SANGER, David, 1936-
THE ARCHAEOLOGY OF THE LOCHNORE-NESIKEP LOCALITY, BRITISH COLUMBIA: FINAL REPORT.

University of Washington, Ph.D., 1967
Anthropology

University Microfilms, Inc., Ann Arbor, Michigan

THE ARCHAEOLOGY OF THE LOCHNORE-NESIKEP LOCALITY,

BRITISH COLUMBIA: FINAL REPORT

by

DAVID SANGER

A thesis submitted in partial fulfillment

of the requirements for the degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF WASHINGTON

1967

Approved by George I. Quimby
(Chairman of Supervisory Committee)

Department Anthropology
(Departmental Faculty sponsoring candidate)

Date March 9, 1967

UNIVERSITY OF WASHINGTON

Date: February 13, 1967

We have carefully read the dissertation entitled The Archaeology of the Lochnore-Nesikep Locality, British Columbia: Final Report submitted by David Sanger in partial fulfillment of the requirements of the degree of Doctor of Philosophy and recommend its acceptance. In support of this recommendation we present the following joint statement of evaluation to be filed with the dissertation.

Until the completion of this thesis the archaeology of the vast Interior Plateau of British Columbia was virtually unknown. Mr. Sanger's research has produced a cultural sequence of 7,500 years duration. In addition to the areal sequence and cultural comparisons, Mr. Sanger's analysis has resulted in a general examination of Pacific Northwest Plateau prehistory, and the proposal of a new hypothesis for the origin of Columbia Plateau Culture. The thesis manifests an excellent piece of research and is well written.

DISSERTATION READING COMMITTEE: George I. Quimby
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Signature David Sanger

Date March 9 1967

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CHAPTER I

INTRODUCTION

Purpose of Report

In a recent collection of essays (Prehistoric Man in the New World) a sketch map of western North America indicates a coastal strip designated "West Coast" and an intermontane region labelled "Desert West" (Jennings 1964: 152). The "Desert West" encompasses eastern Washington, Oregon, and all of Idaho, but extends only a few miles into southern British Columbia, following the Canadian portion of the Columbia River. No paper in this volume considers the vast Interior Plateau of British Columbia which extends from Latitude 49° at the International Boundary to Latitude 54° (see Bostock 1948). The exclusion of this area was not an oversight; it was simply because so little is known of the prehistory. The main objective of this report is to present the first cultural sequence from the Interior Plateau of British Columbia, and to consider the area's cultural affiliations with better-known regions of western North America.

Following Ray (1939:1) the term "Plateau" used without modification refers to the Pacific Northwest Intermontane region which "lies between the Rocky Mountains on the east and the Cascade Mountains on the west. The northern boundary is roughly the great bend of the Fraser River, while on the south this plateau merges with the Colorado Plateau." To refer specifically to that portion of the Plateau in British Columbia, the term "Interior Plateau of British Columbia", or more simply, "Interior Plateau" is used. The section of the Plateau in the United States is called the "Columbia Plateau" after the Columbia River which drains the region.

The cultural sequence is derived from excavations in the Lochnore-Nesikep Creek Locality on the Fraser River. Lochnore and Nesikep Creeks are minor tributaries of the Fraser River entering the river from the east and the west respectively. The Locality includes numerous open archaeological sites contained within a rectangle approximately 1.5 by .5 miles, and located roughly midway between Lytton and Lillooet at coordinates Lat. 50° 32' Long. 121° 46' (Figure 1). Sites within the Locality manifesting different assemblages are considered to be of different time periods. All known sites in the Locality capable of being excavated were tested to varying degrees, and this report is considered to represent a cross section of the prehistory of the Fraser River Valley between Lytton and Lillooet, a stretch of approximately 44 miles. Confidence in the representativeness of the sequence lessens with distance from the Lytton-Lillooet region, and one of the purposes of the comparative section (Chapter VI) is to review the affinities with adjacent areas such as the remainder of south central British Columbia, the Northwest Coast, the Columbia Plateau, the Plains, and the sub-Arctic. Finally, it should be possible to present some testable hypotheses concerning the prehistory of the Interior Plateau as a guide to future archaeological research.

History of Archaeological Investigations in the Interior Plateau

Knowledge of the prehistory of south central British Columbia is very limited. Late in the 19th century Harlan I. Smith dug in sites near Lytton (Smith 1899), and along the Thompson River to Kamloops (Smith 1900). Smith's reports and illustrations suggest that very little time depth is involved in his sites. Except for occasional burial excavations by naturalists, the Interior Plateau was left neglected until the 1950's when C.E. Borden, of the University of British Columbia, surveyed a section of southeastern British Columbia (Borden 1956), investigated some burials near Cache Creek (Sanger n.d.), and surveyed the Tweedsmuir Park region of central

British Columbia (Borden 1952a). A very brief site survey of the Similkameen and Okanagan valleys was conducted by Caldwell (1954). In the late 1950's L. Hills, geologist, collected from sites between Lillooet and Big Bar on the Fraser River.

Interest in the Interior Plateau was renewed in 1960 by the discovery of a very rich late prehistoric burial site near Chase, 36 miles east of Kamloops on the South Thompson River. Although the site was extensively looted by relic collectors, a small field crew from the University of British Columbia under the direction of Borden, was able to salvage 6 burials and ascertain the probable burial pattern. A report of this excavation and the associated artifacts has been prepared by Sanger (n.d.). In February of 1961 a representative of the Kamloops Municipal Museum contacted Borden regarding the feasibility of a jointly sponsored excavation of a burial site near the mouth of Texas Creek on the west bank of the Fraser River. After a visit in May 1961 it was obvious that extensive bulldozer activity had almost entirely destroyed the site and excavations were out of the question. Following the visit to the Texas Creek site we were advised of another burial site at Mile 28 Ranch on the east side of the Fraser. Here the landowner had exposed burials in the course of land clearing operations. Borden and Sanger excavated two skeletons from the Mile 28 Ranch site (EdRk:3) and, as the site is within the area defined as the Lochnore-Nesikep Locality, a description of the site and the artifacts is included in the general analysis.

From the condition of the two burial sites and rumours of other similar occurrences, it was decided to survey the Lytton-Lillooet region in hopes of finding burial sites worthy of excavation. Financed by a contract from the National Museum of Canada, and with additional support from the University of British Columbia, the survey of 1961 indicated the rich potential of the Fraser Valley. Several burial sites were located, but because of the habit of burying in loose sand dunes, many of the sites were badly disturbed. The Nesikep Creek site (EdRk:4) seemed especially favourable for excavation. Reports indicated burials and scattered human skeletal remains on the surface supported the claims.

Excavations in 1962 were again financed by the National Museum of Canada and the University of British Columbia. The 1962 work at the Nesikep Creek site uncovered no complete or undisturbed burials but did disclose a deeply stratified site in which seven components were recognized. Examination of the Locality indicated other sites, the most interesting of which were located on Lochnore Creek opposite Nesikep Creek. The sites along Lochnore Creek contained materials some of which were quite different from those recovered from the Nesikep Creek site and presumably of a different age. In 1964 the National Museum, the University of British Columbia, the Provincial Sites Advisory Board, and the University of Washington sponsored excavations which tested the Lochnore Creek sites, re-excavated the Nesikep Creek site, and sampled other nearby locations. In addition to the major summer digs, frequent trips of two days to one week duration were made for the purpose of examining collections and sites.

Despite the desire to examine sites up and down the valley between Lytton and Lillooet, excavations were sharply limited to the Lochnore-Nesikep Locality. It is realized that with this approach a cultural manifestation of importance may have been missed, but it was deemed more important to establish a local sequence which could be used as a point of departure for future investigations. The single exceptions to the locality restrictions were the excavation of a disturbed burial site (EdRl:10) located five miles south of Lillooet, and some limited work at the Drynoch Slide site (EcRi:1) on the

Thompson River. Thus the sequence here, it must be re-emphasized, offers the chronology of cultural events of a cross section of the Fraser Valley. Artifacts picked up on survey and viewed in private collections indicate the sequence probably has greater applicability, but in order to find analogues in collections gathered through controlled excavations, it is sometimes necessary to make comparisons over hundreds of miles of archaeologically unknown territory.

Most of the Lochnore-Nesikep Locality sites have been assigned names in addition to code numbers. Following the Borden (1952 b) coordinate system of site designation, the Lochnore-Nesikep sites are given code names of EdRk:3 to EdRk:12 consecutively. For quick reference, the site names and code symbols are listed in Table 1.

TABLE I

LIST OF SITES AND SYMBOLS IN THE LOCHNORE-NESIKEP LOCALITY

Site Symbol	Site Name
EdRk:3	Mile 28 Ranch
EdRk:4	Nesikep Creek
EdRk:5	Cow Springs
EdRk:6	McPhee
EdRk:7	Lochnore Creek
EdRk:8	Lehman
EdRk:9	Pine Mountain
EdRk:10	
EdRk:11	
EdRk:12	

Acknowledgements

The Lochnore-Nesikep Locality investigations were financed primarily through contracts with the National Museum of Canada. Institutional support came from the University of British Columbia, whose archaeology division, under the direction of Dr. C.E. Borden, supplied much of the field equipment and served as a base for field operations. Additional support derived from the British Columbia Provincial Sites Advisory Board, the Graduate School of the University of Washington, and the Department of Anthropology of the University of Washington.

Cooperation in the field from the residents of the Lytton-Lillooet region was of the highest order, and although I cannot mention all the individuals involved, I should like to single out Mr. and Mrs. C. McPhee of Nesikep Creek, Mr. and Mrs. B. Lehman of Lochnore Creek, and Mr. D.C. Jones on whose land we pitched our tents. The fine field crews during the 1962 and 1964 seasons included: Hugh Campbell-Brown, Linda Elson, Vern Glade, Andrew Johnny Jr., David Keenlyside, Jon Maas, Patrick Monahan, Mary Jo Sanger, Malcolm Suttles, and David Wyatt.

My wife, Mary Jo Sanger, assisted me on the 1961 survey, and acted in dual capacity as camp cook and excavator during the 1962 and 1964 seasons. In 1964 she directed excavations at the Pine Mountain site. Her enthusiasm and energy have been a very major contribution.

Various students and faculty members at the University of Washington have offered many useful suggestions. Dr. Robert E. Greengo obtained financial backing for the project and otherwise greatly assisted through his encouragement and guidance. Mr. Robert S. Kidd and Mr. Garland Grabert have contributed much with their knowledge of Columbia River prehistory which they so freely shared with me.

My colleagues in the Archaeology Division at the National Museum of

Canada have assisted me in many ways. I have asked for and received many valued comments on the artifact collections and general matters of interpretation. The discussions with Drs. William E. Taylor, James V. Wright, William N. Irving, David R. Hughes, George F. MacDonald, and Roscoe Wilmeth, are very much appreciated. Members of the Natural History Branch of the Museum, including Dr. Arthur Clarke who identified the shell fish, and Mr. Phillip Youngman who identified some mammal bones, have also contributed to this study.

It is my pleasure to acknowledge the valuable and much appreciated support derived from the Museum's photography section directed by Mr. G. Anderson; from Mr. David Laverie, who assisted in the basic analysis, drafted the maps, and produced the artifact drawings; from Miss Heather Buck who typed the preliminary draft and numerous tables; and from Mrs. Jeanette McConnell who typed the final manuscript.

Members of the University of Washington faculty who have acted as the thesis Advisory Committee include: Professor George Quimby, Chairman; Dr. Viola Garfield; Dr. Edgar Winans; and Dr. Charles Borden, Outside Consultant.

Finally, a great deal of credit is due Dr. Charles E. Borden of the University of British Columbia, with whom it has been a pleasure and a privilege to work for six years. Dr. Borden's interest, guidance, and continued support of the Lochnore-Nesikep Locality archaeological investigations is very much appreciated.

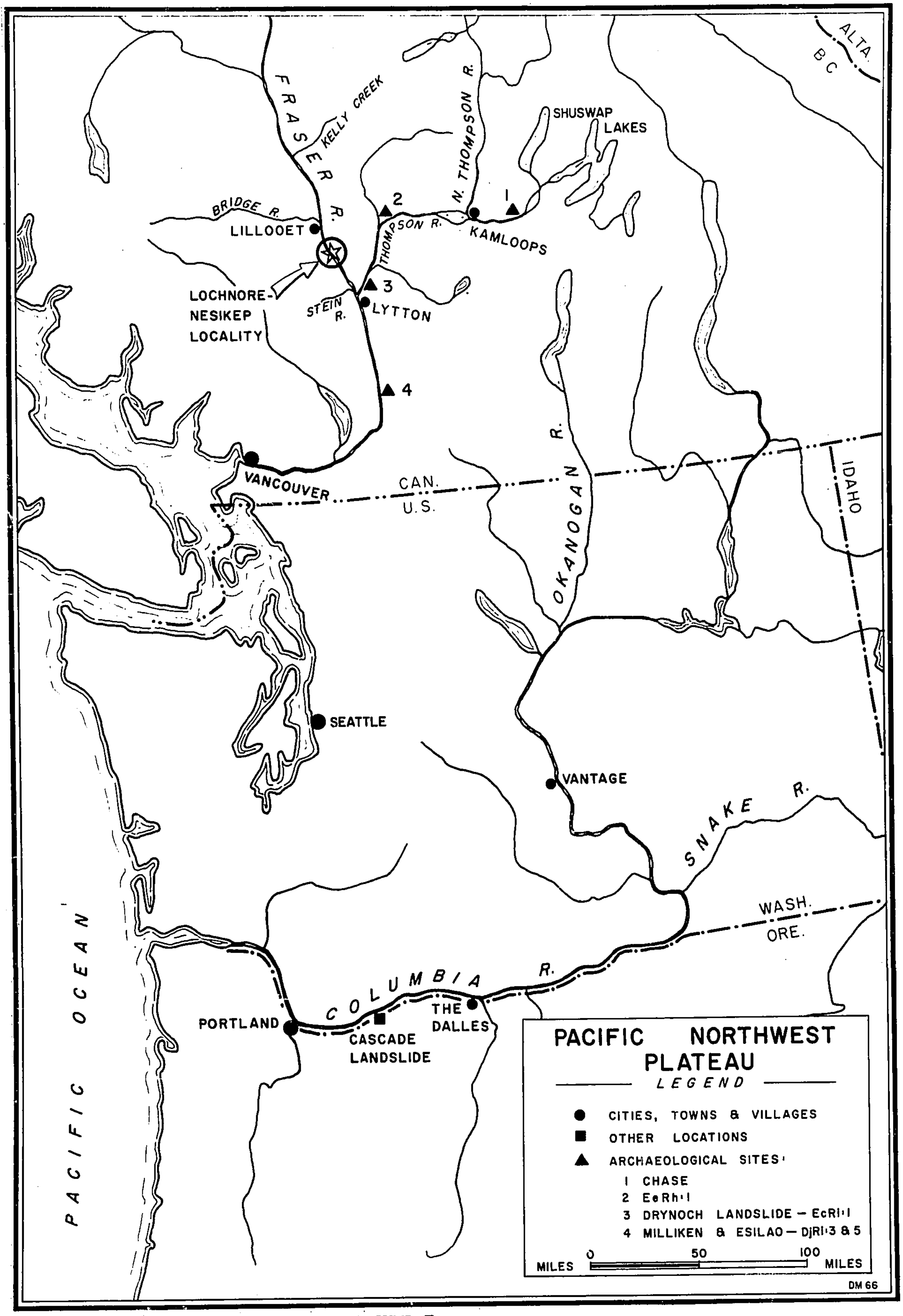

FRASER R.
KELLY CREEK
N. THOMPSON R.
SHUSWAP LAKES
ALTA.
B.C.
BRIDGE R.
LILLOOET
THOMPSON R.
KAMLOOPS
LOCHNORE-NESIKEP LOCALITY
STEIN R.
LYTTON
VANCOUVER
CAN.
U.S.
OKANOGAN R.
IDAHO
SEATTLE
VANTAGE
SNAKE R.
WASH.
ORE.
PACIFIC OCEAN
COLUMBIA R.
PORTLAND
CASCADE LANDSLIDE
THE DALLES
PACIFIC NORTHWEST PLATEAU
LEGEND
CITIES, TOWNS & VILLAGES
OTHER LOCATIONS
ARCHAEOLOGICAL SITES
1 CHASE
2 EeRh:1
3 DRYNOCH LANDSLIDE – EcRl:1
4 MILLIKEN & ESILAO – DjRl:3 & 5
MILES 0 50 100 MILES
DM 66

FIGURE I

CHAPTER II

THE SETTING

Physiography of the Interior Plateau - General

South central British Columbia lies within the Interior Plateau of the Interior System of the Cordilleran Region (Bostock 1948; Holland 1964). The topography is made up of rolling uplands punctuated by peaks, and deeply-incised river systems. When viewed from the river valleys the impression is one of rugged relief, but with the exception of a few high peaks which may attain elevations of 7,600 feet above sea-level, most of the Interior Plateau lies between 3,000 and 5,000 feet in elevation. The general accordance of summit elevations has been attributed to a Tertiary erosion surface (Fulton 1965b).

For periods during the Pleistocene the Interior Plateau was covered with ice. Eratics and glacial striae have been noted at elevations of 8,000 feet on mountains bordering the Plateau. South and southeastward trending valleys are usually wide, symmetrical, and U-shaped. During deglaciation, the subsequent effects of outwash deposition and downcutting formed extensive terraces in the Fraser and Thompson river valleys. The terraces, some of which stand nearly 900 feet above the present level of the Fraser River near Lillooet, consist of coarse boulder and cobble gravels, interstratified with lenses of finer sediments (Duffell and McTaggart 1952: 71,2).

Recent studies by Fulton (1965a;b) in the Kamloops-Merritt area represent the most detailed work on the late glacial and early post-glacial geology in south central British Columbia. In a discussion of deglaciation for that area Fulton (1965a:95) notes that in early post-glacial times the drainage of the Thompson River systems was to the south through the Okanagan, and eventually into the Columbia River.

Duffell and McTaggart (1952:72) mention the presence of large alluvial fans formed at the mouths of many tributary streams as they debouche into the Fraser. These outwash deposits are composed of unsorted angular to rounded boulder and cobble gravels, together with lenses of sand and silt. The tributary streams have downcut through the fans to match the lowering level of the Fraser. Post-glacial downcutting of the Fraser through outwash deposits in the Lochnore-Nesikep Locality has resulted in a difference of about 400 feet between the main terraces and the present level of the river.

Frequent deposits of windborne sand and silt are found along the Fraser River between Lytton and Lillooet. In some areas this aeolian mantle is only a few inches thick, while in others sand has accumulated and duned to depths of ten to twelve feet. Developed soil profiles are rare, and the aeolian sands may generally be described as azonal, although leaching has taken place in the upper portions of some of the more stable areas, and here a calcium carbonate or Cca layer may be present.

Knowledge of late glacial and early post-glacial geochronology is also the most complete for the Kamloops-Merritt region. Mathews (1944) has defined glacial Lake Quilcluna which drained south through Otter Lake near Aspen Grove. A radiocarbon determination on a sample of peat from the Otter Creek peat deposit indicates that the drainage channel had been abandoned by Lake Quilcluna waters prior to 9320 ± 160 (GSC 256; Dyck and others 1965:33; 34). From near the mouth of the Fraser Canyon at the Milliken site (DjRi:3) Borden (1961:4) has reported human occupation dated by C-14 to 9,000 ± 150 (S-113). It would appear, therefore, that the Interior Plateau was probably largely deglaciated and likely quite suitable for human residence by 9,000 to 10,000 years ago.

Absolute geochronological horizon markers exist for the post-glacial period in the Interior Plateau. Volcanic ash deriving from the Glacier Peak eruption and dated to 12,000 ± 130 years (Fryxell 1965; WSU 155), has been identified in northern Washington and Idaho, but as yet not in southern British Columbia. Ash deposits formerly attributed to this eruption (Hansen 1955: 657) probably stem from the eruption of Mt. Mazama in Oregon. Mt. Mazama ash, dated at about 6,600 years ago by a series of radiocarbon dates (Powers and Wilcox 1964: 1335) is more widespread in its distribution, and has been identified at several localities in the Interior Plateau. St. Helen's "Y" ash, dated to 3,200 years (Crandell and others 1962), has been noted in south central British Columbia (Fulton 1965b). Finally, recent work has revealed Bridge River pumice thought to be approximately 2,400 years old (Fulton personal communication).

Investigations of postglacial climates in the Interior Plateau are limited to a few pollen profiles. The most regional interpretation is that of Hansen (1955), based on three profiles from south central British Columbia. Hansen noted that the stratigraphic position of volcanic ash (probably Mazama) was in the same relative position as the expansion of the grasses, chenopods, and composites, but he felt that the "Xerothermic stage" in the Interior Plateau was not as well marked as the Thermal Maximum in eastern Washington and Oregon. A section taken from a peat bog at Otter Creek near Aspen Grove, indicated the greatest increase of Artemisia (sagebrush) in the middle of a period bracketed by C-14 dates of 3390 ± 130 (GSC 298) and 9320 ± 160 (GSC 256) (Fulton 1965b: 90,1). The pollen diagram suggests a return to a more humid climate about 3,000 years ago.

Physiography of the Lochnore-Nesikep Locality

As it passes through the Lytton-Lillooet region, the Fraser River abuts the western slopes of the Coast Range Mountains. The rise in elevation from the valley to the mountain peaks is abrupt; for example, a change from 600 feet to 5,000 feet may be encountered in a lateral distance of 2 miles, and within 5 miles of the river valley are found 9,000 foot peaks. Access to the rugged mountains is gained through numerous trails which follow up the tributary streams. The Fraser Valley marks the western extremity of the Interior Plateau.

Nesikep Creek has carried down from the Coast Range Mountains debris which accumulated as an alluvial fan forcing the Fraser to the east and against the bedrock on the east bank. Since the time of fan deposition, the creek has downcut as much as 200 feet dissecting the deposit. Debris has also been washed down by Lochnore Creek, but the deposit is not as extensive as the Nesikep Creek fan, and no lateral displacement of the Fraser is evident. Aeolian sands and silts have accumulated since the formation of these fans, and it is in these areas that most of the archaeological sites are located.

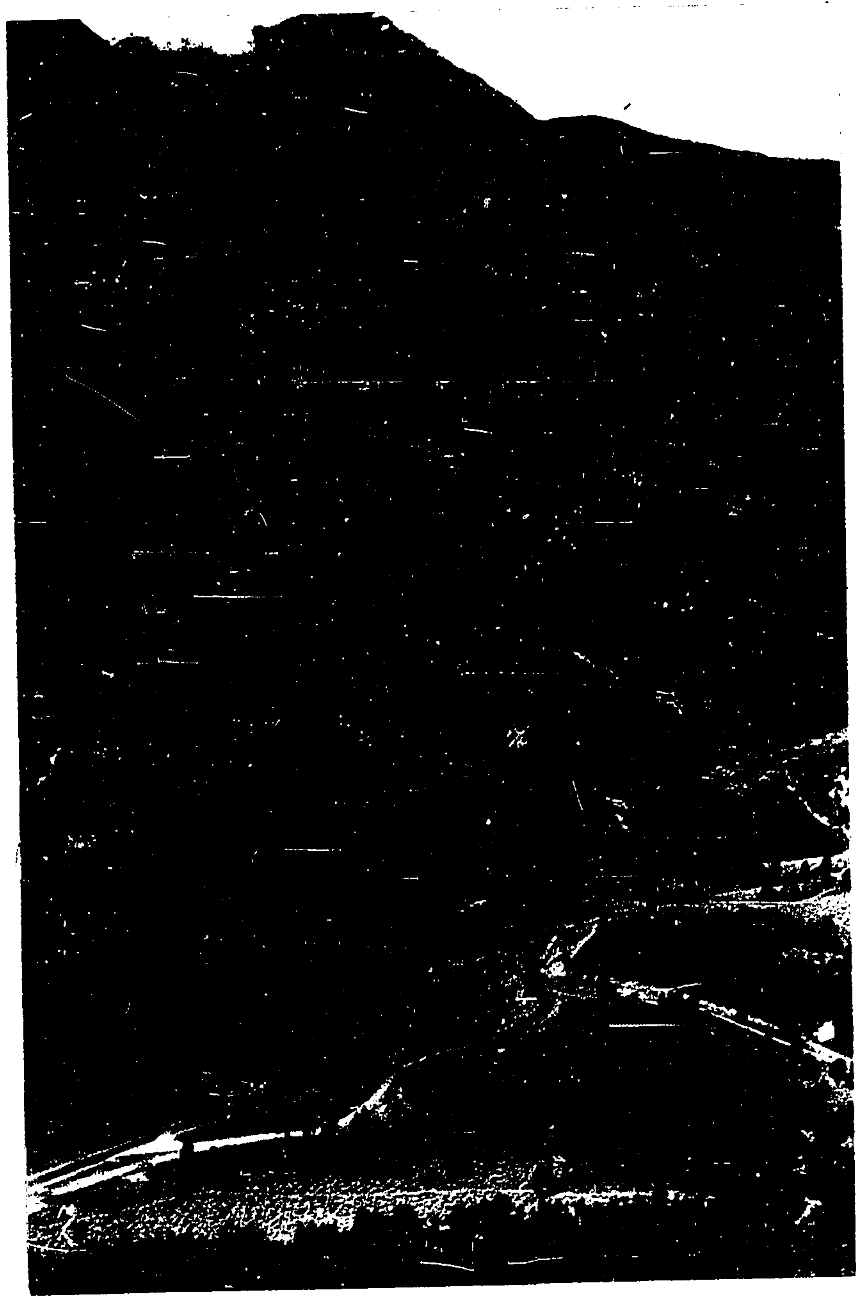
Floral cover in the Lochnore-Nesikep Locality correlates closely with altitude and precipitation. In the valley where the annual precipitation averages 15 inches (Anon. 1954) the dominant plants are sagebrush (_Artemisia tridentata_ and _A. frigida_), cactus (_Opuntia fragilus_), rabbit bush (_Chrysothamnus nauseous_), "cheat grass" (_Bromus tectorum_), "bunch grass" (_Agropyron spicatum_), and local stands of Ponderosa pine (_Pinus ponderosa_). In a report on the grasslands of south central British Columbia, Tisdale (1947) argues that the present dominance of _Artemisia_ and _Bromus_ represents a recent phenomenon post-dating the arrival of the White Man into British Columbia. Prior to the extensive overgrazing by cattle and other livestock the lower elevations were covered with _Agropyron spicatum_ and other grasses which have since given way to the _Compositae_ and the introduced _Bromus_.

PLATE I

The Lochnore-Nesikep Locality

The Lochnore-Nesikep Locality looking west towards the Nesikep Creek fan and the Coast Range Mountains. In the foreground is Lochnore Creek and associated sites. See also Figure 2.

PLATE I



Grassland and increasingly dense stands of Ponderosa Pine merge into Douglas fir (Pseudotsuga taxifolia), and finally into Alpine meadows, with the tree limit usually reached around 6,000 feet. Thus, the summits of most of the Interior Plateau peaks are wooded, while those of the adjacent Coast Range mountains feature Alpine meadows or are perpetually snow covered.

The floral cover in the Lochnore-Nesikep Locality has important implications for prehistoric cultural adaptation. A partial listing of primary vegetable food resources is discussed below under a description of Thompson ethnology. More extensive grasslands in the past would have increased the available feed for mule deer (Odocoileus hemionus hemionus) and elk (Cervus canadensis nelsoni) although evidence for the latter mammal in the Lytton-Lillooet region is slight. The present grazing pattern for deer in the Lochnore-Nesikep Locality reflects the modern distribution of the grasslands. The deer spend the bulk of the year in the higher elevations which have not been invaded by the non-edible sagebrush, and only during the winter months, when the snow cover makes foraging difficult or impossible, do the deer drift down into the lower slopes and into the sheltered creek beds.

[1]From a human subsistence point-of-view the east bank of the Fraser is more desirable for groups dependent upon hunting and gathering. The ascent into the Interior Plateau via Lochnore Creek is gradual and traverses excellent root digging and berry picking grounds. On the western side of the Fraser, with the greater relief, the changes in biotic zones from the valley floor to the high peaks are sudden, and vegetable food potentialities are less. Similarly, the eastern side supports more large

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1 This paragraph is derived from personal observation plus discussion with Mr. B. Lehman of Lochnore Creek.

game animals. Deer can be taken from the river level up into the hills, and from as far into the Plateau as hunters wish to pursue them. In addition, the eastern side is the sunny side, an attractive feature to deer which come down from the higher reaches of the Interior Plateau to winter in the valleys of tributaries such as Lochnore Creek. While deer inhabit the Nesikep Creek side of the Fraser Valley, their numbers are fewer, and there is not the great tract of forested hills from which to draw large herds of deer during the winter. The unequal game situation is reflected in the observation that modern Indians cross over to the eastern side of the valley to hunt deer. Mountain goats (Oreamnos americanus americanus) frequent the more inaccessible faces of the Coast Range Mountains, but the climb to these elevations could scarcely have been worth the effort expended. Mountain sheep (Ovis canadensis californiana) may have roamed in the hills behind Lochnore Creek, but compared with mule deer, sheep hunting is an arduous undertaking even with firearms.

The Fraser River provides resources as valuable as the grasslands and wooded slopes. Various species of salmon (Oncorhynchus) and the steelhead (Salmo gairdneri) annually ascend the Fraser in search of upriver spawning grounds. The sheer volume of fish during Spring and Summer months allows tremendous catches given correct gear and favourable fishing stations. Rocks close to the river's edge, and situations where the river is forced through steep-walled canyons, both afford excellent fishing. The Lochnore-Nesikep Locality offers ideal fishing stations on both sides of the Fraser, while exposed terraces provide good locations for fish drying racks.

Placer mining activities, agriculture, and highway construction have damaged or destroyed many archaeological sites between Lytton and Lillooet. Most destructive, perhaps, were the 19th century placer miners, who sluiced away whole terraces in the search for gold. Occasional housepits on the edges of eroded terraces hint at the presence of former aboriginal settlements. The Indians' preference for village locations on level areas near streams and springs has resulted in many ruined sites, as White farmers and ranchers also have selected those areas for homesteads and hay fields. The Lochnore-Nesikep Locality has suffered less than usual from the above hazards. Artifacts picked up around the farm buildings of C. McPhee on Nesikep Creek indicate the former presence of a site, and the bulk of another site by Nesikep Creek has been ploughed. No less than three roads have cut through the Lochnore Creek site, and the richest site in the Locality, the Lehman site, has been ploughed annually since 1955. Housepit depressions are often levelled by grading the lips of the pits into the depressions and then ploughing. Local lore suggests that sites were often deliberately obliterated to encourage Indians to work as farm hands. Amateur collecting has not caused much damage except to burial sites, which are looted whenever possible for the finely-fashioned objects. A recent museum practice of purchasing such artifacts has tended to encourage collecting for gains. Most housepits have a single, round, exploratory hole, usually in the centre, but only rarely is the digging carried to a point where serious harm is done, and interpretation threatened.

Thompson Ethnography

Much of the Interior Plateau was inhabited at the beginning of the historic period (1808) by Interior Salish speakers. From a point five miles south of Lillooet down to Lytton and beyond, both banks of the Fraser River were claimed by members of the Upper Fraser and Lytton bands of the Upper Division of the Thompson Indians (Teit 1900). The Thompson's chief ethnographer is James Teit, whose monograph (1900) is the standard reference for the Canadian Interior Salish. A long-term resident of the country, Teit married a Thompson woman from Spences Bridge on the Thompson River, and in the late 19th century questioned informants who remembered much of their aboriginal culture. The archaeologist finds in Teit's monograph a most valuable documentation of settlement patterns and subsistence techniques, but the social anthropologist notes the inadequate and sketchy comments on social organization. Other 19th century scholars queried the Interior Salish, but none came close to matching the detail recorded by Teit. Ray (1939) utilized Teit and carried out a limited amount of fieldwork among the Canadian Salish to complement his own rather extensive research on the American Plateau groups. The results of this comparative study draw together most of what is known about Plateau non-material culture.

The historic period is taken here to begin in 1808 when Simon Fraser, searching for a route to the sea for the Northwest Fur Company, passed through Thompson territory on his descent of the Fraser River (Lamb 1960). For the next few decades contacts with the White Man were of a cursory nature, and it was not until the middle of the nineteenth century and the "Gold Rush", that European and aboriginal Thompson cultures were fully juxtaposed. By this time European diseases had taken a large toll, and from the White man's point-of-view, the Thompson presented few problems, docilely accepting Reserve life and its restrictions.

The annual round of subsistence activities and seasonal transhumance as recorded by Teit (1900:238) affords a view of certain aspects of aboriginal culture. The record not only offers a description of the historic and late prehistoric cultures, but also an idea of environmental factors which must have had some influence on culture thousands of years in the past. The annual ascent of the salmon, the periodic rut and herding of the deer, and the early Spring availability of vegetable foods, are all facets of the environment that shaped man's adaptive patterns in the Fraser Valley ecological system.

November - "The deer rut and people hunt"

With the onset of frosts and light snow falls in the mountains, the mule deer rut and herd, moving around more than usual during the day. Both bucks and does are fat from the summer and fall grazing and the meat is especially good. The primary hunting weapon was the bow, usually of sinew-backed juniper, and service berry wood (Amelanchier alnifolia) arrow shafts tipped with chipped points. Illustrations of arrowheads indicate that small side-notched points were in use. Deer were shot from ambush in game trails and at local saltlicks. Communal drives were frequent as was the use of a rough brush fence designed to steer the deer into an ambush or snare. Elk, goat, and sheep, where available, were also hunted at this time.

December - "The weather begins to get cold, and the people go into their winter houses".

The standard winter dwelling for the Thompson was a circular semi-subterranean pit house excavated into sandy or loose soil. After the hole was excavated heavy green timbers (usually 4) were placed as the major uprights supporting hip rafters, to which a series of closely spaced horizontal poles were lashed with withes. Smaller sticks, bark, and soil formed the final covering. A gap in the center of the roof served as entrance, smokehole, and skylight. Access was gained by a notched log, under which was located the cooking fire. Occasionally an isolated pithouse was built, but more often several dwellings formed a village which might range in size from 2 to 12 houses. Some hunting might continue into this month, especially for does, but preserved fish, berries, and meat would form a major portion of the diet.

January - "Bucks shed their antlers, and does become lean".

With the coming of the winter the deer drift into the protected creek valleys and congregate on the sunny slopes. Feed is not plentiful and the deer are thin. Stored foods are important for the Indians, although deer hunting and the trapping of small mammals occupies most of the men.

February - "The weather improves, and spring plants begin to sprout. The people come out of their winter houses".

The coldest months of the winter are past, and some families might emerge from the winter houses during this month depending upon the severity of the weather. The number of occupants in a pithouse probably varied with the size of the house, but an extended family domicile is likely. Teit records that houses averaged 20-40 feet in diameter, although some depressions noted in the Lytton-Lillooet area are up to 70 feet across, and there may be others that are even larger. With only the one smokehole-skylight for ventilation, conditions after two or three months must have been difficult.

March - "The grass grows, and people come out of their winter houses".

For close to nine months of the year, the Thompson utilized temporary shelters consisting of wood frames covered with bark mats. Teit (1900:197) illustrates several forms of "lodge" frames.

April - "The people catch trout with dipnets, and begin to go to the lakes to trap fish".

Although some ice-fishing is done, most lake fishing occurs after the ice clears. Dragnets weighted with naturally-rounded pebbles were used in deep lakes, while in shallow waters dipnets were more efficient. Throughout much of the year steelhead (*Salmo gairdneri*) are present, and speared with a variety of spears or leisters, especially in the Thompson River and in some of the clearer tributary creeks of the Fraser River.

May - "The people dig roots".

In the spring, and sometimes in the fall, women went back into the hills and mountain slopes to dig for edible roots especially the camas (*Quamasia quamash*). A complete listing of plants utilized for food, medicinal, and magical purposes has been published by Steedman (1930) based upon the notes of Teit. Excavated with the assistance of a digging stick manufactured from hardwood with a wood or antler cross piece handle, the roots were baked in subterranean ovens heated with fired rocks. In the non-salmon months the collecting, baking, and storage of vegetable foods was the primary occupation of Thompson females.

June - "The deer drop their young, and service berries begin to ripen". Soon after the season for the early roots and greens, the service berries (Amelanchier alnifolia) become ripe on the lower slopes. Gathered in large quantities by women and children, these berries were eagerly sought, and preserved by drying or by baking in cakes. The service berry (or saskatoon) season is short, but as the summer progresses the berries ripen at increasingly higher altitudes.

July - "The sun returns and all the berries begin to ripen". July is the hot month in Thompson country with temperatures generally in excess of 85' F. and frequently over 100' F. Various berries ripen and, as the month progresses, the tempo of fishing increases.

August - "The sockeye or red salmon run". Although salmon (especially the Spring Salmon - Oncorhynchus tshawytscha) have been ascending the Fraser for more than a month, in late July and August the major runs of sockeyes (Oncorhynchus nerka) appear. Indians flocked to the favourable fishing locations and the men fished for salmon with dipnets, a highly specialized bag net which collapses around the fish upon contact. In the clearer waters of the Thompson River the dipnet was often not as effective as the fish spear. Salmon fishing was a cooperative effort, with the cleaning and drying relegated to the women.

September - "The cohoes or silver salmon come, and the salmon begin to get poor".

With the termination of the sockeye runs the cohoe (Oncorhynchus kisutch) appear in somewhat lesser quantities. The fish at this time of year have lost some of their firmness and desirability, so much of their stored-up energy having been expended in the arduous ascent of the Fraser. This is also the season for Humpbacks (Oncorhynchus garbuscha), a much less desirable fish from the Indian's point-of-view than the cohoe or sockeye, and during this "time of plenty" the Indians can usually afford to be selective.

October - "The people trap and hunt and the bucks begin to run".

In October the snow returns to the high country, and the deer become restless. They are fat from the summer and in their prime. Men form hunting parties and may camp for a week or two in the hills.

Such are the average seasonal activities associated with the food quest and shelter. Precise timing depends upon the particular climatic conditions, local geographical features, and to some extent personal preference. Naturally occurring cycles in numbers of fish and density of specific mammals are also a factor. Because various subsistence resources are located in differing ecological niches, seasonal transhumance and a certain amount of sexual specialization of labour are essential. Without involving a deterministic philosophy it might be noted that Thompson society is "well-adjusted" to the transhumant pattern.

Our knowledge of aboriginal Thompson society is very limited. From Teit's meagre descriptions, and from what reconstruction can be achieved from observing present behaviour, the aboriginal Thompson society was probably characterized by a certain structural flexibility and looseness, in which neither kin nor residence ties were permanent or binding, although favouring the paternal side in inheritance and marriage locality (for males). Small, mobile, and independent bands of people were probably quite typical of much of south central British Columbia.

The present political structure is a mixture of aboriginal and modern administrative patterns. Thompson polity probably called for the appointment of temporary task chiefs, both male and female, although hereditary chieftainship might also have been practised. Teit makes it clear that original Thompson band groupings encompassed villages on both banks of the Fraser for distances of roughly 20 miles. Band members probably intermarried with affinal ties effecting the composition of fishing, hunting, and root digging parties. The change to administrative units which include Indians living along one side of the river is probably a reflection of improved land travel since the coming of the White Man. Simon Fraser's journal (Lamb 1960) indicates that dugout canoes were in use on the Fraser between Lytton and Lillooet, and that crossings were frequent.

Other aspects of Thompson ethnography, such as burial patterns and more complete data on settlement patterns and linguistics, are included in the general discussion following the description of the archaeological remains.

CHAPTER III

STATEMENT OF PROBLEMS

In 1939 V. Ray published Cultural Relations in the Plateau of Northwestern America. The burden of his monograph is that one can legitimately speak of a single Plateau Culture Area, encompassing both the Columbia Plateau and the Interior Plateau of British Columbia, and that the Plateau Culture Area contains sufficiently discreet cultural elements to warrant its separation from the Northwest Coast Culture Area to the West, and the Plains to the East. After outlining the boundaries of the Plateau Culture Area, Ray considers subdivisions. Utilizing non-material cultural traits, Ray discerns three longitudinal, or vertical divisions, and three lateral areas. The three vertical subdivisions stem largely from the influence of extra-areal relationships. Thus the western portion illustrates considerable coastal influence, while the eastern subdivision is obviously effected by the Plains horse culture. In the centre, according to Ray, are found the older, more fundamental, Plateau culture traits (Ray 1939:145-9).

Considering the lateral divisions, Ray notes that they are of an entirely different order from the vertical subdivisions. The northernmost is the Athabaskan area - the Carrier and Chilcotin. South of the Athabaskans, and occupying the central lateral division, are the Canadian Interior Plateau peoples (Salish speakers), and south of them, the mixed Salish and Sahaptin populations of the Columbia Plateau. Ray (1939:147) points out that the majority of culture traits distinguishing the Canadian from the American Plateau groups indicate that the present International Boundary between Canada and the United States is at the same time the major cultural boundary. The linguistic break between the Salish and Sahaptin, however, is located about 180 miles south of the International Boundary. Concerning the

Canadian Interior Plateau - American Columbia Plateau division, Ray writes (1939:147,8):

> "This north-south division is the most definite and distinctive of any in the Plateau. It is encountered more consistently in aspects of religious culture than in other branches, but is unmistakably present in social and material fields as well. The cleavage is pronounced in those elements which are fundamental to Plateau identify, such as social attitudes, religious dances, spirit quest, house types, canoe types, and the like."

In the concluding paragraph Ray (1939:149) comments on the conservative nature of the groups located in the geographical centre of the Plateau.

> "The Southern Okanogan, Colville, Sanpoil, Lower Spokane, and Columbia may with reasonable safety be viewed as the most representative of older levels and fundamental aspects of Plateau Culture."

In a recent paper (Sanger n.d.) I have attempted to test the validity of Ray's ethnographic divisions by utilizing archaeological evidence. Sites from the late prehistoric period (roughly A.D. 1000 to A.D. 1800) of both the Canadian and American Plateaus were examined, and although the archaeological assemblages are few, the comparisons do suggest a well-defined cultural break between the two plateaus.

It is a most appropriate question to ask why these subdivisions are present. Explanations may be historical, environmental, or a combination of the two. Environmental explanations are commonplace in archaeological writings, and while environment can scarcely be said to be determining, it may certainly be an influencing factor. Difficulties arise, however, when attempts are made to assess the role played by environment at any one time and place, without obtaining a broader view with temporal and spatial controls.

The interrelationships between environment and culture are multifaceted. Steward's (1955) concept of cultural ecology and the tripartite method of cultural ecology offers a useful technique for viewing the interrelationships. Steward states that cultural ecology does not attempt to arrive at universal explanations or "general principles applicable to any cultural environmental situation" (1955:36). Rather, cultural ecology is interested in "seeking to explain the origin of particular cultural features and patterns which characterize different areas." In the method of cultural ecology three procedures are followed. First, the interrelationships between exploitative or productive technology and environment must be examined. Second, any behaviour patterns associated with the technology must be analyzed, and third, how these behaviour patterns effect other aspects of culture.

The degree of correspondence between climatic change and culture change is not constant, and it is no more sound to imply that a climatic shift resulted in culture change, than it is to infer that culture change was dependent upon a climatic shift. Before assuming any casual relationships between the Hypsithermal (Deevey and Flint 1957) and direction of culture change, for example, the archaeologist should attempt to analyze the probable effects of such a warming period. A model could be established in which certain species of flora and fauna have reached a very sensitive ecological balance with the environment. Under these conditions a shift to a slightly dryer climate could seriously threaten the species by thinning out the numbers or, in extreme cases, even cause extinction. If the archaeologist can demonstrate man's dependence upon these species to a point of specialization, then there might be some merit in associating climatic shifts with culture change. This model is probably not applicable to the Lochnore-Nesikep Locality, however, where historically the Indians were extremely diversified in their subsistence quest, utilizing resources from many ecological niches. A shift to a warmer, dryer climate might dessicate the lower-lying valleys, but at the same time increase deer and elk grazing potential on the higher slopes with the uphill migration of the bunch grass communities.

General Hypothesis

It is the general hypothesis of this Dissertation that, despite many cultural similarities in the historic period, there is a basic difference between the culture history of the Interior Plateau and the Columbia Plateau. This cultural dissimilarity intensifies with time back to a period about 7,500 years ago, the earliest date thus far for Interior Plateau sites. Observable in certain key artifact classes such as projectile points and microblades, this difference is also reflected in subsistence and settlement patterns.

Part and parcel of the general hypothesis is an explanatory statement. The historic cultural subdivisions of the Plateau Culture Area are understandable given the different culture histories of the Interior Plateau and the Columbia Plateau. Historical and environmental factors both influenced the cultural development of the Plateau Culture Area. Following Cressman (1960) and Daugherty (1962) it would appear that the prehistoric cultures of the Columbia Plateau have been strongly influenced by ideas originating from the Great Basin, and in Daugherty's terminology (1962:144), shared in the Intermontane Western Tradition with other areas of the Desert West. The Interior Plateau, on the other hand, derived many of its most diagnostic cultural elements from the Prairies and the sub-arctic. These, then, in broad outline, are thought to be the primary historical factors involved.

Environmentally there are many similarities between the Columbia Plateau and the Interior Plateau. Both areas lie within the Intermontane area characterized by Kroeber (1939:55) as the "Columbia-Fraser Plateau". Kroeber, on the basis of vegetation, suggests that this area be subdivided into three provinces: (1) The Middle Columbia, (2) The Upper Columbia, and (3) The Fraser. There is precedent, therefore, for considering the aboriginal culture of the Plateau in terms of the two major rivers - the Columbia and the Fraser. Archaeologically, many of the important sites in the Columbia Plateau were located along the Columbia River and its major tributaries, while the Fraser and its confluents were the areas of population concentration for the Interior Plateau. For the purpose of comparing the prehistory of the two plateaus it is valid to refer to the culture histories of the two river drainage systems (see Figure I).

