing platforms, drying racks and weirs would have been necessary at such a site and therefore not surprising that celts should be associated. Roasting pits were also included in the classification of resource sites. Interpretation of these kinds of sites have generally focused on their use for roasting plant materials (e.g., Pokotylo and Froese 1983). Beyond gathering roots, activities would have been directed towards gathering firewood. However, no nephrite has ever been recovered at such sites.

Conclusions on Context and Distribution

It is more than likely that most celts were manufactured primarily of nephrite in a production zone along the mid-lower Fraser River. In this area, celts were probably crafted to serve utilitarian woodworking needs and others were created specifically for use as trade items or primitive valuables. Larger celts were traded to groups in the Nicola Valley and Western Shuswap Lakes to the east, as well as being consumed in the immediate area. Trade of these items may have occurred for ceremonial exchanges, material gains, emergency conversions, or may possibly have been obtained in warfare. The relationships between the trading groups is hard to define. It is possible that the area was connected by kinship patterns and trade was between lineages. This might not have been the case for the Nicola Valley, however, as it has been demonstrated that the region down to the Similkameen was occupied by Athapaskan speakers who became extinct shortly before contact (Bouchard and Kennedy 1984:12-24). If this were the situation, although the evidence is not conclusive (Richards and Rousseau 1984:56), exchange of nephrite artifacts could have occurred with competing groups. However, since Plateau societies appear not to have had tribal organization (Ray 1939), language may not have been a factor in trade.

Going beyond the direct contact area to the Okanagan and Columbia Plateau, celt sizes decrease and occur less frequently in burials, with the exception of the southern Arrow Lakes region. Alternate materials other than nephrite were not used more frequently for celts in these areas suggesting the use of some different form of technology for woodworking such as antler or bone chisels and celts. It would be likely that nephrite celts would have been valued in these areas distant from the main source. The decrease in size may represent the natural process of size decay away from the source or possibly the existence of secondary celt size reductions in the Nicola Valley and Shuswap Lakes area.

It should be noted that nephrite was only one component of a larger trade network. Many other valuable items were actively traded in conjunction with nephrite by the time of contact (Hayden et al. 1985; Richards and Rousseau 1987). The extent of this trade system ranged from the coast (Richards and Rousseau 1987; Fladmark 1982) down to the Columbia Plateau (Galm 1994). There has been no attempt to factor in the exchange of nephrite to the coast in this thesis. Large quantities of nephrite were exported to the Coast (see Mackie 1992) and Fladmark (1982) has even speculated that Coastal groups may have exerted influence into the Interior to ensure an adequate supply of the material. It is hard to speculate how much nephrite moved from north of the Lytton area onto the Coast because of access by lower Fraser groups to sources in the Hope region. Sites in the lower Fraser area have large numbers of nephrite artifacts, including manufacturing debris. In sites such as DjRi 5, DiRi 38 (von Krogh 1980), DiRi 14 (Roberts 1973; Eldridge 1979), DjRi 1 (Mitchell 1963), and DiRi 39) there are 79+ items reportedly made of nephrite or serpentine. Because this figure is over half the number of artifacts reported for the whole interior of British Columbia and the Columbia Plateau put together, it is highly likely that many of the celts found on the coast originated from the Lower Fraser rather than in the mid-Fraser region.

Examination of the nephrite celt industry through time indicates that changes that occurred in this artifact type appear to coincide with other events on the Plateau and outlying regions. The intensity of nephrite exchange started in the Plateau horizon (Richards and Rousseau 1987:39) at the same time nephrite use intensified on the coast during the Marpole phase , 2250-1500 BP (Burley 1980). There also appears to be increasing cultural complexity in the mid-Fraser region during the Plateau horizon (Hayden et al 1985; Stryd 1973; Fladmark 1982) and the distribution of nephrite at this time suggests that the center of activity in the Interior was in the Lillooet area. There is, however, limited contextual information for nephrite from this period. Nephrite from this time is primarily found in housepit contexts. Contrary to the pattern observed in the Kamloops horizon, this suggests emphasis was not placed on nephrite grave inclusions. However, Schulting (1995:180) notes that burial sites associated with some of the large housepit villages of the time (e.g. for the Bell Site EeRk 4 (Stryd 1973) or Keatley Creek EeRl 7 (Hayden and Spafford 1993)) have not been explored. Thus, it is possible that further investigations may indicate greater value was placed on nephrite artifacts during the Plateau horizon than is currently represented in the data.

During the Shuswap horizon, nephrite artifacts are rare. It is interesting, however, that they have a distribution across the British Columbia and Columbia Plateaux. That may suggest that special importance was ascribed to such objects from their original introduction onto the Plateau. Even though they could represent a solution developed to meet increased woodworking tasks, their sparse numbers suggests that they were novelties rather than a pervasive tool type. Richards and Rousseau (1987:30) also state that nephrite celts are the first form of evidence for inter-Plateau trading.

By the Kamloops horizon, it is evident that nephrite artifacts were important or valued commodities. At this time, the longest and most exaggerated nephrite celt sizes are found and the greatest differences exist between celts found in burials compared to other site types. Although it appears that there was an abandonment of large scale housepit villages and changes in social organizations after the early Kamloops horizon (Hayden et al. 1985), this does not seem to have affected the nephrite industry. If anything, there was an intensification in the manufacture of nephrite artifacts. Perhaps the changes in nephrite celts through time was part of an overall adaptation scheme to create a economic system that sought to reduce the threat of starvation from cyclical salmon shortages by maximizing the production of valuable commodities during times of surplus. As salmon resources may have been less predictable in the Plateau horizon (Richards and Rousseau 1987:57), and it has been demonstrated that there was the possibility of a large scale collapse in the cultural complexity in the Lillooet region because of the Texas Creek landslide (Hayden and Ryder 1991), it is possible that a more elaborate exchange system evolved to minimize the effects of resource failure.