Both river systems were characterized in early historic times by salmon which provided a major portion of the river's resource potential. Utilizing geological and archaeological evidence I shall endeavour to show that the great salmon runs have been present in the Fraser drainage for 7,000, and possibly 9,000 years, while the presence of salmon in the Columbia drainage has not been continuous. Salmon were taken by the inhabitants of The Dalles region as far back as 9,000 years (Cressman 1960), and up to 6,000 years ago, but between that time and A.D. 1200 there may have been very few, if any, salmon ascending the Columbia River past the Celilo Falls at The Dalles. The proposed absence of salmon in the Columbia River during that long span of time is considered to have played a leading role in the maintenance of cultural discreetness between the Fraser and Columbia drainage systems. The late prehistoric and early historic emergence of shared cultural traits, and the southeastward expansion of Salish language (Elmendorf 1965) appears to coincide with the re-introduction of salmon in the Columbia drainage system.

Of more regional import is the problem of the Fraser River Valley as a logical North to South diffusion route for ideas and migrating human populations. Borden (1962:17) notes that the Interior Plateau, especially the Fraser River, must be considered "a potentially important diffusion route" and he constructs a time gradient for the spread of microblades downriver from the subarctic. Microblades and their attendant cores are probably not the only artifact types to have derived from the North, and the Lochnore-Nesikep sequence should shed light on the introduction of ideas into south central British Columbia _via_ the Fraser River.

In comparing the prehistory of the Fraser River drainage system with that of the Columbia, it is apparent that we may be dealing with the prehistory of Salish and Sahaptin languages respectively. To what extent linguistic and archaeological data can be correlated is another problem to be considered.

In summary then, there are four major areas of problem to be considered:

1. The cultural origins of the Plateau Culture and its various subdivisions.
2. The effect of the interrelationships between historical and environmental determinants.
3. The role of the Fraser Valley in the diffusion of ideas and human population into south central British Columbia.
4. The correlation of linguistic and material cultural evidence as present in archaeological assemblages.

CHAPTER IV

DESCRIPTION OF SITES

Excavation Techniques

Excavation techniques varied from site to site in accordance with the particular problems encountered. Horizontal controls were maintained by grid systems laid out in metric units, while vertical measurements utilized both depths beneath surface and depths below an arbitrary datum line. The size of excavation units varied considerably, even within any one site.

A few months prior to the 1964 field season a group of individuals representing a considerable amount of experience in Plateau archaeology, met with the purpose of discussing the excavation of semi-subterranean housepit sites. From the discussion it was apparent that no "ideal" or universally acceptable techniques had been devised, and no individual was particularly satisfied with past excavations. Following the seminar a short note titled "The Excavation of Housepit Sites" was prepared and circulated among the discussants. The note is included here as it sets out the basic methodology inherent in the approach to the Lochnore-Nesikep Locality housepit sites. Unfortunately, manpower problems and the general character of the sites did not permit us to adhere to all the recommendations. The large Lochnore Creek site (EdRk:7) was approached in this manner, however, and a detailed account of these excavations is included in the general description of the site.

The Excavation of Housepit Sites

1. A pithouse site is like any other habitation site in that it contains:
   a) cultural deposits of an unknown depth, nature and cultural affiliation;
   b) non-cultural fill deposited by a series of natural events, some of

which have a bearing on the interpretation of the cultural remains;

c) a series of cultural features which must be excavated carefully if all the inter-feature relationships are to be understood;

d) the most prominent of these features are the housepits.

2. Therefore, the investigator, in order to secure data on all aspects of the site, should treat the pithouse site not as a series of unrelated pits, but first and foremost as an integrated archaeological site. If the ethnographic evidence is correct, the design of the housepits would encourage the performance of many activities not in, but rather around the outside of the dwellings.

3. It follows then, that excavations should not be limited to testing housepits only. In other words, the examination of inter-pit areas should not be subsidiary to the testing of the housepit depressions.

4. No dig is worth while unless sufficient data are gathered, and a representative sample oi the site obtained. The investigator must decide what constitutes a representative sample of the site and deploy his resources accordingly. If there appears to be a good chance of recovering superstructual features of the pithouses, time and labor resources may permit the uncovering of one housepit only. In an unknown area, archaeologically speaking, this may be the most reasonable approach. In any event, level stripping would appear to be the obvious method of carefully examining a housepit.

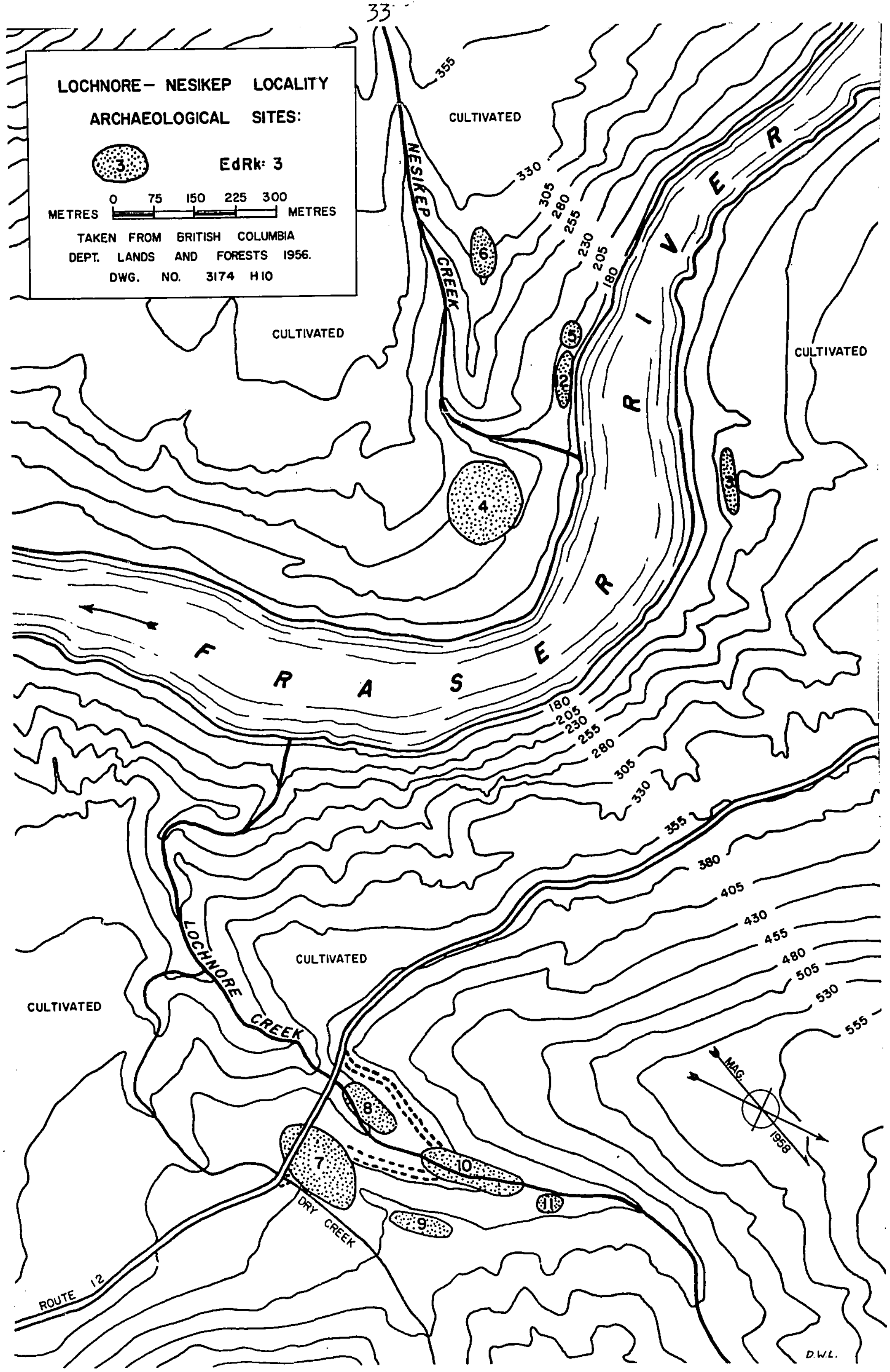

LOCHNORE – NESIKEP LOCALITY
ARCHAEOLOGICAL SITES:
EdRk: 3
0 75 150 225 300
METRES
METRES
TAKEN FROM BRITISH COLUMBIA
DEPT. LANDS AND FORESTS 1956.
DWG. NO. 3174 H10
CULTIVATED
NESIKEP CREEK
FRASER RIVER
LOCHNORE CREEK
DRY CREEK
ROUTE 12
MAG.
1958
D.W.L.

FIGURE 2

Site Descriptions

The Mile 28 Ranch site (EdRk:3) (Figure 2) is a burial site located on a small terrace about 65 metres above the Fraser River on the east bank. It is the only described site in the Locality not beside either Nesikep or Lochnore Creeks. On the surface, and down to an undetermined depth, the soil consists of windborne sand. The action of the wind sweeping along the valley and carrying sand up onto the terrace has resulted in a characteristic dune, which extends along the outer edge of the terrace and stands close to 1 metre above the average elevation of the terrace surface. In the Spring of 1961 the landowner, Mr. Holzer, decided to cultivate the terrace, and employed a small bulldozer to prepare the dune for irrigation agriculture. It was during these levelling operations that the burials were pedestalled by the bulldozer operator and the sites brought to the attention of C.E. Borden by Mr. J. Meek, the Superintendent of the Lytton Indian Agency.

Prior to bulldozing, the Mile 28 Ranch site was covered with a sparse colony of sagebrush and related species with no evidence of trees. In the 19th century the terrace was probably used as a camp for Chinese placer miners.

One of the pedestalled burials was too badly disturbed to warrant systematic excavation. The remaining burials were exposed and photographed. Burial 1, an adult male, was interred approximately 60 cm below estimated ground level. The burial was tightly flexed on the left side with the arms drawn in tightly against the chest and the hands encircling the neck. Cause of death was fairly obvious with a large point embedded in the thorasic vertebrae. Oriented north/south, with the head to the north and facing east, the long axis of the burial is perpendicular to the direction of flow of the Fraser. Associated with Burial 1 were 14 artifacts arranged in a compact group beside the shoulder. A thin brown stain surrounding the artifacts may represent the remains of a basket or bark container.

Burial 2 was an infant burial with un-fused long bone epiphyses. It was interred beside Burial 1, but a little deeper, with the depth below surface estimated to be around 75 cm. Burial 2 was flexed tightly on the right side with the left arm resting on the left cheek region, and the right arm extended under and beyond the veterbral column. The orientation of the body was east/west with the head to the west and facing south. A chipped point found between the left radius and the ribs was the only remaining grave inclusion.

In the course of levelling the terrace, the Holzers picked up a collection of artifacts which were examined in 1961 and photographed in 1963. Sketches were made of some of the decorated pieces in 1964. Holzer estimates that 7-8 individuals were unearthed making a total of 10 or 11 from the site. Judging from the size of the collection and the numbers of scattered bones, 7-8 burials is probably a conservative estimate. There is no evidence that any burials remain at this site. The excavated skeletal material plus disturbed bones were sent to the University of Toronto for further examination.

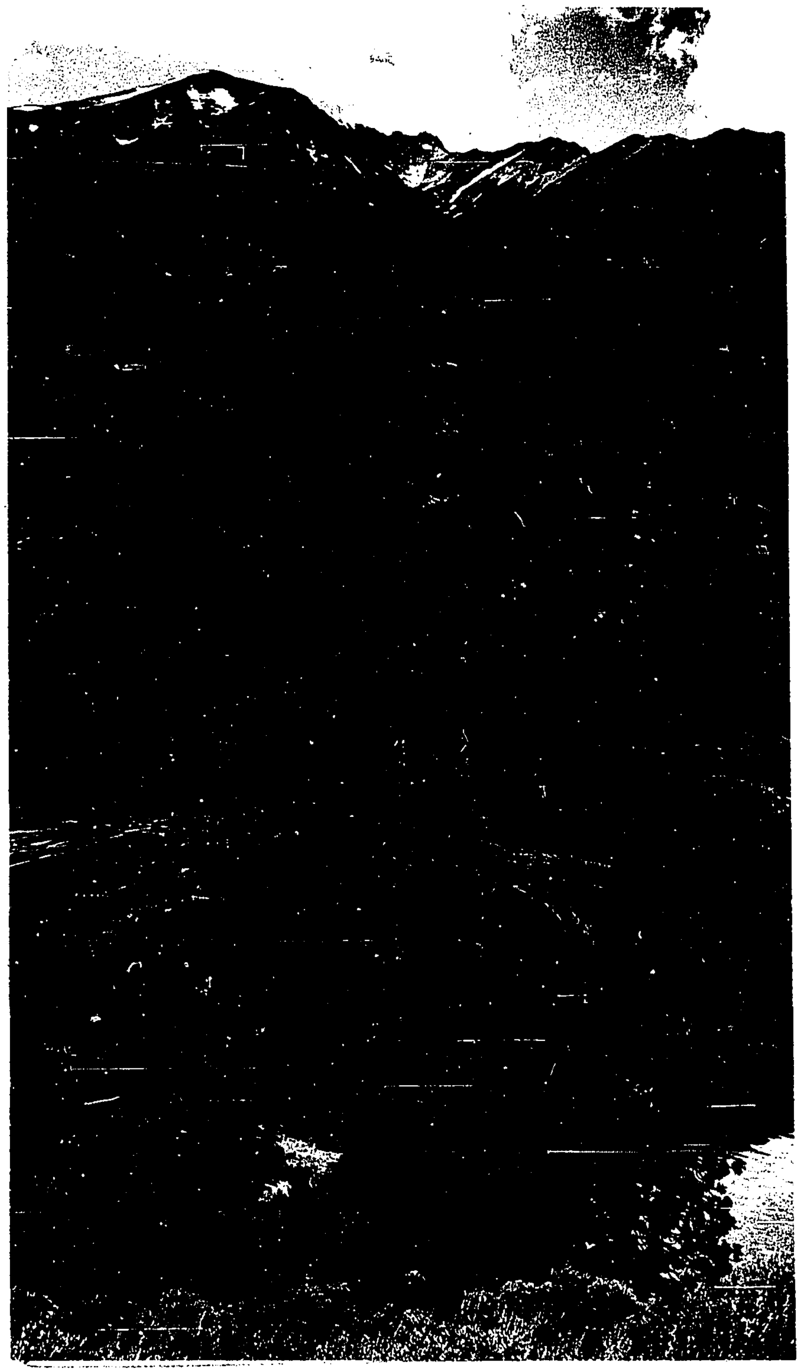
The Nesikep Creek site (EdRk:4) is located on an exposed terrace on the right bank of Nesikep Creek (Figures 2, 3), approximately 65 metres above the present level of the Fraser River. The site's dimensions, as suggested by test pits, is roughly 100 by 70 metres. Part of the site can be described as "blown-out", especially in the western and northern ends where the prevailing down-valley winds have almost exposed the underlying fan gravel. Small mounds of sand surround isolated clumps of sagebrush. At the southern and eastern extermities sand was duned to considerable depths. Some test pits in the duned areas attained depths of four metres

PLATE II

The Nesikep Creek Fan and Sites

The Nesikep Creek site is the sandy area in the lower left; the Cow Springs site is to the right at the base of the slope; and the McPhee site is above on the edge of the high terrace. See also Figure 2. Photograph by M. Suttles.

PLATE II



before striking gravel. Floral cover on the site includes the customary sagebrush, cactus and rabbit bush, with the addition of some Ponderosa pine, Douglas fir, and wild rose.

In a preliminary report on the Nesikep Creek site (Sanger 1964), something was indicated of the events leading up to the excavations. Reports on human burials, coupled with the presence of scattered human skeletal material on the surface and around recent-looking relic collector holes, suggested that the Nesikep Creek site should be excavated. Our extensive trenching and pitting operations in 1962 recovered no complete burials but did unearth broken and sun-bleached bones lying beneath apparently undisturbed ground, over which a camaflaging cover of sagebrush and related species had spread. Subsequently, it was discovered that a one-time resident has an extensive collection of artifacts from this and other nearby sites.

First excavated in 1962, the Nesikep Creek site was re-examined in 1964, and visited again in 1965. Work in 1962 commenced with testing operations in the extreme southern end of the site, where human burials had been reported. The excavations recovered no articulated human skeletons, but did unearth many deer bones in association with scattered fire-cracked rocks and 30 artifacts. The thin cultural stratum, which is designated Zone I, apparently overlay the burials, which comprise Zone II. Further testing throughout the site indicated the former presence of burials concentrated in a strip approximately 30 metres wide, following the north-south axis of the site.

Late in July of 1962 test pits in the duned area in the north-eastern portion of the site contacted several stratified components. Labelled Pit B in the site map (Figure 3), the duned area contained 5 cultural strata (Zones III-VII) and the bulk of the 1000 plus specimens

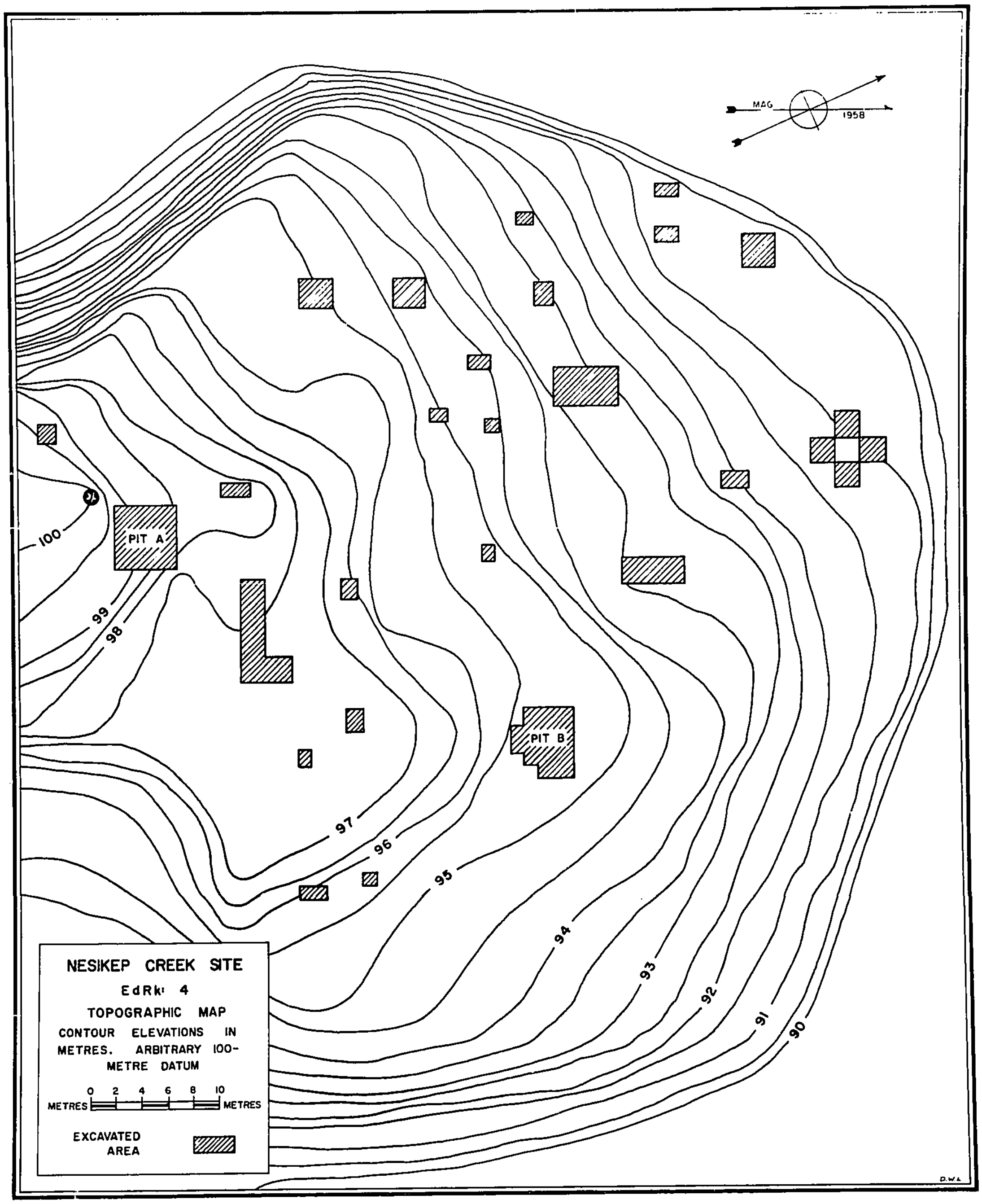

MAG
1958
PIT A
PIT B
100
99
98
97
96
95
94
93
92
91
90
NESIKEP CREEK SITE
EdRk: 4
TOPOGRAPHIC MAP
CONTOUR ELEVATIONS IN METRES. ARBITRARY 100-METRE DATUM
0 2 4 6 8 10
METRES
METRES
EXCAVATED AREA

FIGURE 3

recovered from the Nesikep Creek site. At the conclusion of the 1962 season Pit B measured 5.5 by 5.0 metres. Pit B was excavated by trowel in 5 cm. levels within natural strata. All deposits, except the windborne topsoil, were screened.

Zone III, the uppermost of the sequence from Pit B, consists of a dark brown sand averaging 10-15 cm in thickness. Features include several pits, some partially lined with fir bark and rocks, which are probably storage pits rather than house structures. Preservation of organic remains is good, and concentrated middens of fish bone are present. The specimens from Zone III in Pit B, when combined with additional Zone III artifacts from surface collections and other test pits, make a total of about 450 pieces. A previously reported figure of 470 artifacts include 20 microblades now ascribed to Zone IV.

Separated from Zone III by a stratum of sterile grey sand, Zone IV appears as an intrusive pit into underlying components. Although only a small portion of Zone IV is excavated, the dimensions of the pit suggest a semi-subterranean housepit. Subsequent excavation in 1964 neither supported nor refuted this hypothesis, and it still remains an open question. Eighty-three artifacts are now attributed to this component.

The Zone V deposits are made up of a compact light grey-to-white silty sand, which increases both in compactness and silt content with depth. The artifact count similarly increases with the maximum concentration reached about 5 cm from the bottom of the 20 cm deposit. This zone is probably represented in several test pits throughout the site. A total of 310 artifacts is from this component.

The silty-sand of Zone V merges into the very compact white silty-sands of Zone VI. According to F.J. Sanger, a soils scientist with the U.S. Army Corps of Engineers, Zone VI has the following characteristics:

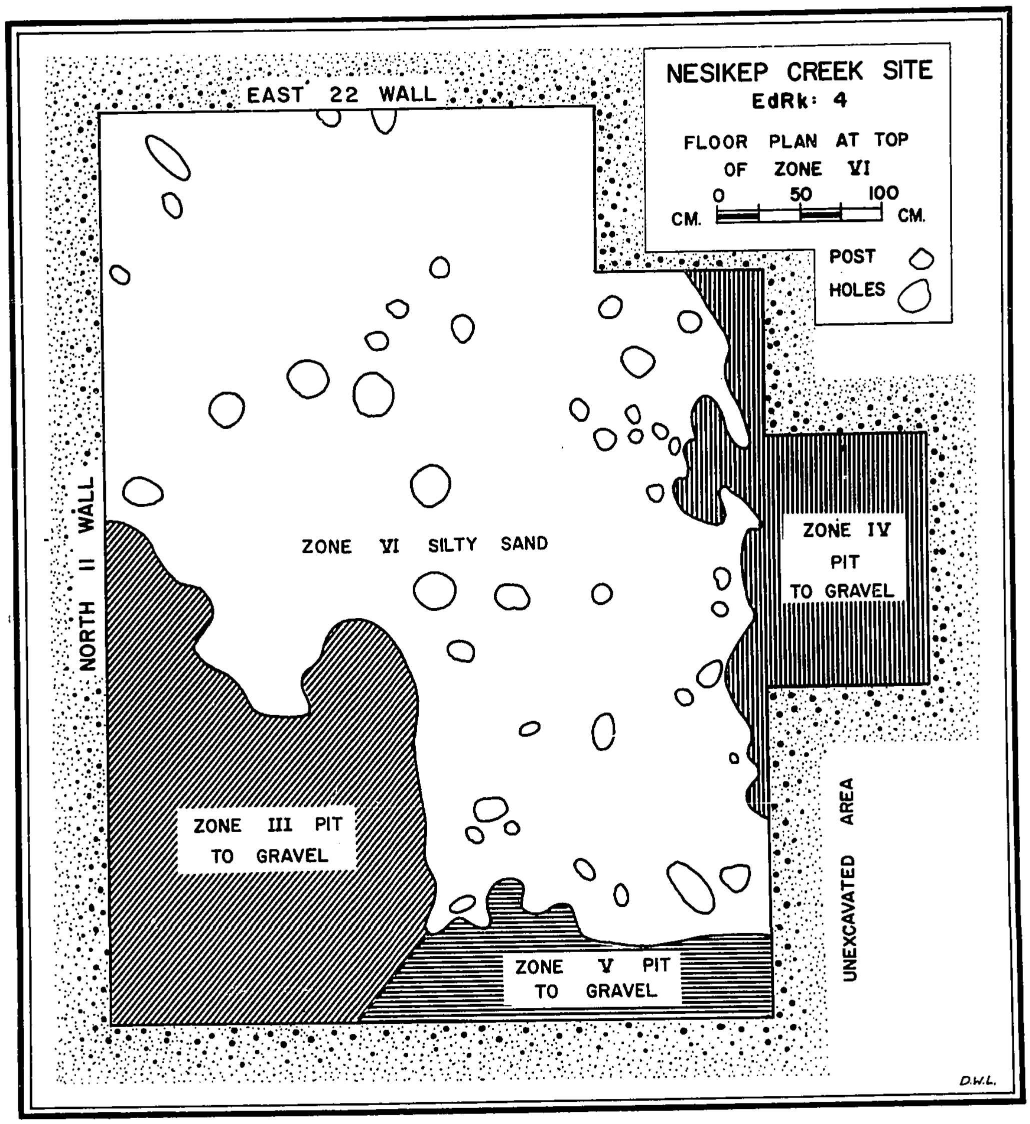

NESIKEP CREEK SITE
EdRk: 4
FLOOR PLAN AT TOP OF ZONE VI
0 50 100
CM. CM.
POST HOLES
EAST 22 WALL
NORTH II WALL
ZONE VI SILTY SAND
ZONE IV PIT TO GRAVEL
ZONE III PIT TO GRAVEL
ZONE V PIT TO GRAVEL
UNEXCAVATED AREA
D.W.L.

FIGURE 4

"The soil is obviously windborne and is mainly fine sand with some silt and practically no clay.... the structure is quite like that of loess but the material slakes to slowly for loess.... I would call it a calcereous windborne silty fine sand, with structure resembling that of loess, but non-plastic."

In order to penetrate the 20-40 cm thick deposit it was necessary to use a sturdy machete, hammering on the back of the blade with a billet of wood. Once cut, each 50 by 50 cm square can be lifted intact. Scattered throughout the Zone VI deposit are flecks of charcoal, animal bones, and chipped stone. The deposit is penetrated numerous times by posts driven from the upper components (Figure 4). One group of 6 depressions, of greater diameter than usual, may be associated with a pit dug from Zone III through the Zone V, VI, and VII deposits right down to the underlying gravels. Thin columns of Zone VI soil extend from the main deposit 5-10 cm into Zone VII. These columns, described as "finger-like projections" in the preliminary report (Sanger 1964), are apparently stake holes filled-in with the Zone VI silty-sands.

There is no gradation of soil types from Zone VI to Zone VII; the change is very abrupt. The Zone VII deposits are medium-to-coarse, brown sand, probably of fluvial origin, which are mantled by the aeolian Zone VI silty-sands. Underlying the 10-15 cm thick Zone VII sands is a gravelly-sand stratum comprised of coarse sand and fine gravels. This in turn rests on the unsorted, angular to sub-angular gravels of the Nesikep Creek fan. The following hypothesized sequence of depositional events is supported by R.J. Fulton, geologist, who visited the site. It seems possible that after the formation of the Nesikep Creek fan the Fraser River began downcutting, creating small terraces such as the one under the Nesikep

Creek site. At a time when the Fraser was much higher than it is at present (it is now about 65 metres below the site) the river flooded depositing the gravelly sand, capped by the medium-to-coarse brown sand. Later, man occupied the site, scattering his artifacts throughout the soft sand. Some artifacts, when excavated, lay on the surface of the sand, half covered by the windborne white silty-sands of Zone VI. The depositional history from this time (circa 6,000 years ago on) is one of accumulating windborne sands interstratified with human occupation.

Features in Zone VII include localized hearth areas of rocks, small pieces of charcoal, and thin stake holes surrounding the fires. The most interesting feature, however, consists of a cache of artifacts which may have originally been placed in a container (Plate III). Included in the cache are three stone projectile points (Plate XV:a,c,f), a large piece of red ochre, sharpened marmot's incisors, an antler point (Plate XXVI:d), several scrapers, and miscellaneous bird bones of an unidentified small species. During the 1962 excavations 120 specimens were recovered from Zone VII, and in subsequent visits an additional 10 artifacts were collected.

It was originally reported that an artifact (?) might be associated with the top of the fan gravel (Sanger 1964:144). The possibility now seems extremely remote, and any notion that the gravels might be cultural is now completely abandoned.

The Cow Springs site (EdRk:5) is a housepit site located on the west bank of the Fraser approximately 400 metres upriver from the confluence of the Fraser River and Nesikep Creek (Figure 2). Situated on a narrow terrace 40 metres above the Fraser, the site now comprises a single 10 metre wide housepit in which two cultural components are recognized. Local vegetation consists of grass and, on the northern end, scattered sagebrush and wild rose. Flanking the site are fir trees and some saskatoon bushes.

PLATE III

Zone VII Cache at the Nesikep Creek Site (EdRk:4)

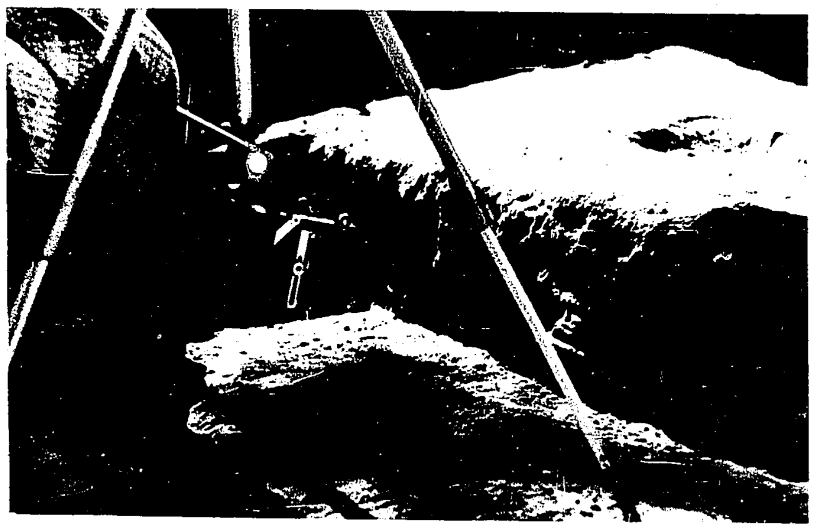
a Photographing cache when first exposed. Note the white silty sand of Zone VI over darker Zone VII sands. Arrow indicates location of cache artifacts.

b Top layer of Zone VII cache exposed

c Lowest level of Zone VII cache artifacts

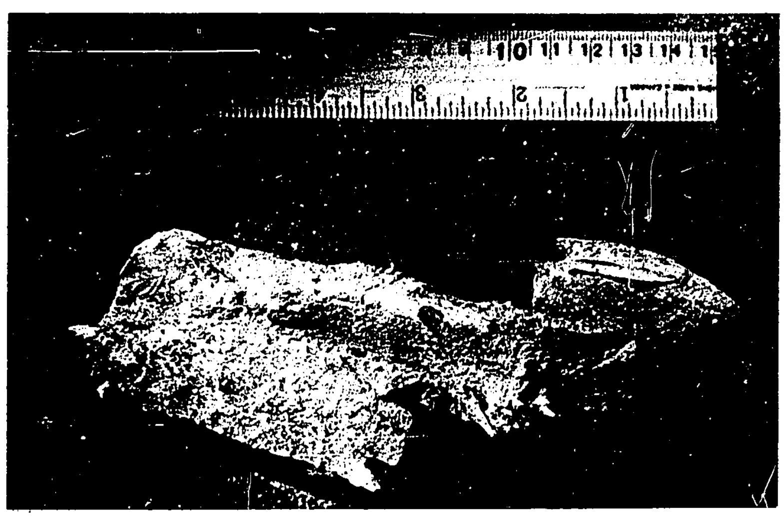
PLATE III

a



b

c



The position of the site at the toe of the long slope has resulted in increased ground moisture reflected in the floral cover, and has also played the decisive role in the site's soil deposition history. Surrounding the housepit are 43 small storage pits, designated collectively as EdRk:12; they are, therefore, considered distinct from EdRk:5.

The Cow Springs site was tested during the 1964 season. Due to other excavation commitments only three men could be spared for one week to examine the deposits. Initial testing disclosed two cultural zones separated by a thick sterile strata of sand, silt, and gravel. It was decided to level strip the deposits in a one-metre wide trench along the north/south axis. The trench was laid out so that it by-passed a test pit and thereby the centre of the housepit by at least one metre; a fortunate accident as the excavation intercepted some crucial housepit structural remains. Cultural stata were excavated with trowel, and the soil screened. The lower of the two zones contained great quantities of fish bones, only a percentage of which were retained. Although the excavation plans called for the completion of the north/south trench, time expired before the deep northern lip deposits could be fully examined. A large percentage of this site remains to be excavated.

Horizon A includes the topsoil plus the thin (less than 5 cm) uppermost component, Zone I, which appears to represent a brief encampment utilizing the older depression. Separating the two cultural strata is Horizon B, a sterile level of fluvial origin, made up of sands, silts, and gravels, in alternate bands. The Horizon B deposits evidently originate from the slope behind the housepit and an erosion channel links the Cow Springs site with a Spring run-off stream. Horizon B sediments closest to the slope contain coarser soils (gravels and coarse sand), while in the northern end of the housepit the deposits are thinner and finer (more silt)

(Plate IV) (Figure 5).

Zone II deposits, which range in thickness from a few centimetres to 1 metre, consists of a dark brown fine sand. The outstanding feature of Zone II is the excellent preservation of organic remains, including pieces of wood, fish skeletal remains, mammal bones, and artifacts. Cultural features include small concentrations of charcoal (but not the central hearth), an ill-defined pile of rocks of unknown function, and several post moulds. From the profile (Figure 5) it can be seen that a deep pit was aboriginally excavated deep into the centre of the house. Approximately 2 metres wide in the test trench, this central pit expands towards the centre of the house. Within the pit are two large post moulds (30 cm by 35 cm and 50 cm by 55 cm in diameter) which are probably two of the four primary upright supports of the house superstructure. Other structural remains include smaller post moulds and large, charred pieces of wood, possibly secondary supporting members.

A total of 158 artifacts, 12 from Zone I, 138 from Zone II and 8 of dubious provenience, comprise the specimens recovered from the north/south trench and the test pits. A spring, located a stone's throw away, supplied the inhabitants with water.

The McPhee site (EdRk:6) is situated on an exposed ridge approximately 150 metres above the west bank of the Fraser River (Figures 2,6). Although only 3 housepits now remain, it seems likely that the site was once considerably larger, with those housepits originally located further back on the terrace having been ploughed and levelled. An isolated housepit, surrounded by large boulders, is the sole survivor of the terrace group. The 3 pits were not destroyed as the ridge is not suitable for ditch irrigation agriculture. Although the ridge commands an excellent view up and down the Fraser River, it is very exposed to all winds, and it is quite

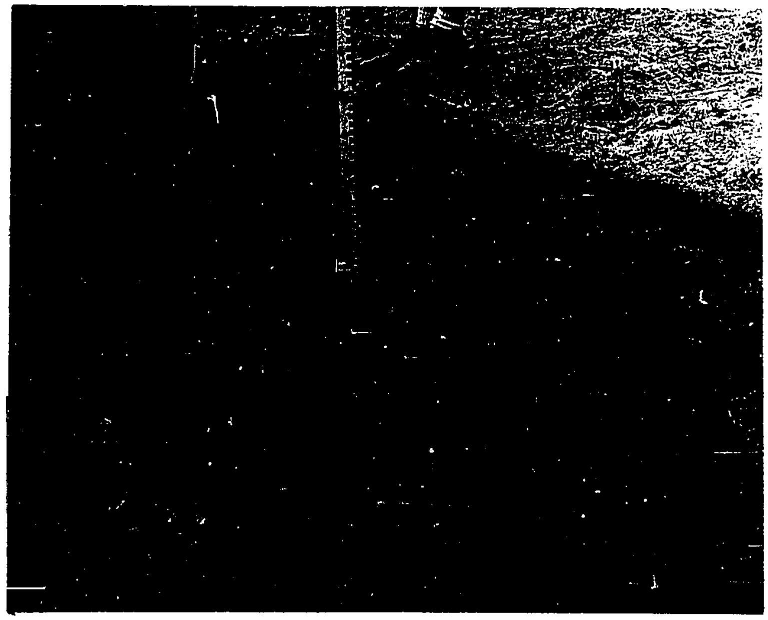
PLATE IV

Cow Springs Site Excavation

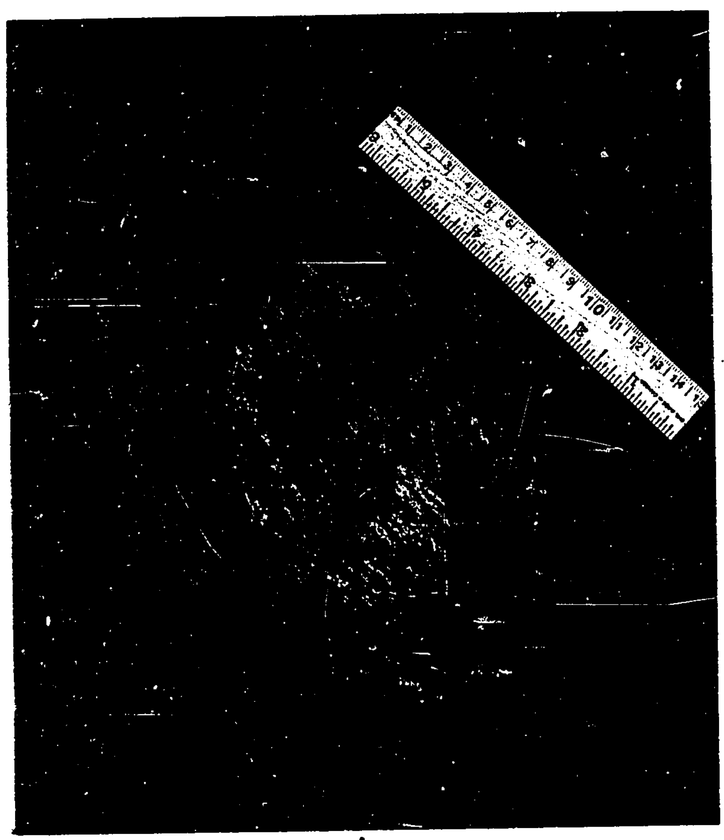
a East wall of north/south trench looking north. Dark lower stratum is Zone II with sterile silts and sands above. Scale is metric. See also Figure 5.

b Birch bark container in Zone II deposit. Photograph by M. Suttles.

PLATE IV



a



b

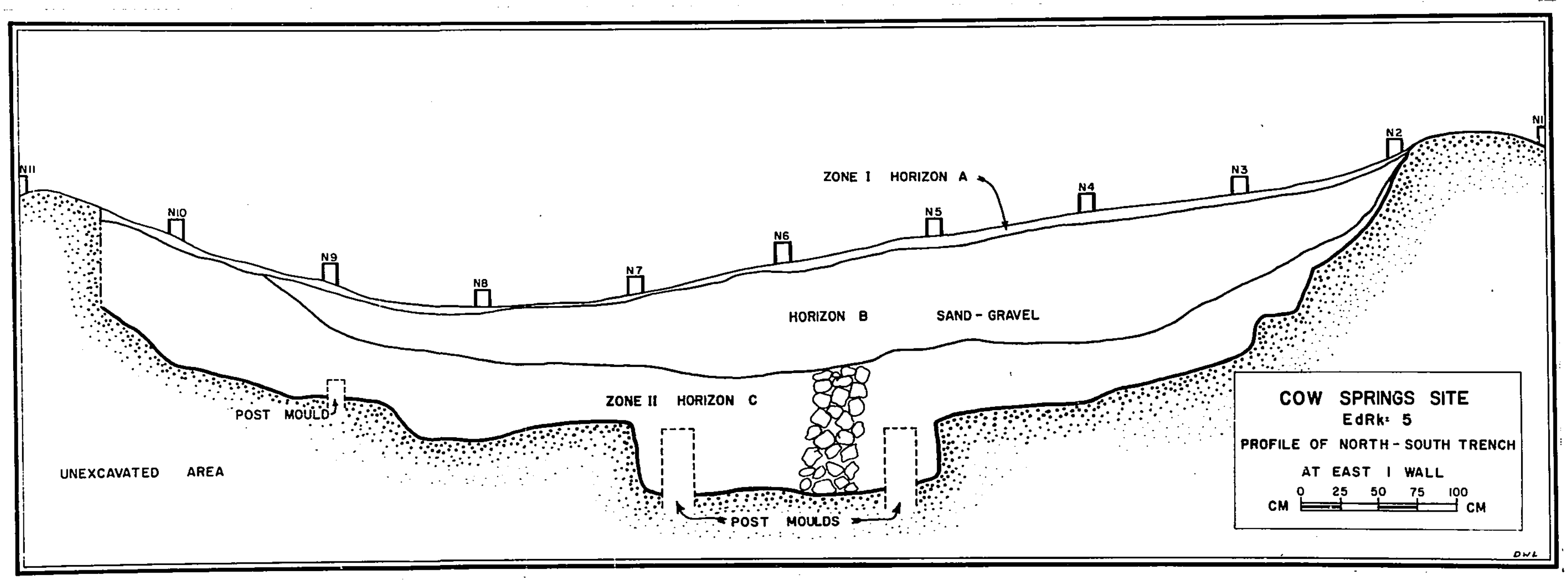

N1
N2
N3
N4
N5
N6
N7
N8
N9
N10
N11
ZONE I HORIZON A
HORIZON B
SAND - GRAVEL
ZONE II HORIZON C
POST MOULD
POST MOULDS
UNEXCAVATED AREA
COW SPRINGS SITE
EdRk: 5
PROFILE OF NORTH - SOUTH TRENCH
AT EAST I WALL
0 25 50 75 100
CM CM
DWL

FIGURE 5

removed from the nearest source of water — Nesikep Creek. Floral cover includes the usual sagebrush, cactus, rabbit bush, Ponderosa Pine, and Douglas Fir. Surrounding the housepits, and even interspersed within them, are numerous storage pits, probably similar to the one described below. A crew of 2 excavated the McPhee site for 2 weeks under the direction of Jonathan A. Maas.

Initial examinations suggested that the 3 remaining housepits were relatively intact. Once the sagebrush was cleared, however, it became evident that some dispoiling had in fact occurred. Housepit I, the southernmost depression (Figure 6), appeared to be the least disturbed, and it was examined by a two metre-wide cross trench in addition to a series of 2 by 1 metre pits excavated by natural depositional strata. Some of the deposits outside the housepit were briefly examined.

Cultural deposits within housepit I were thin, varying in thickness between 5 and 10 cm. Features included a central fire hearth about 150 cm wide, made up of flat angular rocks, and 3 storage pits intrusive into the housepit deposits. Within the storage pits remains of deer and fish were noted wrapped in sheets of unstitched birch bark (Plate V). Charred wood and some rocks were also encountered in these pits. Storage pit 1, located near the southeastern lip of housepit 1, was aboriginally excavated through the housepit deposits, down to a depth of 125 cm where the basal gravels were contacted. The straight-sided pit averaged 150 cm in diameter.

Housepit 1 appears to have been a shallow, saucer-shaped habitation with no real indications of a step in the profiles. Excavated to a depth of less than 50 cm, housepit 1 had an average diameter of between 9 and 10 metres.

Thirty-three artifacts, including three collected from the surface,

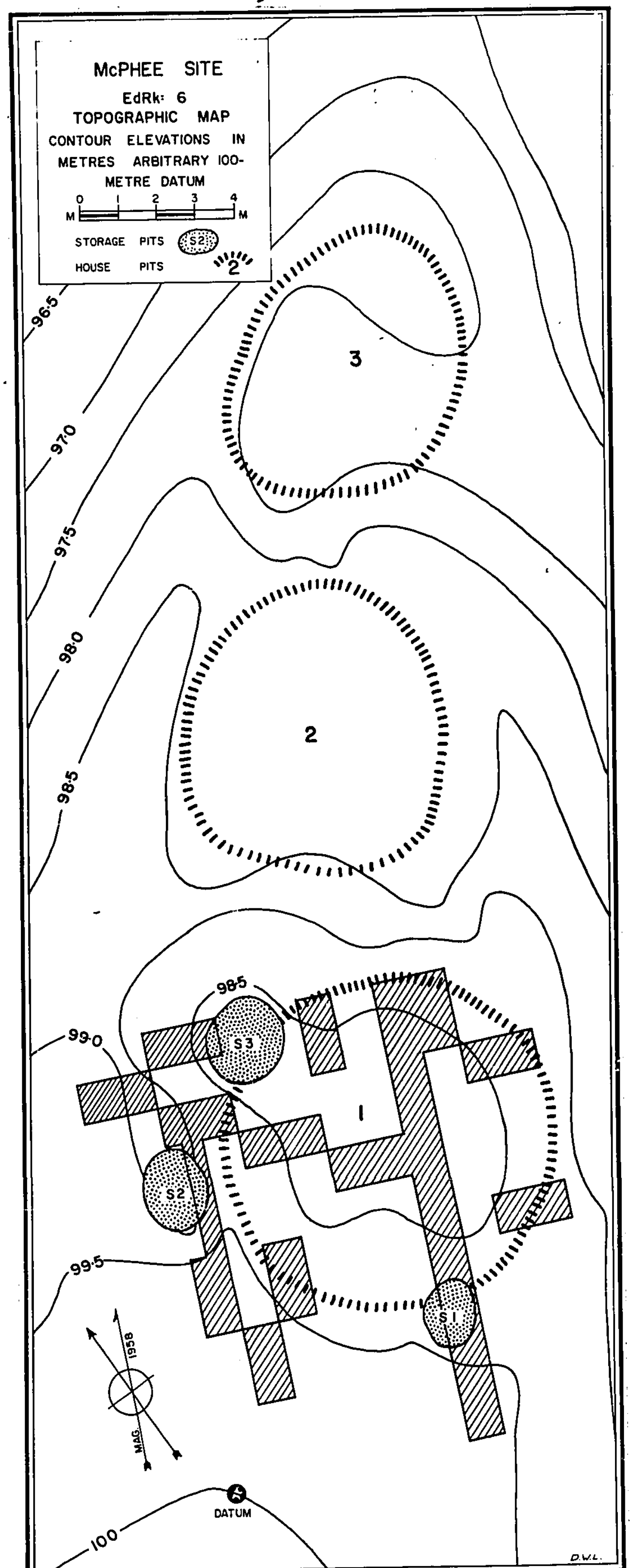

McPHEE SITE
EdRk: 6
TOPOGRAPHIC MAP
CONTOUR ELEVATIONS IN METRES ARBITRARY 100-METRE DATUM
0 1 2 3 4
M M
STORAGE PITS S2
HOUSE PITS 2
96·5
97·0
97·5
98·0
98·5
99·0
99·5
100
3
2
1
S1
S2
S3
1958
MAG.
DATUM
D.W.L.

FIGURE 6

PLATE V

Birch Bark Storage Container

A birch bark container in a storage pit from the McPhee site. Note fish vertebrae in centre of container. Scale is metric. Photograph by M. Suttles.

PLATE V

were recovered from housepit 1. In addition to the artifacts, the site yielded numerous skeletal remains of deer, fish, and possibly mountain sheep.

The Lochnore Creek site (EdRk:7) is located on the east side of the Fraser River Valley approximately 240 metres above the present river level, and 30 metres above the left bank of Lochnore Creek (Figures 2,7). Originally occupying an area of almost 200 by 75 metres, the construction of 3 roads prior to 1964 had reduced the site to approximately 60 by 50 metres. The site is now destroyed with the area bulldozed and under cultivation.

Like many of the Lochnore-Nesikep sites, the Locknore Creek site is situated on aeolian sands which have accumulated on gravel fan deposits. One of the roads dissecting the site (labelled Route 12 on the site map; Figure 7) has created a long profile of the east/west axis. In this exposure the inclined parallel bands of unsorted, angular gravel, silt, and sand, are plainly visible. Windborne sands of varying textures and colours have accumulated on the fan gravel, and it is on the aeolian deposits that close to 6 millennia of human occupation have occurred. Prior to clearing and ploughing, the site was covered with sagebrush, grass, rabbit bush, cactus, Ponderosa pine, and a few fir trees. A crew of 7 excavated in the Lochnore Creek site for a period of 2 months, resulting in the most intensively investigated site in the Locality. Over 3,000 artifacts have been catalogued.

The excavation plan of the Lochnore Creek site adheres quite closely to the method outlined in the note on housepit site excavation. Investigations commenced with an exploratory trench excavated rapidly through the east/west axis of the site (Figure 7). In order to expedite this process, alternate 2 by 1 metre pits were excavated with shovels in

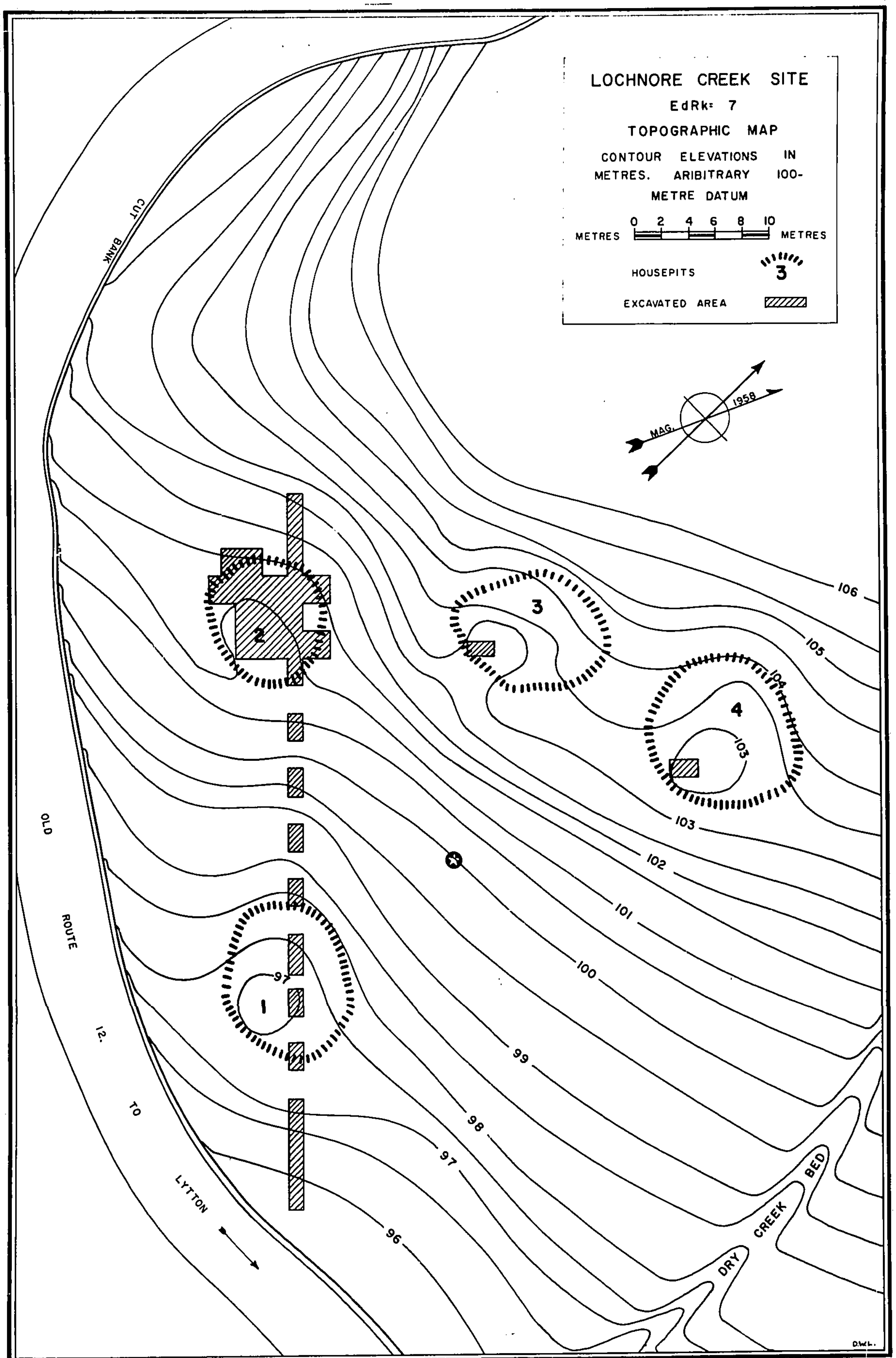

LOCHNORE CREEK SITE
EdRk: 7
TOPOGRAPHIC MAP
CONTOUR ELEVATIONS IN METRES. ARIBITRARY 100-METRE DATUM
0 2 4 6 8 10
METRES
METRES
HOUSEPITS
3
EXCAVATED AREA
MAG.
1958
CUT BANK
OLD ROUTE 12. TO LYTTON
DRY CREEK BED
1
2
3
4
96
97
98
99
100
101
102
103
104
105
106
D.W.L.

FIGURE 7

arbitrary 25 cm levels down to the underlying gravel, usually encountered within 2 to 2.5 metres below surface. All deposits were screened, and each excavator recorded features, artifact accumulations, soil changes, and numbers of fire-cracked rocks per level. In this manner, a 52 metres east/west trench was excavated through housepit 1 and housepit 2, in addition to portions of buried and un-numbered housepits. The north and west walls of each 2 by 1 metre cut were profiled, and later some of the intervening pits were removed. Tentative plans to excavate a north/south trench with the aid of a mechanical backhoe did not materialize.

Housepit 1 had been badly disturbed by relic collectors and so housepit 2 was selected for a more complete examination. As one of the alternate unexcavated 2 by 1 metre columns of the east/west trench was located close to the centre of housepit 2, it was designated the "Control Column" on which the various soil strata were labelled, and a datum elevation transferred. The "Control Column" was never excavated (Figure 8; Plate VII).

The excavation of housepit 2 was accomplished by means of 2 by 2 metre squares, dug by quadrants and in 25 cm arbitrary levels. Precise locations of artifacts were not recorded, once it was realized that at least three different occupations had occurred in the same depression. At each new occupation there was a certain amount of enlarging with the excavated material piled to the side, only to be thrown on top of the new house structure as the final cover (Teit 1900:194). When the timbers collapsed after the abandonment of the house, the already mixed midden deposits fell back into the depression, to be re-arranged by the succeeding occupants. The 2 metre square pits were excavated in a sequence calculated to effect a checker-board design with free-standing 2 by 2 metre columns (Plate VIII,b). Following the recording of profiles, each of the standing

PLATE VI

The Lochnore Creek Site

a Excavation of the east/west trench looking west.

b Housepit 2 prior to the removal of the standing columns -- looking southwest.

PLATE VI

a

b

columns was then level-stripped according to the natural depositional layers with closer attention being paid to artifact provenience. By exposing 4 sides of each block the natural levels could be traced with some confidence. The end result was the almost total removal of the deposits of housepit 2.

Housepits 3 and 4 were examined by only a single 2 by 1 metre pit in each depression, as the artifacts recovered indicated close cultural affiliations with housepit 2.

The overall soil depositional history at the Lochnore Creek site is a familiar one. Following the formation of the fan, windborne sands of differing colours and textures mantled the gravels to varying depths. At the eastern end of the site the fan gravel drops off rapidly, and here a considerable depth of grey, medium-to-coarse sand has accumulated. In the test pits west of housepit 1 the underlying gravel was reached at depths of 2 to 2.5 metres, but east of housepit 1 equally deep pits did not contact the gravel. Above the grey sand at the eastern extremity is an orange-coloured sand which is cultural. (This stratum, labelled Zone II, was erroneously reported as being in the western end of the site in a preliminary report.) Above the orange sand, and intrusive into it, is the dark brown aeolian sand of Zone I, the uppermost cultural horizon. The cultural deposits of Zone II in the orange sand thin out west of housepit 1, suggesting that the now dry creek at the extreme eastern boundary of the site was flowing at the period of occupation, and served as the focal point for the site's inhabitants.

At the western end of the site the depositional history differs in that the orange sand is not present as a well-defined stratum, and the grey sand is in direct contact with the uppermost dark brown stratum. In housepit 2 the following soil sequence is noted on the "Control Column"

PLATE VII

The Lochnore Creek site "Control Column"

South wall of the "control column" in housepit 2 in the Lochnore Creek site. The tags on the left identify cultural zones Ia-Ic. Scale is metric. See also Figure 8.

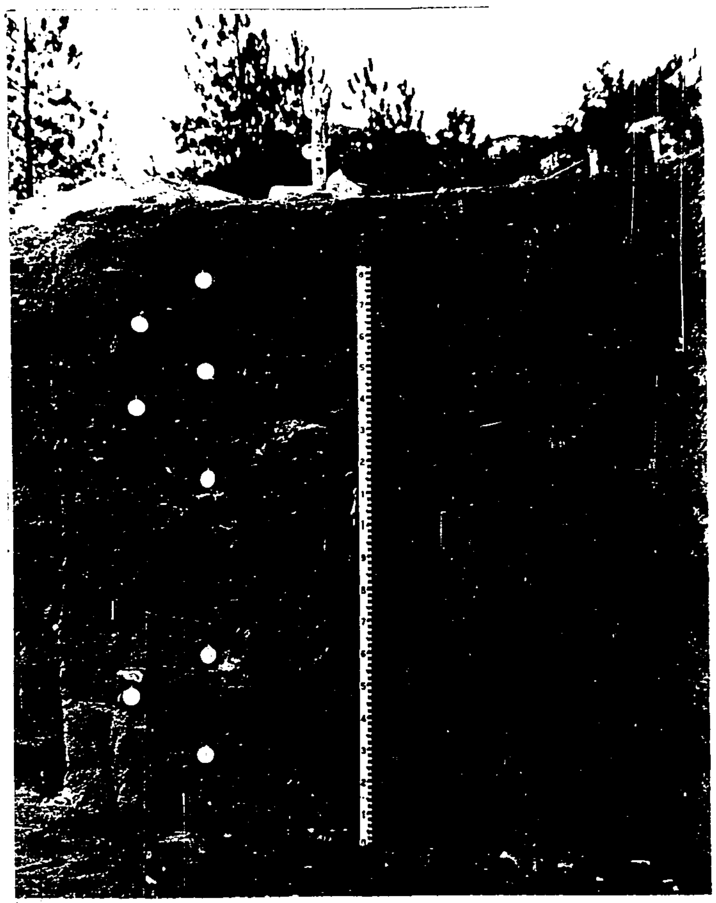


PLATE VII

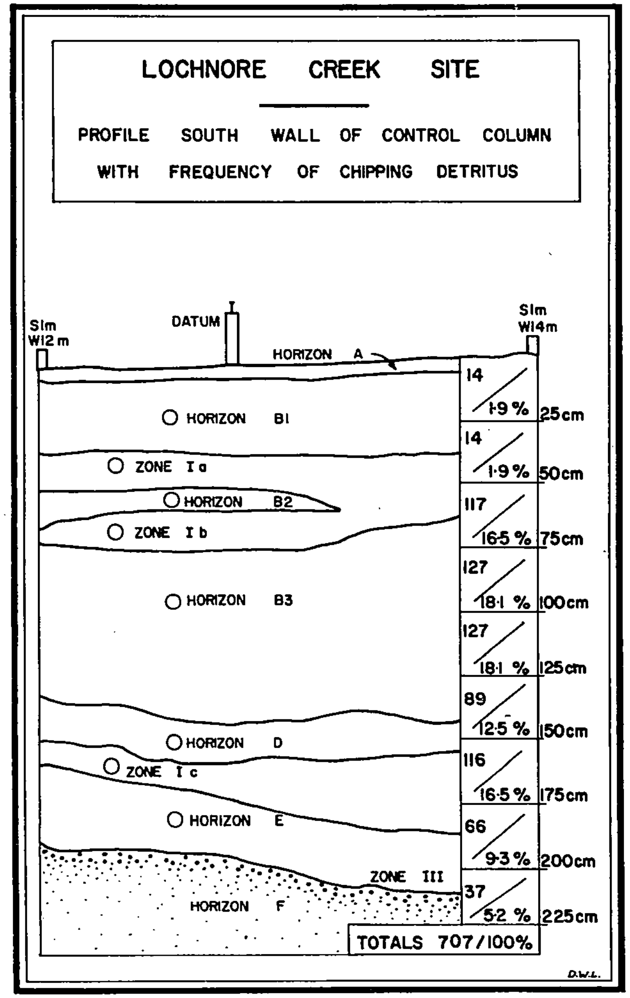


FIGURE 8

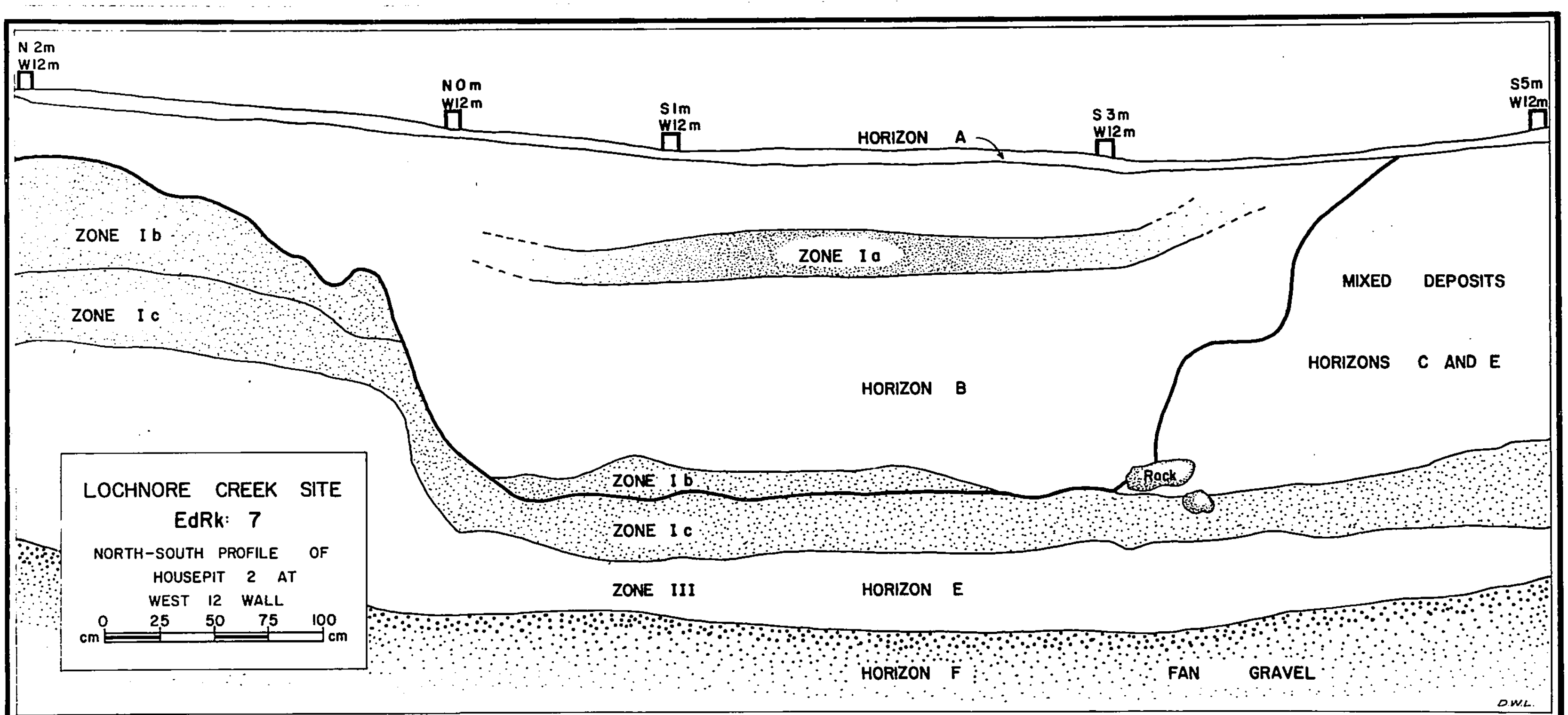

N 2m
W12m
N 0m
W12m
S1m
W12m
HORIZON A
S3m
W12m
S5m
W12m
ZONE Ib
ZONE Ic
ZONE Ia
MIXED DEPOSITS
HORIZONS C AND E
HORIZON B
ZONE Ib
Rock
ZONE Ic
ZONE III
HORIZON E
HORIZON F
FAN GRAVEL
LOCHNORE CREEK SITE
EdRk: 7
NORTH-SOUTH PROFILE OF
HOUSEPIT 2 AT
WEST 12 WALL
0 25 50 75 100
cm cm
D.W.L.

FIGURE 9

(Figure 8; Plate VII).

Horizon A -- Fine-textured grey and brown windborne sand as topsoil.

Horizon B -- Fine-to-medium-textured grey and brown sand. Horizon B is divided into B1, B2, and B3.

Horizon C -- Fine-to-medium-textured dark brown to black sand with some small gravel. Horizon C is divided into cultural zones Ia, Ib, and Ic.

Horizon D -- Fine-textured light brown sand which blends into B3, and may possibly be related to the orange sand at the eastern end of the site.

Horizon E -- Medium-to-coarse-textured light grey sand containing artifacts of Zone III.

Horizon F -- Angular-to-subangular gravel and silty sand of fan deposit.

All horizons, except A and F, yielded artifacts and chipping detritus. Horizon C is divided into three cultural zones thought to represent 3 successive living floors in housepit 2. The only significant physical difference between Horizon B and Horizon C is the darker colour of the latter.

In order to test for possible concentrations of cultural activity, the results of the chipping detritus analysis were superimposed upon an east/west section of housepit 2. The results, taken from the 2 by 2 metre squares excavated in 25 cm levels, confirm those from the level-stripped units, indicating little detritus in the upper 50 cm., with approximately 80% of the total in the next 125 cm., and about 15% in the remaining 50 cm. Figures from a single 2 by 2 metre square adjacent to the "Control Column" are listed on Figure 8. In conclusion, it may be noted that while the darker-coloured soils of Horizon C suggest occupation levels, the lighter-coloured Horizon B soils contain as many chipped stone specimens, and therefore Horizon B and Horizon C should probably be considered the same.

Horizon E consists of a grey windborne sand very similar to, if not identical with, the grey sand previously described in the eastern end of the site. Apparently the first of many aeolian sands to accumulate at the Lochnore Creek site, Horizon E contains artifacts and other cultural manifestations of Zone III, considered to be one of the earliest in the entire locality.

The various horizons are seldom as clearly differentiated everywhere in housepit 2 as they appear on the "Control Column". Re-excavation and enlargement of the housepit by successive occupants has accounted for considerable mixing and disturbance. On the basis of artifact examination, there seems to be little reason for assuming any significant cultural differences between the B and C horizons. Artifacts of bone and antler are more common in that segment of Horizon C labelled Zone Ic, but this is largely due to Zone Ic being below the zone of leaching. In some areas of Housepit 2 the original excavations disturbed Horizon E and its associated cultural Zone III, resulting in a mixing of assemblages. Fortunately, all artifacts recovered from undisturbed Zone III deposits have adherring to them a thick and distinctive surface coating of sand and carbonates, greatly assisting the identification of Zone III specimens in the housepit 2 fill.

Some data pertaining to the housepit construction were obtained, although facts concerning certain aspects are completely lacking. Housepit 2 occupies a depression excavated to a depth of over 2 metres. Essentially oval in plan, with the long axis oriented along the east/west axis of the site, the dimensions are approximately 11 by 9 metres. The walls are stepped; that is, the depressions is dug with a shelf or platform approximately midway between the floor and the top of the subterranean walls. A series of post holes are dug into the gravel, and some of these apparently represent the larger upright supports for the sloping side rafters. No direct evidence for the latter was found, however. Associated with Zone Ia and Ib is a rectangular fire hearth consisting of many angular and rounded blackened and heat-cracked cobbles. This hearth measures 1.4 by 1.3 metres and it is in the approximate centre of housepit 2. Extensive spreads of charcoal and burned sand are present in much of Zone Ic and are suggestive of a conflagration. Perhaps the most interesting feature of Zone I in housepit 2 is the presence of a rock wall situated on the uphill side of the housepit against the wall (Plate VIII,a). Stretching almost 3.5 metres following the curve of the housepit wall, it seems likely that this feature is a retaining wall, holding back the soft grey sand of Horizon E from the interior of the dwelling. Most of the food bones (primarily deer and some fish) and a substantial portion of the chipping detritus, is located along the west wall in the general vicinity of the retaining wall.

Buried beneath housepit 2, and in places disturbed by it, is Horizon E and the distinctive Zone III assemblage. The concentration of Zone III artifacts in some excavation units is such that wind deflation is suspected, while in other areas hearths (minus charcoal) and food bone features are intact. In conclusion, there is little that can be said about the Zone III physical component except that it is definitely associated with the Horizon E grey sand, and that it pre-dates the housepit 2 deposits by a considerable period of time.

A human burial was encountered 3 metres east of housepit 2 in the east/west trench. Three boulders were arranged in a crude cairn approximately 1 metre below surface. Upon excavation only a badly crushed cranium (minus mandible) was found directly beneath the largest of the 3 boulders. Although at the time of excavation it seemed likely that the remainder of the skeleton was not buried with the cranium, it now appears

PLATE VIII

Excavations at the Lochnore Creek Site

a The retaining wall in housepit 2

b Completed excavation of housepit 2 looking southwest.

PLATE VIII

b

a

more reasonable to assume that the large boulders offered the skull a certain amount of protection not enjoyed by the anterior portions of the skeleton. In the Lochnore Creek site bones were generally very poorly preserved in the upper metre of deposits, the region of leaching.

As mentioned earlier, over 3,000 specimens are catalogued from EdRk:7. Although it is desirable to present an accurate enumeration of artifacts according to Zone, it must be admitted that in the case of the Lochnore Creek site this is not feasible owing to the extensive mixing, especially in the eastern end of the site, where the Zone 1 occupation in intrusive into the Zone II deposits. When the un-excavated units of the east/west trench in the eastern end were removed in order to get a more complete inventory of Zone II specimens, the deposits were level-stripped with all artifacts from the orange sand stratum separated from the upper component. Zone II specimens with established orange sand provenience number a little over 100. Additional Zone II objects, especially microblades, are undoubtedly interspersed with the Zone I assemblage. A preliminary report (Sanger 1966) indicates that approximately 175 artifacts are of Zone III origin; the final count, based on an intensive examination of the total Lochnore Creek site collection, is double that figure. The approximate number of artifacts in each assemblage is as follows:

Zone I -- 2,500 specimens

Zone II -- over 100 specimens

Zone III -- 400 specimens

The Lehman site (EdRk:8) is located on a small terrace in the narrow valley created by the downcutting Lochnore Creek. The area investigated coincides with the present list of Mr. Lehman's vegetable garden, a rectangular plot measuring 18 by 50 metres (Plate IX) (Figure 2). The site area would undoubtedly have been larger in aboriginal times. Prior to

1954, when Lehman built his house, and cultivated the garden, the site was covered with the usual sagebrush, grass, pine, and fir. Housepits were once plainly visible, but over a decade of ploughing and grading has all but obliterated the depressions.

Because it is a garden the Lehman site had to be investigated either before or after the growing season. In the Spring of 1963 limited excavation revealed two distinct soil strata and indicated the potential of the site. In November of 1964 a crew of 4 spent a cold week excavating through frozen topsoil. During that period 6 pits, each measuring 2 by 1 metres, were excavated through to the underlying gravel. Each of the two distinctive soil strata were removed as units utilizing 10 cm arbitrary levels within each of the 2 major strata. Horizon A, the uppermost soil stratum, consists of a dark brown to black well-graded loam disturbed by the plough to depths of 25 cm. In places the plough has cut into the Horizon B deposits leaving long parallel cuts filled with the Horizon A soil. Elsewhere Horizon A approaches 40 cm in thickness and here the plough has not disturbed the whole stratum. Below Horizon A, and in sharp contrast to it, is the yellow sand and clay of Horizon B, which becomes increasingly gravelly to the underlying fan gravel.

Each of the two horizons is associated with a distinctive cultural assemblage. Zone I, which occupies Horizon A, is a housepit component. In the course of excavation traces of housepit outlines and rock features were noted, but nothing is known of housepit shape or size. Fortunately, a sizeable collection of artifacts from Zone I is available for study. Zone II, which is associated with Horizon B, is a non-housepit occupation in which no prominent features were noted. Although artifacts were encountered throughout Zone II, the majority were recovered from the two 10 cm levels closest to the Zone I deposits. All Zone II artifacts

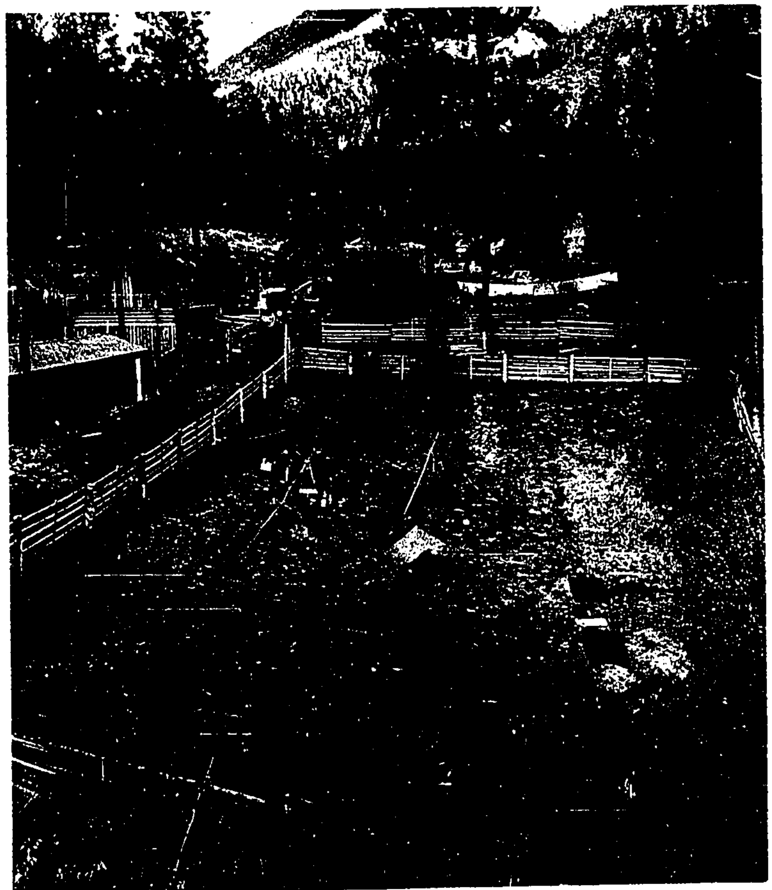
PLATE IX

The Lehman Site

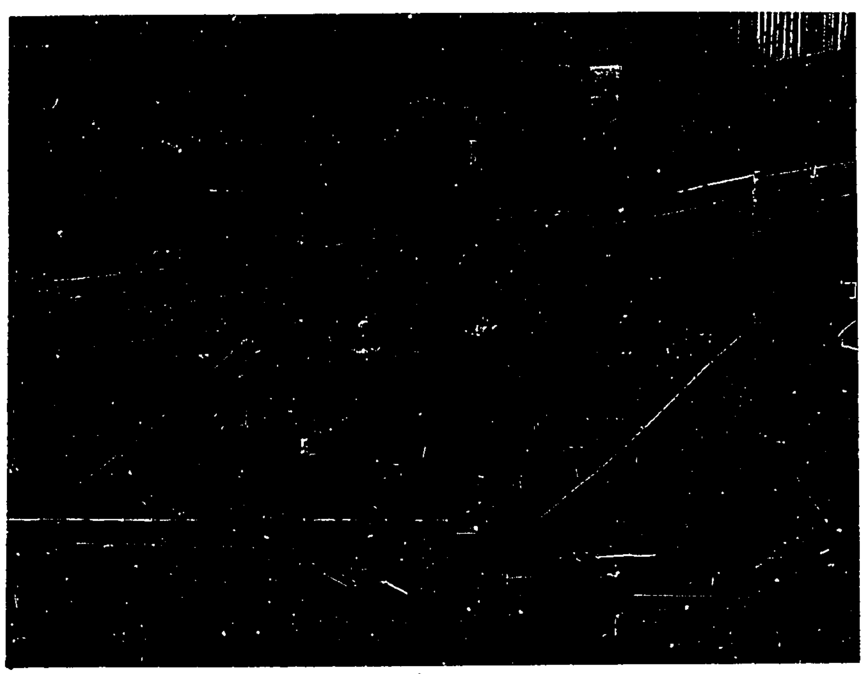
a Overall view of the Lehman site looking west. Lochnore Creek is to right of garden area.

b Excavation of the Lehman site.

PLATE IX



a



b

have a yellow patina clinging to them, a feature which greatly assists in sorting out artifacts recovered from the ploughzone.

The 1964 excavation recovered approximately 900 artifacts from which must be considered the richest site in the Locality in terms of artifact concentration. In addition to these artifacts there is an unstratified surface and ploughzone collection of over 2,000 specimens donated by Mr. Lehman, and a large collection of projectile points in Lehman's private collection. Consequently, it is not possible to specify the number of specimens from each zone.

The Pine Mountain site (EdRk:9) is located on a ridge behind the Lochnore Creek site approximately 40 metres above the left bank of Lochnore Creek (Figures 2,10). Six housepits, arranged in 2 groups, cover an area 80 by 25 metres. The northernmost depression labelled housepit 1, is separated from the others by 20 metres. Sagebrush, grass, cactus, rabbit bush, pine, fir, and saskatoon bushes covered the site when it was examined in the 1964 season. Immediately after the close of the excavation, however, all the foliage was slashed, the housepits graded-in, and the land prepared for seeding. A crew of 2, and sometimes 3, spent 2 months excavating the Pine Mountain site under the direction of my wife, Mary Jo Sanger.

Housepit 1 designates the northernmost dwelling, an oval depression measuring approximately 5 by 8 metres along the north/south axis. The deposits were tested by a one metre wide trench excavated for 9 metres in 25 cm levels along the north/south axis of the housepit. Once it was apparent that 2 distinct cultural zones were present, excavations proceeded by natural levels. A 7 metre long east/west trench crossed the first trench. Most of the deposits were removed with trowel and then screened, but some of the most compact portions were first loosed by pick. Following the trenching much of the west side of the depression was removed, although

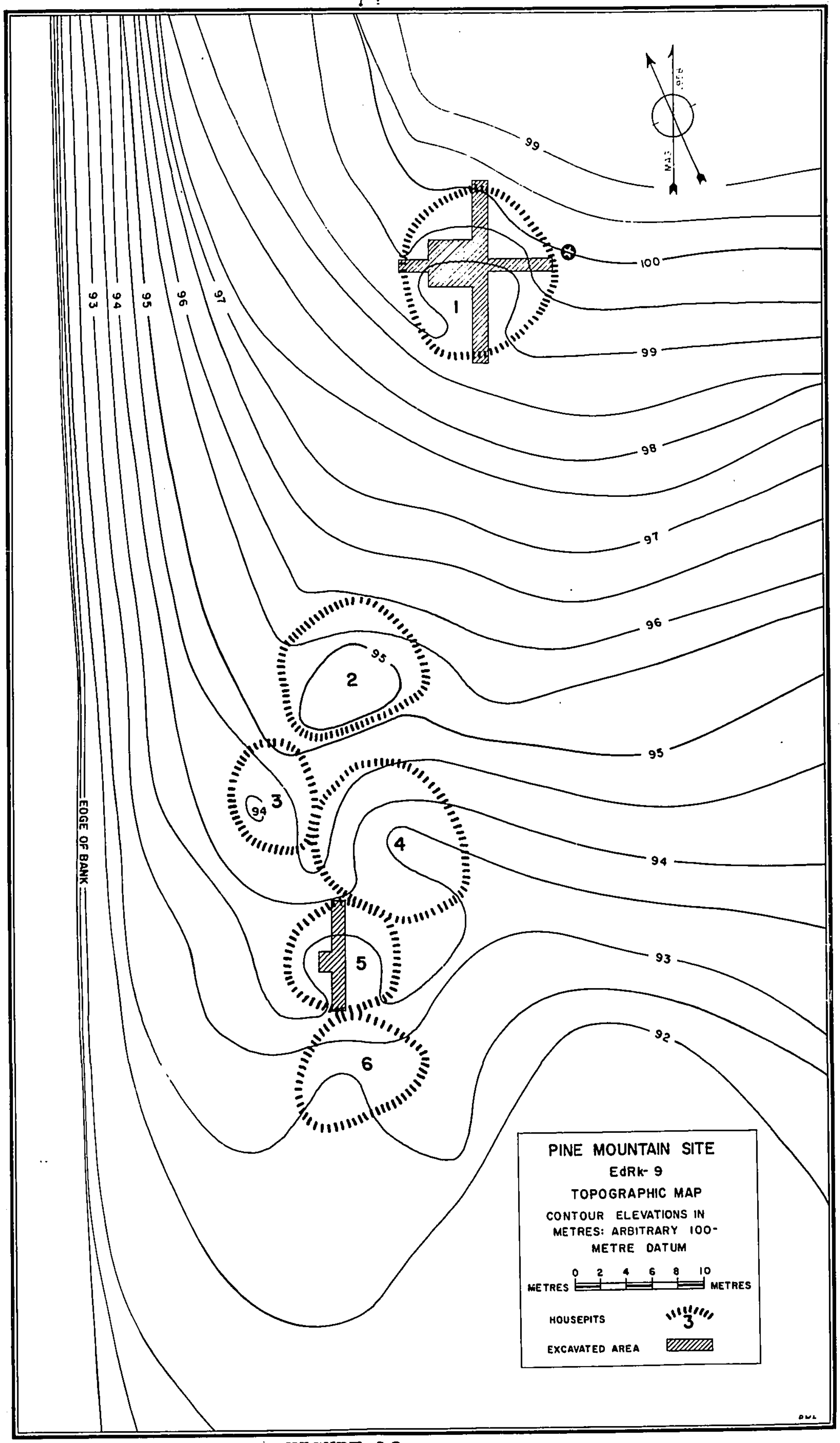

PINE MOUNTAIN SITE
EdRk- 9
TOPOGRAPHIC MAP
CONTOUR ELEVATIONS IN METRES: ARBITRARY 100-METRE DATUM
0 2 4 6 8 10
METRES
METRES
HOUSEPITS
EXCAVATED AREA
EDGE OF BANK
93
94
95
96
97
98
99
100
92
1
2
3
4
5
6

FIGURE 10

a 2 by 1 metre "control column" was left intact.

The second depression examined, housepit 5, is one of a cluster so closely spaced that the housepit lips frequently intersect. A trench 11 metres long and 1 metre wide was dug by arbitrary levels with trowels and the material screened. A 2 by 1 metre area was also excavated in the western side of the housepit in an abortive attempt to recover a charcoal sample.

Within housepit 1 there are 2 occupation zones (I and II) separated by a sterile fill. Zone I is a compact silty sand and gravel deposit up to 75 cm in depth with many fire-cracked rocks and large boulders interspersed throughout. Separating Zone I and II is a light brown silty sand and gravel which is also very compact, requiring a pick to loosen. Zone II consists of soft sand, much of it stained red by intense heat. In places the total depth of deposits in housepit 1 approached 1.5 metres.

Zone I is remarkable for the number of cobble and boulders in the deposit. At the southern end of the pit a series of rounded cobbles forms the edge of the housepit excavation, and other clusters of cobbles were noted around the peripheries. Close to the centre of the housepit a rock lined depression (Plate XI,b), interpreted as a foundation for one of the upright supporting poles, was encountered. Other features include hearth areas, groups of boulders of unknown function, and a human burial.

The burial (Plate XI,a) was located in the western side of housepit 1 beneath some large boulders which <u>might</u> constitute a cairn over the body. There is no evidence to suggest that the burial was intrusive through Zone I into the lower deposits. Some of the skeletal material rested in the Zone II deposits while the remainder, including the cranium, was in the intermediate non-cultural fill. The burial is that of an adult male (?) loosely flexed on the right side, and oriented north/south with

PLATE X

The Pine Mountain Site

a Housepit 5 at the Pine Mountain site - looking south along the north/south trench.

b Housepit 1 at the Pine Mountain site from above. Crew members are examining Burial 1.

PLATE X

a

b

PLATE XI

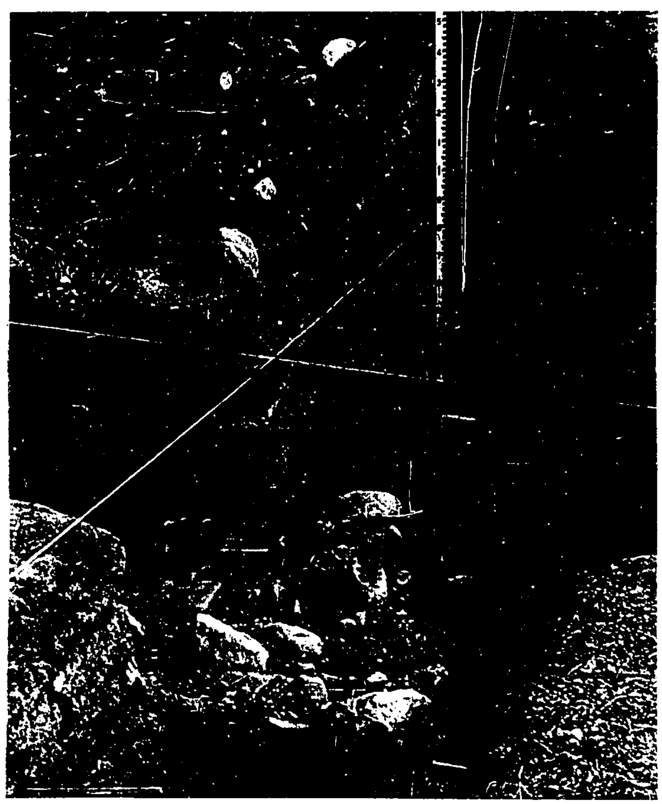
Excavations at the Pine Mountain Site

a Burial 1 at the Pine Mountain site

b Part of the east/west trench in housepit 1, the Pine Mountain site - looking east. In the foreground is a possible base for an upright support of the house superstructure. Scale in background is metric.

PLATE XI

a



b

the cranium to the north and facing west. No artifacts were noted with the burial. As the accompanying photograph indicates, the preservation of the skeletal material is poor.

Zone II consists of many fire-cracked rocks, burnt sand, red ochre, a few basalt chips, 2 or 3 artifacts, and a hearth area.

Housepit 5 represents an entirely different cultural assemblage and is labelled Zone III. Windborne sand filled the pit almost to ground level leaving a shallow depression. The housepit was aboriginally excavated through a thin, compact, white silty sand and then through a coarse grey sand similar to that described for the Lochnore Creek site. Total depth of excavation probably did not exceed 1 metre. Cultural features from housepit 5 are few in number, consisting of one well-defined spread of fire-cracked rocks in a hearth of unknown dimensions, and a few miscellaneous cobble concentrations. Despite the limited area of excavation, housepit 5 was surprisingly rich in artifacts, especially in the 10-15 cm living floor near the northern end of the dwelling.

A total of 99 artifacts were recovered from housepit 1. Of these only 2 or 3 can be assigned to Zone II. The limited excavations in housepit 5 (Zone III) netted 261 artifacts. Surface collections, mainly from the area around housepits 2-5, recovered an additional 50 specimens.

EdRk:10 consists of a series of housepits strung out for about 400 metres along both banks of Lochnore Creek upstream from the Lehman site. Never excavated systematically, the assemblage from this site was collected at various times while digging pits and trenches in the course of establishing tent camps. The housepits are in sandy gravel and aboriginally were never excavated very deeply. Thirty-five artifacts are catalogued for this site.

EdRk:11 refers to a small spring located in the bank of the left side of the Lochnore Creek Valley. In 1964 Borden and Sanger collected two heavily-patinated cobble choppers eroding out of the bank. A subsequent search in November 1964 when the foliage had thinned did not reveal any additional artifacts.

EdRk:12 comprises 43 storage pits arranged along the same terrace as that occupied by the Cow Springs site. None of the storage pits were investigated and the cultural affiliation is unknown. Many of the pits have been badly eroded while others have been worn down by grazing cattle.

Miscellaneous sites in the Lochnore-Nesikep Locality include various destroyed locations in the heavily-farmed terraces on the right banks of both Nesikep and Lochnore Creeks, and the large cultivated fields above the Mile 28 Ranch site (Figure 1). Aside from a few non-diagnostic pieces of chipped stone, little remains of these sites.

CHAPTER V

ARTIFACTS

Introduction

As the title suggests, this chapter describes the artifacts from the Lochnore-Nesikep Locality. Before commencing with the descriptions some comments on the nature of the collections and the general typological methods employed are desirable.

The bulk of the Lochnore-Nesikep Locality collections was recovered from the systematic excavations of 1961 through 1965. In addition to these, however, are included the private collections of Mr. Holzer (Mile 28 Ranch site - EdRk:3), and Mr. Lehman (the Lehman site - EdRk:8). Neither collector has attempted to catalogue his artifacts, but each has kept his collections more or less separated from other materials. The Mile 28 Ranch site specimens, which were picked up immediately following the bulldozing of the site, were examined and briefly described in field note books when Borden and Sanger excavated the two remaining burials in 1961. Photographs and sketches were made of the Holzer collection in 1963 and in 1964. The Lehman collection derives almost entirely from the various sites along Lochnore Creek, with the bulk of the collection from the Lehman site. As described in the previous chapter, this extremely productive site has yielded a large collection from the ploughzone.

The analysis of the private collections has been undertaken after the analysis of collections derived from the systematic excavations. In the case of the Lehman collection, where so many of the artifacts came from the ploughzone, the method has been to compare the specimens our excavations recovered from the lower component (Zone II) with those in the Lehman collection, and to consider forms not represented in our collections as having derived from Zone I, the uppermost component. This procedure is not arbitrary as it might first appear, as the yellow sandy silt matrix of Zone II sticks tenaciously to cracks and depressions in the artifacts, and because there is a considerable temporal and cultural difference between the two components. Even so, in the question of projectile point provenience, specimens from the Lehman collection assigned to Zone II must be classifiable in the same typological category as points recovered from Zone II in our excavation in order to be considered artifacts of Zone II origin. Zone I points affiliate with examples from Zone I of the Lochnore Creek site, and have been assigned to groups largely established through examination of the Lochnore Creek site specimens. Although a large collection (over 2,000 specimens) of unifaces and bifaces was donated by Mr. Lehman, no attempt has been made to incorporate them into the present study. Artifacts described from photographs have been assigned numbers followed by the letter "L" or "H" to signify the Lehman and Holzer collections respectively.

The systematics of artifact description remains a central problem area in Pacific Northwest archaeology. Classificatory methods should probably be kept as flexible as possible in order to make the best possible use of them for descriptive purposes (see Brew 1946). A "Type", which is considered here to be a statement with cultural meaning, should have definable temporal and spatial parameters. The chronological bias of this report, combined with the virtual absence of regional comparative material, makes any attempt to establish Types seem totally unwarranted.

The materials described in this chapter are presented as groups, designed to express a clustering or central tendency of attributes. These groups are not intended to be counterparts of Types; they are employed as a means to facilitate further discussions and analysis. Although the establishment of Types offers an economical method of referring to a cluster of attributes, it can also contribute to confusion and constriction in cross cultural analysis. Some workers will tend to extend the Type concept to its upmost, lumping into a single Type artifacts that may share only one or two attributes with the original type specimen. Other analysts insist upon precise correspondences with the result that each archaeological locality has its own Types. In the final analysis, the value of a site report is directly related to its degree of usefullness, by which I mean: Can the report be used for comparative purposes? Comparative studies, are not, of course, the final goal of archaeology, but they are a necessary prerequisite to areal synthesis and the derivation of cultural statements concerning the prehistoric inhabitants. It follows from this that descriptive devices which allow us to make more precise comparative statements are preferable to overly-broad classificatory units which tend to emphasize some attributes at the expense of others. Consequently, the materials in this report are described emphasizing attributes rather than Types. Attributes of any one artifact class, such as projectile points, can be independent of one another. For example, attributes defining stem form may be completely independent of others effecting blade configuration, and furthermore, any attribute or cluster may be diffused at different rates or even in opposite directions. What I am suggesting here has certain parallels in the ethnographic literature of the Plateau peoples. V. Ray (1939:146) pointed out that, "On the whole, the Plateau has been more receptive to detached elements of culture than to whole complexes." Comparisons with other collections are found in Chapter VI.

Projectile Points

Introduction A total of 255 artifacts, are described as projectile points.

Traditionally considered the most important artifact class in Plateau sites, the points are considered here in some detail. The concept of a chipped projectile point is a fluid one, with almost any pointed object, bifacially flaked and with a prepared base called a projectile point. It is realized that not all such objects functioned to arm spears or arrows and many probably served as knives. The point descriptions follow terminology commonly utilized in the Plateau, but in order to avoid possible confusion Figure II has been prepared. The nomenclature of attributes used here is adapted from the Projectile Point analysis form prepared by the Archaeology Laboratory of the University of Washington.

Point Groups The reason for the grouping of points is strictly as an aid to description and further analysis. The groups, it should be re-emphasized, are not the counterparts of Types, for as argued earlier, there is insufficient data to warrant their establishment. Form is the primary classificatory determinant, especially the shape and treatment of the stem and the absence or presence of shoulders. In some instances, however, the presence of extensive basal grinding or even general excellence of flaking technique has been utilized to differentiate groups. The description of each point group consists of a general account of each group plus tables (2-15) listing dimensions. These include length, breadth, thickness, neck width, a width/length index, and a thickness/width index. Other measurements are included when deemed pertinent. For each of these quantitative attributes is given the number measured, the range in dimensions, the arithmetic mean, the mode, and the standard deviation. In groups where the total number is less than 10, the mode and the standard deviation are considered not significant. Qualitative attributes have been tabulated in tables 16 through 25, where percentages of attributes are arranged by groups. Also included in the general point description is an estimate of the temporal

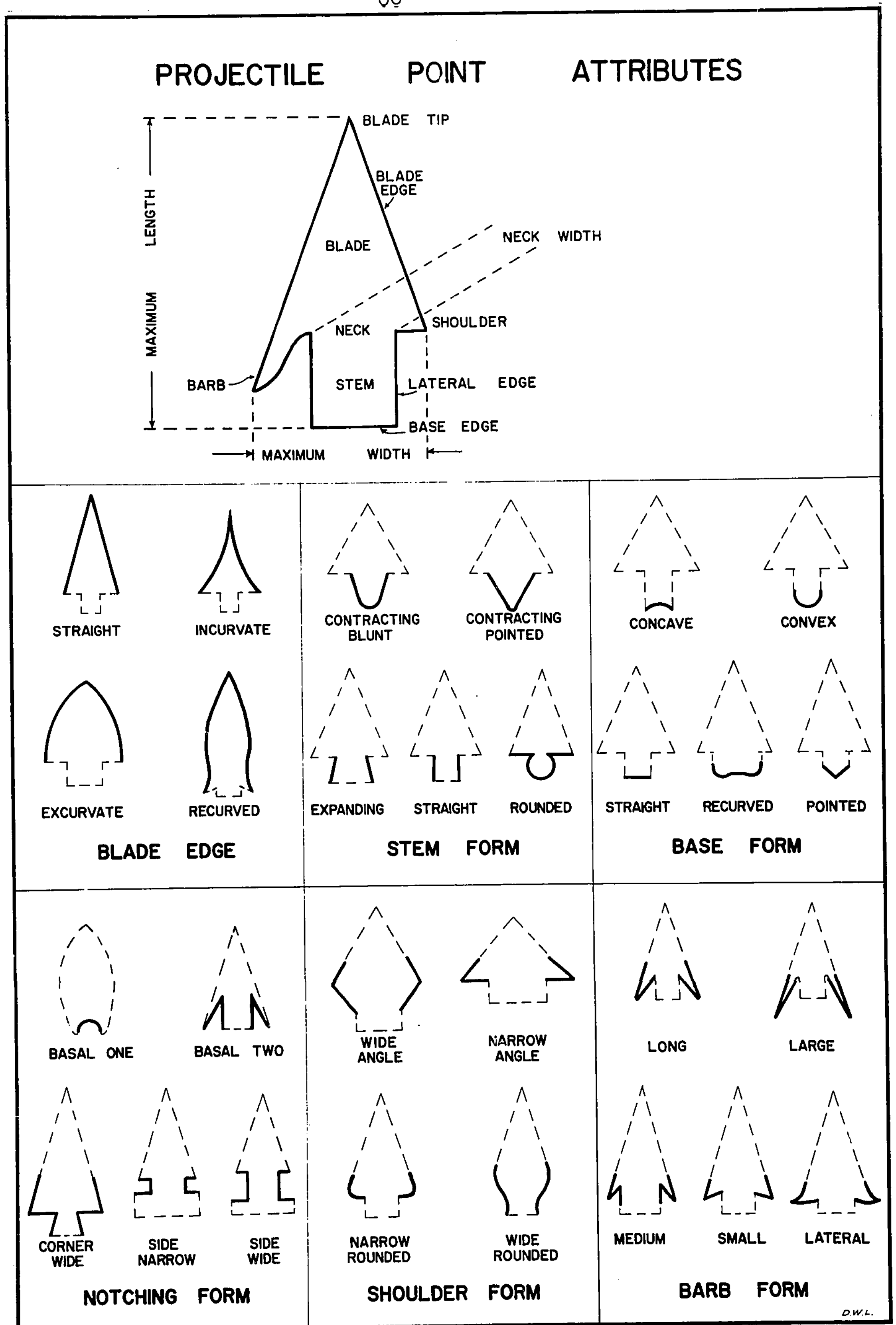

PROJECTILE POINT ATTRIBUTES
BLADE TIP
BLADE EDGE
NECK WIDTH
BLADE
MAXIMUM LENGTH
SHOULDER
NECK
BARB
STEM
LATERAL EDGE
BASE EDGE
MAXIMUM WIDTH
STRAIGHT
INCURVATE
EXCURVATE
RECURVED
BLADE EDGE
CONTRACTING BLUNT
CONTRACTING POINTED
EXPANDING
STRAIGHT
ROUNDED
STEM FORM
CONCAVE
CONVEX
STRAIGHT
RECURVED
POINTED
BASE FORM
BASAL ONE
BASAL TWO
CORNER WIDE
SIDE NARROW
SIDE WIDE
NOTCHING FORM
WIDE ANGLE
NARROW ANGLE
NARROW ROUNDED
WIDE ROUNDED
SHOULDER FORM
LONG
LARGE
MEDIUM
SMALL
LATERAL
BARB FORM
D.W.L.

FIGURE 11

range according to the estimated age of the components in which examples of the group are located. A complete discussion of the chronology of the Lochnore-Nesikep Locality is contained in the following chapter. Finally, the majority of the points are made from basalt of varying degrees of vitreousness. Occasionally some of the silicates, such as chalcedony and jasper, are noted, especially among the basally notched group 13 collection. There are no examples of points chipped in slate, quartzite, or related materials.

Group I Leaf-shaped

Number of Specimens: 23, Plate XII: a-g, Table 2

General Description: These are leaf-shaped points with no evidence of notching or stemming.

Blade: Most points in this group have excurvate edges, although a few are asymmetric. The majority of points are widest in the middle one-third of the artifact. Transverse and longitudinal sections vary considerably.

Stem: There are no stems except for a slight constriction towards the base in a few examples. Bases are occasionally pointed, but more often rounded (convex). Roughly one-quarter of the points have ground lateral edges of the basal portion.

Technique: Most points are thinned down from thicker flakes and are bifacially flaked. General workmanship varies from below to above average.

Time Span: Through the entire sequence.

Group 2 Small leaf-shaped

Number of Specimens: 5, Plate XII: h-j, Table 3

General Description: These are very small and narrow leaf-shaped points without stems or notches.

TABLE 2

DIMENSIONS OF GROUP I PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	21	33-90	55.7	73.1	12.4
Width (mm)	23	14-30	21.7	22.6	4.6
Thickness (mm)	19	4-10	7.5	6.0	2.2
Width/Length	20	29-60	40.0	53.5	8.7
Thickness/Width	19	28-48	36.3	41.4	4.9

TABLE 3

DIMENSIONS OF GROUP 2 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	4	25-34	30.8	--	--
Width (mm)	5	8-10	9.4	--	--
Thickness (mm)	5	2-3	2.4	--	--
Width/Length	4	26-40	30.5	--	--
Thickness/Width	5	20-33	26.2	--	--

Blade: The blades have unbroken symmetrical edges. Maximum width varies from the upper one-third to the lower one-third of the artifact.

Stem: There are no stems caused by constrictions of the base or by notching. Bases of points vary from rounded to straight.

Technique: These points are made on small blade-like flakes or possibly microblades. The edge retouch is bifacial, but thinning is mostly unifacial. Workmanship is above average.

Time Span: Middle period; 2,000-5,000 years ago.

Group 3 Corner-notched, shouldered, stem-ground

Number of Specimens: 45, Plate XII: k-t, Table 4

General Description: These are corner-notched points featuring shoulders, expanding stems, and stem-grinding.

Blade: Blade outlines range from short with triangular edges to longer parallel-sided edges. Most blade tips are broken, but some complete specimens show deliberate tip rounding. Serration, especially on the longer parallel-sided blades, is common. The points are shouldered with no barbed examples. Maximum width is usually at the shoulders.

Stem: The stems are expanding. Bases are thinned, and 2/3 are concave with the remainder straight. Grinding of the lateral edges is present on all examples, and is extensive. (A single exception is probably an unfinished point). Grinding of the base is present on many examples. Lateral and basal edges often meet at an acute angle, although in some examples the junction is rounded.

Technique: Complete specimens usually indicate random but shallow flaking over the entire artifact. There is considerable variation in workmanship from below to above average.

Time Span: Middle period; 2,000-5,000 years ago, with majority in the

3,500 to 5,000 year range.

Group 4 Corner-notched, barbed, stem-ground

Number of Specimens: 16, Plate XII: u-y, Table 5

General Description: These are corner-notched points featuring small to medium barbs, expanding stems, and stem grinding.

Blade: Blade outlines range from short with triangular edges to longer parallel-sided edges. Most blade tips are broken, but some complete specimens show deliberate tip rounding. The points are all barbed with barbs in some specimens extending almost down to the base. Maximum width is at the barbs. Serration is more common in this group than on the group 3 specimens.

Stem: The stems are expanding. Bases are thinned and over $\frac{1}{2}$ are concave with the remainder straight. Grinding of the lateral edges is present on all examples, and is extensive. Basal grinding is present on over $\frac{1}{2}$ of the sample. Lateral and basal edges usually meet at an acute angle, although in some examples the junction is rounded.

Technique: These points seem to be manufactured in essentially the same fashion as the group 3 points.

Time Span: Middle period; 2,000-5,000 years ago.

Group 5 Small corner-notched, concave base, no grinding

Number of Specimens: 10, Plate XIII: a-c, Table 6

General Description: These are small corner-notched points with expanding stems, straight to concave bases, and shoulders. The total length does not exceed 35 mm.

Blade: Blades are triangular with straight to excurvate edges. All point blades are shouldered; there are no barbed examples. Maximum width is at

TABLE 4

DIMENSIONS OF GROUP 3 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	20	26-50	37.3	39.4	5.7
Width (mm)	41	15-31	23.1	22.8	3.9
Thickness (mm)	28	4-7	5.3	5.9	0.54
Neck Width (mm)	43	12-22	17.2	16.6	2.8
Width/Length	20	40-92	61.3	75.4	12.5
Thickness/Width	25	16-30	22.9	23.2	4.6

TABLE 5

DIMENSIONS OF GROUP 4 PROJECTILE POINTS

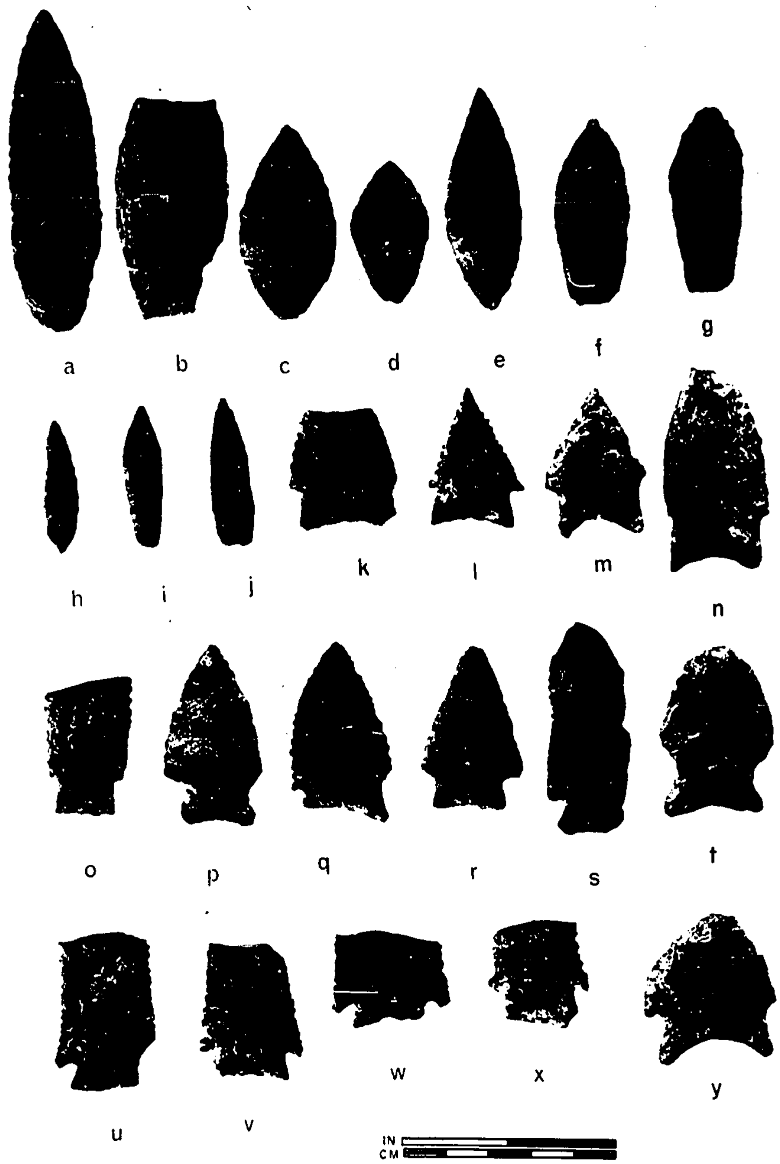
	Number	Range	Mean	Mode	s.d.
Length (mm)	2	27-37	--	--	--
Width (mm)	14	22-32	25.2	27.8	3.9
Thickness (mm)	14	4-6	4.9	5.2	0.8
Neck Width (mm)	15	13-25	17.0	16.0	2.9
Width/Length	2	87-107	--	--	--
Thickness/Width	13	13-27	19.9	20.2	4.5

PLATE XII

Projectile Points

a	Group 1	EdRk:4, Unstratified
b-d	Group 1	EdRk:7, Zone III
e	Group 1	EdRk:7, Zone I
f	Group 1	EdRk:9, Zone III
g	Group 1	EdRk:7, Zone I
h-i	Group 2	EdRk:7, Zone I
j	Group 2	EdRk:8, Zone II
k-p	Group 3	EdRk:8, Zone II
q	Group 3	EdRk:4, Zone V
r-t	Group 3	EdRk:8, Zone II
u	Group 4	EdRk:7, Zone I
v-y	Group 4	EdRk:8, Zone II

PLATE XII



shoulders.

Stems: Stems are expanding. Bases are straight to concave. There is no stem or base grinding, although thinning is present.

Technique: The flaking is generally random and shallow. Workmanship is above average.

Time Span: Upper Middle period; 2,000-3,500 years ago.

Group 6 Corner-notched, convex base

Number of Specimens: 13, Plate XIII: d-g, Table 7

General Description: These are small corner-notched points with straight to convex bases and expanding stems.

Blade: The blades are triangular in outline with straight edges. All examples but 2 are shouldered. Blades are thin. Maximum width is at shoulders.

Stem: The stems expand and most have convex bases, although some have straight bases. Basal thinning is evident, but there is no stem grinding.

Technique: These points are thin in transverse and longitudinal sections and are apparently based on thin flakes with very little secondary retouch over the main point surface. Retouch is mainly on the stem and blade edges. Workmanship is average to above average.

Time Span: Upper Middle period; 2,000-3,000 years ago.

Group 7 Large corner-notched, concave base, no grinding

Number of Specimens: 19, Plate XIII: h-l, Table 8

General Description: Essentially similar to group 5 points, but larger, with all examples over 35 mm in length. These are corner-notched points with expanding stems, straight to concave bases, and shouldered. No examples are barbed.

TABLE 6

DIMENSIONS OF GROUP 5 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	10	23-35	28.7	29.6	4.4
Width (mm)	9	15-24	20.6	--	--
Thickness (mm)	2	4-5	4.5	--	--
Neck Width (mm)	10	12-16	13.9	14.2	1.1
Width/Length	9	53-104	74.3	--	--
Thickness/Width	2	21-27	24.0	--	--

TABLE 7

DIMENSIONS OF GROUP 6 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	8	24-37	31.9	--	--
Width (mm)	11	15-27	20.9	21.2	3.2
Thickness (mm)	5	2-4	3.1	--	--
Neck Width (mm)	12	6-18	12.5	11.0	3.9
Width/Length	8	49-73	62.9	--	--
Thickness/Width	4	14-22	18.7	--	--

Blade: Blades are triangular tapering from maximum width at shoulders. Edges are straight to excurvate with occasional recurved examples. All points are shouldered.

Stem: Stems are expanding with straight to concave bases. There is no evidence of stem grinding, although thinning is evident.

Technique: The flaking is generally random and shallow. Workmanship is about average.

Time Span: Upper Middle period; 2,000-3,500 years ago.

Group 8 Corner-notched, barbed.

Number of Specimens: 18, Plate XIII: m-q, Table 9

General Description: These are corner-notched points with expanding stems and barbs.

Blade: Blade outlines are triangular with maximum width at the barbs. Edges are straight to excurvate. Barbs vary from small to medium with no barbs extending down to the base.

Stem: Stems are expanding with straight to concave bases. There are no examples of stem grinding although thinning is present.

Technique: The flaking is random and shallow. Workmanship is generally about average.

Time Span: Upper Middle period; 2,000-3,500 years ago.

Group 9 Large side-notched, narrow notches.

Number of Specimens: 6, Plate XIII: r-t, Table 10

General Description: These are side-notched points over 30 mm in length, and with narrow side notches.

Blade: Blades are basically triangular with straight to excurvate edges. Notches are narrow (average 2 mm. wide) and enter the blade at approximately

TABLE 8

DIMENSIONS OF GROUP 7 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	18	36-63	43.8	40.0	3.2
Width (mm)	17	15-34	24.6	24.3	3.8
Thickness (mm)	5	5-7	5.4	--	--
Neck Width (mm)	19	7-20	13.4	13.7	3.2
Width/Length	19	38-76	57.0	57.0	15.9
Thickness/Width	4	19-33	26.0	--	--

TABLE 9

DIMENSIONS OF GROUP 8 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	16	23-46	33.3	37.8	6.7
Width (mm)	10	19-30	25.4	22.7	3.1
Thickness (mm)	5	4-5	4.8	--	--
Neck Width (mm)	18	9-18	13.7	13.1	1.9
Width/Length	8	48-97	76.9	--	--
Thickness/Width	4	15-22	18.5	--	--

90 degrees. Notches are generally in the lower one-third of the artifact.

Stem: Stems produced by the side notches are parallel to expanding. Bases are usually straight, but can be concave. Basal thinning is present but there is no grinding. The widest portion of the artifact is at the stem.

Technique: These points are above average in workmanship with random but controlled shallow flaking over both surfaces. They are probably made on fairly thin flakes.

Time Span: Late period; 200-1,000 years ago.

Group 10 Small side-notched, narrow notches.

Number of Specimens: 10, Plate XIII: u-y, Table 11

General Description: These are small side-notched points with narrow notches (2 mm. wide). Length is under 30 mm.

Blade: Blade outlines are generally triangular with straight edges. Narrow notches enter the blade at right angles usually about one-third to one-half the way up the point.

Stem: The stems generally expand and the maximum width of the point is usually the base. Straight to concave bases predominate. There is no basal grinding in this group.

Technique: These are bifacially thinned down from thin flakes. Workmanship on these points is above average.

Time Span: Late period; 200-1,000 years ago.

Group 11 Wide side-notched

Number of Specimens: 13, Plate XII: z-ee, Table 12

General Description: These are side-notched points with wide notches.

Blade: Blades are generally excurvate with some examples of straight edges. Notches are wide (averaging over 6 mm), and often enter the blade obliquely.

TABLE 10

DIMENSIONS OF GROUP 9 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	6	36-53	43.7	--	--
Width (mm)	6	14-18	15.7	--	--
Thickness (mm)	3	2-5	3.3	--	--
Neck Width (mm)	6	6-10	7.7	--	--
Width/Length	6	30-45	36.3	--	--
Thickness/Width	3	13-31	20.7	--	--
Height of Notches Above Base (mm)	5	7-11	9.2	--	--

TABLE 11

DIMENSIONS OF GROUP 10 PROJECTILE POINTS

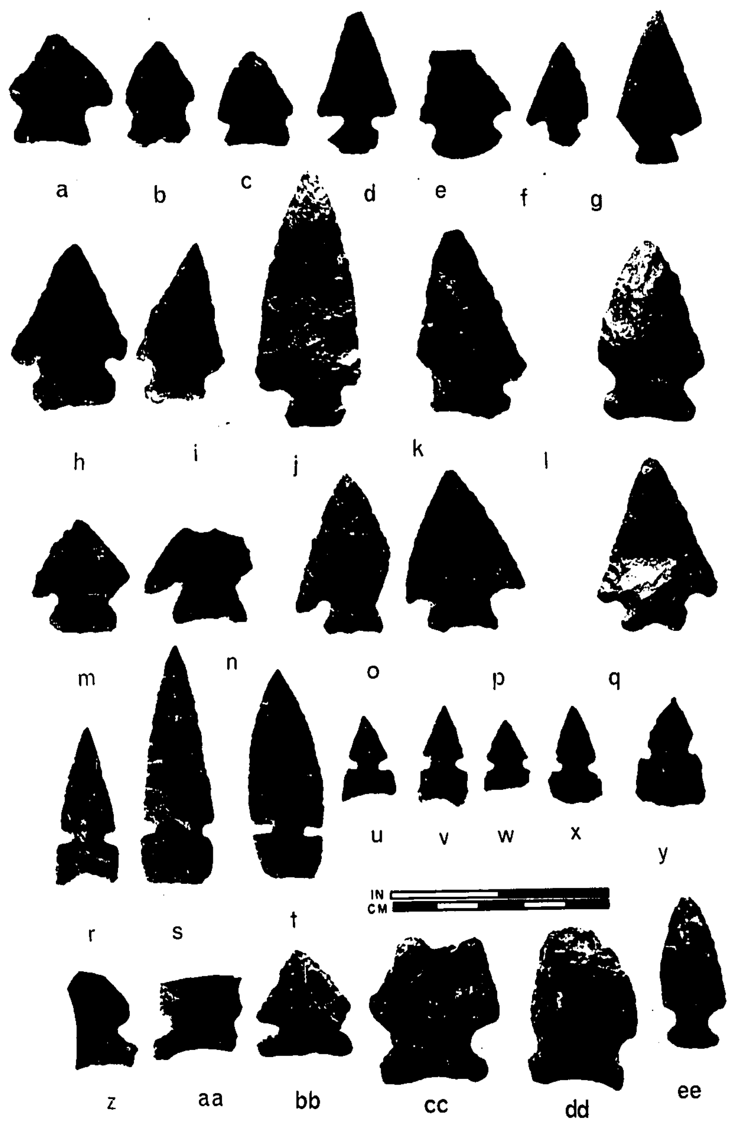
	Number	Range	Mean	Mode	s.d.
Length (mm)	9	16-29	22.0	--	--
Width (mm)	9	11-17	13.0	--	--
Thickness (mm)	8	2-4	2.7	--	--
Neck Width (mm)	9	5-9	6.8	--	--
Width/Length	8	43-72	58.3	--	--
Thickness/Width	7	15-25	20.0	--	--
Height of Notches Above Base (mm)	10	5-11	6.7	--	--

PLATE XIII

Projectile Points

a-b	Group 5	EdRk:7, Zone I
c	Group 5	EdRk:8, Zone I
d	Group 6	EdRk:10
e-f	Group 6	EdRk:7, Zone I
g	Group 6	EdRk:8, Zone I
h	Group 7	EdRk:7, Zone I
i	Group 7	EdRk:10
j	Group 7	EdRk:8, Zone I
k	Group 7	EdRk:10
l	Group 7	EdRk:8, Zone I
m-n	Group 8	EdRk:9, Zone III
o	Group 8	EdRk:8, Zone I
p	Group 8	EdRk:7, Zone I
q	Group 8	EdRk:8, Zone I
r	Group 9	EdRk:6
s-t	Group 9	EdRk:4, Zone III
u-y	Group 10	EdRk:6
z	Group 11	EdRk:5, Zone II
aa	Group 11	EdRk:7, Zone I
bb	Group 11	EdRk:8, Zone I
cc	Group II	EdRk:8, Zone II
dd	Group II	EdRk:8, Zone II
ee	Group II	EdRk:8, Zone I

PLATE XIII



Stem: The stems are frequently expanding. Bases are usually concave, basal thinning is present, but basal grinding is very rare.

Technique: These tend to be rather thick points with considerable variation in workmanship. Generally, however, the quality of workmanship is not up to the calibre of groups 9 and 10.

Time Span: Middle period and Late period; 1,000-5,000 years ago.

Group 12 Single basal notch.

Number of Specimens: 14, Plate XIV: a-g, Table 13

General Description: This group includes leaf-shaped and stemmed points characterized by a single basal notch.

Blade: Blade edges on the leaf-shaped examples are excurvate tapering down sharply to the base. On the stemmed specimens the edges are straighter. Maximum width is usually half-way up the blade or at the shoulders. Some examples have asymmetric edges with a bulge on one edge. Several examples have deliberately rounded or squared tips of the blades.

Stem: The diagnostic stem is indented with a single notch in this group. The basal portion of the leaf-shaped examples may contract to the base or may flare out slightly. Thinning of the base is common; basal grinding is less frequent.

Technique: Workmanship on these points is generally above average with the removal of broad, flat flakes. Points with rounded tips indicate flake removal from the tip along the long axis of the artifact in distinction to the more usual technique of retouch flakes entering the point blade at a right or an oblique angle.

Time Span: Middle period; 2,000-5,000 years ago.

TABLE 12

DIMENSIONS OF GROUP 11 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	9	22-44	33.0	--	--
Width (mm)	12	15-30	21.6	24.3	3.5
Thickness (mm)	4	3-8	5.5	--	--
Neck Width (mm)	12	7-19	14.3	10.4	3.7
Length/Width	8	45-91	61.6	--	--
Thickness/Width	3	20-30	26.3	--	--

TABLE 13

DIMENSIONS OF GROUP 12 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	9	25-59	37.1	--	--
Width (mm)	10	15-26	19.4	21.7	3.2
Thickness (mm)	13	4-7	5.2	6.1	0.9
Neck Width (mm) (at notch)	9	7-14	10.6	--	--
Width/Length	8	32-77	55.7	--	--
Thickness/Width	8	19-33	26.6	--	--
Width Notch (mm)	13	4-10	6.1	8.8	2.0
Depth Notch (mm)	13	1-4	2.3	2.9	0.9

Group 13 Basal-notched, barbed.

Number of Specimens: 27, Plate XIV: h-l, Table 14.

General Description: These are basal-notched points (2 notches) with medium to large barbs. A large number of examples are in silicates.

Blade: The blades are generally wide and exhibit straight to excurvate edges with a few examples of incurvate blade edges. Maximum width is at the end of the barbs which usually extend down to the base.

Stem: The stems formed by the wide basal notches are usually expanding. Basal thinning is present and grinding absent. More than one-half of the bases are straight.

Technique: There are some very well made points in this group, especially examples manufactured from silicates. Other examples have very little retouch over the blade surface.

Time Span: Mostly upper Middle period and Late period; 250-3,500 years ago.

Group 14 Contracting stem, no barbs

Number of Specimens: 10, Plate XIV: m-p, Table 15

General Description: These are contracting stem points with wide rounded shoulders and no barbs.

Blade: Blades are generally triangular with straight to excurvate edges. Maximum width is at the shoulders, which are generally wide rounded.

Stem: The stems are contracting, usually blunt. Basal thinning is present and grinding is usually absent.

Technique: These points are about average in workmanship with bifacially worked surfaces and edges.

Time Span: Throughout the sequence with majority in Upper Middle and Late period; 250-5,500 years ago.

TABLE 14

DIMENSIONS OF GROUP 13 PROJECTILE POINTS

	Number	Range	Mean	Mode	s.d.
Length (mm)	17	23-53	38.5	37.0	8.7
Width (mm)	17	22-37	29.7	29.1	4.0
Thickness (mm)	10	4-6	5.0	5.0	0.6
Neck Width (mm)	27	10-19	13.3	16.9	2.7
Width/Length	10	64-117	72.9	--	18.5
Thickness/Width	8	13-19	16.2	--	--

TABLE 15

DIMENSIONS OF GROUP 14 PROJECTILE POINTS

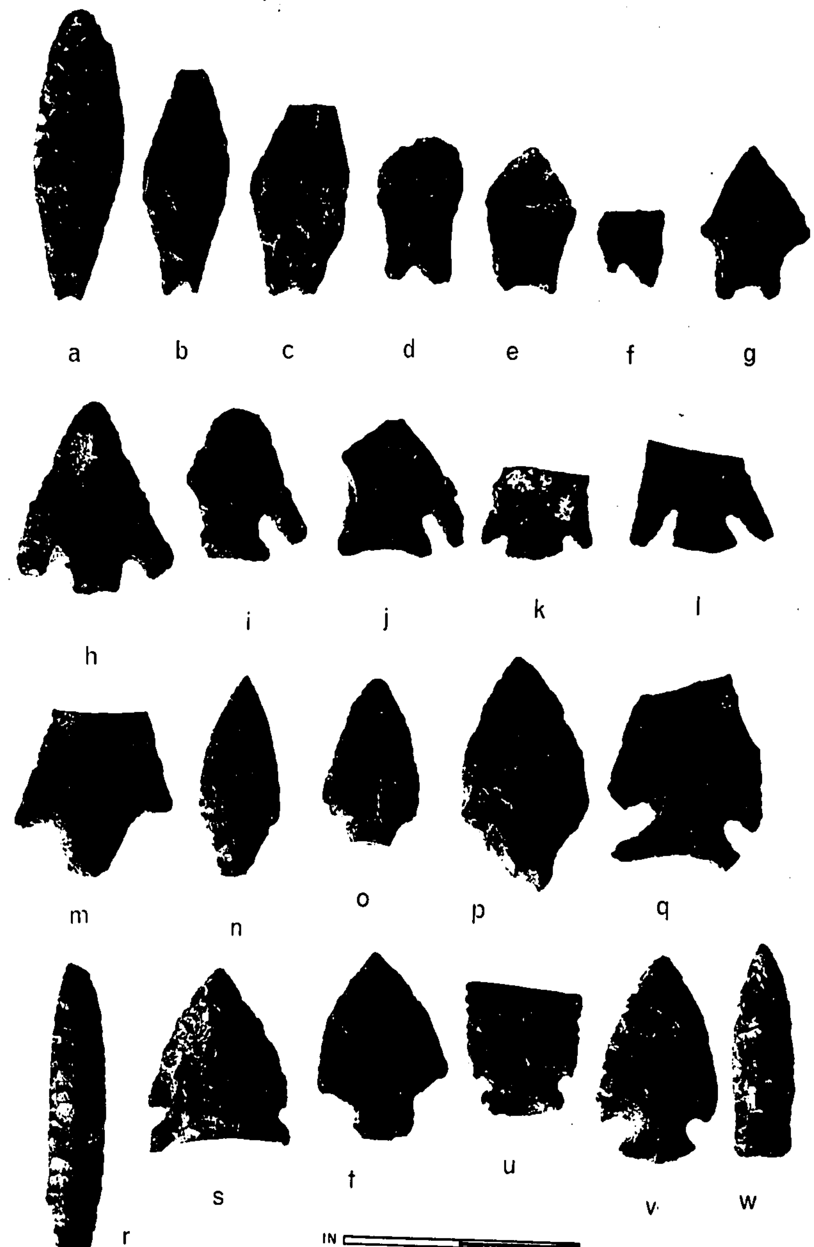
	Number	Range	Mean	Mode	s.d.
Length (mm)	8	39-52	45.0	--	--
Width (mm)	10	16-34	22.5	30.0	5.0
Thickness (mm)	5	5-6	5.4	--	--
Neck Width (mm)	10	10-18	14.1	13.8	3.7
Width/Length	6	40-56	47.8	--	--
Thickness/Width	6	15-35	23.7	--	--

PLATE XIV

Projectile Points

a-d	Group 12	EdRk:7, Zone I
e	Group 12	EdRk:8, Zone II
f	Group 12	EdRk:7, Zone I
g	Group 12	EdRk:7, Zone I
h	Group 13	EdRk:7, Zone I
i	Group 13	EdRk:8, Zone I
j	Group 13	EdRk:5, Zone II
k	Group 13	EdRk:8, Zone II
l	Group 13	EdRk:8, Zone I
m	Group 14	EdRk:8, Zone I
n	Group 14	EdRk:9, Zone I
o	Group 14	EdRk:4, Zone III
p	Group 14	EdRk:4, Zone III
q	Miscellaneous	EdRk:9, Zone I
r	Miscellaneous	EdRk:9, Zone I
s	Miscellaneous	EdRk:7, Zone III
t	Miscellaneous	EdRk:4, Zone V
u	Miscellaneous	EdRk:4, Zone V
v	Miscellaneous	EdRk:8, Zone I
w	Miscellaneous	EdRk:7, Zone I

PLATE XIV



Group 15 Nesikep Complex Points

Number of Specimens: 10, Plate XV

General Description: These points, which are all from Zone VII at the Nesikep Creek site (EdRk:4), have in common very thin transverse sections and extremely fine workmanship which is not surpassed by any other collection of points in the Lochnore-Nesikep Locality. Several of the points are basically triangular in outline with the widest portion of the point near or at the base. These points are not notched. Other points are stemmed either by corner-notching or by basal-notching, the latter technique producing barbs. All points are made from a fairly granular basalt, which makes the skillful flaking even more remarkable. The estimated age for this group of points is 6,000 years or more, a figure arrived at through a combination of radiocarbon dating and the geological context. (See Chapter VI.) Each point is described individually.

Catalogue Number: EdRk:4-716, Plate XV: h

Description: This is a triangular point with excurvate edges and a straight base which has some thinning but no grinding. Longitudinal and transverse sections are biplano and very thin. The flaking is shallow, random, and mostly limited to edge retouch.

Measurements: Length: 36 mm; Width: 24 mm; Thickness: 3 mm.

Catalogue Number: EdRk:4-715, Plate XV: g

Description: This is a triangular point with excurvate edges and a straight base which has two long and wide (12mm X 8mm) thinning flakes and a series of small flakes removed bifacially. There is some grinding of the lateral edges. Two very shallow side notches appear halfway up the point. Transverse section is biplano; longitudinal section is plano-convex. The flaking is irregular but well-controlled.

Measurements: Length: 43mm; Width: 26mm; Thickness: 4mm; Height of notches above base: 20mm; Width notches 4mm.

Catalogue Number: EdRk:4-713, Plate XV: e

General Description: This is the basal portion of a large triangular point with straight edges and a concave base. The base is thinned by the removal of broad flakes which extend up to 13mm from the base. There is a limited amount of grinding on the lateral edges near the base. The flaking is well-controlled and regular. Longitudinal and transverse sections are biconvex.

Measurements: Length: 36mm; Width: 30mm; Thickness: 5mm.

Catalogue Number: EdRk:4-953, Plate XV: c

Description: This is a stemmed point with straight edges curving in sharply towards the tip. Broad corner notches have produced a slightly expanding stem and shoulders rather than barbs. The base of the stem is slightly concave with thinning flakes and grinding on the lateral and basal edges. The flaking is well-controlled with the removal of broad, shallow flakes, (some diagonal) meeting approximately in the midline of the blade. Longitudinal and transverse sections are biplano resulting in a very thin point.

Measurements: Length: 63mm; Width at Shoulders: 24mm; Thickness: 4mm; Neck width: 16mm..

Catalogue Number: EdRk:4-710, Plate XV: b

Description: This is a triangular point with straight edges converging sharply to the tip. The base is slightly convex and is thinned by several longitudinal flakes. There is some grinding along the lateral edges near the base. The transverse section is biconvex; the longitudinal section is biplano. The flaking is well-controlled with several broad (9-10mm) flakes removed diagonally from left to right on one face.

Measurements: Length: 60mm; Width: 21mm; Thickness: 5mm.

Catalogue Number: EdRk:4-714, Plate XV: i

Description: This is a basal fragment of a triangular point with straight edges and a slightly convex base. It is quite similar to specimen EdRk:4-710 described above, except for an absence of basal grinding.

Measurements: Length: 21mm; Width: 23mm; Thickness: 3mm.

Catalogue Number: EdRk:4-955, Plate XV: f

Description: This is a stemmed point with corner notches producing an expanding stem, a portion of which is broken. The blade has excurvate edges and is asymmetrically barbed with a small barb on one side, and a shoulder on the other. The base is straight. Flaking is limited to edge retouch. There is no basal grinding or extensive thinning.

Measurements: Length: 49mm; Width: 25mm; Thickness: 3mm; Width of Neck: 14mm.

Catalogue Number: EdRk:4-999, Plate XV: d

Description: This is a triangular point with straight to slightly recurved edges and a straight base. There is basal thinning but no grinding. Transverse and longitudinal sections are both plano-convex. Flaking is excellent with broad flakes meeting at the midline of the blade.

Measurements: Length: 47mm; Width: 21mm; Thickness: 4mm.

Catalogue Number: EdRk:4-954, Plate XV: a

Description: This is a large basally-notched point with strongly recurved edges and barbs extending to the base. There is a suggestion of serration on the blade edge just above the notches. The stem is expanding and slightly concave. The stem is thinned bifacially, and laterally ground.

The transverse section is biconvex and the longitudinal section is plano-convex. Of the finely-flaked Nesikep Complex points, this specimen illustrates the best controlled flaking. Near the tip, flake scars coming from each edge are matched producing the appearance of single flakes removed transversely across the artifact. In the median section of the point, the shallow flake scars run diagonally from upper left to lower right.

Measurements: Length: 83mm; Width: 30mm; Thickness: 5mm; Width of Neck: 14mm.

Another strongly recurved point very similar to, but a little smaller than EdRk:4-954 described above, was found in two pieces. Unfortunately it has since disappeared from the collection.

Miscellaneous Specimens

The 17 points and fragments listed here are specimens which do not readily fit into the groups. They are described individually together with their provenience. All measurements are in millimetres.

Specimen Number: EdRk:9-241

Location: EdRk:9, Zone III

This is a corner-notched point broken just above the shoulders. The stem exhibits thinning but no grinding. The stem is expanding with a straight base. Longitudinal and transverse sections are plano-convex.

Length: -; Width: 15; Thickness: 5; Width of Neck: 9.

Specimen Number: EdRk:8-220

Location: EdRk:8, Zone I; Plate XIV: v

This is a corner-notched point with excurvate edges and small barbs caused by the wide corner notches. The stem is expanding with a convex base on

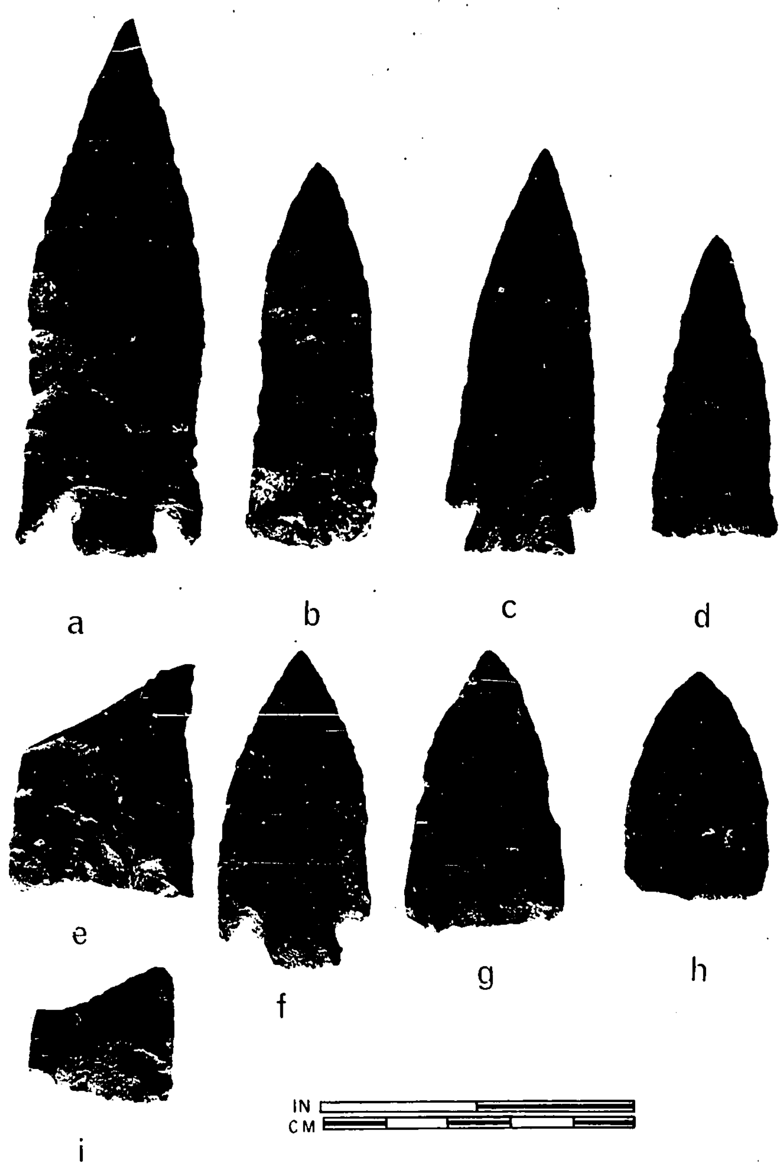
PLATE XV

Group 15 Projectile Points from the

Nesikep Creek Site, Zone VII

a	EdRk:4-954
b	EdRk:4-710
c	EdRk:4-953
d	EdRk:4-999
e	EdRk:4-713
f	EdRk:4-955
g	EdRk:4-715
h	EdRk:4-716
i	EdRk:4-714

PLATE XV



which there is some thinning but no grinding. Longitudinal and transverse sections are both plano-convex.

Length: 42; Width: 26; Thickness: 7; Width of Neck: 13.

Specimen Number: EdRk:7-189

Location: EdRk:7, Zone I

This is a corner-notched point with straight edges and rounded shoulders. The stem is expanding with a slightly concave base, basal thinning, and no grinding.

Length: -; Width: -; Thickness: 5; Width of Neck: 16.

Specimen Number: EdRk:7-3058

Location: EdRk:7, Zone I

This is a corner-notched point with straight blade edges and shoulders. Wide corner notches have produced an expanding stem. The stem is too fragmentary to determine the base form, but no grinding is in evidence.

Length: 49; Width: -; Thickness: 6.

Specimen Number: EdRk:8-1067

Location: EdRk:8, Zone I

This is a corner-notched specimen with straight blade edges and small barbs. The stem is parallel to slightly contracting and exhibits thinning but no grinding. The base is partially broken but is probably straight.

Length: -; Width: -; Thickness: 7; Width of Neck: 10.

Specimen Number: EdRk:4-613

This is the basal fragment of a corner-notched point with an expanding stem and a straight base. The point is shouldered. The base is thinned and

there is some grinding (for illustration see Sanger 1964: Plate V, N)
Length: -; Width: 18; Thickness: 4; Width of Neck: 13.

Specimen Number: EdRk:9-59, Plate XIV: q
Location: EdRk:9, Zone I
This is a corner-notched point with the notches entering the point obliquely and almost constituting side notching. The blade is broad with straight edges and small barbs. The stem is expanding with a concave base which is thinned but not ground.
Length: -; Width: 33; Thickness: 6; Width of Neck: 16.

Specimen Number: EdRk:7-2414, Plate XIV: s
Location: EdRk:7, Zone III
This is a large side-notched point with excurvate edges and a broad blade. The notches are situated well down toward the base of the point. The base is broken, but there is a suggestion of a small basal notch at one end.
Length: 40+; Width: 30; Thickness: 6; Width of Neck: 24.

Specimen Number: EdRk:4-638, Plate XIV: t
Location: EdRk:4, Zone V
This is a corner-notched point with excurvate blade edges and shoulders. The stem is straight to slightly expanding and is without thinning or grinding. Longitudinal and transverse sections are plano-convex.
Length: 38; Width: 28; Thickness: 5; Width of Neck: 13.

Specimen Number: EdRk:4-712, Plate XIV: u
Location: EdRk:4, Zone V
This point was previously described as belonging in Zone IV of the Nesikep

Creek site (EdRk:4) (Sanger 1964:138). After a re-examination of the stratigraphy in 1964, however, it seems likely that this point derives from the Zone V component. The point is a corner-notched specimen with straight sides and shoulders. Large flakes removed from the edges create the impression of serration. The stem is expanding with a straight base, thinned by long flakes but without grinding. Longitudinal and transverse section are plano-convex.

Length: -; Width: 24; Thickness: 5; Width of Neck: 15.

Specimen Number: EdRk:7-2744, Plate XIV: w

Location: EdRk:7, Zone I

This is a stemmed point with a narrow blade and straight edges. The stem, formed by a slight constriction, is parallel-sided and straight-based. The base is thinned but not ground. The transverse section is diamond-shaped and the longitudinal section is biconvex.

Length: 44; Width: 13; Thickness: 7; Width of Neck: 12.

Specimen Number: EdRk:9-100, Plate XIV: r

Location: This is a surface find from the Pine Mountain site (EdRk:9). The point is stemmed with long straight edges and shoulders. The stem is parallel-sided with a straight base which is thinned and laterally ground. The transverse section is diamond-shaped, and the longitudinal section is biconvex.

Length: 65+; Width: 13; Thickness: 8; Width of Neck: 10.

Specimen Number: EdRk:5-55

Location: EdRk:5, Zone II

This is a side-notched point with very wide notches extending from the base to halfway up the length of the point. The blade edges are excurvate. The base is straight with thinning but no grinding. Both transverse and longitudinal sections are plano-convex. (For illustration see Sanger 1966: Plate IV, h)

Length: 30; Width: 18; Thickness: 6; Width of Neck: 8.

<u>Specimen Number</u>: EdRk:3-32H

<u>Location</u>: EdRk:3

This is a large side-notched point with wide notches, excurvate blade edges, and a convex base.

Length: 76; Width: 38; Thickness: -; Width of Neck: 22.

<u>Specimen Number</u>: EdRk:3-26H

<u>Location</u>: EdRk:3

This is a multi-notched point with one notch on one edge and four notches on the other. The blade edges are excurvate. The base is concave.

Length: 38; Width: 16; Thicknes: -; Width of Neck: 8.

<u>Specimen Number</u>: EdRk:7-1798

<u>Location</u>: EdRk:7, Zone III

This is a very thin point based on a blade or blade-like flake. The edges are excurvate and shouldered. The stem is parallel-sided and straight-based. There is no grinding but some thinning is evident. Retouch is limited mostly to the blade edges. Transverse section is plano-triangular, and the longitudinal section is concavo-convex. (For illustration see Sanger 1966: Plate VI, d).

Length: 34; Width: 12; Thickness: 2; Width of Neck: 9.

TABLE 16

DISTRIBUTION OF BLADE EDGE FORM ATTRIBUTES

OF PROJECTILE POINTS -- BY GROUP

Group	Attributes											
	Straight		Incurvate		Excurvate		Recurved		Assymetric		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	0		0		21	91.3	0		2	8.7	23	100
2	0		0		5	100	0		0		5	100
3	21	61.8	1	2.9	10	29.2	1	2.9	1	2.9	34	99.7
4	8	80	0		1	10	1	10	0		10	100
5	6	60	0		4	40	0		0		10	100
6	10	91	0		1	9	0		0		11	100
7	10	55.5	0		5	27.8	2	11.1	1	5.5	18	99.9
8	12	66.8	0		6	33.3	0		0		18	100.1
9	3	50	0		3	50	0		0		6	100
10	9	100	0		0		0		0		9	100
11	5	45.5	0		6	54.5	0		0		11	100
12	3	33.3	0		4	44.4	1	11.1	1	11.1	9	99.9
13	17	63	2	7.4	4	14.8	4	14.8	0		27	100
14	3	30	0		6	60	0		1	10	10	100
Totals	107	53.2	3	1.5	76	37.8	9	4.5	6	2.9	201	99.9

TABLE 17

DISTRIBUTION OF STEM FORM ATTRIBUTES
OF PROJECTILE POINTS -- BY GROUP

Group	Attributes												Totals	
	Contracting blunt		Contracting pointed		Expanding		Straight		Rounded		Edge Assymetrical			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	17	81	4	19	0		0		0		0		21	100
2	3	75	1	25	0		0		0		0		4	100
3	0		0		45	100	0		0		0		45	100
4	0		0		16	100	0		0		0		16	100
5	0		0		10	100	0		0		0		10	100
6	0		0		13	100	0		0		0		13	100
7	0		0		19	100	0		0		0		19	100
8	0		0		18	100	0		0		0		18	100
9	2	33.3	0		1	16.7	3	50	0		0		6	100
10	0		0		9	90	0		1	10	0		10	100
11	2	15.5	0		11	84.5	0		0		0		13	100
12	8	57.1	0		2	14.3	4	28.6	0		0		14	100
13	1	3.7	0		26	96.3	0		0		0		27	100
14	9	90	1	10	0		0		0		0		10	100
Totals	42	18.6	6	2.6	170	75.1	7	3.1	1	.4	0		226	99.8

TABLE 18

DISTRIBUTION OF BASAL PREPARATION ATTRIBUTES
OF PROJECTILE POINTS -- BY GROUP

Group	Attributes												Totals	
	Thinning only		No thinning no grinding		Lateral grinding only		Thinning and lateral grinding		Thinning, lateral & basal grinding		No thinning, but lateral grinding			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	6	33.3	5	27.7	1	5.5	2	11.1	2	11.1	2	11.1	18	99.8
2	2	40	3	60	0		0		0		0		5	100
3	1	3.4	0		1	3.4	14	48.2	13	44.7	0		29	99.7
4	0		0		0		6	40	9	60	0		15	100
5	2	100	0		0		0		0		0		2	100
6	6	100	0		0		0		0		0		6	100
7	6	100	0		0		0		0		0		6	100
8	4	100	0		0		0		0		0		4	100
9	2	66.6	0		0		1	33.3	0		0		3	99.9
10	8	100	0		0		0		0		0		8	100
11	2	66.6	0		0		1	33.3	0		0		3	99.9
12	5	38.5	1	7.7	1	7.7	5	38.5	1	7.7	0		13	100.1
13	4	100	0		0		0		0		0		4	100
14	3	60	1	20	0		0		0		1	20	5	100
Totals	51	42.1	10	8.3	3	2.5	29	24.0	25	20.6	3	2.5	121	100

TABLE 19

DISTRIBUTION OF BASE FORM ATTRIBUTES
OF PROJECTILE POINTS -- BY GROUP

Group	Attributes										Totals	
	Concave		Convex		Straight		Recurved		Pointed			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	0		12	57.2	5	23.8	0		4	19.0	21	100
2	0		1	25	2	50	0		1	25	4	100
3	34	75.7	0		11	24.3	0		0		45	100
4	11	68.8	0		5	31.2	0		0		16	100
5	5	55.5	0		4	44.5	0		0		9	100
6	0		10	76.9	3	23.1	0		0		13	100
7	12	63.2	0		7	36.8	0		0		19	100
8	10	62.5	0		6	37.5	0		0		16	100
9	2	33.3	0		4	66.6	0		0		6	99.9
10	5	50	1	10	4	40	0		0		10	100
11	9	69.1	1	7.7	3	23.2	0		0		13	100
12	13	97.8	0		1	7.2	0		0		14	100
13	5	19.2	3	11.6	18	69.2	0		0		26	100
14	0		6	85.7	0		0		1	14.3	7	100
Totals	106	48.3	34	15.5	73	33.4	0		6	2.7	219	99.9

TABLE 20

DISTRIBUTION OF NOTCHING FORM ATTRIBUTES

OF PROJECTILE POINTS -- BY GROUP

Group	Attributes										Totals	
	Basal one		Basal two		Corner wide (more than 2 mm)		Side narrow (less than 2 mm)		Side wide (more than 2 mm)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	0		0		0		0		0		0	
2	0		0		0		0		0		0	
3	0		0		45	100	0		0		45	100
4	0		0		16	100	0		0		16	100
5	0		0		10	100	0		0		10	100
6	0		0		13	100	0		0		13	100
7	0		0		19	100	0		0		19	100
8	0		0		18	100	0		0		18	100
9	0		0		0		6	100	0		6	100
10	0		0		0		9	100	0		9	100
11	0		0		0		0		13	100	13	100
12	13	100	0		0		0		0		13	100
13	0		27	100	0		0		0		27	100
14	0		0		0		0		0		0	
Totals	13	6.9	27	14.3	121	64.0	15	7.9	13	6.9	189	100

TABLE 21

DISTRIBUTION OF SHOULDER FORM ATTRIBUTES OF PROJECTILE POINTS -- BY GROUP

Group	Wide angle (more than 90°) No.	Wide angle (more than 90°) %	Narrow angle (less than 90°) No.	Narrow angle (less than 90°) %	Narrow rounded (less than 90°) No.	Narrow rounded (less than 90°) %	Wide rounded (more than 90°) No.	Wide rounded (more than 90°) %	Totals No.	Totals %
1	0		0		0		0		0	
2	0		0		0		0		0	
3	37	84.1	2	4.5	0		5	11.4	44	100
4	0		0		0		0		0	
5	2	20	1	10	4	40	3	30	10	100
6	2	20	3	30	5	50	0		10	100
7	6	31.6	4	21.1	8	42.2	1	5.3	19	100.2
8	0		0		0		0		0	
9	0		0		0		0		0	
10	0		0		0		0		0	
11	7	53.8	4	30.8	1	7.7	1	7.7	13	100
12	2	100	0		0		0		2	100
13	0		0		0		0		0	
14	0		2	20	0		8	80	10	100
Totals	56	51.7	16	14.8	18	16.7	18	16.7	108	99.9

TABLE 22

DISTRIBUTION OF BARB FORM ATTRIBUTES
OF PROJECTILE POINTS -- BY GROUP

Group	Attributes										Totals	
	Long, flush with base		Large, extend below base		Medium		Small		Lateral		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	0		0		0		0		0		0	
2	0		0		0		0		0		0	
3	0		0		0		0		0		0	
4	0		0		2	12.5	13	81.2	1	6.3	16	100
5	0		0		0		0		0		0	
6	0		0		0		2	100	0		2	100
7	0		0		0		0		0		0	
8	0		0		5	27.8	11	61.0	2	11.1	18	99.9
9	0		0		0		0		0		0	
10	0		0		0		0		0		0	
11	0		0		0		0		0		0	
12	0		0		0		0		0		0	
13	19	79.2	0		5	20.8	0		0		24	100
14	0		0		0		0		0		0	
Totals	19	31.7	0		12	20.0	26	43.3	3	5.0	60	100

TABLE 23

DISTRIBUTION OF SERRATION LOCATION ATTRIBUTES OF PROJECTILE POINTS -- BY GROUP

Group	Attributes					
	Medial		Extensive		Totals	
	No.	%	No.	%	No.	%
1	0		1	100	1	100
2	0		0		0	
3	1	11.1	8	88.9	9	100
4	0		5	100	5	100
5	0		0		0	
6	0		0		0	
7	0		0		0	
8	0		0		0	
9	0		0		0	
10	0		0		0	
11	0		0		0	
12	0		0		0	
13	0		0		0	
14	0		0		0	
Totals	1	6.7	14	93.3	15	100

TABLE 24

DISTRIBUTION OF TRANSVERSE CROSS SECTION FORM ATTRIBUTES OF PROJECTILE POINTS -- BY GROUP

Group	Biconvex		Plano-Convex		Biplano		Concavo-Convex		Plano-Triangular		Convexo-Triangular		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	8	42.1	8	42.1	1	5.3	0		2	10.5	0		19	100
2	0		3	60	1	20	1	20	0		0		5	100
3	11	39.4	16	57.1	0		0		0		1	3.6	28	100.1
4	6	40	7	46.6	1	6.7	1	6.7	0		0		15	100
5	1	50	1	50	0		0		0		0		2	100
6	3	50	3	50	0		0		0		0		6	100
7	2	40	1	20	0		0		2	40	0		5	100
8	1	20	3	60	0		0		1	20	0		5	100
9	0		1	33.3	0		1	33.3	1	33.3	0		3	99.9
10	2	25	5	62.5	0		0		1	12.5	0		8	100
11	1	25	3	75	0		0		0		0		4	100
12	6	46.2	5	38.4	1	7.7	1	7.7	0		0		13	100
13	2	20	7	70	1	10	0		0		0		10	100
14	0		5	100	0		0		0		0		5	100
Totals	43	33.6	68	53.1	5	3.9	4	3.1	7	5.5	1	.8	128	100

TABLE 25

DISTRIBUTION OF LONGITUDINAL CROSS SECTION FORM ATTRIBUTES OF PROJECTILE POINTS -- BY GROUP

Group	Attributes								Totals	
	Biconvex		Plano-Convex		Biplano		Concavo-convex			
	No.	%	No.	%	No.	%	No.	%	No.	%
1	9	47.3	6	31.6	1	5.3	3	15.8	19	100
2	0		2	66.6	1	33.3	0		3	99.9
3	5	25	10	50	3	15	2	10	20	100
4	5	55.5	4	44.5	0		0		9	100
5	1	50	1	50	0		0		2	100
6	1	16.7	3	50	2	33.3	0		6	100
7	1	25	2	50	1	25	0		4	100
8	1	25	3	75	0		0		4	100
9	0		0		0		3	100	3	100
10	1	14.3	6	85.7	0		0		7	100
11	2	50	1	25	0		1	25	4	100
12	1	11.1	4	44.5	4	44.5	0		9	100.1
13	2	22.3	7	77.7	0		0		9	100
14	2	40	1	20	2	40	0		5	100
Totals	31	29.8	50	48.0	14	13.4	9	8.6	104	99.8

TABLE 26

DISTRIBUTION OF PROJECTILE POINTS BY GROUP AND COMPONENT

Group	Component															Totals
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	
1	3	1	1				1		9	3	1	1	1	1		22
2									4			1				5
3				1	1				3			38	1	1		45
4				1					4			11				16
5									2		8					10
6	1								4		7				1	13
7	1								2		13				3	19
8	1								1		13			3		18
9	3		2					1								6
10	2	1					3	4								10
11	2						1		1		7	2				13
12									13			1				14
13	4						1		3		18	1				27
14	1		2		1						5		1			10
15						10										10
Misc.	2				4		1		3	2	3		1	1		17
Total	20	2	5	2	6	10	7	5	49	5	75	55	4	6	4	255

TABLE 27

DISTRIBUTION OF PROJECTILE POINTS BY PERIOD AND GROUP

Period	Years Ago	Projectile Point Group																Totals
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	M	
LATE	0–2000	6	-	-	-	-	1	1	1	6	10	4	-	5	3	-	4	41
MIDDLE Upper	2000–3500	11	4	5	4	10	12	18	17	-	-	7	13	21	6	-	7	135
MIDDLE Lower	3500–5000	1	1	39	12	-	-	-	-	-	-	2	1	1	-	-	-	57
EARLY	5000–7000	4	-	1	-	-	-	-	-	-	-	-	-	-	1	10	6	22
TOTALS		22	5	45	16	10	13	19	18	6	10	13	14	27	10	10	17	255

Specimen Number: EdRk:4-812

Location: EdRk:4, Zone V

This is very similar to specimen EdRk:7-1798 described above. It too has very little retouch on a very thin flake. (For illustration see Sanger 1964: Plate V, O).

Length: 26; Width: 13; Thickness: 3; Width of Neck: 7.

Specimen Number: EdRk:8-1060

Location: EdRk:8, Zone I

This point is corner-notched producing an expanding stem and shoulders. The blade edges are excurvate. The stem is damaged but the base appears to have been convex. There is some evidence of thinning, but no grinding. Longitudinal and transverse sections are plano-convex.

Length: 37; Width: 21; Thickness: 5; Width of Neck: 13.

Unclassified fragments: There are numerous bifacially worked pieces which are probably fragments of broken points. A large collection of unclassifiable point tips has been included in the formed biface artifact class. Medial fragments of points, which are less common, are also discussed in the biface category.

Microblades and Cores

Microblades and associated cores are among the most diagnostic of the Lochnore-Nesikep Locality artifacts, and therefore warrant extensive treatment. The sample numbers about 700 excavated microblades and 73 cores and core fragments. This section will begin with a description of the cores followed by an analysis of the microblades. The microblade presentation is split into two sections designed to complement one another.

A detailed statistical description prepared by David Wyatt is contained in Appendix I, with the results of a microscopic examination presented in this chapter. This section concludes with a tentative statement on the function of the microblades and core complex.

Microblade Cores (Figure 12) Microblade core (also referred to as core in this study) refers to the prepared nucleus from which microblades (to be defined elsewhere) were removed. Striking Platform is the surface of the core struck to produce microblades. The Fluted Surface refers to the surface of the core bearing scars (flutes) of removed microblades. There may be more than one fluted surface on a core. In the event of more than one fluted surface the microblade core could be called a polyhedral core, but that term is not applied to cores exhibiting only one fluted surface. Lateral Surfaces are the non-fluted surfaces of the core excluding also the striking platform and the portion of the core opposite the striking platform. The Keel is that portion of the core opposite the striking platform and usually formed by the junction of the lateral surfaces. On many cores the keel is chisel-shaped and sharp. The Core Edge is the outer edge of the striking platform, specifically the junction of the striking platform and the fluted surface(s). The distance across the striking platform measured between opposite ends of the core edge is known as the Edge Chord. The Angle At Core Edge is the angle formed by the junction of the fluted surface and the striking platform. A measure of the degree of curvature of the Core Edge is known as the Index of Core Edge Curvature, which is computed from the length of the core edge divided by the edge chord.

Microblade core measurements are given in Tables 28 through 32. The length of the striking platform refers to the maximum length of the surface serving as the striking platform. Width of striking platform

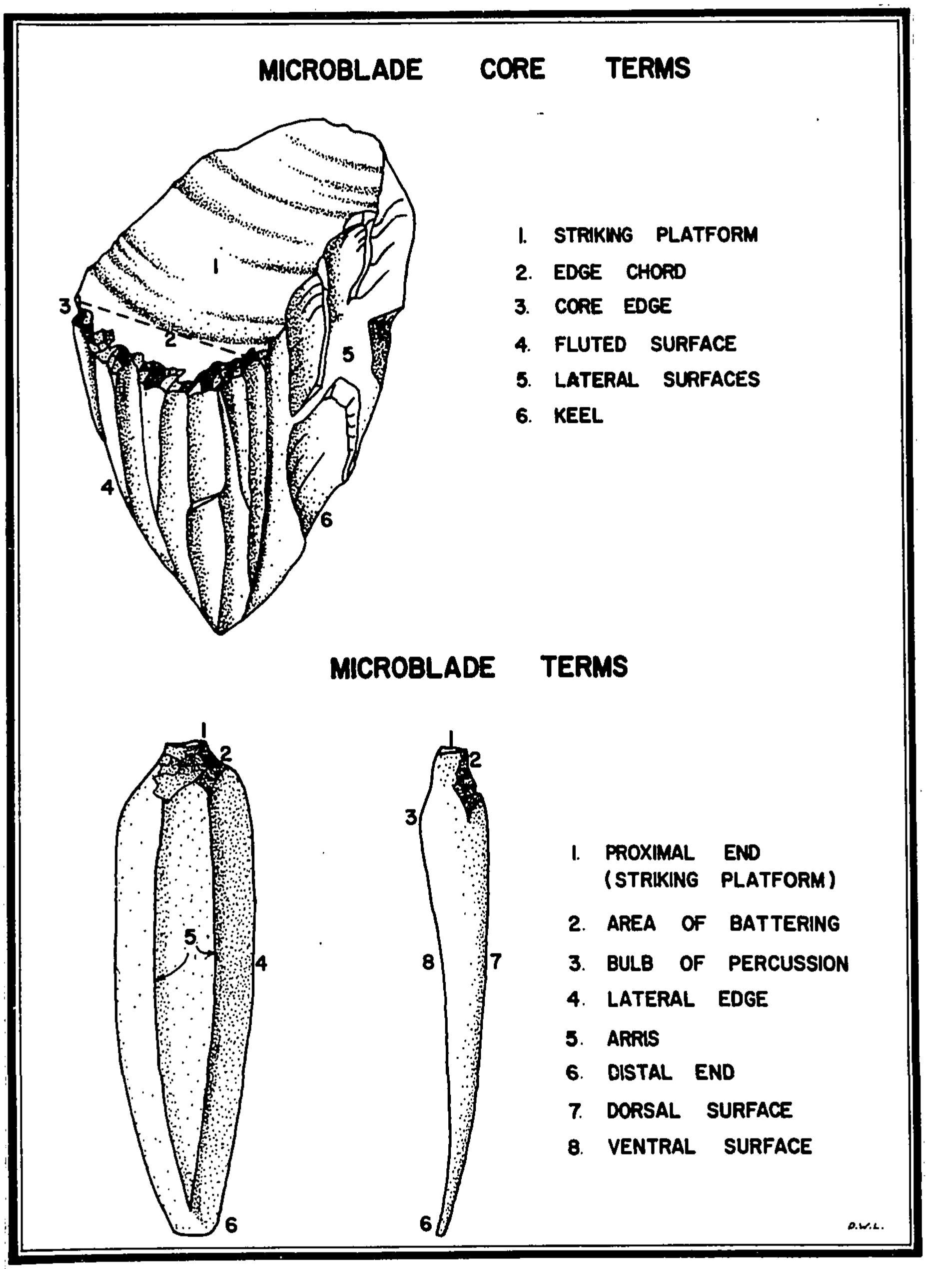

MICROBLADE CORE TERMS
1
2
3
4
5
6
I. STRIKING PLATFORM
2. EDGE CHORD
3. CORE EDGE
4. FLUTED SURFACE
5. LATERAL SURFACES
6. KEEL
MICROBLADE TERMS
1
2
3
4
5
6
7
8
I. PROXIMAL END (STRIKING PLATFORM)
2. AREA OF BATTERING
3. BULB OF PERCUSSION
4. LATERAL EDGE
5. ARRIS
6. DISTAL END
7. DORSAL SURFACE
8. VENTRAL SURFACE
D.W.L.

FIGURE 12

likewise refers to the maximum dimension. Length of core edge was measured by rolling the core along a piece of paper from one edge of the fluted area to the other. Each core was rolled three times and the average measurement recorded. The edge chord was measured with calipers. Length of the fluted surface refers to the length of the longest flute from the striking platform to the keel, measured on a straight line and with calipers. The height of the core is measured as a maximum dimension. In some specimens this measurement corresponds with the length of the fluted surface, in others it is less, and in still others, it exceeds the height of the fluted surface. The width of the flutes or microblade scars is taken as close to the core edge as possible, where the number of flake scars are also counted. Most cores indicate a series of short scars near the core edge which might have been abortive microblades, or more likely, are associated with core preparation. These were not measured. All measurements and counts were taken just below the short scars. The angle at the core edge was computed with the aid of a Formagage manufactured by Penn Industries. The Formagage consists of a series of closely-spaced steel rods which are pressed onto the core edge recording the angle between the striking platform and the fluted surface.

On the basis of these measurements and qualitative attributes, the cores have been divided into two groups, somewhat arbitrarily selecting the angle of the core edge as the criteria for separation.

Group I (24 specimens) (Plate XVI: a-h) The diagnostic attribute of this group is the approximate right angle formed by the intersection of the striking platform and the fluted surface. Examination of the core attributes suggests that an angle of 80 degrees or greater is a useful arbitrary division between group 1 and group 2 microblade cores. Striking platforms of group 1 cores are sometimes fashioned by a single blow from either the front of the core (fluted surface) or the back. Quite frequently, however, a natural cleavage surface is utilized. Multiple blow preparation is less common. When viewed from the side of the core (Lateral surfaces) the striking platforms are generally straight, with concave and convex forms rare. Extensive core edge preparation is indicated by battering (the removal of short stepped flakes struck in the same general direction as the microblades), crushing, and some grinding. Scalloping, created by the presence of unbattered microblade scar ridges at the core edge, is seen on only one specimen. When viewed from the front of the core the lateral edges of the fluted surface nearly always taper symmetrically to a point effecting an isosceles triangle with the core edge as the odd length side. The keels on group 1 cores are characteristically chisel-shaped in transverse section, and infrequently pointed or rounded. Preparation of the lateral surfaces is commonly by longitudinal flaking from the striking platform towards the keel, and _vice versa_, or less frequently a combination of longitudinal and transverse flaking. A few keels exhibit a certain amount of crushing, suggesting perhaps, that the cores were rested on a fairly hard and unyielding anvil when the microblades were detached.

Group 2 (15 specimens) (Plate XVI: i-l) Microblade cores in this category are characterized by an angle of less than 80 degrees between the striking platform and the fluted surface. Striking platforms are usually formed by a single blow, both from the front (fluted surface) and the back, with a few platforms created by multiple blows. Natural cleavage surfaces are also used. Like the group 1 cores, the striking platform, when viewed from the lateral surfaces, appears straight in most cases. Preparation of the core edge by battering, crushing, and grinding is universal. When viewed from the front of the core the edges of the fluted surface commonly contract symmetrically to form an isoscelcs triangle; however, there a few examples of parallel-edged striking platforms. Compared with the group 1 examples, group 2 cores exhibit a lower incidence of chisel-shaped keels with a greater percentage of pointed, flat and rounded keels. No crushing on keels was noted.

A comparison of quantitative attributes (Tables 31-32) suggests considerable overlap between group 1 and group 2 microblade cores from the Lehman site. Height of core compared with maximum length of fluted surface for cores indicates that, on the average, these dimensions are essentially identical for group 1 cores, while group 2 cores exhibit a maximum flute length slightly longer than the average core height.

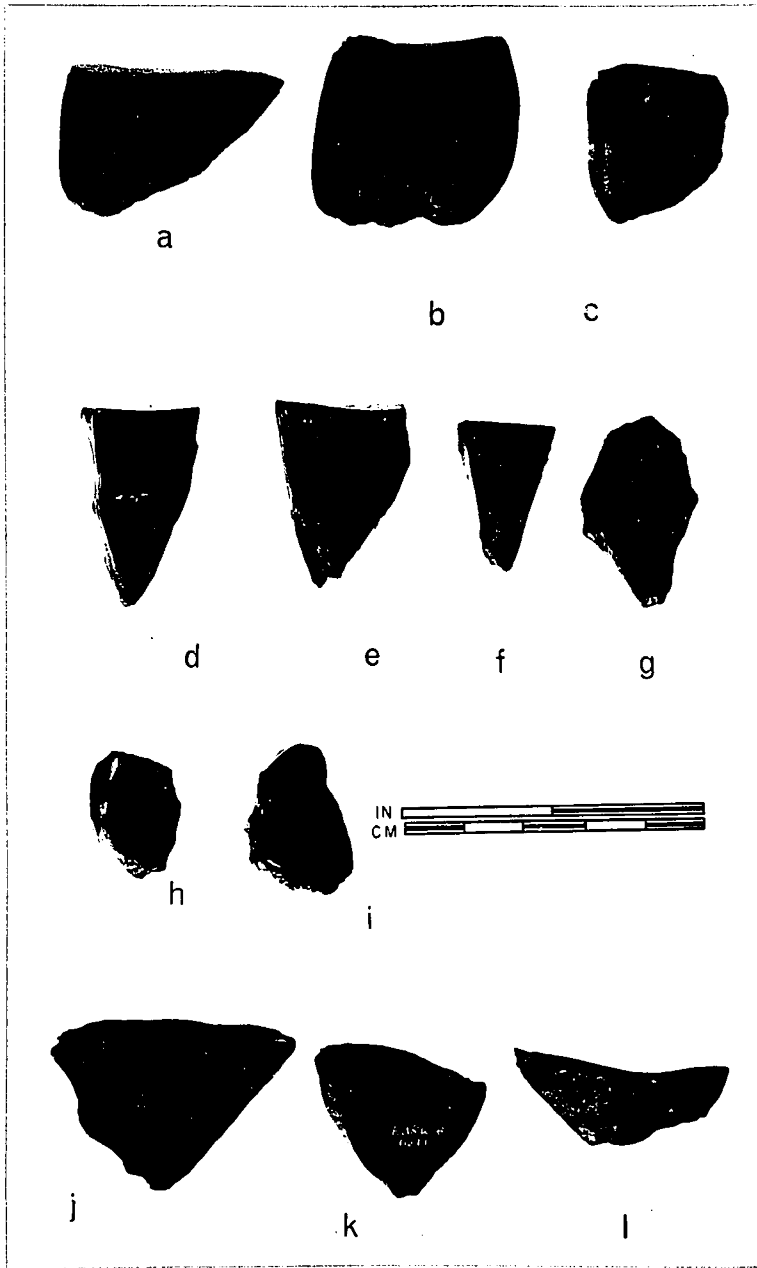
Microblades Artifacts designated microblades adhere closely to the criteria for artifacts of this class established from Watanabe (Okada 1951):

1. The microblades are detached from the core from one specific direction.
2. The edges and ridges are straight and parallel.
3. The microblades are relatively thin and the thickness/width index is relatively constant.
4. The angle formed by the striking platform and the blade surfaces is approximately 90° (only in about 60% of specimens from the Lehman site - see Table 35).
5. Cores are found in association.

To these criteria can be added a qualification that the width is below 10mm. (For a more detailed discussion of microblade definitions, attributes, and distribution within the Lochnore-Nesikep Locality see Appendix I by Wyatt).

As the dimensions and morphological traits are considered in detail

PLATE XVI



Microblade Cores (Striking Platforms Up)

All but i are from EdRk:8, Zone II; i is from EdRk:9, Zone III

a-h Group 1
i-l Group 2

TABLE 28

DIMENSIONS OF MICROBLADE CORES
FROM THE LEHMAN SITE

Attribute	No.	Range	Mean	Mode	s.d.
Length of Striking Platform (mm)	38	11-43	25.2	--	6.5
Width of Striking Platform (mm)	38	11-29	19.7	20.6	4.6
Length of Core Edge (mm)	34	8-31	20.5	23.5	5.1
Edge Chord (mm)	34	7-28	17.7	17.1	4.1
Maximum Fluted Surface Length (mm)	40	18-35	24.8	24.5	4.0
Height of Core (mm)	37	15-31	24.6	26.0	3.6
Number of Flutes	41	2-8	4.8	5.0	1.4
Average Width of Flutes (mm)	41	2.3-6.0	3.7	--	0.78
Index of Curvature	34	100-154	177	122.5	11.2

Total Number Including Fragments: 55

TABLE 29

DIMENSIONS OF MICROBLADE CORES
FROM THE LOCHNORE CREEK SITE

Attribute	No.	Range	Mean
Length of Striking Platform (mm)	6	10-30	23.8
Width of Striking Platform (mm)	6	18-30	23.1
Length of Core Edge (mm)	5	16-32	23.2
Edge Chord (mm)	5	14-24	19.2
Maximum Fluted Surface Length (mm)	6	20-26	23.1
Height of Core (mm)	6	20-30	24.1
Number of Flutes	6	4-8	6.0
Average Width of Flutes (mm)	6	2.7-5.0	3.9
Index of Curvature	5	105-133	119.4

Total Number Including Fragments:16

TABLE 30

DISTRIBUTION OF MICROBLADE CORE EDGE ANGLES-BY SITE

Angle (degrees)	Component				Totals
	EdRk:7	EdRk:8 (Displaced)[1]	EdRk:8 (In Situ)	EdRk:9	
98-100		1			1
95-97				1	1
92-94	1				1
89-91	3	9			12
86-88		3			3
83-85		2			2
80-82		3	1		4
77-79		2	1		3
74-76			1		1
71-73		1			1
68-70	1	1			2
65-67				1	1
62-64		1			1
59-61			1		1
56-58			1		1
53-55		1			1
50-52		1			1
47-49					
44-46					
41-43		1			1
38-40					
35-37			1		1
Totals	5	26	6	2	39

[1]"Displaced" refers to specimens recovered from surface or ploughzone.

TABLE 31

DIMENSIONS OF GROUP I MICROBLADE CORES
FROM THE LEHMAN SITE

Attribute	No.	Range	Mean	Mode	s.d.
Length of Striking Platform (mm)	19	11-37	23.4	25.2	7.1
Width of Striking Platform (mm)	19	11-29	19.2	21.6	4.3
Length of Core Edge (mm)	18	14-25	20.5	17.5	3.6
Length of Edge Chord (mm)	18	11-24	17.5	17.5	3.9
Height of Core (mm)	18	20-31	26.2	24.1	3.6
Max. Length of Fluted Surface (mm)	19	20-31	25.9	24.7	3.1
Number of Flutes	19	2-7	4.7	4.1	2.0
Mean Width of Flutes (mm)	19	2.5-5.4	3.5	4.7	1.0
Core Edge Angle (degrees)	19	80-100	87.5	90.0	5.8
Index of Curvature	18	104-141	117.5	--	9.1

TABLE 32

DIMENSIONS OF GROUP 2 MICROBLADE CORES
FROM THE LEHMAN SITE

Attribute	Number	Range	Mean	Mode	s.d.
Length of Striking Platform (mm)	13	11-41	28.3	21.7	8.7
Width of Striking Platform (mm)	13	13-29	20.6	21.8	4.7
Length of Core Edge (mm)	13	16-31	22.0	23.5	4.0
Length of Edge Chord (mm)	13	13-28	18.7	20.1	4.0
Height of Core (mm)	13	15-29	21.6	22.8	4.4
Max. Length of Fluted Surface (mm)	13	18-28	22.6	23.8	3.3
Number of Flutes	13	2-8	4.8	5.4	1.4
Mean Width of Flutes (mm)	13	3.1-6.0	4.0	5.5	1.0
Core Edge Angle (degrees)	13	35-79	62.3	--	11.2
Index of Curvature	13	105-154	118.6	--	12.2

in Wyatt's analysis (Appendix I), this section will concentrate upon the microscopic analysis. The reason for a microscopic analysis is threefold:

1. Examination through a microscope might reveal aspects of microblade manufacture which could not readily be discerned through the unaided eye or even hand lens examinations.
2. Microscopic examination might suggest descriptive attributes which could assist in formulating a more precise description of the Lochnore-Nesikep Locality microblades.
3. Detailed examination of retouched areas might suggest possible functions of microblades.

Striking Platforms From the Lehman site (EdRk:8) collection of 444 microblades, a random sample of 50 was selected, each having the proximal end intact. In order to remove a calcareous deposit, the microblades were immersed in hydrocloric acid and scrubbed with a stiff brush. Each specimen was then examined under a binocular microscope set at varying degrees of magnification. It was discovered that 24 and 60 powers were the most useful, although 90 power was utilized to advantage on some specimens. Illumination was provided by a standard incident lamp with rheostatically controlled light intensity.

Striking platforms display a flat unfacetted surface with the ventral edge (core side) prescribing a smooth unbroken to gently undulating line in the form of a crescent; the dorsal edge presents a very irregular outline (Plate XVII, b). The edge formed by the striking platform and the ventral surface of the microblade is sharp, while the corresponding edge on the dorsal surface is battered and rounded. The dorsal surface of the microblade just below the striking platform always indicates extensive battering in the form of short flakes driven off from various angles, but generally towards the direction from which the microblade itself was detached. Such battering (Plate XVII, a) has the effect of producing a striking platform which is narrower than the maximal width of the microblade, the latter being just below the area of battering. In addition, this battering substantially reduces the thickness of the microblade at the proximal end, so that when viewed in longitudinal cross section there is a step on the dorsal surface of the microblade. Opposite the step, on the ventral or core side, there is the bulb of percussion. The battering sometimes results in shatter marks extending into the striking platform. Examination of the battered surface under higher magnification (60 and 90 power) reveals the presence of a limited amount of grinding and crushing, especially of the high points.

Utilizing evidence from the microblade cores and the striking platforms of microblades, the following aspects of microblade manufacturing technique are noted. First, the technique of microblade detachment involves the careful preparation of the core after the removal of each microblade. As each microblade is removed it leaves a scar which is characterized by the remains of a hinge fracture at the core edge which extends out over the fluted surface. In order to strike off another microblade, the overhang is removed by battering. The limited areas of grinding, evident on both microblades and cores edges, are probably the result of the final step in removing unwanted high spots in the battered area. When viewed with the naked eye or low-power hand-lens, the battering and general techniques effect the appearance of a rounded proximal end, a feature noted on all proximally complete Lochnore-Nesikep microblades.

The general technique of blade detachment utilizing ethnographic data and some limited experimentation has been considered at length by Barnes (1947) and Semenov (1964) and need not be repeated here.

PLATE XVII

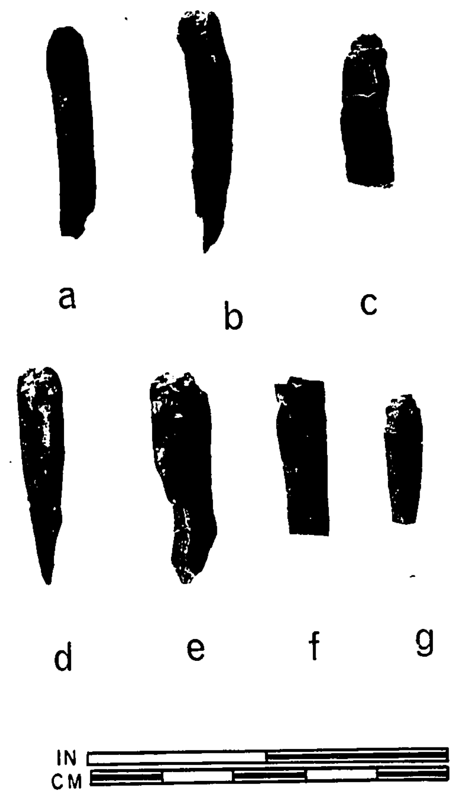
Microblades

a Microblade Forms and Artifacts (proximal ends up)

a	Group 1 graver on complete microblade	EdRk:8, Zone II
b	Group 2 graver on complete microblade	EdRk:9, Zone III
c	Distally squared microblade with edge retouch	EdRk:7, Zone I
d	Group 3 graver with single edge retouch	EdRk:8, Zone II
e	Group 4 graver with bilateral edge retouch	EdRk:8, Zone II
f	Distal and proximally squared microblade	EdRk:8, Zone II
g	Microblade from the Drynoch Slide site	EcRi:1

b Microphotograph of Microblade Striking Platform (proximal end). Note battering below striking platform. Magnification about 6 times linear.

PLATE XVII



a

b

<u>Microblade Functions</u> Microblades were no longer being produced by the historic aboriginal populations of Interior British Columbia, and there is, therefore, no ethnographic data to indicate how these small artifacts were utilized. Lacking the ethnographic information it is necessary to rely upon evidence inherent in the artifacts themselves. The following comments on functions of microblades, which represent a mere beginning into what is seemingly an endless study, should be regarded as tentative and preliminary statements which will undoubtedly require modification with further analysis and broader comparative studies.

A general assumption in the New World is that microblades were hafted longitudinally, presumably in slotted hafts (MacNeish 1954; Giddings 1964). As more and more microblade-bearing sites rich in bone and antler remains are excavated and described, however, it becomes increasingly difficult to accept the longitudinal haft hypothesis to account for most North American microblades. The suggestive occurrence of microblades in association with slotted bone points from the Trail Creek site in Alaska (Larsen 1951) may be a possible exception.

In the Lochnore-Nesikep components the richest microblade-bearing sites have yielded few bone and antler specimens. At the productive Lehman site, 444 microblades were recovered from 12 square metres of excavated area, with the majority of microblades located in two 10cm levels. From one of these levels over 1,000 grams of bone was recovered, none of it bearing any traces of slotting for microblade insertion. Other sites in the Locality which did contain well-preserved bone and antler were either low in microblade frequency or lacking them altogether.

In Appendix I Wyatt has analyzed the incidence of retouch along the lateral edges and the size and form of the microblades. In the Lehman site collection Wyatt reports that approximately 40% of the microblades are retouched, with one edge being retouched more often than both edges. Wyatt's work indicates that retouched microblades are generally longer and wider than the non-retouched specimens, and that the retouch is present along a considerable portion of the microblade edge(s), perhaps supporting evidence for the longitudinal haft hypothesis. In considering longitudinal hafting one should not overlook the possibility of wooden hafts, in which case only the most unusual circumstances would lead to haft preservation in the Pacific Northwest.

It is difficult in a naked eye or low-power hand-lens examination of retouched lateral edges to determine the retouching agent, and in some instances it may be pertinent to be able to differentiate between intentional retouch through secondary flaking, and retouch deriving from use, sometimes called use-retouch. Even under the microscope, the agent of retouch on some microblades is often in doubt. Indications of wear, however, are plainly discernable, as is something of the nature of the retouched edge. On many of the edges examined, dorsal retouch (flakes scars on dorsal surface), probably by flaking, is steep, creating almost a 90° angle with the ventral surface of the microblade. Ventral retouch (flake scars on ventral surface) usually creates an angle of closer to 45° with one of the dorsal surfaces. Wyatt's figures indicate that dorsal retouch is the more common form.

The microblades exhibiting continuous areas of retouch along one or both edges could function as knives or scrapers. The basalt from which most of the microblades are made does not readily reveal striae or abrasions, and it is difficult to differentiate longitudinal cutting or sawing activities from lateral scraping motions. In those examples where the retouch meets the ventral surface at 90°, a scraping function is suspected, but definitely not proven. Conversely, I would expect those retouched edges forming approximately a 45° angle to have possibly functioned in a longitudinal cutting or sawing fashion.

A substantial number of microblades functioned as minute graving tools. A total of 130 microblades manifesting evidence of having been used as fine graving implements has been divided into two categories: (1) graving tools based upon complete or nearly complete distal extremities of microblades and (2) graving tools made on squared or broken microblades. Distributional data are contained in tables 33 and 34.

Graving tools based on complete or nearly complete microblades comprise 50% (65 specimens) of the sample of graving implements. Artifacts in this category have been divided into 4 groups delineated on the basis of technique of graver point manufacture.

Group 1 Gravers produced with little or no modification

Number of Specimens: 30, Plate XVIIa: a; Plate XVII; d

This group comprises artifacts with the graving point noted on the distal extremity of the microblade. On many specimens the naturally-thickened and down-curving distal end has resulted in a graving spur requiring a minimum of modification. Other specimens exhibit limited retouch around the end of the microblade.

Group 2 Gravers produced by burin blows at the distal end

Number of Specimens: 15, Plate XVIIa: b; Plate XVIII; b, c

The artifacts in this group are distinguished by sharp graving points created by one or more "burin blows", defined as blows struck from the distal end and generally towards the proximal end of the microblade. Frequently the blow is delivered so that the resulting scar is oblique to the long axis of the microblade. There are instances of multiple blows, but more common is the presence of a single burin blow scar intersecting a retouched lateral microblade edge, or sometimes an unmodified lateral edge. Wear polish often extends along the dorsal surface of the microblade, especially along ridges.

Group 3 Gravers produced by retouch along a single lateral edge

Number of Specimens: 12, Plate XVIIa: d

This group of gravers features sharp tips formed by steep and usually extensive retouch along one lateral edge. Wear polish is most common at the junction of the retouched edge and the distal tip but does extend over the dorsal surface of the microblade and the distal end.

Group 4 Gravers produced by bi-lateral retouch

Number of Specimens: 8, Plate XVIIa: e

This group exhibits sharp tips formed by the intersection of the two steeply-flaked lateral edges. Wear polish is similar to that described for group 3 above.

Sixty-five graving implements are based upon microblades broken towards the distal end (distally squared). Although the majority of breaks are perpendicular to the long axis of the microblade, there are a few examples with oblique breaks. More than one-half (37) feature graving tips at the junction of a break and a retouched lateral edge, while the remainder exhibit wear polish at the union of a break and non-retouched edge. A fairly frequent occurrence is the presence of a break intersecting a heavily retouched concave edge, resulting in the isolation of the graving point. Although there has not been an opportunity for statistical validation, it may confidently be stated that the wider and thicker microblades were selected for the distally squared gravers.

Some limited experimentation on this artifact form was conducted using unstratified microblades from a surface collection. Microblades readily snap between the fingers, and the junction of a lateral edge and a fresh break creates an effective graving tool. A newly-manufactured graving artifact of this type was first studied beneath the microscope for comparison, and then vigorously used on bone for a period of ten minutes. Miscoscopic examination revealed a "rounding-off" of the once sharp graving edge, but little wear polish was observed. All examples described as graving tools based on a break exhibit considerably more evidence of use. By retouching a lateral edge prior to snapping the microblade, the graving edge is rendered wider and is probably less susceptible to crushing. There may be a relationship between thickness of microblades and the incidence of the break/retouch form of graver, with thinner microblades more frequently manifesting edge retouch. Such a relationship has not yet been demonstrated statistically, however.

Although most of the breaks are perpendicular to the long axis of the microblades, there are, as mentioned previously, examples of oblique breaks. The latter form of break is most easily accomplished by twisting the microblade between the fingers. Graving edges and points created in this manner would appear to offer certain advantages over the straight breaks, and it is surprising that this technique was not more often employed.

Although it is not a large artifact class, these 130 graving tools based on microblades constitute a significant proportion (18%) of all microblades and fragments from the various Lochnore-Nesikep Locality components. No suitable hafts were recovered. The size and suspected function of these scraping and graving tools would probably necessitate an end haft of the "penholder" style, perhaps manufactured from deer antler tine, and

TABLE 33

DISTRIBUTION OF GRAVING IMPLEMENTS BASED ON DISTAL ENDS OF MICROBLADES

Group	Component					Totals
	EdRk:4 (Zone IV)	EdRk:7 (Zone I)	EdRk:7 (Zone II)	EdRk:8 (Zone II)	EdRk:9 (Zone III)	
1	2	3		23	2	30
2		2	1	8	4	15
3		1		9	2	12
4				6	2	8
Totals	2	6	1	46	10	65

TABLE 34

DISTRIBUTION OF GRAVING TOOLS BASED ON DISTALLY SQUARED MICROBLADES

	Component					Total
	EdRk:4 (Zone IV)	EdRk:7 (Zone I)	EdRk:7 (Zone II)	EdRk:8 (Zone II)	EdRk:9 (Zone III)	
Number	2	7	4	43	9	65

PLATE XVIII

Microblade Cores and Microblade-based Artifacts

a Microblade core viewing fluted surface; EdRk:8, Zone II

b Burin blow modified Group 2 graver. See Plate XVII, a:b
(magnification = 6.5 times linear)

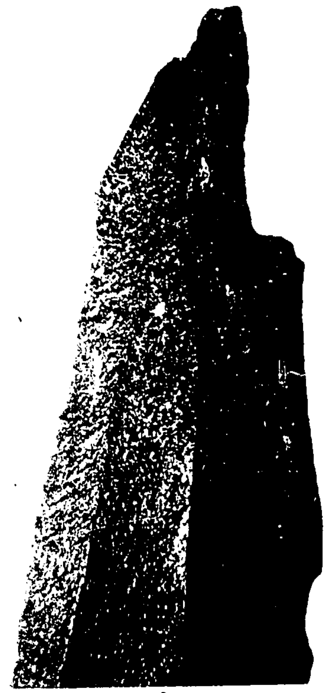
c Graving tip of (b) (magnification = 20 times linear)

d Distal end of Group 1 graver. See Plate XVII, a:a
(magnification = 20 times linear)

e Modified hafted scraper used as graving tool. See Plate XIX:g
(magnification = 5 times linear)

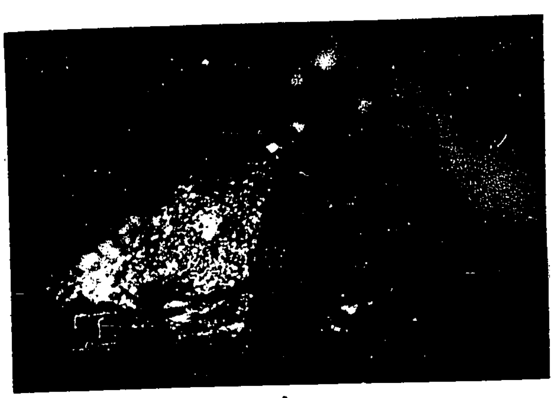
PLATE XVIII

a

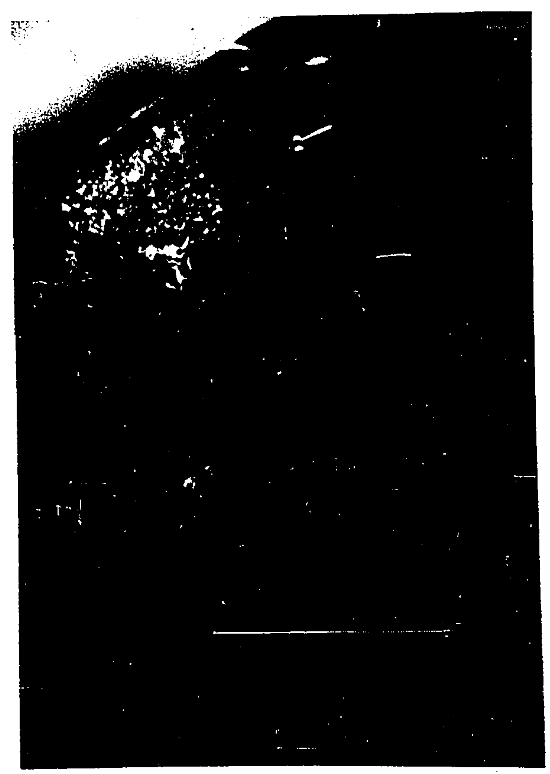


b

c



d



e

somewhat similar to the carved antler haft from the McPhee site (EdRk:6) (Plate XXVI: e). Alternately, these microblade-based artifacts might have been hand-held, although firm pressure on the sharp edge opposite the graving tool is difficult and painful to maintain. Only 11 microblades could be described as "backed" by extensive flaking on the edge opposite the graving point.

Other implements based on microblades include four microblades which have been notched on one edge by unifacial retouch. Microscopic examination reveals wear in the concavities. Finally, the narrow leaf-shaped points described under Group 2 projectile points <u>may</u> have been based upon microblades, although retouching has so altered the basic form that the distinctive microblade attributes are no longer visible.

<u>Concluding Statements</u> Microblades have been considered separately from microblade cores in this section, and it now remains to integrate the discussions. There can be no doubt that the microblades have been detached from the cores, and that the cores were primarily designed as nuclei and not as any other artifact, such as steeply-flaked end scrapers for example. All the attributes exhibited on the core edge, such as battering and grinding, are present on the proximal ends of all microblades in the Lochnore-Nesikep Locality.

One of the peculiarities of the microblade and core complex in the northwest portion of the New World is the ratio of microblades to associated cores. Controlled excavations in the Lehman site netted 444 microblades, including both complete and fragmentary specimens, but only 9 cores and fragments were recovered. The ratio of microblades to cores is approximately 50:1. Noting a somewhat similar proportion of microblades to cores in the Denbigh Flint Complex of the Iyatayet site (2 complete plus 7 fragments of cores to 379 microblades), Giddings (1964:204) suggests that exhausted cores were reworked to economize on valuable raw materials. While this may offer a partial explanation for the Denbigh microblade to core ratio, it does little to elucidate the Lehman site situation, where an ample source of raw material was close at hand. Examination of the Lehman site cores indicates that the average number of flutes per core is 4.8. If the excavated cores accounted for the 444 microblades, each core would presumably have had 10 rows or banks of microblades removed before the core was considered exhausted. Only 20% of the Lehman component microblades are complete, however, suggesting that the ratio of 50 microblades to 1 core is too high. By taking into account only complete microblades and proximal fragments (corrected microblade sample), the total is 323 microblades, which gives a ratio of about 36 microblades per core. The ratio of complete and proximally intact microblades to cores in the Pine Mountain microblade assemblage is 33 microblades per core with 66 microblades and 2 cores. Thus for the two largest Lochnore-Nesikep Locality microblade components, there is a close correspondence in the corrected ratio of microblades to cores (approximately 35 microblades per core).

A comparison of the microblade dimensions and core flutes indicates that most of the cores are exhausted and reduced in size. The mean width of flutes on 41 Lehman site cores is only 3.71mm compared with a mean width of 6.2mm for the complete microblades. Comparisons of lengths of complete microblades with lengths of core flutes suggest that the cores lose little in height, (no core rejuvenation tablets were found) and that the first blades to be detached would be about as long as some of the later specimens. Maximum flute lengths on the Lehman Site cores range from 18mm to 35mm, the latter figure being the upper length limit of the Lehman site microblades. Thus the microblade lengths remains fairly constant throughout the life of the core, but the width of the blades lessens considerably from the mean of 6.2mm for recovered microblades to a mean flute width of 3.7mm on the cores. Even assuming that some of the smallest blades were undetected in excavation, and that the narrowest flutes do not represent blade scars, but rather intersecting scars, the fact remains that there are few flutes on the cores capable of having produced a microblade of 6.2mm in width, and none capable of matching the upper 10 percentile of Lehman site microblade widths. The cores may have been discarded because the microblades became too narrow, or because the reduced core size lowered the manufacturer's efficiency. Exhausted cores were probably not re-worked into other implements, nor were they utilized unmodified for any other function. Finally, it appears that only a percentage (perhaps 50%) of the microblades removed from the cores were actually useful to the manufacturer. Slight microblades were infrequently utilized and may have constituted detritus in the microblade technique.

In order to determine whether or not microblade core edge angle could be determined from microblades, an examination was made of proximal ends of all Lehman site microblades. Microblades were arranged by excavation levels, examined under magnification, and sorted into two groups; (1) microblades in which the angle formed by the striking platform and the dorsal surface was 80 degrees or over, and (2) microblades in which the angle was less than 80 degrees. The results, tabulated in Table 35, indicate an almost constant ratio of "over 80 degree" (60%) to "less than 80 degree" (40%) examples, with little change throughout the three excavation units. A comparison of the incidence of "over 80 degrees" microblades with the number of cores of the same type (group 1), indicates the following remarkable correspondence:

Percent of microblades in the Lehman site with angle over 80° - 59.4%

Percent of cores in the Lehman site with angle over 80° - 59.5%

TABLE 35

DISTRIBUTION OF STRIKING PLATFORM ANGLES OF LEHMAN SITE MICROBLADES - BY LEVEL

Level	80 to 90 Degrees		Less than 80 Degrees		Totals	
	Number	Percent	Number	Percent	No.	Percent
Zone I (ploughzone)	58	61.0	37	39.0	95	100.0
Zone II, Level 1	27	58.6	19	41.4	46	100.0
Zone II, Level 2	66	58.4	47	41.6	113	100.0
Totals	151	59.4	103	40.6	254	100.0

Following the test described above the index of core edge curvature was examined for group 1 and group 2 cores. Initially it was thought that group 1 cores might display a significantly higher index of curvature and a more rounded core edge, thereby resulting in thicker microblades. Comparisons of core curvature indices between both groups indicate no significant differences, and a plot of core edge angle vrs index of curvature of individual cores also indicates no definite tendency. Microblades from group 1 cores, therefore, should be no thicker than those drawn from group 2 cores. In order to test for possible functional advantages between microblades thought to have been struck off group 1 and group 2 cores, 65 microblade artifacts were examined. Out of a total of 29 with proximal ends intact, 55% could be assigned to group 1 cores and 45% to group 2 on the basis of the striking platform angle. This proportion is comparable to that for the entire Lehman site microblade collection, where the percentages were 59.4% and 40.6% for group 1 and group 2 cores respectively. Thus it may be concluded, on the basis of this limited test, that microblades derived from group 1 cores are not obviously superior to those detached from group 2 cores. A more thorough test, which was not undertaken for reasons of time and uncertainty of function, would be to compare all laterally retouched microblades with the striking platform angle. Another possible approach to the problem would be to consider the advantages of one core type over another from the point-of-view of ease of core preparation, ease of microblade detachment, or greater predictability of microblade form.

The preliminary results of microblade and microblade core analysis suggest that it may be possible to reconstruct a number of diagnostic core attributes given a sample of microblades. This could be especially valuable where sample sizes are small, and where microblades far outnumber cores.

Microscopic examination of striking platforms can indicate core edge preparation, core edge angle, and perhaps something of core edge curvature. Length of complete microblades is probably a good reflection of core height, as microblades appear to become narrower, but not necessarily shorter with core exhaustion. In assemblages where microblades cores are not present, but where occasional parallel-sided flakes are found, a microscopic examination of the blade striking platform should readily differentiate between parallel-sided flakes fortuitously resembling microblades, and products of a prepared microblade and core technology. The battering and grinding of the core edge in order to prepare the striking platform, which is naturally reflected on the proximal end of the microblades, should perhaps be added as a criterion for microblade identification.

In conclusion, it should be noted that thorough microblade examination must be aided with a magnifying glass and sometimes with a microscope. Microblades modified to form scraping and graving tools can only be effectively examined under magnification, as can the region around the striking platform, which is probably the most important diagnostic portion of the microblade. The photographs used to illustrate the descriptions of microblades and implements based on microblade preforms were taken through a Wild M4 microscope using a single lens reflex camera and direct lighting, with a polarizing filter used at light source to control unwanted reflections.

Hafted Scrapers

In an earlier paper reference was made to, "carefully flaked, thin discoids with narrow side notches" (Sanger 1966:10) which I called hafted end scrapers. I also indicated that this type of artifact was confined to the Lehman site. Since the writing of that interim report, however, a more thorough examination of the Lochnore Creek site collection has revealed two more hafted scrapers, one from Housepit 2, in Zone I, and the other from a mixed stratum between Zone I and Zone II at the eastern end of the site. The total number of hafted end scrapers from both sites is 38, with 36 presumed to have derived from Zone II of the Lehman site. Our excavations recovered some examples from that Zone, and the collection donated by Mr. Lehman is typified by the presence of the yellow deposit found on all artifacts from Zone II.

Hafted scrapers are a heavy-duty tool subject to extensive use and hence damage. Of the 38 specimens examined only 6 are intact with the remainder broken, generally around the notches where the greatest strain would be expected. The scrapers are bifacially notched from each edge, usually in the lower one-quarter of the implement, although the notches may be as high as half the way up the edges. The notches are well-made, deep, and ground smooth. Grinding, following basal thinning, is extreme on the base (proximal end of the artifact) and up to the region of notching on all specimens. Convex bases outnumber straight bases 2:1 (25 and 13 specimens respectively). The distal portion of the artifact varies from concave to pointed.

Hafted scrapers are divided into two groups on the basis of notching.

<u>Group 1</u> Plate XIX: a-f

The 20 scrapers in this group are side-notched obliquely with the notch slanting upwards towards the distal or business end of the implement. The upper edge of the notch is taken as the determining edge.

<u>Group 2</u> Plate XIX: g-k

The 18 hafted scrapers in this group are, on the average, wider and thicker than the group 1 counterparts, with wider necks (distance between notches) and wider notches. The narrower oblique notches on group 1 specimens tend to be chipped more deeply into the artifact, however. Measurements are summarized in tables 36 and 37.

The functional identification as scrapers is based both upon examination of the distal end and the overall form of the six complete specimens. In addition, the nature of the fracture on the fragmentary examples gives some hint as to the mode of employment. Four of the complete scrapers have a straight to concave working edge located at the distal end of the artifact. Of these, three specimens can only be examined in photographs taken of Mr. Lehman's collection, but the fourth has a unifacially-worked concave business end with wear polish and small spalls removed from one face only - the surface indicating retouch. The configuration of the retouched surface and the reconstructed method of employment suggests a scraping action such as the shaping of wooden shafts. Examination of the 32 fragmentary scrapers indicates a high percentage of transverse hinge fractures resulting, presumably, from pressure applied to one of the artifact faces, and perpendicular to the longitudinal axis of the artifact.

Following a fracture, three of the scrapers appear to have been used as graving tools. On specimen EdRk:8-1077 there is wear polish on the sharp edges formed by the intersection of a transverse hinge fracture and a vertical break. Two other broken scrapers seem to have been intentionally modified to produce graving tools by blows delivered in a burin fashion from the distal tip intersecting with diagonal hinge fractures, and producing sharp chisel-like edges (EdRk:8-1048 and 1046; Plate XIX: e,f). Microscopic examination reveals considerable use. Another intentionally reworked graving tool (EdRk:8-1079; Plate XIX: g) also features a burin-like

TABLE 36

DIMENSIONS OF GROUP 1 HAFTED SCRAPERS

Attribute	Number	Range	Mean	Mode	s.d.
Length (mm)	0	--	--	--	--
Width (mm)	14	19-31	24.6	23.4	4.1
Thickness (mm)	18	3-6	3.7	--	1.0
Neck Width (mm)	14	13-22	16.6	19.3	3.2
Notch Width (mm)	19	2-3	2.4	--	--
Notch Depth (mm)	19	5-9	6.6	7.8	1.7

Total Number: 20

TABLE 37

DIMENSIONS OF GROUP 2 HAFTED SCRAPERS

Attribute	Number	Range	Mean	Mode	s.d.
Length (mm)	6	25-40	30.8	--	--
Width (mm)	14	20-35	28.5	25.5	4.9
Thickness (mm)	13	3-6	5.0	3.5	1.0
Neck Width (mm)	17	9-25	19.3	--	4.1
Notch Width (mm)	12	4-7	5.0	5.0	1.0
Notch Depth (mm)	14	3-7	4.9	4.7	1.0

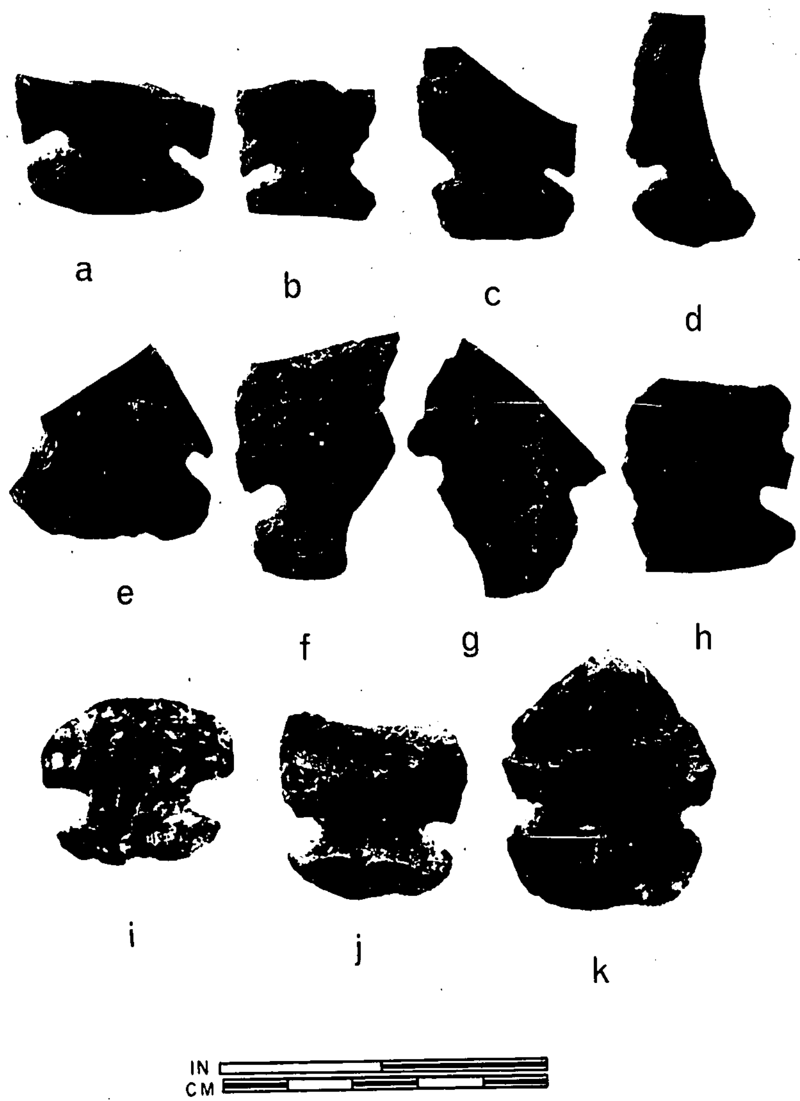
Total Number: 18

PLATE XIX

Hafted Scrapers from the Lehman site, Zone II

a-d	Group 1
e-f	Group 1 modified by burin blows
g	Group 2 midified by burin blows (see Plate XVII:e for closeup)
h	Group 2; distal end complete
i-k	Group 2; complete specimens

PLATE XIX



blow intersecting a diagonal hinge fracture. Wear is extensive over the entire chisel edge (Plate XVIII: e). A single scraper indicates use along one edge of a transverse hinge fracture.

These implements were undoubtedly end-hafted in a haft similar to that employed for projectile points. The extensive grinding along the basal edges and inside the notches probably functioned to protect lashings and haft from the severe abrasion which would result from vigorous scraping and gouging actions. The oblique notching, found on group 1 scrapers, may represent an attempt to present a greater area for lashing, perhaps resulting in more stability within the haft.

Chipped Bifaces

Commonly called "knives", these small bifaces are implements whose working edges are formed primarily by bifacial retouch. They are described under two main headings: formed bifaces and non-formed bifaces.

Formed Bifaces manifest what is considered to be a deliberate attempt on the part of the tool manufacturer to achieve a pre-conceived form. In addition to artifacts which probably functioned as cutting and scraping implements, the formed biface category also includes projectile point fragments, such as tips, isolated medial fragments, and bases of leaf-shaped points. Distributional data and measurements are contained in tables 38 and 39.

Group 1 Elliptical bifaces, Plate XX: a-c

Number: 12

This group is comprised of well-made, medium-sized bifaces of a general leaf-shape, with the widest portion in the lower one-third of the artifact. The thinned but unground bases range from slightly convex to almost pointed.

Tips are not as pointed as those of projectile points, but on three of the four complete specimens the tips illustrate uneven wear polish. The primary area of use, however, appears to have been the blade edges.

Group 2 Asymmetrically hafted bifaces, Plate XX: d, e

Number: 7

This group is characterized by stems which are oblique to the blade portions of the artifacts. Two specimens indicate use across a straight distal edge, while the distal ends of the other five are missing. All exhibit signs of use on the edges above the shoulders, however. Four specimens have grinding on the basal and lateral edges of the stem.

Group 3 Triangular bifaces, Plate XX: f-i

Number: 17

The specimens in this group are characterized by a general triangular outline with the widest portion at or near the base. Most bases indicate thinning and a few are ground smooth in addition. True notching in the form of pronounced concavities is absent, although on some specimens there is a tendency for the edges to constrict slightly above the base, presumably to facilitate hafting. Blade edges vary from straight to convex and many are asymmetric.

Group 4 Pentagonal bifaces, Plate XX: j

Number: 4

This small group of bifaces is made up of pointed artifacts which are five-sided or pentagonal in outline. In all examples the widest portion of the biface is at the shoulders, with the lateral edges of the base tapering gradually to a straight base. The illustrated example (Plate XX: j) exhibits evidence of use on both edges of the sharply tapering blade, and also on the blade tip.

Group 5 Leaf-shaped bifaces, Plate XX: m, n

Number: 4

This group includes bifaces whose maximum width is situated in the middle third of the artifact. Too crude to be convincingly classified as projectile points, these objects generally exhibit a minimum of retouch, usually confined to the edges.

Group 6 End notched bifaces, Figure 13: d, e

Number: 6

These bifaces range in outline from oval to leaf-shaped, but have in common shallow notches chipped into one or both extremities. Rather than functioning in a hafting capacity, these small notches may have been designed for a suspension thong attachment.

Group 7 Projectile point tips and bases

Number: 146

This group of artifacts includes sharp tips of projectile points or other similarly formed bifaces, and what are assumed to be bases of leaf-shaped points. No attempt has been made to segregate tips from bases, as there is a complete gradation from very pointed to very rounded forms. The spread of measurements is also considerable and, as the group is considered to be comprised wholly of fragmentary specimens, dimensions are not given.

Group 8 Projectile point medial segments, Plate XX: k

Number: 47

Like group 7 above, these are fragments of projectile points or other bifaces with a wide range in size. Of particular interest in this group is the presence of serrated medial sections of what are assumed to be group 3 and 4 projectile points (Plate XX: k).

<u>Miscellaneous Formed Bifaces</u> From Zone III of the Lochnore Creek site was recovered a very finely made pointed biface with a straight cutting edge (Plate XX: p). One edge of the artifact is straight and joins with the base at a right angle. The other edge also forms a right angle with the base but halfway up the edge it is chipped diagonally to meet with the longer edge, thus creating a four-sided implement. Long shallow flake scars cover both faces of this artifact. The base is not ground. A section of a base, recovered from the same component, may be a fragment of a similar object. Length: 55mm; Width: 25mm; Thickness: 5mm.

Two bipoints, each with four sides, may have functioned as perforators. One specimen from EdRk:5-Zone II (Plate XX: q) exhibits wear polish over both faces of the narrower end of the artifact. A second object of this form from EdRk:7-Zone I, is considerably cruder and may be unfinished.
EdRk:5-66; Length: 66mm; Width: 27mm; Thickness: 9mm.
EdRk:7-2370; Length: 52mm; Width: 23mm; Thickness: 11mm.

Associated with the cache from Zone VII at the Nesikep Creek site was a large pointed biface shaped by very broad, flat flakes over the entire surface (Plate XX: s). Basically triangular in outline, with the widest portion at the base, the lateral edges are ground for almost half of the artifact's length, with heavy polishing (wear polish?) extending the entire length of one edge. The base is unground with a portion of the striking platform remaining.
Length: 130mm; Width: 45mm; Thickness: maximum 10mm, average about 7mm.

TABLE 38

DIMENSIONS OF FORMED BIFACES

— BY GROUP

Group	Attribute (mm)	Number	Range	Mean	Mode	s.d.
1	Length	4	43-62	51.0	--	--
	Width	11	28-41	33.7	36.1	5.1
	Thickness	12	6-13	8.0	6.5	2.0
2	Length	2	36-39	37.5	--	--
	Width	6	22-27	25.0	--	--
	Thickness	7	5-6	5.7	--	--
	Neck Width	7	13-18	15.1	--	--
3	Length	15	25-53	39.5	38.4	8.0
	Width	17	14-33	20.2	--	5.0
	Thickness	17	3-9	5.4	7.2	1.7
4	Length	4	48-62	51.5	--	--
	Width	4	28-38	32.5	--	--
	Thickness	1	--	6.0	--	--
5	Length	4	40-67	53.0	--	--
	Width	4	22-37	27.5	--	--
	Thickness	4	5-8	6.0	--	--
6	Length	6	54-88	68.3	--	--
	Width	6	20-36	27.0	--	--

TABLE 39

DISTRIBUTION OF FORMED BIFACES -

BY GROUP

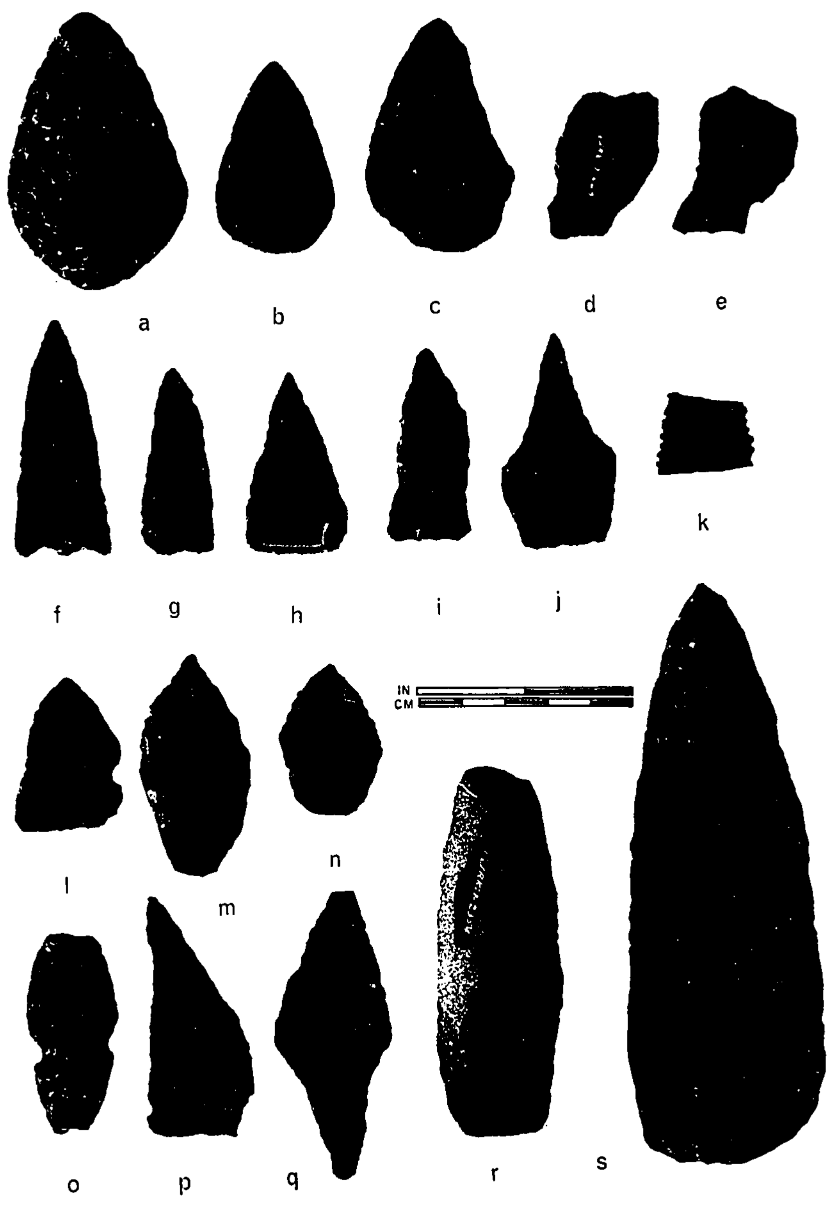
Group	Component																	Totals
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone I	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	
1										6		6						12
2										4		1		1	1			7
3		2			2			2		5		1		3	2			17
4	3							1										4
5				1						2		1						4
6	6																	6
7	3		2		1	1		2	2	94		20	3	5	6	6	1	146
8					3		1	2		32	2	2	1	3		1		47
Misc.					2		1			2		4		1				10
Totals	12	2	2	1	8	1	2	7	2	145	2	35	4	13	9	7	1	253

PLATE XX

Formed Bifaces

a-b	Group 1	EdRk:7, Zone III
c	Group 1	EdRk:7, Zone I
d	Group 2	EdRk:7, Zone I
e	Group 2	EdRk:9, Zone I
f	Group 3	EdRk:9, Zone I
g	Group 3	EdRk:5, Zone II
h	Group 3	EdRk:7, Zone I
i	Group 3	EdRk:4, Zone V
j	Group 4	EdRk:5, Zone II
k	Group 8	EdRk:8, Zone II
l	Miscellaneous	EdRk:8, Zone II
m	Group 5	EdRk:7, Zone I
n	Group 5	EdRk:7, Zone III
o	Miscellaneous	EdRk:7, Zone III
p	Miscellaneous	EdRk:7, Zone III
q	Miscellaneous	EdRk:5, Zone II
r	Miscellaneous	EdRk:7, Zone I
s	Miscellaneous	EdRk:4, Zone VII

PLATE XX



Also from Zone VII is a very thin triangular artifact with bifacial edge retouch but only unifacial flaking over the artifact faces.

Length: 35mm; Width: 25mm; Thickness: 5mm.

A side-notched, leaf-shaped biface with a broken base and tip was recovered from Zone III of the Lochnore Creek site (Plate XX: o). The notches, which are located just off the centre of the artifact, are chipped unifacially but from opposite faces. There is wear polish along the length of both edges, although the notches themselves are not ground.

Length: 45mm+; Width: 21mm; Thickness: 6mm.

In the ploughzone of the Lehman site was found a small triangular biface notched bifacially but on one edge only. It is impossible to state a precise provenience, but the presence of yellow precipitate suggests that the artifact is of Zone II origin. Wear polish occurs on both edges above the position of the notch, and is most pronounced on the notched edge. There is a limited amount of grinding on the base (Plate XX: 1).

Length: 35mm; Width: 25mm; Thickness: 6mm.

A long sturdy rectangular biface from Zone I of the Lochnore Creek site is blunted at both extremities, presumably by extensive use. One end of the object has been chipped unifacially to achieve an asymmetrically beveled edge. On the opposite face (at the same end) there is wear polish extending along flakes scar ridges for more than 20mm. The other extremity appears to have been battered. The configuration of the asymmetrically beveled edge and the unifacial wear polish suggest that this object may have functioned as a chisel (Plate XX: r).

Length: 83mm; Width: 29mm; Thickness: 15mm.

A small, four-sided, pointed biface came from Zone III deposit of the Lochnore Creek site (Plate XX: n). Grinding appears on the two edges assumed to be the basal portion.

Length: 34mm; Width: 24mm; Thickness: 8mm.

Non-formed bifaces Unlike the formed biface class, these implements appear to reflect little deliberate shaping, the general outline of most pieces being essentially amorphous. Artifacts in the non-formed class are divided into groups based upon the nature of the retouched edge or edges. Many of the pieces are fragments of larger artifacts and specific measurements have little meaning. There are some examples almost 70mm and others 10mm in length, with the majority of the specimens in the 20 to 40mm range. Of the 291 bifaces in this class, less than 8% are manufactured from non-basaltic materials. Distribution according to components and groups is presented in Table 40.

Group 1 Single edge, concave

Number of Specimens: 10

Group 2 Single edge, straight

Number of Specimens: 94

Group 3 Single edge, convex

Number of Specimens: 45

Group 4 More than one edge, straight-straight (continuous)

Number of Specimens: 62

Group 5 More than one edge, straight-concave (continuous)

Number of Specimens: 8

Group 6 More than one edge, straight-convex (continuous)

Number of Specimens: 31

TABLE 40

DISTRIBUTION OF NON-FORMED BIFACES -

BY GROUP

Group	Component															Totals
	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone I	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7, Zone III	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	
1								1	7		1			1		10
2		7		7	5		5		45	1	12	3	2	6	1	94
3		1	1	2	1			2	24		7	2	2	3		45
4		1		8	1		3		26		9	8	1	5		62
5				1	1				3		1	2				8
6				2			3		16		6	3		1		31
7		1		1	1				4		2	1	1	1		12
8												2				2
9				3			1	2	16		3			1	1	27
Totals		10	1	24	9		12	5	141	1	41	21	6	18	2	291

Group 7 More than one edge, convex-convex (continuous)

Number of Specimens: 12

Group 8 More than one edge, convex-concave (continuous)

Number of Specimens: 2

Group 9 More than one edge, variable (continuous)

Number of Specimens: 27

Artifacts in this group display continuously worked edges which vary from concave to convex, frequently around all edges of the specimen.

Unifaces

This section describes small unifacially-chipped implements excluding large unifaces such as cobble choppers. Most of the small unifaces discussed here were probably hafted or held in the hand and used for scraping and cutting operations of a type requiring considerable control.

Formed unifaces Like the formed biface class, this group of artifacts comprises pieces which exhibit well-defined outlines, reflecting, presumably, deliberate shaping on the part of the manufacturer. Dimensions and distributions are given in tables 41 and 42.

Group 1 Round to oval unifaces, Plate XXI: a, b

Number of Specimens: 24

These are round to oval and retouched all around the edge. The retouch flaking at the edges is very steep, usually forming a 60-90 degree angle with the ventral surface of the artifact. Cross sections are thin due to extensive flaking over the dorsal surface. Most specimens could have been hand held and probably functioned in hide working. Length and width are computed taking the greatest measurement on each axis. The thickness dimension is a maximum one. The height of the working edge is measured where the greatest concentration of wear is observed, and is usually a measure of the height of the retouching flakes. All examples are of basalt.

Group 2 Round to oval; broken or discontinuously flaked unifaces

Number of Specimens: 58, Plate XXI: c, d

The convex working edges of this group are similar to those described for group 1 above. Cross sections tend to be less symmetrical and frequently thicker, as the proximal end is often untrimmed. Length is measured with the working edge (as determined through examination of wear polish) considered one extremity (distal). The width is taken perpendicular to this axis. The angle between the retouched edge and the ventral surface of the flake is usually more acute than group 1 specimens, with proportionately fewer 90 degree angles recorded. All but two examples are of basalt.

Group 3 Stemmed or tanged unifaces, Plate XXI: e, f

Number of Specimens: 29

These unifaces exhibit convex working edges similar to those specimens in groups 1 and 2. Some examples indicate heavy wear polish suggesting, perhaps, more prolonged or more rigorous use. The characteristic attribute of this group, however, is the presence of a stem or tang, presumably for hafting. The stem is usually contracting, and in some examples carefully finished. These unifaces are thin in cross section with the dorsal surface trimmed. All but two examples are made of basalt.

Group 4 Round to oval-thick unifaces, Plate XXI: g, h

Number of Specimens: 21

The artifacts in this group are thicker and generally cruder than those of groups 1-3. Many of the unifaces in this group may have been cores prior to eventual modification. All examples feature a convex working edge, and a few also exhibit straight and concave edges. Three examples are of non-basaltic materials.

Group 5 Concave-edged, thick plano-convex unifaces, Plate XXI: i, j, k

Number of Specimens: 3

Previously described as, "plano-convex, concave end scrapers" (Sanger 1966: 18), these highly distinctive artifacts are triangular in outline with the maximum width at the distal end. In longitudinal section they are plano-convex, while in transverse section they are plano-triangular. All three are made of non-basaltic materials, being manufactured from cryptocrystal-lines of an unusual variety in the Lochnore-Nesikep Locality sequence. On all specimens the ventral surface is entirely unmodified. The distal edge (working edge) of each artifact is steeply flaked and crescent-shaped (concave). Grinding appears on the lateral edges of one specimen, but not on the others.

Group 6 Straight-edged unifaces, Plate XXI: l, m

Number of Specimens: 17

This group is made up of unifaces with at least one straight retouched lateral edge. The specimens vary considerably in outline ranging from parallel-sided to almost triangular examples. Steepness of retouch also varies, but generally the angle is very acute, being 45 degrees or less. Five of the artifacts are made of cryptocrystallines.

Group 7 Concave-sided unifaces, Plate XXI: o, p, q

Number of Specimens: 5

Of the 5 specimens in this group 4 are of cryptocrystallines. Many could be described as crescents, as they exhibit one concave edge and one convex edge meeting at a point. The opposite extremity, apparently the proximal or hafted end, is rounded, and sometimes laterally ground. Two of the larger examples, and one small, are illustrated in Plate XXI.

Group 8 Small triangular unifaces, Plate XXI: r

Number of Specimens: 3

These three small pieces are essentially isosceles triangles retouched around all edges. Two are characterized by acute angle retouch while the third artifact manifests considerably steeper retouch. Equilateral edges average 17mm in length.

Group 9 Pointed unifaces, Plate XXI: t

Number of Specimens: 13

This group includes unifacially retouched pointed objects and tips of pointed artifacts. Few are complete and no dimensions are given. One complete example (EdRk:8-246) (Plate XXI: t) is bi-pointed with the maximum width in the central portion of the artifact. It seems likely that this piece functioned as a perforator; Length 54mm; Width: 20mm; Thickness: 9mm. All group 9 unifaces are of basalt.

Miscellaneous Formed Unifaces From Zone III of the Lochnore Creek site (EdRk:7-2021, 2022, 2005; Plate XXI: u) a long basalt macroblade, drawn from a prepared blade core, was recovered in three pieces. The proximal end of the blade exhibits the characteristic battering noted on the microblades described earlier in this report. The blade is triangular in transverse section and it is evident that two blades of equal length were previously detached. Judging from the angle formed by the striking platform and the plane of the blade's dorsal surface, the blade was removed from a core with a core edge angle of approximately 60°. The blade is dorsally retouched continuously along one edge, around the distal end, and intermittently along the other lateral edge. Some limited ventral retouch is also present. The most extensive wear polish is located around the distal extremity. Length: 87mm; Width: 20mm; Thickness: 5mm.

A rectangular basalt uniface with a single basal notch comes from Zone III of the Lochnore Creek site (EdRk:7-2458; Plate XXI: v). Although it is carefully retouched along all edges, wear polish is distributed along one lateral edge, especially at the junction of the lateral and the distal transverse edges. The notch, which is positioned midway along the proximal edge, is formed by unifacial chipping. Length: 52mm; Width: 25mm; Thickness: 6mm; Width of Notch: 4mm.

A second notched basalt uniface is also from Zone III of the Lochnore Creek site (EdRk:7-2363; Plate XXI: w). This is a fragmentary specimen with what appears to be the basal portion remaining. The notch is chipped unifacially into a lateral edge with no suggestion of a notch on the opposite lateral edge. Heavy wear polish is present only on the notched edge. Length: 36+mm; Width: 25mm; Thickness: 9mm; Width of Notch: 2.5mm.

From Zone I of the Lochnore Creek site (EdRk:7-1161) is a cryptocrystalline uniface very similar to group 3 tanged unifaces in basic configuration, but with a working edge height that far exceeds the upper limits of the unifaces in that group. Wear polish is present along the slightly convex distal extremity, and the tapering basal portion is ground

TABLE 41

DIMENSIONS OF FORMED UNIFACES

- BY GROUP

Group	Attributes (mm)	Number	Range	Mean	Mode	s.d.
1	Length	24	20-43	32.0	33.5	5.9
	Width	24	18-36	26.0	29.0	5.1
	Thickness	24	3-8	5.1	6.3	1.4
	Height Edge	24	1.5-5.5	3.4	3.7	1.4
2	Length	58	14-43	26.6	32.3	8.4
	Width	58	17-39	27.7	28.7	5.4
	Thickness	58	2-11	5.6	8.3	2.1
	Height Edge	58	1.0-6.6	3.2	5.0	1.4
3	Length	29	29-59	40.9	50.0	7.9
	Width	29	16-42	26.6	33.8	6.0
	Thickness	29	3-10	5.7	8.1	1.9
	Height Edge	29	1.5-5.1	3.2	3.2	1.2
4	Length	21	17-58	35.1	42.3	9.9
	Width	21	22-47	34.9	33.3	7.3
	Thickness	21	9-22	12.2	--	--
5	Length	3	23-31	27.0	--	--
	Width	3	19-21	20.3	--	--
	Thickness	3	8-10	8.6	--	--
6	Length	17	32-65	44.6	56.2	8.7
	Width	17	18-36	25.8	29.4	5.0
	Thickness	17	3-11	5.8	--	2.5
7	Length	5	22-41	32.4	--	--
	Width	5	10-21	14.8	--	--
	Thickness	5	3-5	4.2	--	--

TABLE 42

DISTRIBUTION OF FORMED UNIFACES -

BY GROUP

Group	Component																	
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone I	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	Totals
1					4	7				5		5		3				24
2				1	8	2		2		19	2	9		12		3		58
3		1		1	2	5		1		7		6		5		1		29
4				1	1	2		1		9		4		2	1			21
5					1							2						3
6				2	1	2				6		5		1				17
7								1				1			1	2		5
8								1		1					1			3
9					2					5	1	3		1		1		13
Misc.						1				1		5						7
Totals		1		5	19	19		6		53	3	40		24	3	7		180

PLATE XXI

Formed Unifaces

a	Group 1	EdRk:7, Zone I
b	Group 1	EdRk:4, Zone VII
c	Group 2	EdRk:4, Zone V
d	Group 2	EdRk:8, Zone II
e-f	Group 3	EdRk:7, Zone III
g	Group 4	EdRk:8, Zone II
h	Group 4	EdRk:4, Zone VII
i	Group 5	EdRk:7, Zone III
j	Group 5	EdRk:4, Zone V
k	Group 5	EdRk:7, Zone III
l	Group 6	EdRk:7, Zone III
m	Group 6	EdRk:4, Zone VII
n	Miscellaneous	EdRk:4, Zone VII
o	Group 7	EdRk:5, Zone II
p	Group 7	EdRk:9, Zone III
q	Group 7	EdRk:7, Zone III
r	Group 8	EdRk:7, Zone I
s	Miscellaneous	EdRk:7, Zone III
t	Group 9	EdRk:8, Zone II
u-x	Miscellaneous	EdRk:7, Zone III

PLATE XXI

smooth. Length: 37mm; Width: 25mm; Thickness: 9mm; Height of Edge: 8.5mm.

Associated with the Zone VII cache at the Mesikep Creek site (EdRk:4-956; Plate XXI: w) was a flat triangular cryptocrystalline uniface. Generally reminiscent of the concave edged group 5 unifaces, it lacks the distinctive thick cross section associated with that group, and tapers more rapidly back to the pointed proximal end. Length: 33mm; Width: 25mm; Thickness: 4mm.

Two basalt unifaces from Zone III of the Lochnore Creek site manifest roughly crescentic outlines. Both are retouched around all edges, and both exhibit greatest use along the short, slightly convex transverse edge.

EdRk:7-2803 (Plate XXI: s) Length: 49mm; Width: 28mm; Thickness: 8mm.
EdRk:7-1807 (Plate XXI: x) Length: 69mm; Width: 31mm; Thickness: 5mm.

Non-formed unifaces include pieces which manifest little or no deliberate shaping. Commonly designated "flake scrapers", most are based on small amorphous flakes, and many are undoubtedly fragmentary. The 2,370 non-formed unifaces were first separated into 6 lots employing the type and location of retouched edge(s) as the sorting determinant. These lots, together with the number of specimens in each, are as follows:

Retouch along a single lateral edge................	556
Retouch along a single transverse edge............	592
Continuous retouch along more than 1 edge.........	398
Non-continuous retouch along more than 1 edge.....	260
Reversed retouch on opposite surfaces.............	329
Miscellaneous......................................	235
Total..................	2,370

The lateral edges refer to the long edges of a flake while the transverse edges are the shorter ones. On long narrow specimens the distinction is clear, but as the edges become more equilateral the differences between lateral and transverse edges is not so apparent. The more uncertain examples are placed in the miscellaneous category. Some unifaces display continuous retouch along more than one edge, such as along a transverse and along a lateral edge, while others exhibit non-continuous retouch on more than one edge. The reversed category of unifaces includes objects retouched along one edge from the ventral surface, and along another edge from the dorsal surface. Frequently the edges are non-continuous, that is to say, retouching is noted on opposite lateral or opposite transverse edges. Some examples of continuous reversed retouch are also present, but the incidence of each variation was not determined.

Following the basic sort, the five categories, excluding the miscellaneous one, were split into samples of 100 employing a quartering technique to achieve representative quotients. Each lot was then broken down into groups based upon a slightly more refined description of the shape of the retouched edge or edges. Table 43 lists the distribution of these non-formed unifaces by group and component. Due to the fragmentary nature of most of the pieces, measurements are not given. It should be emphasized that the specimens listed in this table represent a little less than 25% of the total sample of non-formed unifaces.

Group 1 Single edge transverse -- concave edge

Number of Specimens: 13

Group 2 Single edge transverse -- straight edge

Number of Specimens: 47

Group 3 Single edge transverse -- convex edge

Number of Specimens: 40

Group 4 Single edge lateral -- concave edge

Number of Specimens: 22

Group 5 Single edge transverse -- straight edge

Number of Specimens: 63

Group 6 Single edge lateral -- convex edge

Number of Specimens: 15

Group 7 Edges continuous -- concave-concave edges

Number of Specimens: 5

Group 8 Edges continuous -- convex-convex

Number of Specimens: 15

Group 9 Edges continuous -- concave-convex

Number of Specimens: 15

Group 10 Edges continuous -- concave-convex

Number of Specimens: 11

Group 11 Edges continuous -- straight-straight

Number of Specimens: 22

Group 12 Edges continuous -- straight-convex

Number of Specimens: 32

Group 13 Reversed retouch

Number of Specimens: 100

Group 14 Edges non-continuous -- straight-straight

Number of Specimens: 26

Group 15 Edges non-continuous -- straight-convex

Number of Specimens: 17

Group 16 Edges non-continuous -- straight-concave

Number of Specimens: 25

Group 17 Edges non-continuous -- concave-convex

Number of Specimens: 17

Group 18 Edges non-continuous -- concave-concave

Number of Specimens: 13

Group 19 Edges non-continuous -- convex-convex

Number of Specimens: 2

Burins

The term burin is used here to refer to objects modified by a burin blow, and with the sharp edge or tip so created manifesting signs of use. Burins are not plentiful in the Lochnore-Nesikep Locality sequence; nevertheless, the technique is known from several components. Most of the burins are based on microblade pre-forms and have already been discussed under group 1 graving implements in the microblade section of this report. Other burins were noted on broken hafted scrapers. Numerous flaked objects manifest chisel-like edges and could have functioned in a cutting and slotting capacity, but do not indicate definite evidence of burin blows. Other pieces with one or more burin blows fail, under microscopic examination, to exhibit signs of use.

In addition to the burins based on microblades and hafted scrapers, there are two artifacts from Zone I of the Lochnore Creek site which exhibit more than one burin blow together with signs of use. One burin

TABLE 43

DISTRIBUTION OF NON-FORMED UNIFACES - BY GROUP

Group	Component																Totals
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone I	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7, Zone III	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	
1					1			1		8		2	1				13
2			1		3	1				23		12	1	2	3	1	47
3						1	1	1		24		7	2	2	2		40
4			2		1			1		9		4	1	3	1		22
5			2		3	1		3		35	2	4	6	2	5		63
6					2					6	1	1	2	1	2		15
7			1							2		1		1			5
8			1		1	1				6		3	2		1		15
9					2					7		2	2		2		15
10				1	1	1				6			2				11
11					3					14		1	2		2		22
12			1		3			1		16		5	5		1		32
13			1		6			3		55	1	11	14	2	5	2	100
14			1		3	1				16		1	2		1	1	26
15					1		1	2		11			1		1		17
16					4					15		2	2		2		25
17						1				11	1	2		1	1		17
18			1							5		1	3		3		13
19					1					1							2
Totals			11	1	35	7	2	12		270	5	59	48	14	32	4	500

(EdRk:7-2081, Zone I; Plate XXIV: a) is a thick flake with at least two, and possibly three, vertical spalls removed in succession. The proximal end of the artifact (opposite the chisel edge) is thinned, presumably for hafting. There are indications of wear at the tip and on the surrounding edges. A second burin (EdRk:7-2624, Zone I) exhibits a sharp edge, apparently formed by breaks and not burin blows, which is further modified by three small burin blows. Wear polish is evident on the chisel edge. Dimensions of these two burins are as follows:

EdRk:7-2081: Length: 41mm; Width: 29mm; Thickness: 10mm; Length of burin spalls: 17.5mm; Width of burin spalls: 3.7mm.

EdRk:7-2624: Length: 25mm; Width: 21mm; Thickness: 6mm.

Gravers

These are defined as artifacts exhibiting a pronounced projection(s) in the form of a point or spur. Although this class may manifest some bifacial chipping, the graver spur is always created by unifacial retouch, and never by burin blows. Precise function is unknown; it is assumed, however, that these artifacts served as cutting and sectioning implements, employed in the manufacture of bone and antler tools. It is noteworthy that only one specimen in this small class of 17 objects derives from a component yielding microblades in any quantity, suggesting, perhaps, that these gravers represent the functional equivalents of the end-of-the-microblade implements discussed in the microblade section of this report. The gravers are divided into 2 groups delineated by the width of the graving spur and the overall thickness of the artifact. Dimensions and distributions are listed in tables 44 and 45.

Group 1 Sharply-pointed graving spurs

Number of Specimens: 11, Plate XXII: b-e

The characteristic attributes of group 1 gravers include: a sharp projecting graving spur (or spurs); unifacial retouch over the entire artifact; very thin cross sections; and every example based on a thin basalt flake pre-form. Although most specimens in this group feature one graving spur, some have two or more projections. The most complex example is a four-spurred rectangular specimen with concave edges. Two continuous edges are retouched from one face of the artifact; the remaining edges are retouched from the reverse face (Plate XXII: b).

Group 2 Rounded graving spurs

Number of Specimens: 6, Plate XXII: f-h

Artifacts in this group exhibit more rounded projections, and are generally narrower, but thicker, than specimens in group 1. Five of the six examples are manufactured from cryptocrystallines. Wear polish is evident on the graver tips and over the dorsal surface of the distal end. Despite the fact that wear polish is usually less evident on cryptocrystalline artifacts, the group 2 gravers generally exhibit considerably more polish than the group 1 specimens in basalt. When the evidence of increased wear polish is combined with the broader spurs and thicker cross sections, it appears that group 2 gravers were possibly designed for a more rigorous task, perhaps the initial sectioning or bone and antler, as opposed to more delicate finishing work on organic artifacts.

Drills and Perforators (Plate XXII: i-l)

These 8 artifacts, which are from various components, feature elongated points chipped bifacially. The wear polish pattern on 3 specimens

TABLE 44

DIMENSIONS OF GRAVERS - BY GROUP

Group	Attributes (mm)	Number	Range	Mean
1	Length	10	26-38	31.6
	Width	11	18-30	22.6
	Thickness	11	2-4	3.0
2	Length	5	34-50	40.0
	Width	5	15-23	18.2
	Thickness	5	7-9	7.4

TABLE 45

DISTRIBUTION OF GRAVERS - BY GROUP

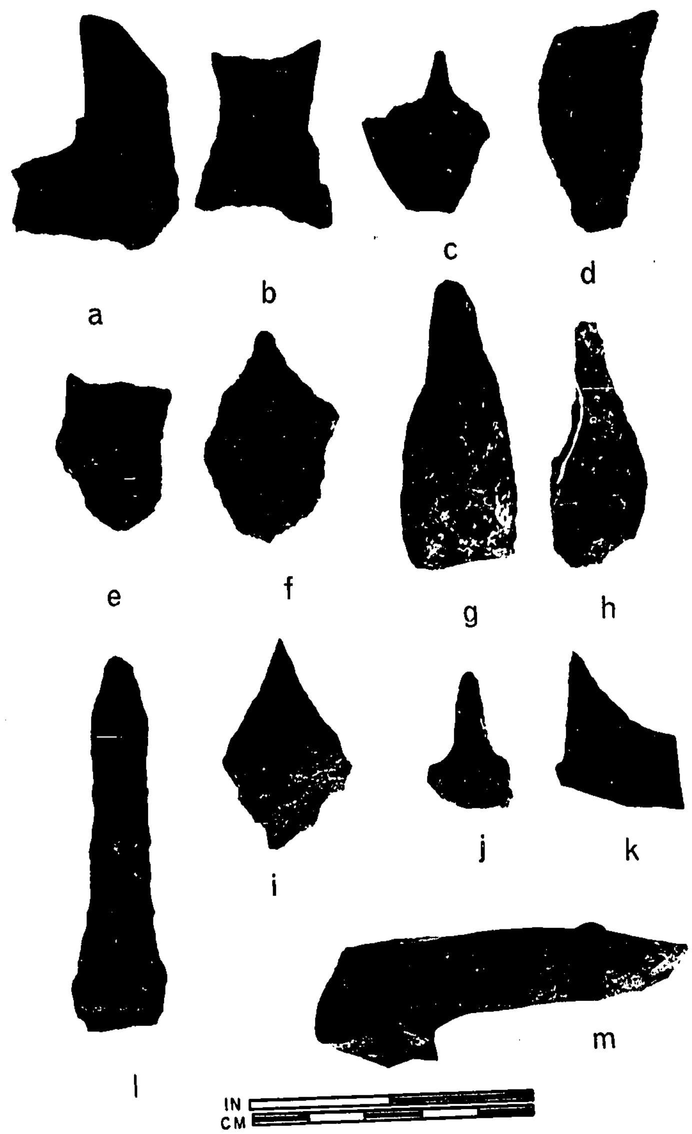
Group	Component																	
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone I	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7; Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	EdRk:10	Totals
1				1	2					4		3					1	11
2			1							1		3					1	6
Totals			1	1	2					5		6					2	17

PLATE XXII

Gravers, Perforators, Drills, and Macroblade Core

a	Burin	EdRk:7, Zone I
b	Group 1 graver	EdRk:7, Zone III
c	Group 1 graver	EdRk:7, Zone I
d	Group 1 graver	EdRk:4, Zone IV
e	Group 1 graver	EdRk:7, Zone I
f	Group 2 graver	EdRk:7, Zone I
g-h	Group 2 graver	EdRk:7, Zone III
i	Perforator	EdRk:4, Zone III
j	Drill	EdRk:8, Zone II
k	Perforator	EdRk:7, Zone I
l	Perforator	EdRk:7, Zone III
m	Macroblade core	EdRk:7, Zone III

PLATE XXII



suggests a rotary action, and are hence designated as drills. The remaining 5 are better described as perforators, or perhaps stone awls. The artifacts range in length from 63mm to 19mm, and all but one are of basalt.

Bi-polar Flaked Artifacts

Fifteen artifacts, scattered throughout the sequence, indicate some evidence of a bi-polar flaking technique, with one edge of the piece evidently resting on a hard surface while the opposite edge was being struck from the edge and towards the centre of the specimen. Although somewhat comparable artifacts have been called "cores" (Binford and Quimby 1963) and "wedges" (MacDonald 1966), Wright (personal communication) has pointed out that when this commonly recurring artifact is noted in the Eastern Woodlands it frequently occurs with a high frequency. The extremely low incidence of this artifact class in the Lochnore-Nesikep Locality sites suggests that it is not functionally equivalent to the eastern specimens and should, therefore, probably be considered a by-product or detritus of the general chipping technique.

Macroblades and Cores

Throughout the sequence, long, parallel-sided flakes are occasionally noted. Some of these may be described as macroblades, a term applied to products of a prepared core and blade technique. In many attributes this technique parallels that described for microblades and cores; however, the macroblades exceed 10mm in width. Other flakes lack the distinctive striking platform attributes discussed earlier and are simply considered parallel-sided flakes.

Macroblades are present in limited quantities in the Zone III component of the Lochnore Creek site, and two artifacts made on macroblades are illustrated (Plate XXI: f, u).

A fragmentary macroblade core from Zone III of the Lochnore Creek site exhibits three flutes, two of which are over 16mm wide, with a third 10mm wide (Plate XXII: m). The core edge is battered, ground, and in every way it is an enlarged version of the microblade cores from other components. A second macroblade core from the Lochnore Creek site may also be from Zone III, although the provenience is not certain.

A possible macroblade core fragment was recovered from the Lehman site, Zone II. Two flutes (11mm and 14mm wide) are still evident, as is the core edge preparation. A few macroblades are present in the Zone II assemblage, indicating the use of both micro and macroblade techniques in the same component, and presumably same culture.

Cobble Tools

Included in this category are artifacts fashioned from cobbles or fragments of cobbles. Larger in size than the bulk of the chipped stone implements, the 212 artifacts in this category are divided into 67 cobble choppers, 62 spall tools, and 83 hammerstones.

Cobble Choppers

Cobble choppers are defined as unifacially flaked implements based on rounded cobbles. Flaking is generally crude and specimens with 3-4 large flakes removed to form an edge are fairly uncommon. Metrical attributes of choppers include the usual length, width, and thickness measurements. In addition the approximate angle the flaked surface makes with the unflaked or ventral surface of the artifact, and the weight of the artifact is recorded (Table 46). Choppers are probably heavy-duty tools designed primarily for hacking, but there is the possibility that some functioned as crude cores.

Group 1 Single transverse edge

Number of Specimens: 28, Plate XXIII: a

This group features a single flaked edge perpendicular to the long axis of the cobble. Flakes are removed from the one end and only resulting in a considerable area of remaining cortex.

Group 2 Single lateral edge

Number of Specimens: 3, Plate XXIII: b

These choppers are flaked along one edge parallel to the long axis of the cobble. Considerable areas of cortex remain.

Group 3 More than one worked edge

Number of Specimens: 20, Plate XXIII: c

Choppers in this group feature more than one continuously worked edge. Large areas of cortex remain on the surfaces.

Group 4 Both transverse ends flaked

Number of Specimens: 2

The 2 specimens in this group have flakes removed from both transverse edges but not from the lateral edges. Much cortex remains.

Group 5 Extensively flaked over dorsal surface

Number of Specimens: 9, Plate XXIII: d

Choppers in this group are extensively flaked over the one surface leaving one edge unmodified. Very little cortex remains on the dorsal surface.

Group 6 Entire dorsal surface flaked

Number of Specimens: 5, Plate XXIII: e

This group differs from the preceeding in that all edges and the entire dorsal surface is flaked.

Spall Tools

Spall artifacts are large flat flakes derived from cobbles. The naturally-sharp edges are utilized without modification, or they may manifest limited retouch. The 62 artifacts in this class are divided into groups based upon the amount of cobble cortex remaining on the dorsal surface. Measurements are given in Table 47.

Group 1 Cortex remains over entire dorsal surface

Number of Specimens: 16, Plate XXIV: a

Group 2 Cortex remains over much of dorsal surface

Number of Specimens: 11, Plate XXIV: b

Group 3 Some cortex on dorsal surface

Number of Specimens: 13, Plate XXIV: c

Group 4 Very little cortex on dorsal surface

Number of Specimens: 22, Plate XXIV: d

Hammerstones

The 83 hammerstones are un-shaped round to oval cobbles used for a variety of pounding and battering activities. Indications of use in the form of pitting or roughening is usually confined to limited and specific areas on the cobbles, but some specimens illustrate wear all over one or both ends. More specialized tools are hammerstones with extensive wear on the lateral edges of a fairly thin cobble. The wear appears to be the result of pounding rather than abrading. Because of the wide variation in weights, the hammerstones are divided into 4 groups based solely on the weight attribute (Table 48).

Group 1 Weight range 29-393 grams

Number of Specimens: 33

Group 2 Weight range 407-845 grams

Number of Specimens: 31

Group 3 Weight range 901-1901 grams

Number of Specimens: 17

Group 4 Weights 2461 and 3305 grams

Number of Specimens: 2

Miscellaneous Chipped Artifacts

In addition to the chipped artifacts previously described there are a few crude specimens whose functions are quite uncertain. A few of these are rough cores illustrating no particular striking platform, while others are waste products of the chipping process and exhibit some limited use along one edge.

Ground Stone Artifacts

Ground stone artifacts are rare in the Lochnore-Nesikep sequence, and are found mainly in the burial site Mile 28 Ranch (EdRk:3), where the concentration is a function both of the type of site and its recentness. In this section the term ground stone refers to objects fashioned primarily by grinding and polishing techniques, as opposed to shaping by chipping. Dimensions and distributions are given in tables 49 and 50.

TABLE 46

DIMENSIONS OF COBBLE CHOPPERS

Group	Attribute	Number	Range	Mean	s.d.
1	Length (mm)	28	60-180	97.0	36.0
	Width (mm)	28	45-160	90.0	29.6
	Thickness (mm)	28	20-80	50.0	14.8
	Angle (degrees)	28	30-90	66.0	--
	Weight (grams)	28	108-1663	644.1	444.0
2	Length (mm)	3	70-95	85.0	--
	Width (mm)	3	40-55	45.0	--
	Thickness (mm)	3	25-35	30.0	--
	Angle (degrees)	3	80-90	83.0	--
	Weight (grams)	3	106-278	167.0	--
3	Length (mm)	20	60-140	91.0	36.0
	Width (mm)	20	60-115	77.0	18.1
	Thickness (mm)	20	30-70	50.0	13.4
	Angle (degrees)	20	50-90	73.0	--
	Weight (grams)	20	236-1655	515.2	314.32
4	Length (mm)	2	60-110	85.0	--
	Width (mm)	2	80-110	95.0	--
	Thickness (mm)	2	40-55	47.5	--
	Angle (degrees)	2	75-80	77.5	--
	Weight (grams)	2	238-946	592.0	--
5	Length (mm)	9	70-130	100.0	17.8
	Width (mm)	9	50-95	73.0	14.8
	Thickness (mm)	9	35-60	43.0	11.8
	Angle (degrees)	9	30-90	60.0	--
	Weight (grams)	9	196-791	421.4	186.6
6	Length (mm)	5	10-145	116.0	15.8
	Width (mm)	5	70-90	78.0	7.7
	Thickness (mm)	5	35-55	43.0	6.3
	Angle (degrees)	5	--	--	--
	Weight (grams)	5	326-554	430.6	88.9

TABLE 47

DIMENSIONS OF COBBLE SPALLS

Group	Attribute (mm)	Number	Range	Mean	s.d.
1	Length	16	60-130	80.6	17.4
	Width	16	40-105	58.4	15.4
	Thickness	16	10-40	20.6	8.5
2	Length	11	50-80	67.7	10.0
	Width	11	30-65	50.0	15.2
	Thickness	11	5-25	17.3	5.4
3	Length	13	70-145	94.6	17.2
	Width	13	50-85	66.2	10.4
	Thickness	13	10-40	24.2	9.7
4	Length	22	55-120	87.9	17.7
	Width	22	40-95	52.3	28.8
	Thickness	22	5-25	10.7	6.2[1]

[1]High s.d. due to skew of range

TABLE 48

WEIGHTS OF HAMMERSTONES

Group	Number	Range (grams)	Mean	s.d.
1	33	29-393	170.0	98.9
2	31	407-845	556.1	139.7
3	17	901-1901	1345.4	298.4
4	2	2461-3305	--	--

PLATE XXIII

Cobble Choppers

a	Group 1	EdRk:4, Zone VII
b	Group 2	EdRk:7, Zone I
c	Group 3	EdRk:4, Unstratified
d	Group 5	EdRk:4, Unstratified
e	Group 6	EdRk:7, Zone I

PLATE XXIII

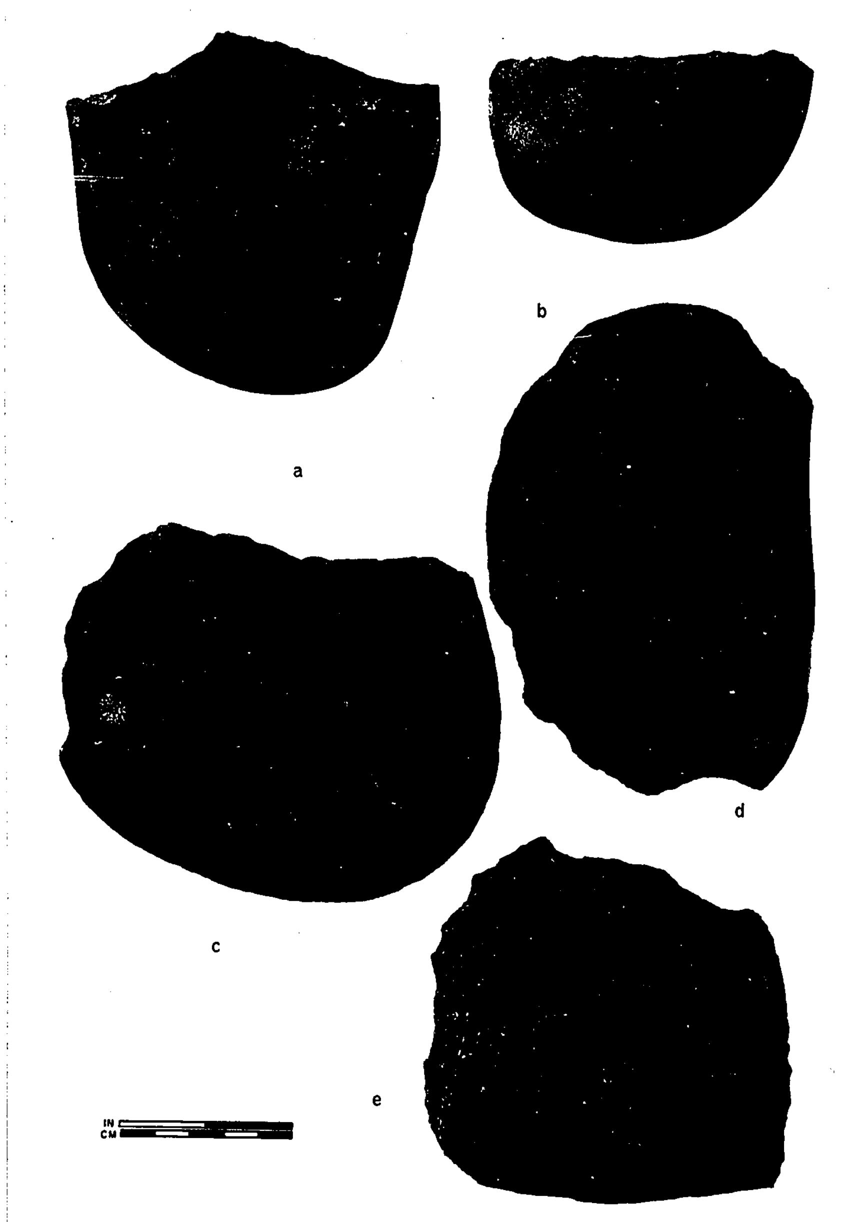
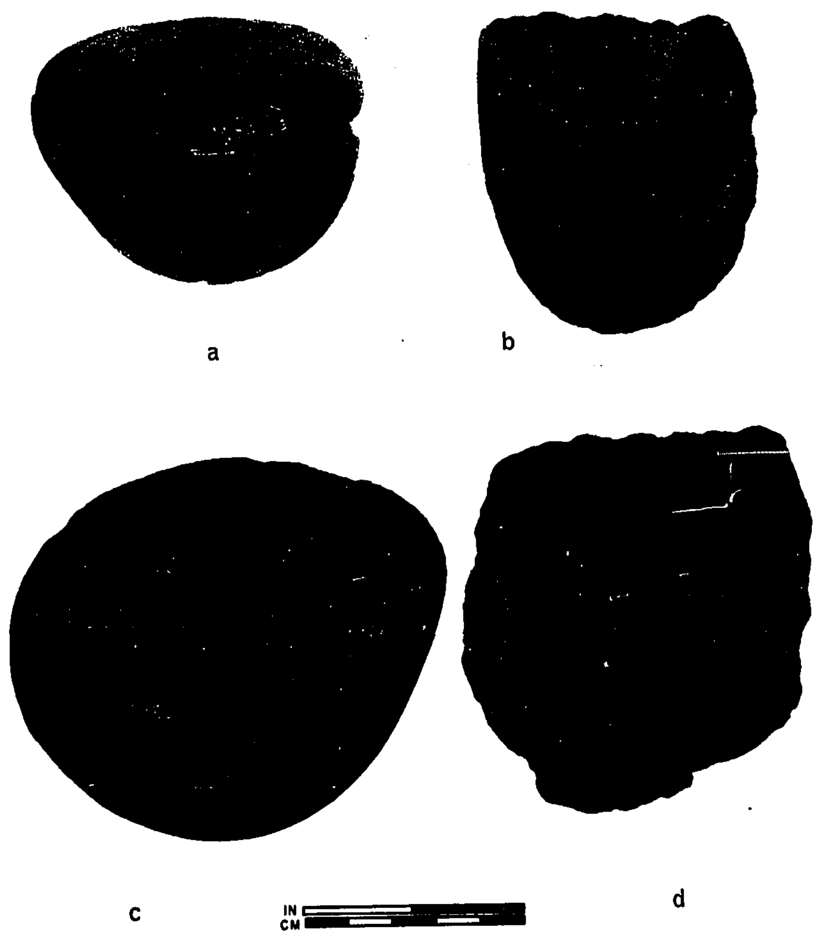


PLATE XXIV

Cobble Spall Artifacts

a	Group 1	EdRk:4, Zone III
b	Group 2	EdRk:4, Zone III
c	Group 3	EdRk:7, Zone I
d	Group 4	EdRk:7, Zone I

PLATE XXIV



Nephrite Celts

Numerically the most important of the ground stone implements, these artifacts functioned as adz blades employed in wood working. Nine fragments of ground and polished nephrite (commonly known as "jade") were recovered from the Lochnore Creek site (Zone I), with seven of the pieces deriving from housepit 1 and its immediate environs. Two fragments were associated with Zone Ic of housepit 2.

Fragmentary though they are, these pieces exhibit the same grinding and beveling techniques noted on more recent ethnographic specimens, and manifest an identical grooving and snapping method for sectioning boulders. In this technique the manufacturer saws through a boulder from two faces until the section is thin enough to break (Teit 1900:182). The sawed edges are sometimes left quite rough, but more frequently they are ground smooth. Traces of the roughing-out procedure are seldom completely obliterated, however.

In addition to the 9 fragments from the Lochnore Creek site, we recovered single pieces from Zone II of the Cow Springs site (EdRk:5) and from Zone III of the Nesikep Creek site (EdRk:4). The most significant collection, however, comes from the Mile 28 Ranch site, from which 9 examples were recovered. Ranging in length from 65mm to 270mm for complete specimens, most taper back from a straight to oblique asymmetrically ground bit, to a pointed or rounded poll. Bit widths range from 15mm to 60mm. Other celts were recovered in the ploughing of the Lehman site (Zone I).

Spindle Whorls

Two steatite spindle whorls (Figure 13: a), one complete and the other fragmentary, were associated with the burials at the Mile 28 Ranch site. Both are devoid of decoration. A third specimen, also made of steatite, may be an unfinished example as it lacks the central perforation. The perforations, which have been gouged rather than drilled, average 13.5mm for the two examples. Although the precise function is unknown, these specimens appear to be associated with the preparation of mountain goat hair in a process similar to that described by Teit for the Lower Thompson (1900: 191).

Pipes

Two steatite pipes were associated with the Mile 28 Ranch burials. Both are of the tubular variety with gently expanding bowls, which are intermediate between the sharply flaring trumpet tubular pipes and the straight cigar varieties. One of the pipes has an expanding mouthpiece, but there are no traces of decoration or raised bands at the junction of the stem and the bowl (Figure 13: b). A specimen recovered by Mr. Holzer is said to have had a small round pebble at the mouthpiece, presumably serving to prevent tobacco (Nicotiana attenuata mixed with bear-berry leaves; Teit 1900:300) from being inhaled.

Hand Mauls

These are formed implements, usually made from greywacke or similarly dense materials, which are thought to have functioned as hammers in the wood working process. Examples from the Lochnore-Nesikep Locality are restricted to the Mile 28 Ranch site, and the upper component (Zone I) of the Lehman site.

The two examples from the Mile 28 Ranch site exhibit the characteristic expanding base (or distal end) and the expanding poll (Figure 13: f,g). Extensive wear polish on the distal end flange indicates use as a hammer and not primarily as a grinding tool. An unknown number of mauls have been collected by Mr. Lehman from his garden (EdRk:8). One particularly fine specimen has been zoomorphically modified (Figure 13: h).

Abrasive Stones

Abrasive stones are rare in the sequence. Fragments of large flat sandstone abrasives have been recovered from several sites. An amorphous piece of basalt, of a variety frequently utilized for chipped artifacts, manifests a smooth narrow groove which may have been used to sharpen pointed bone and antler artifacts.

Sandstone shaft smoothers are also curiously rare, a single fragmentary example being noted in the Mile 28 Ranch site collection.

Saws

Two thin argillite artifacts, exhibiting extensive grinding along a rounded edge, may be saws. When used in conjunction with wet sand these implements could be utilized for sectioning nephrite boulders.

Ground Slate

Three pieces of slate indicate modification by grinding. One large piece (length: 185mm; width: 65mm; thickness: 5mm) from the Mile 28 Ranch site has a rectangular blade and a tapering tang. Most of the surface of the blade is unmodified, with the cutting edge bevelled bifacially.

Two fragments of ground slate were recovered from the surface of the Lehman site, and are therefore tentatively assigned to the Zone I assemblage. The absence of yellow patina on the artifacts also suggests a Zone I location. One specimen (Figure 13: c) is the distal or tip portion of a point. Ground extensively over both surfaces, the edges are quite dull and rounded, suggesting, perhaps, that the object functioned as a perforator rather than as a cutting implement. The second slate artifact is ground only on an asymetrically bevelled edge. It may be a knife.

Pigment

Pigment (red and yellow ochre) was found in substantial pieces in the following sites:

Zone I, EdRk:7; Zone II, EdRk:8; Zone I, EdRk:9; Zone III, EdRk:9; and Zone VII, EdRk:7. Smaller fragments were recovered from EdRk:6 and EdRk:5. A piece of white ochre (volcanic ash?) was associated with housepit 5 at the Pine Mountain site (EdRk:9, Zone III).

Miscellaneous Stone Artifacts

From a small storage or cache pit beneath the living floor of Zone II at the Cow Springs site (EdRk:5) we recovered 2 rounded boulders of material suitable for adz blade manufacture. Neither boulder is modified, and both appear to be very impure nephrite. The measurements are: Length: 120mm; With: 85mm; Thickness: 40mm; and Length: 250mm; Width: 135mm; Thickness: 50mm.

Two flat boulders with shallow central depressions were found on the surface at the Nesikep Creek site (EdRk:4). Thus they may be of Zone III affiliation, although this is not certain. Both may have functioned as shallow mortars. If this is the case they represent the only objects of this kind recovered from the Lochnore-Nesikep Locality. Measurements are: Length: 210mm; Width: 180mm; Thickness: 50mm; and Length: 210mm; Width: 160mm; Thickness: 100mm.

During the excavation of housepit 2 at the Lochnore Creek site

(Zone I, EdRk:7), an angular boulder manifesting indications of wear was recovered. Adherring to polished sections of the boulder were crushed bones of fish and small mammals, suggesting that the artifact was used to crush or pound meat; Length: 140mm; Width: 90mm; Thickness: 100mm.

An unique pencil-like obsidian artifact is associated with the small assemblage from Zone I of the Nesikep Creek site. Shaped by a combination of chipping and grinding techniques it is 103mm in length and less than 10mm thick and wide. The artifact is illustrated in Sanger 1964 (Plate II, B) where it is referred to as an "obsidian tinkler (?)".

Edge-Ground Cobbles

Three flat cobbles from the Lochnore Creek site indicate extensive grinding along part of the edge. Two are from the Zone III component of the site, while the third is from housepit 2 in a general Zone I context. One of the Zone III specimens, an ovate example, is extensively ground along the edge at the wider end. The second Zone III cobble is thinner and more rounded with some wear around much of the edge and extensive use along a section approximately 7 mm in length. The greatest wear is illustrated on the example from housepit 2, a broken oval cobble with heavy wear around all sides. Length range: 90-120mm; Width range: 70-120mm; Thickness range: 38-50mm.

Bone Artifacts

The bone industry in the Lochnore-Nesikep Locality is represented by 79 described specimens, the bulk of which are perforating implements such as awls and needles. The relatively low incidence of bone artifacts, when compared with stone, is largely due to factors of preservation. At the Lochnore Creek site, for example, the upper levels of housepit 2

FIGURE 13

Stone Artifacts

a	Steatite spindle whorl	EdRk:3
b	Steatite tubular pipe	EdRk:3
c	Ground slate object	EdRk:8, Zone I (?)
d	Group 6 formed biface	EdRk:3
e	Group 6 formed biface	EdRk:3
f	Hand maul	EdRk:8, Zone I
g	Hand maul	EdRk:8, Zone I
h	Zoomorphic hand maul	EdRk:8, Zone I

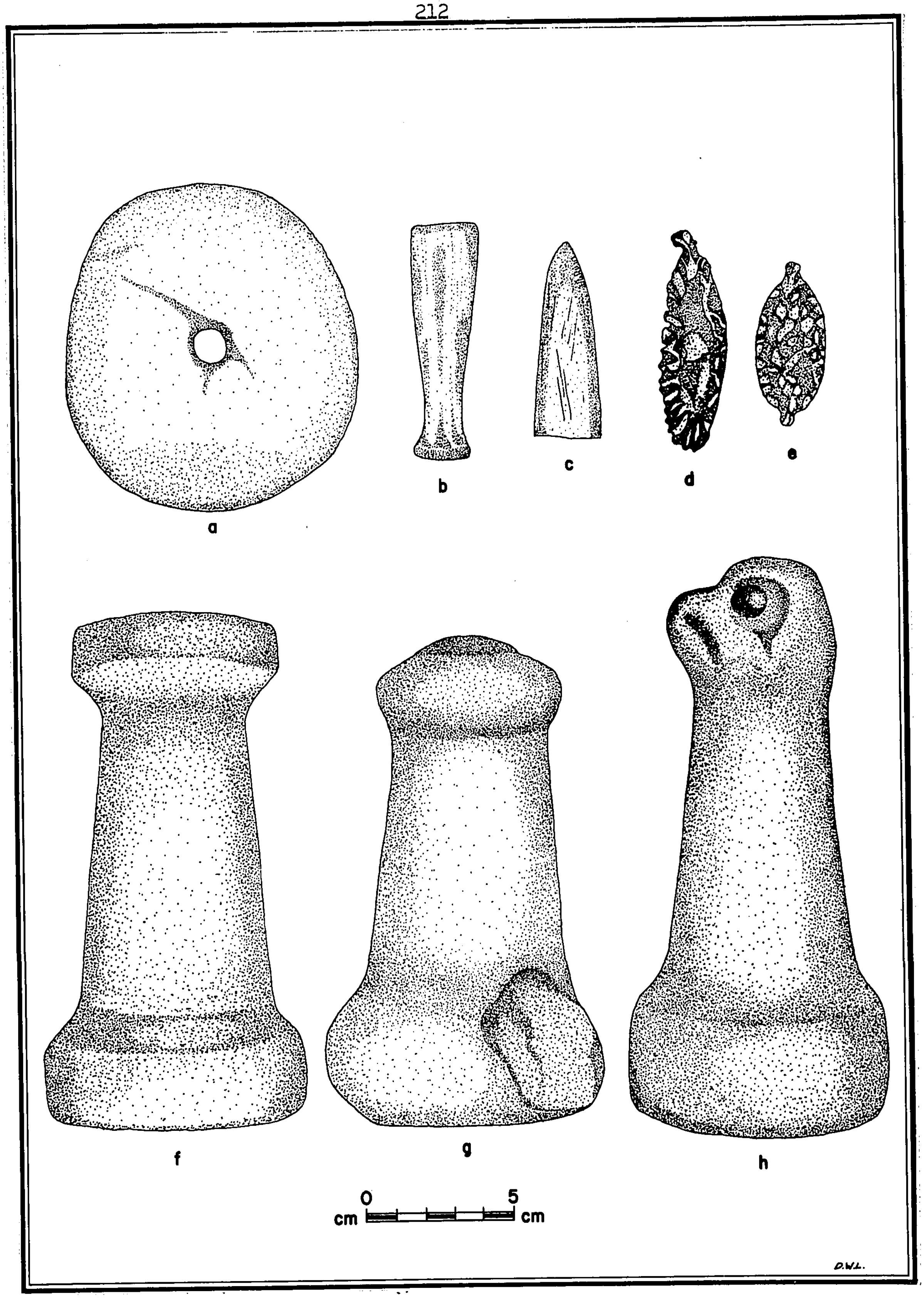


FIGURE 13

TABLE 49

DIMENSIONS OF GROUND STONE ARTIFACTS

	Celts	Spindle Whorls	Pipes	Mauls
Number	7	3	2	3
Length Range (mm)	65-270	95-115	60-75	170-192
Length Mean (mm)	126.4	105.0	67.5	180.6
Width Range (mm)	20-65	95.0	20-25	80-90
Width Mean (mm)	42.1	95.0	22.5	86.6
Thickness Range (mm)[1]	—	6-8	—	—
Thickness Mean (mm)	—	7.0	—	—

[1]Measurements taken from Photographs

TABLE 50

DISTRIBUTION OF GROUND STONE ARTIFACTS

Artifact	Component						Totals
	EdRk:3	EdRk:4, Zone III	EdRk:5, Zone II	EdRk:7, Zone I	EdRk:8, Zone I	EdRk:9, Zone III	
Celts	9	1	1	9	P[1]		20
Spindle Whorls	3						3
Pipes	2						2
Mauls	2				1+		3+
Abrasive Stones	3	1		2	P	1	7
Saws				1	P	1	2
Ground Slate	1				2		3
Totals	20	2	1	12	3+	2	40+

[1]P = present

yielded very few bone artifacts, whereas the frequency increased quite suddenly at depths of a metre and more. Bone objects located between 1 and 2 metres beneath the surface are hard, white, and still have extremely sharp tips. They appear to be as serviceable today as they were 2-3,000 years ago. Other both artifacts include beads, whistles, knives and creasers.

A number of bone artifacts clearly exhibit the procedure employed for sectioning bone and applying the desired finish. Split long bones were sawed from two surfaces until the section was sufficiently thin to snap. The resulting ridge was then ground down as the remainder of the artifact was being polished. The process is similar to that used to section nephrite boulders, except that the bone pieces were probably sectioned with a graving implement rather than with a saw. Close examination of some unfinished bone pieces indicates narrow grooves with a V-shaped section. Other implements were manufactured on split and ground long bones without evidence of sectioning by grooving or sawing. Perforations are always made by gouging and cutting; never by drilling. Artifact dimensions and distributions are listed in tables 51 and 52.

Bone Awls

These are long slender bone implements with sharp points designed for perforating (Plate XXV,a: a-d). The majority of the 29 specimens are well-finished, but others could be described as bone splinter awls, manifesting little modification other than that necessary to form a sharp tip. Roughly one-quarter of the awls exhibit the remains of an epiphysis, but all examples have been split or ground smooth. First metapodial bones of deer are frequently made into awls, but more common are awls based on sectioned long bones. No ulna awls are noted in the collections. Decorated specimens are rare; one awl has a shallowly-incised cross-hafted motif, while another exhibits two parallel lines running from one end of the awl to the other (Figure 14).

Bone Points

There are 14 bone points, some of which may be tips of awls. Others seem to be designed for end-hafting and may have tipped arrows. One example (Plate XXV,a: g) has a notched base which may have facilitated hafting. Due to the fragmentary nature of the artifacts in this class no measurements are given.

Bone Needles

Twelve needles are present in the collections. Manufactured from long slender sections of bone, the majority feature proximal eyes created by bifacial gouging. Some fragmentary examples exhibit an eye formed near a pointed end, which might be the distal extremity. Seven of the needles are flattened in transverse section; the remainder are circular. Decorations consist of zig-zag patterns and spiralling line motifs. From EdRk:7 (Zone 1) comes a fragment decorated by a straight longitudinal line with a series of short perpendicular spurs branching off from one side of the longer line (Plate XXV,a: i). Miscellaneous fragments of worked bone may be portions of needles, but cannot be definitely identified as such unless an eye is present.

Bone Perforators

Included in this class are 4 pieces with sharp tips indicating traces of use. One example, from Zone III of the Nesikep Creek site

(Plate XXV, a: k), is a deer first metapodial broken near the distal epiphysis, and crudely hacked to isolate a projection. There is no evidence of any attempt to apply a smooth finish to the artifact and the projection is well-worn. A comparable perforator, but made on a deer scapula, comes from the Lochnore Creek site (Zone 1).

Bone Beads

There are 10 beads made from large bird bones which were scored and then snapped. Two examples are decorated. One, from Zone VII of the Nesikep Creek site (Plate XXV, b: a), is decorated by a series of deep cuts perpendicular to the long axis of the bead. The second example, from the McPhee site (Plate XXV, a: m), is elaborately embellished by a series of scratches at right angles to the long axis, and zoned in well-defined triangular areas.

Bone Whistles

There are 2 whistles created from large bird bones. The larger of the pair, from the Mile 28 Ranch site, has three gouged circular to oval stops approximately 5mm in diameter, arranged at 88mm, 119mm, and 149mm from the assumed mouthpiece. A slot is located 10mm from the mouthpiece and on the surface directly opposite the 3 stops just described (Figure. 14: e). The total length is 220mm with a width of 17mm at the mouthpiece and 10mm at the distal end. A second example from the Lochnore Creek site (Zone 1) features a single wide slot 19mm long by 6mm wide. Large as it is, the stop can be covered by a finger. The length of the second specimen is 97mm and the width is 11mm (Plate XXV: n). Neither specimen is decorated.

Bone Mat Creasers

There are 4 bone pieces which may have functioned as mat creasers. Three are split sections of deer long bone with a sharpened edge, while the fourth is more meticulously finished into a generalized lanceolate form. None are extensively decorated, although the lanceolate specimen exhibits a series of shallow incisions along one edge.

Miscellaneous Bone Artifacts

There are a number of fragmentary bone specimens which may be sections of awls, beads, or other artifacts previously discussed. Although the majority of fragments are of thick bone cortex, such as limb bones, there are sections of ribs whose naturally sharp edges appear to have been utilized. Other fragments include sections of scapula which may have been made into ornaments. Four miscellaneous specimens are sufficiently distinctive, however, to warrant further description.

Pierced Bone Fragment (Plate XXV,a: o) (Plate XXV,b: b)

From Zone I of the Lochnore Creek site, we recovered a small curved bone piece bifacially perforated at one end and decorated on one surface by 2 parallel rows of raised vertebrae motif. This pattern is created by incising 2 deep parallel lines along the longitudinal axis of the specimen and equally deep shorter incisions between the parallel lines, dividing the area into a series of squares and rectangles which appear in bas-relief. The artifact may have been a pendant or other piece of decoration.

Length: 30+mm; Width: 12mm; Thickness: 2mm.

Spatulate Objects (Plate XXV,a: p,q)

There is a small fragmentary spatulae object from Zone V of the

Nesikep Creek site. The shaft is oval in transverse sections and broken. The round end flares out slightly and is asymmetrically bevelled. Function is unknown.

Length: 43+mm; Width: 8mm; Thickness: 4mm.

A second smaller object of similar design is from the Lochnore Creek site, Zone I.

Length: 21mm; Width: 6mm; Thickness: 4mm.

Incised Piece

A section of sawed and polished bone was found in the Zone I levels of housepit 2 at the Lochnore Creek site. Evidently a fragment of a carefully-finished implement, this piece is of interest as it exhibits traces of sawing and snapping, followed by grinding and polishing, and finally decorated by a series of 19 shallow incisions along one edge.

Length: 82+mm; Width: 8mm; Thickness: 6mm.

Antler Artifacts

Antler artifacts are not common (35 specimens) in the Lochnore-Nesikep Locality sequence, and generally do not seem to have been preserved as well as bone objects. With the exceptions of Zone VII at the Nesikep Creek site and Zone III at the Lochnore Creek sites, antler artifacts are mostly from the recent components. Antler is worked by chopping (adzing?), cutting, and grinding. Some sectioning is evident although the technique employed is not well defined. Most of the antler appears to be of deer; only a few pieces are of elk. See tables 53 and 54 for dimensions and distributions.

Antler Wedges (Plate XXVI: a-c)

The 14 wedges comprise the largest class of antler artifacts.

TABLE 51

DIMENSIONS OF BONE ARTIFACTS

Artifact	Attribute	Number	Range	Mean	s.d.
Awls	Length (mm)	28	57-159	103.0	25.8
	Width (mm)	28			
Needles	Length (mm)	7	95-180	139.2	--
	Width (mm)	7	2.3-8.5	5.0	--
Beads	Length (mm)	8	19-64	37.2	--
	Width (mm)	9	3-9	5.3	--
Mat Creasers	Length (mm)	4	140-185	162.5	--
	Width (mm)	4	22-40	30.0	--

TABLE 52

DISTRIBUTION OF BONE ARTIFACTS -

BY COMPONENT

Artifact	Component														
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	Totals
Awls	1	2	1	1	1	2		3	15					2	28
Points			1					1	9	3					14
Needles	9					1			2						12
Perforators			1						3						4
Beads	1					1		2	5					1	10
Whistles	1								1						2
Creasers	3								1						4
Miscellaneous					1				3						4
Totals	15	2	3	1	2	4		6	39	3				3	78

PLATE XXV

Bone Artifacts

a Bone Artifacts

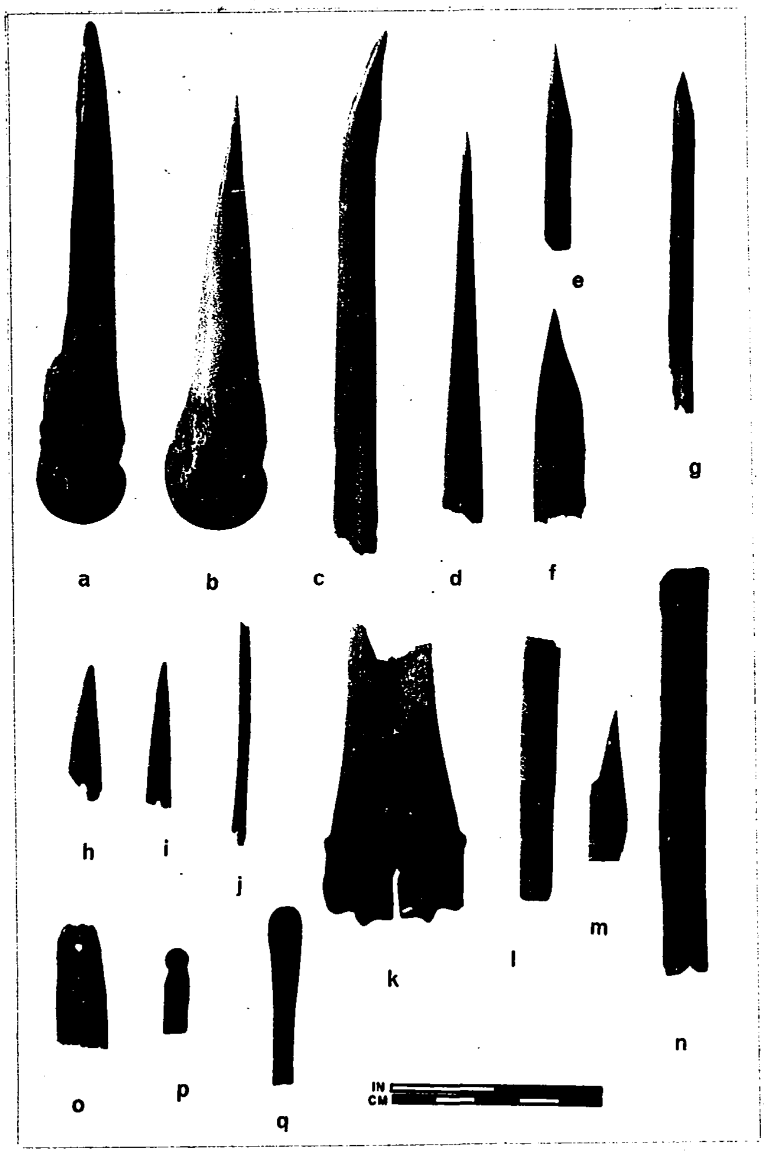
a	Awl	EdRk:6
b-d	Awl	EdRk:7, Zone I
e-g	Point	EdRk:7, Zone I
h-i	Needle	EdRk:7, Zone I
j	Needle	EdRk:4, Zone VII
k	Perforator	EdRk:4, Zone III
l	Bead	EdRk:9, Zone III
m	Bead	EdRk:6
n	Whistle	EdRk:7, Zone I
o	Miscellaneous	EdRk:7, Zone I
p	Spatulate object	EdRk:7, Zone I
q	Spatulate object	EdRk:4, Zone V

b Closeup of Bone Objects (magnification approx. 2.5 linear)

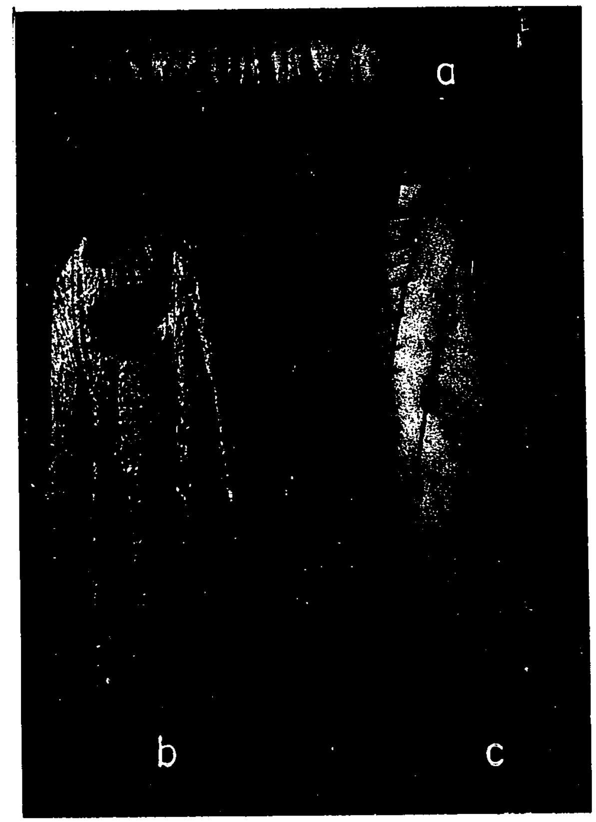
a Bird bone bead from Zone VII, EdRk:4

b Pierced bone fragment, EdRk:7, Zone I (see Plate XXV,a: o)

c Bird bone bead, EdRk:6 (see Plate XXV,a: m)



a



b

PLATE XXV

Five wedges from the Mile 28 Ranch site and one from the Lochnore Creek site (Zone I) exhibit the burr at the base of the antler. One wedge may be manufactured from a tine but the remainder are fashioned from the beam. All wedges but one (from the Nesikep Creek site, Zone VII) are asymmetrically bevelled. Those from the Mile 28 Ranch site that are intact reveal little evidence of extensive pounding on the proximal end. Wedges probably functioned in the woodworking process (Teit 1900:183).

Sharpened Tines (Plate XXVI: f)

There are five sharpened tines which may be perforators. Three indicate shaping by hacking and grinding, while the remaining 2 are ground only.

Antler Points

Of the ten antler points present in the collection, two are long and slender and made from thin sections of cortex. The longer of the two specimens (Plate XXVI: g), from the McPhee site (EdRk:6), is bevelled at the base, presumably to facilitate hafting. The shorter point is associated with the cache from Zone VII of the Nesikep Creek site (EdRk:4). Cross sections are rectangular.

EdRk:6-22 — Length: 290mm; Width: 15mm; Thickness: 6mm.

EdRk:4-967, 8, 9 (in 3 pieces) — Length: 140mm; Width: 17mm; Thickness: 4mm.

In addition, there are 8 points and tips of shorter specimens (some fragmentary) which might have tipped projectiles or formed barbs on composite fish spears or leisters. Most of the points are round in cross section.

Antler Pendants (?)

From the Mile 28 Ranch burial site three distal extremities of

TABLE 53

DIMENSIONS OF ANTLER ARTIFACTS

Artifact	Attribute	Number	Range	Mean	Mode	s.d.
Wedges	Length (mm)	10	77-320	173.0	--	71.8
	Width (mm)	14	19-90	40.7	29.6	16.0
Tines	Length (mm)	5	115-250	166.0	--	--
	Width (mm)	5	18-22	19.8	--	--
Pendants	Length (mm)	3	44-97	76.0	--	--
	Width (mm)	3	11-12	11.7	--	--

TABLE 54

DISTRIBUTION OF ANTLER ARTIFACTS -

BY COMPONENT

Artifact	Component															
	EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone II	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	Totals
Wedges	8		1			3			1		1					14
Tines		1	1				2		1							5
Points	6					1		1	2							10
Pendants	3															3
Hafts	2							1								3
Totals	19	1	2			4	2	2	4		1					35

PLATE XXVI

Antler Artifacts

a	Wedge	EdRk:4, Zone VII
b	Wedge	EdRk:7, Zone III
c	Wedge	EdRk:4, Zone VII
d	Point	EdRk:4, Zone VII
e	Haft	EdRk:6
f	Tine	EdRk:7, Zone I
g	Point	EdRk:6

PLATE XXVI

tine were recovered, each with a constricting groove 1 or 2mm below the distal tip of the tine. The function of these short sections is unknown, but they may be pendants (Figure 14: b).

Antler Hafts

Two slotted fragments of antler from the Mile 28 Ranch site may be hafts. One appears to be a section of tine or beam, while the second example includes the burr.

A section of tine has been converted into a small, stylized, zoomorphic haft (Plate XXVI: e). Deriving from the McPhee site (EdRk:6), the specimen was donated by the landowner, Mr. McPhee. The haft has a chevron design consisting of a long central incision with short spurs incised at an angle of 45° towards the slender end (proximal) of the haft. The chevron or rib motif consists of 9 "ribs" on one side, and 10 "ribs" on the other. The backbone is represented by the motif defined as a "vertebrae motif", with two long parallel incisions joined by equally deep perpendicular cuts. Isolated sections stand out in bas-relief effecting the vertebrae motif. A less pronounced, more shallow, version of this design appears on the underside or belly of the zoomorphic haft. The nature of the hafted object is uncertain, but the drilled hole located in the wider end of the specimen would allow the insertion of a beaver tooth knife or perhaps drill. The narrow or proximal end is damaged, but it does exhibit a encircling groove, presumably to accommodate a suspension thong.

Length: 92mm; Width: 13mm; Thickness: 12mm.

Tooth Artifacts

Tooth artifacts are represented by beaver incisors, marmot incisors, and by canine teeth of dogs or coyotes.

Beaver Incisors (Plate XXVII: a)

Split and, less frequently, unsplit incisors are present in several components. Wear polish suggests that the teeth were utilized as gouging tools employing the naturally sharp occlusal surface of the tooth. Occasionally the lingual surface is cut back to expose more of the enamel. Beaver incisors were probably hafted. No teeth were found embedded in split mandibles, and no decorated beaver teeth dice were recovered.

Marmot incisors (Plate XXVII: b)

Marmot incisors, both split and whole, were excavated from several components. One, from the Mile 28 Ranch burial site, was excavated still embedded in a split mandible.

Perforated Canines (Plate XXVII: c)

From the Lochnore Creek site (Zone I), and from the Pine Mountain site (Zone III), single examples of biconically drilled canines of dog or coyote were recovered. Both artifacts are probably pendants.

Shell Artifacts (Plate XXVII: d-h)

Four undecorated Dentalium shells were excavated. One may have been shortened by scoring and snapping. All examples are approximately 33mm long.

Two Olivella shells, both with the turrets removed, were found.

Three shell pendants, probably fashioned from fresh water clam (Margaritifera margaritifera) are in the collection. One specimen, from the Lochnore Creek site (Zone I) has 2 perforations, one of which was broken prior to excavation (Plate XXVII: g). The second pendant, which is from the Cow Springs site (Zone II), is heart-shaped, with a single unifacially-drilled hole in the centre (Plate XXVII: h). The third

FIGURE 14

Bone, Antler, and Shell Artifacts

(from the Mile 28 Ranch - EdRk:3)

a Bone awl fragment

b Antler pendant (?)

c Bone awl fragment

d Bone awl fragment

e Bone whistle

f Pierced *Pecten caurinus* shell

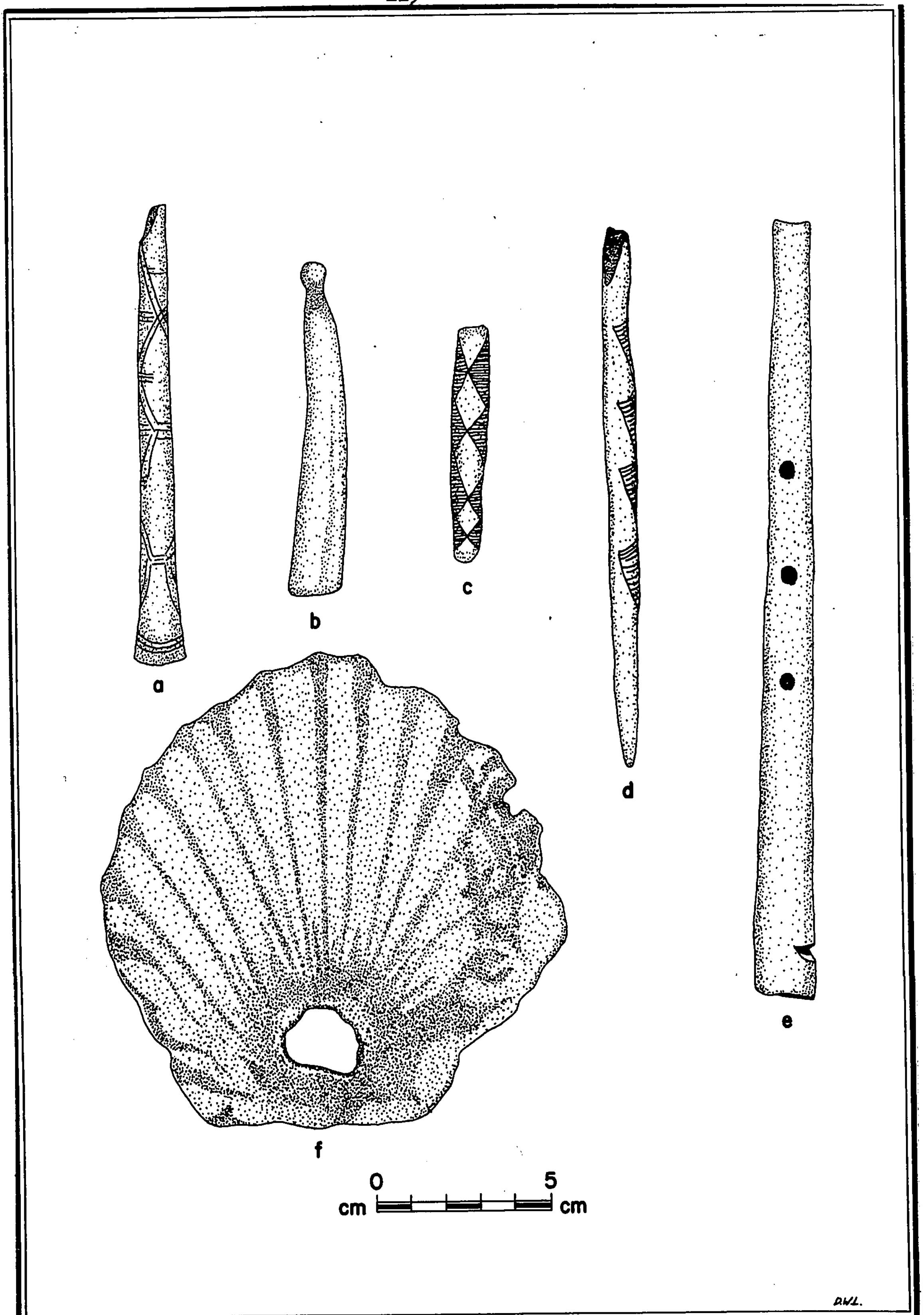


FIGURE 14

pendant, from EdRk:4 (Zone I), is notched at one end for suspension.

Another saltwater shell found in the Lochnore-Nesikep Locality comes from Zone III of the Lochnore Creek site. It is a small, but diagnostic, fragment of the large *Mytilus californianus*[1] (Plate XXVII: d).

The most interesting shell artifacts were discovered by Mr. Holzer when he gathered up the specimens following the bulldozing of the Mile 28 Ranch site. Mr. Holzer came across 7 scallop (*Pecten caurinus*) shells each pierced once near the hinge (Figure 14: f). According to the finder, the shells were superimposed one above the other with the perforation in alignment. The description suggests the Coast Salish type of scallop shell rattle.

Metal Artifacts

Metal artifacts are limited to 9 pieces of native copper. Two of these (from the Mile 28 Ranch Site) are small, square, flat copper pendants each measuring about 25mm to a side. Also from the same site are 5 tubular copper beads ranging in length from 25mm to 85mm. A rolled copper bead was recovered deep in the Zone Ic deposits in housepit 2 of the Lochnore Creek site, and a second tube was encountered at a depth of 1.25 metres.

Wood Artifacts

Charred sections of birch bark rolls were noted in most of the more recent components, as indicated in Table 55. A few wooden fragments and pieces of bark were also found in the more recent sites.

Perhaps the most unusual artifact discovery in the Locality is a small, shallow, one piece birch bark container recovered from Zone II of

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[1] Identified by Arthur Clarke, National Museum of Canada.

the Cow Springs site (Plate IV, b). Of a generally rectangular form, the container measures 200mm long, 90mm wide, and 30mm deep. There is no evidence of sewing and the container appears to be fashioned from a single rectangular piece of bark slit twice near the edge at both of the shorter edges. The ends were turned up, the sides folded behind, and then secured in that position by pitch. The technique is similar to that employed on ethnographic specimens gathered from the Thompson area.

TABLE 55

DISTRIBUTION OF TOOTH, SHELL, METAL, AND WOOD ARTIFACTS -- BY COMPONENT

Artifact	Component: EdRk:3	EdRk:4, Zone I	EdRk:4, Zone III	EdRk:4, Zone IV	EdRk:4, Zone V	EdRk:4, Zone VII	EdRk:5, Zone II	EdRk:6	EdRk:7, Zone I	EdRk:7, Zone III	EdRk:8, Zone I	EdRk:8, Zone II	EdRk:9, Zone I	EdRk:9, Zone III	Totals
Beaver Incisors	1					1			4						6
Marmot Incisors	1					5									6
Perforated Canines									1					1	2
Dentalium Shells	2								2						4
Olivella Shells			1						2						3
Pendants		1					1		1						3
Mytilus cal.										1					1
Pecten Shells	7														7
Copper Pendants	2														2
Copper Tubes	7								2						9
Birch Rolls	P[1]	P	P				P	P	P				P		
Birch Container							1								
Totals	20	1	1			6	2		12	1				1	44

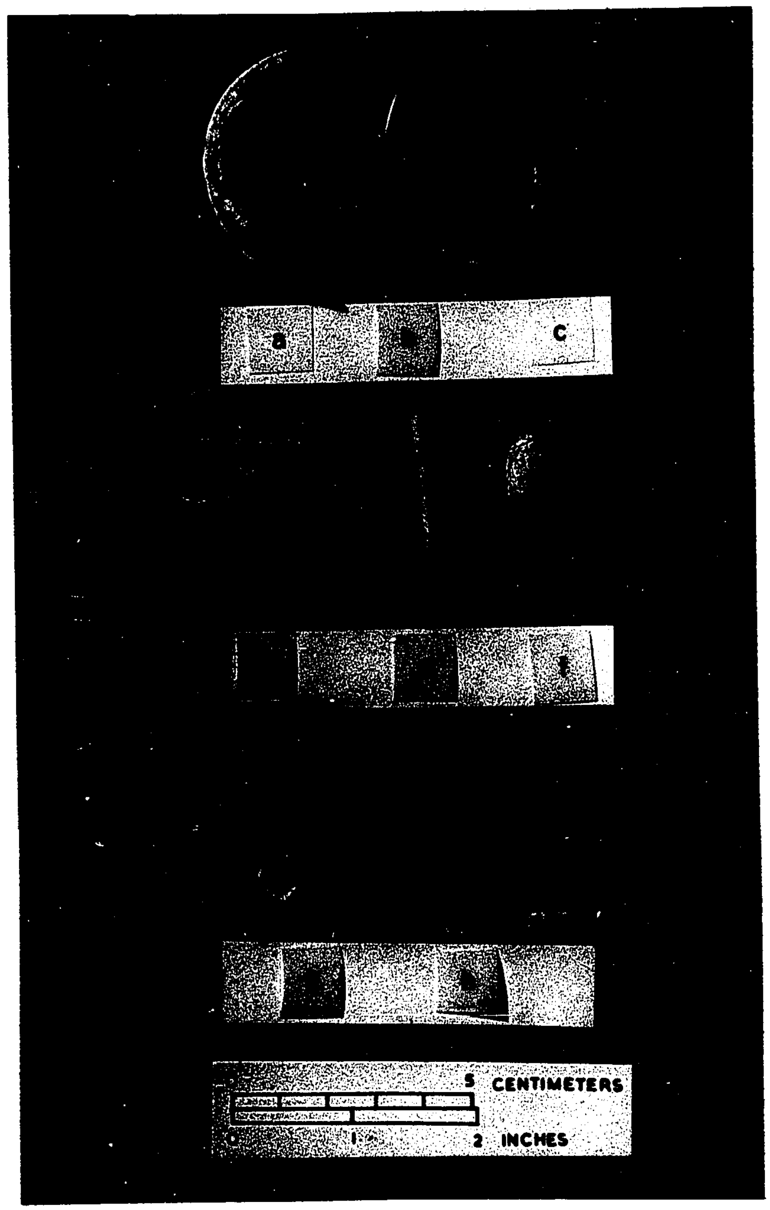
[1]P = present

PLATE XXVII

Tooth and Shell Artifacts

a	Modified beaver incisor	EdRk:7, Zone I
b	Modified marmot (?) incisor	EdRk:7, Zone I
c	Perforated canine	EdRk:9, Zone III
d	*Mytilus californianus* fragment	EdRk:7, Zone III
e	*Dentalium*	EdRk:7, Zone I
f	*Olivella*	EdRk:4, Zone III
g	River mussel pendant	EdRk:7, Zone I
h	River mussel pendant	EdRk:5, Zone II

PLATE XXVII



CHAPTER VI

DISCUSSION

Chronology

<u>Introduction</u> The chronology of the Lochnore-Nesikep Locality is established through integration of geological, radiocarbon, and stratigraphic dating techniques. No one of these can be utilized alone, and none can be considered "absolute" in the sense of providing firm calendrical dates. The first step in establishing the broad outlines of the chronology has been the arranging of the various components into sequential order, a task involving several assumptions which should be made explicit. First, in stratified sites the older components are considered to lie beneath more recent ones, provided it can be demonstrated that the superimposition is the product of an accumulative process and not of solifluction or aboriginal pitting. Secondly, the proximity of the sites within the Locality suggests that extensive dissimilarities in the cultural content of assemblages are indicative of differences in time. This must be a subjective assessment, however, and care is exercised to avoid the erroneous assumption that greater cultural dissimilarities reflect increased temporal separation. An idea of temporal spread between components of the <u>same</u> site can be gained from an examination of the extent of carbonate and sand accumulation on artifacts, but this technique must be restricted to a single site, preferably to a single vertical column within the site. The technique has proved useful in situations (especially the Lochnore Creek site) where a housepit has been aboriginally excavated into an earlier cultural zone. Artifacts of the more recent housepit recovered from the same depth below the surface as artifacts of the earlier zone will have less precipitate adhering to them.

Geological Studies   Attempts to attach firm calendrical dates from geochronological methods suffer from inadequate late glacial and post-glacial studies. The only regional report of the geology of the Fraser River between Lytton and Lillooet (Duffell and McTaggart 1952) is essentially a bedrock study which sums up the glacial and post-glacial events in 4 pages. Although his research area has been primarily to the east of the Fraser River region, Robert Fulton of the Geological Survey of Canada kindly spent a day examining the surficial geology of the Lochnore-Nesikep Locality. In Fulton's opinion (personal communication), the gravel fans underlying the sites probably date to early post-glacial times, estimated to have commenced between 9,000 and 10,000 years ago. Since that time additional gravel debris has been carried down by Lochnore and Nesikep creeks, especially at high flood stages. It is difficult to specify dates for the aeolian sands which are constantly being deposited and re-deposited. Loss of vegetation through overgrazing, fire, or habitation can result in rapid duning or deflation, according to wind direction and surface contours.

Radiocarbon Dates (Table 56)   The radiocarbon determinations from the Lochnore-Nesikep Locality present a confusing picture, and there is, unfortunately, no other cultural sequence in the southern Interior of British Columbia offering an opportunity for cross-referencing. Despite the conflicting dates, preferences are expressed in this chapter. Future workers in the area may find that dates considered less reliable at this time are in fact more accurate.

Dates are presented here in radiocarbon years ago. Several recent papers have discussed the fluctuating rate of radioactivity in the past, and until correction factors can be established it may be preferable to avoid the A.D./B.C. scale in presenting the various radiocarbon deter-

TABLE 56

RADIOCARBON DATES FROM THE

LOCHNORE-NESIKEP LOCALITY

Site and Component	Radiocarbon Years ago	Year counted
Cow Springs (EdRk:5), Zone II	310 ± 130 (GSC 405)	1965
Cow Springs (EdRk:5), Zone II	775 ± 95 (GX 406-2)	1965
Cow Springs (EdRk:5), Zone II	825 ± 85 (GX 404)	1965
Lehman (EdRk:8), Zone I	2,185 ± 150 (GSC 404)	1965
Lochnore Cr. (EdRk:7), Zone I	1,610 ± 95 (I-2085)	1966
Lochnore Cr. (EdRk:7), Zone I	2,605 ± 140 (GSC 407-2)	1965
Lochnore Cr. (EdRk:7), Zone I	2,670 ± 130 (GSC 407)	1965
Lochnore Cr. (EdRk:7), Zone I	2,680 ± 100 (I-1866)	1965
Lochnore Cr. (EdRk:7), Zone I	3,220 ± 90 (GX 407-2)	1965
Lochnore Cr. (EdRk:7), Zone I	3,280 ± 125 (GX 407)	1965
Nesikep Cr. (EdRk:4) Zone VII	5,635 ± 190 (GX 408)	1965
Lehman (EdRk:8), Zone II	6,650 ± 110 (I-2367)	1966

NOTES: All dates with reference to Libby half-life.

GSC = Geological Survey of Canada.

GX = Geochron Laboratories, Inc.

I = Isotopes, Inc.

Cow Springs Site dates on single field sample.

Lochnore Cr. dates GSC 407, 407-2; GX 407, 407-2; I-1866 on single sample.

GX 408 and I-2367 on bone collagen.

minations (Krueger 1966; Rainey 1966; Stuiver and Suess 1966).

The most recent dates are from the lower component of the Cow Springs site (EdRk:5, Zone II) from which determinations of 310 ± 130 (GSC 405), 775 ± 95 (GX 406-2), and 825 ± 85 (GX 406) years were received. All three results were obtained from a single field sample which was split in half and sent to the two laboratories. Advised of the discrepancy, Geochron Laboratories re-ran an unused portion of the sample (GX 406) and received a comparable figure on the second assay (GX 406-2). Culturally the Cow Springs site deposit should be earlier than 300 years, and the two corroborating dates of 775 and 825 years ago are probably more nearly correct.

During our excavation of the Lehman site we were unable to recover any charcoal from the deepest portions of the lower component (Zone II). A very small charcoal sample was located at the junction of the two zones, however, and this was combusted at the Geological Survey of Canada Laboratory (GSC), using inert gas to build up sufficient pressure. The resulting date of 2,185 ± 150 (GSC 401) is too recent for the lower component, which should be older than components dated between 2,600 and 3,200 years ago. A date of 2,185 is reasonable for the upper component of the Lehman site, however.

The excavation of housepit 2 at the Lochnore Creek site netted a number of excellent charcoal samples from the earliest housepit occupation, Zone Ic. One of these samples, unquestionably associated with the housepit living floor, was split in two with the quotients sent to Geochron and the Geological Survey of Canada. The first pair of results diverged, like those from the Cow Springs site, by 500-600 years - 2,670 ± 130 (GSC 407) and 3,280 ± 125 (GX 407). A re-run by Geochron yielded a determination of 3,200 ± 90 (GX 407-2), while a new assay at the Geological Survey gave a date of 2,605 ± 140 (GSC 407-2). In a concerted effort to resolve this discrepancy Geochron sent the Geological Survey another un-used portion which once again gave a determination of between 2,600 and 2,700 years on a very small sample[1]. A portion of the same field sample combusted by Isotopes Inc. indicated an age of 2,680 ± 100 years (I-1866), tending to support the 2,600-2,700 year old group of dates. Another charcoal sample from the same site, but from housepit 4, was dated at 1,610 ± 95 (I-2085) years ago. The sample was with an assemblage thought to be older than that associated with housepit 2, and this last date seems erroneously recent. In conclusion, a date of 2,600 to 2,700 years ago is presently accepted for Zone Ic of the Lochnore Creek site, with the other subzones, Ia and Ib, being more recent, perhaps extending into the Christian era.

One of the earliest radiocarbon dates for the Lochnore-Nesikep sequence is the 5,625 ± 190 years B.P. (GX 408) determination from Zone VII of the Nesikep Creek site. Excavations in 1962, and again in 1964, recovered insufficient charcoal for radiocarbon analysis, and in 1965 a bone sample was submitted to Geochron Laboratories for a date based on the collagen content. As mentioned in the earlier description of the Nesikep Creek site, the component labelled Zone VII rests directly upon the basal fan gravels of the Nesikep Creek fan. The coarse angular-to-subangular gravels merge into finer, better-sorted gravels, and finally into the medium-to-coarse brown sand of Zone VII. The sequence of deposition, plus the nature of the material, suggests a fluvial rather than an aeolian depositional agent for the sand. Superimposed above the brown sand is the wind-deposited, calcareous silty-sand of Zone VI, thought to represent some of the earliest post-glacial aeolian deposits in the

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[1] There is no laboratory number for this determination.

region.

Literature on the techniques of bone dating (Berger, Horney, and Libbey 1964; Krueger 1965; Tamers and Pearson 1965) generally reflects greater confidence in the utilization of the collagen content than in techniques based upon the carbonate fraction. Hypothetically, a secure date on associated food bones from a habitation midden should yield a more reliable date than one based on wood charcoal which need not reflect the age of the site but rather than antiquity of the wood. Charcoal, like bone, can be contaminated by the downward migration of humic acids and leached salts, and also by carbonates in ground water. According to recent articles on the subject, the collagen content of bone should be relatively uneffected by these sources of contamination (Berger, Horney, and Libby 1964; Krueger 1965). After studying the results of radiocarbon determinations based on bone, Tamers and Pearson (1965) have arrived at the conclusion that most dates based upon bone are erroneously recent. Determinations utilizing the collagen content are considered the most reliable, but even these show a tendency to yield falsely young readings, causing the authors to conclude, "that a more realistic use of bone dates would be to take them as only lower limits and to precede the dates with a sign indicating 'greater than or equal to'." (Tamers and Pearson 1965: 1055). In light of the above stratigraphic and radiocarbon dating discussion, the age of Zone VII is probably at least 6,000 years, and perhaps older.

The earliest date for the Lochnore-Nesikep sequence comes from Zone II of the Lehman site (EdRk:8). Lacking charcoal from this component, approximately 1000 grams of broken bone, mostly deer, was sent to Isotopes Inc. for a date based upon the collagen content. The date is a surprising 6,650 ± 110 years ago (I-2367).

Prior to the receipt of any radiocarbon determinations, it was thought, on the basis of both cultural and geological evidence, that Zone II at the Lehman site was more recent than Zone VII at the Nesikep Creek site. Assuming this to be the case, there are two possible explanations for the 6,650 date from the Lehman site: (a) The date is correct and confirms the suspicion that the 5,635 year date for Nesikep Creek Zone VII is much too recent, indicating a date of more than 6,600 years for Zone VII; or (b) The date of 6,650 is wrong, being at least 1,600 years too old. Alternately, Zone II at the Lehman site may be older than the Nesikep Creek component, although a close affiliate of Zone II (Zone IV at the Nesikep Creek site), is definitely intrusive into Zones V-VII at the Nesikep Creek site.

In conclusion, I prefer to believe that the Lehman site Zone II is more recent than Nesikep Creek Zone VII, and that the 6,650 year determination is too early. This puts me in the paradoxical position of having quoting Tamers and Pearson (1965) to the effect that bone-derived dates tend to date too recent, while I now suggest that the Zone II Lehman site collagen date is too old. Obviously more components and more testable samples must be recovered before the problem can be resolved. At this time it is suggested that Zone VII at the Nesikep Creek site is the oldest known component in the Lochnore-Nesikep Locality, having an antiquity in excess of 6,000 years, and possibly as old as 7,000 years. The microblade-rich Lehman site is probably more recent than 6,000 years, and a maximum age of around 5,000 years ago is presently suggested.

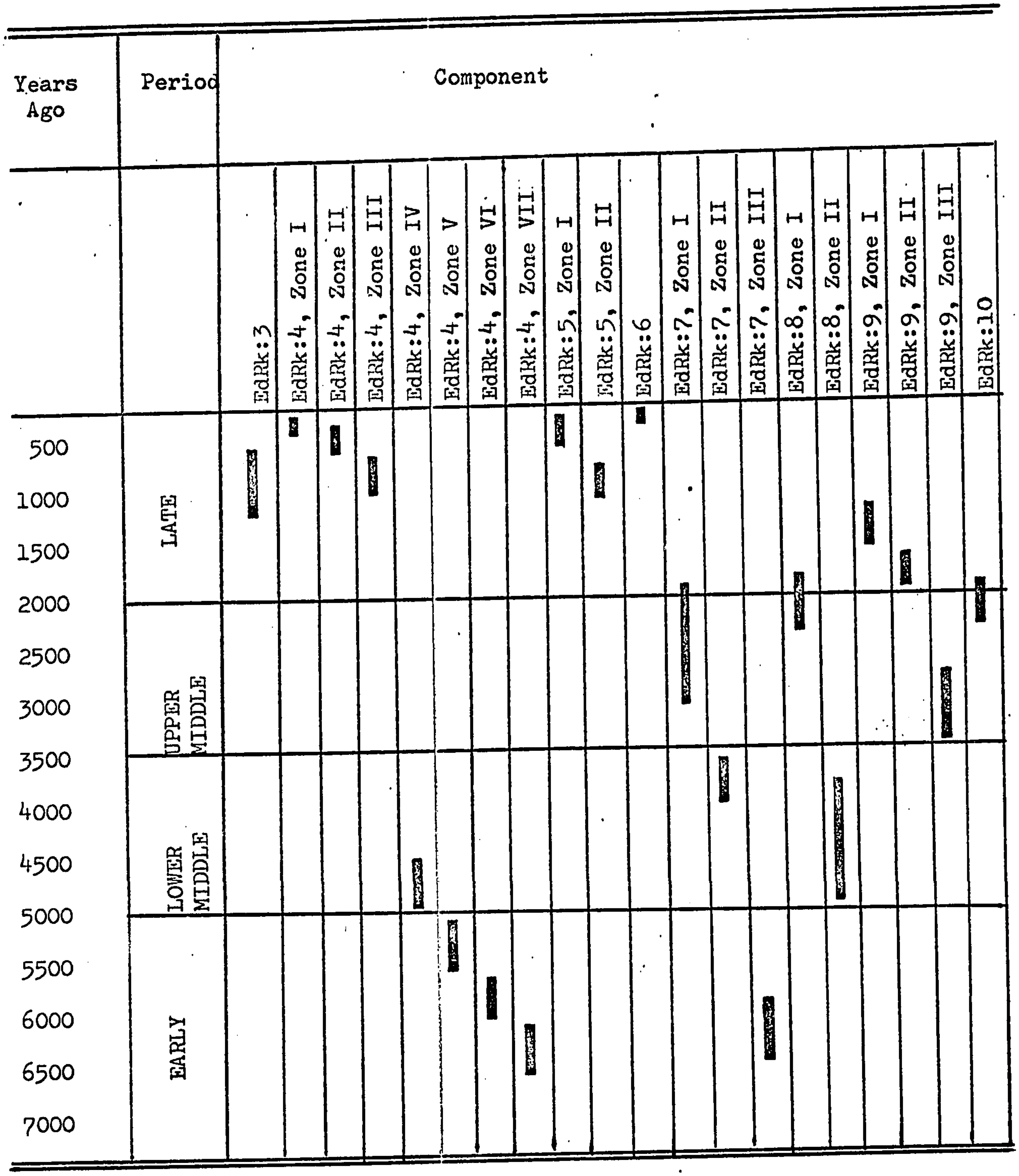
Conclusions The chronological framework provided by the radiocarbon dates can now be superimposed upon the sequence of components, which is derived from piecing together shorter 'runs' from several stratified sites.

Pivotal to the sequence of components is the Nesikep Creek site; of the seven components recognized here, five are sufficiently distinctive for comparative purposes. The components range in time from the late prehistoric Zone I through the 6,000 or more year old Zone VII, but not without long periods when the site was apparently unoccupied. As indicated in Table 57 there is probably a hiatus of 3,000 years between Zone III and Zone IV. The silty sand of Zone V merges almost imperceptibly with the Zone VI white silty sand, which in turn rests directly upon the Zone VII sands. Although the cultural distinctions between Zones V and VII are impressive, no great span of time need be involved, as the two components are probably culturally unrelated. (See the following chapter for a more detailed discussion of this point).

The winter housepits of the Cow Springs and McPhee sites complement the fall and winter hunting and fishing stations of Zone I and III at the Nesikep Creek site. The burials from the Mile 28 Ranch site overlap in time with the above components, although some of the artifacts probably date from a slightly earlier time. A little earlier, but still within the last 2,000 years, would be Zones I and II at the Pine Mountain site. Between 2,000 and 3,000 years ago are the most recent components of the Lochnore Creek site, the Lehman site, and EdRk:10. Dating between 3,000 and 3,500 years is Zone III of the Pine Mountain site, which is preceded by Zone II of the Lehman site, and Zone II of the Lochnore Creek site. Somewhat comparable in time, or even a little older, is Zone IV at the Nesikep Creek site. The earliest three components (Zones V-VII) at the Nesikep Creek site, plus the early Zone III at the Lochnore Creek site, comprise the assemblages which probably range in time from 5,000 to more than 6,000 years ago, with Nesikep Creek Zone VII currently considered the oldest-known component in the Locality.

TABLE 57

LOCHNORE-NESIKEP LOCALITY SEQUENCE



One of the difficulties inherent in discussing the Lochnore-Nesikep Locality sequence is the constant reference to zone numbers and various site names. In order to facilitate the forthcoming discussion of cultural events through time, the sequence is arbitrarily divided into three periods: Late, Middle, and Early. The Late period includes the events from 2,000 years ago to the historic period (about A.D. 1800). The Middle period is divided into a more recent upper Middle period dating from 2,000 to 3,500 and a lower Middle period dating from 3,500 to 5,000 years ago. The Early period begins at 5,000 and continues back in time to about 7,000 years ago. It must be emphasized that these temporal periods are not considered technological stages, and that they are only offered as a means of short-hand reference to segments of time. The periods are presented in Table 57 together with the assumed temporal span of the various components.

In summary, it is evident that despite the number of components in the Lochnore-Nesikep Locality, certain gaps are probably present. Most obvious, perhaps, is a lacuna between the upper Middle period sites, such as Lochnore Creek Zone I and Lehman site Zone I, and assemblages like the Mile 28 Ranch site and the Cow Springs components. Pine Mountain Zones I and II probably fall into the proposed gap between approximately 2,000 and 1,000 years ago, although the dating is uncertain, and the assemblages are small and relatively non-diagnostic. By extending the age of the Mile 28 Ranch site downwards, and the terminus of the more recent upper Middle sites upwards, this gap could be lessened, but probably not closed.

The Lochnore-Nesikep Artifact Sequence

Introduction The artifact descriptions and distributions presented in the previous chapter comprises the basic data for the discussion in this section. Each of the artifact classes, and in some instances constellations of artifact classes (such as microblades and cores), is discussed against the chronological framework. Throughout the discussion the emphasis is on the cultural processes of stability and change, as it was in the preliminary report (Sanger 1964).

Workers in the Pacific Northwest have tended to use phases and components as the basic taxonomic units, although only rarely are these employed in the fashion suggested by Willey and Phillips (1958) which does, at least, offer formal definitions of the terms. While the latter authors acknowledge the fact that in archaeologically little-known areas single components may assume the status of phases, they note that, "In theory" the phase consists of a number of components. After considerable thought on the matter, I have elected not to structure the Lochnore-Nesikep sequence into arbitrary phases. Phases, by their very nature, must be arbitrary constructs in that the archaeologist seeks out constellations of traits to distinguish a certain cluster of components from other similarly conceived clusters. The arranging of components into phases can place the archaeologist in a dilemma, as a single example from the Lochnore-Nesikep sequence will indicate.

In the initial stages of analysis it seemed clear that Zone I of the Lochnore Creek site comprised the basis for a Lochnore Creek Phase, while Zone II of the Lehman site provided the basic component for a Lehman Phase. There remained the problem of incorporating Zone III of the Pine Mountain site into this scheme. Known only from a single test trench, and by 261 artifacts, the component by itself hardly inspires confidence as a formal phase. Perhaps the most diagnostic artifact classes in the Locality are projectile points and microblades. In the Pine Mountain site Zone III assemblage the points affiliate with the Lochnore Creek specimens, while the microblades are reminiscent of the Lehman site. One is left then, with a few reasonably clearly-defined phases and a series of orphaned components. To force these into phases is to potentially bury much useful data.

The second reason is methodological in nature, and is dependent upon the nature of the archaeological sample. Phases, I think, are best suited to situations where both the temporal and the spatial limits of clusters of traits are known. With the exception of the late prehistoric Kamloops Phase (Sanger n.d.), almost nothing is known of the spatial distributions of Lochnore-Nesikep components. The emphasis in the Lochnore-Nesikep sequence is almost entirely chronological; hence the division of the temporal coordinate into arbitrarily-established time periods which are entirely independent of the components or the associated artifacts.

It hardly needs to be stated that the following discussion does not even approach exhausting the possible statements which can be made. Indeed, it seems quite likely that a series of monographs could be written on the history of the Lochnore-Nesikep Locality and its cultural relationships with other regions of North America. This section, therefore, attempts to highlight those events and relationships which seem to be particularly significant at this time.

Projectile Points The Lochnore-Nesikep sequence projectile points show marked changes through time. Table 27, which orders the point groups according to time periods, illustrates the popularity of certain groups at specific times, while other groups, such as the leaf-shaped group 1 specimens, are distributed throughout the sequence.

While it would be desirable to plot the metrical or quantitative attributes against the chronological scale in the expectation of discovering trends of projectile point manufacture through time, the calculations, if done by hand, would involve a far greater expenditure of time than is currently available. All of the quantitative and qualitative attributes for each point are transferred to work sheets, however, and in time the data may be programmed for computer analysis.

As a rough pilot study, neck widths for several point groups were examined. Groups 3 through 10 were selected because the majority of the points in each group come from a single time period (Table 27). The neck widths (distance between the notches) for the lower Middle period point groups 3 and 4 average 17.2mm and 17.0mm respectively; the upper Middle period point groups 5, 6, 7, and 8 average 13.9mm, 12.5mm, 13.4mm, and 13.7mm respectively; and the Late period groups 9 and 10 average 7.7mm and 6.8mm respectively (see Tables 4-11 for figures). The decrease in neck width is probably dependent upon a decrease in the diameter of the shaft, and may reflect changes from heavy spear shafts to lighter arrow shafts. A more sensitive analysis would involve the plotting of each individual point neck width against the temporal scale. Once again, this would require computer techniques.

The non-metrical or qualitative attributes (Tables 16-26) also suggest certain trends through time, as well as some definite tendencies noted throughout the entire sequence. Blade edge form attributes indicate a clear preponderance of straight and excurvate (over 90% of the total) and very few incurvate or recurved edges. There is no obvious correlation between time and blade edge form.

Stem form attributes (Table 17) indicate a strong tendency (75%) to expanding stems. Contracting blunt stems, mostly in the group 1 leaf-shaped points, constitute the only other popular stem form attribute (18%). Expanding stems are prevalent throughout the sequence.

Basal preparation attributes (Table 18) reveal the expected widespread technique of basal thinning; less than 10% are not thinned. Basal and lateral grinding, however, is limited almost exclusively to early and lower Middle period points. Strongly represented in the lower Middle period groups 3 and 4, lateral and basal grinding is absent in the upper Middle period point groups 5-8, and appears only once in the Late period group 9.

Base form attributes (Table 19) indicate that approximately half of the bases are concave or indented, with one-third being straight. With the exception of the base-indented group 12 examples, most of the strongly concave-based points come from the lower Middle period components. Straight-based points, on the other hand, are more frequent in the upper Middle and Late periods.

Wide corner-notched points comprise nearly two-thirds of the sample, with the large Middle period samples strongly influencing the figures. Generally, however, corner notching is an attribute represented in the Early and Middle periods. Basal notching is noted scattered throughout the sequence, but it is most common in the upper Middle period groups 12 and 13. Wide side notching is found in the early Middle and Late periods, while narrow side notches are a feature of the Late period.

Shouldered points (Table 24) outnumber barbed points (Table 22) by almost 2 to 1, with wide angle shoulders being the most frequent form. Nearly one-half of the barbs are small and one-third are long, extending to the base. The latter barb form (confined to group 13) is found in the upper Middle period and in the Late period. Medium and small length barbs are represented in lower Middle and upper Middle periods.

Serration of point blade edges (Table 23) is confined to the Early and Middle periods, with the majority from the lower Middle period.

Cross section attributes (Tables 24 and 25) may reflect the basic pre-form flake configuration. In both transverse and longitudinal cross section attributes, plano-convex forms account for approximately 50% of the total. Bi-convex forms comprise approximately one-third of the points.

As previously indicated, the Lochnore-Nesikep sequence projectile points illustrate marked changes through time. The points from the Early period apparently represent two distinct traditions in point manufacture. The specimens from Zone VII of the Nesikep Creek site (group 15) are long, slender, thin in cross section, stress the removal of long parallel-sided flakes, and are often laterally and basally ground. Points from Zone III at the Lochnore Creek site are leaf-shaped (bi-pointed) or side-notched with wide side notches, are thicker in section, are randomly flaked, and display no basal grinding. Points from Zone V may be distantly related to the Lochnore Creek Zone III examples.

Projectile points of the lower Middle period are characterized by wide, expanding stems which are usually concave and ground along the lateral and basal edges. Short in length, the points are usually less carefully flaked than the early period examples. Some points from this period may be related in form to specimens of group 15 from Zone VII of the Nesikep Creek site, but others apparently represent new notions in point manufacture. Some serration of point blade edges is found during this period.

During the upper Middle period the varieties of point style increase. Expanding stem, concave-based points (usually without grinding) are noted, but contracting stems, and markedly-barbed points are also present. Some points are becoming smaller, anticipating the diminuitive point of the following period.

The Late period points represent a continuation of the basal and corner-notched upper Middle period specimens, but midway through the Late period, these points are replaced by the side-notched points with narrow necks and narrow notches. Some of the earlier examples of the side-notched points are large, but by historic times the most typical point is the small, triangular point with two (and sometimes more) notches worked perpendicularly into the blade edges.

It seems likely that some projectile point attributes may serve as time horizon markers. The skillful flaking of the group 15 points is distinctive enough to consider it an indicator for the Early period. The combination of an indented, expanding stem which is strongly-ground seems to be a hallmark of the lower Middle period points. Frequently concomitant with this latter cluster of attributes is blade serration. The long barbed points appear to have a fairly restricted temporal range spanning the upper Middle period and perhaps into the beginning of the Late period. Typical of the Late period, especially the last 1,000 years of it, is the triangular point with the narrow side notches. It is worth noting that leaf-shaped points of a general bi-point form are distributed through the sequence and the presence of them in assemblages is not in itself indicative of great antiquity.

Microblades and Microblade Cores Microblades and their attendant cores have a long history in the Lochnore-Nesikep sequence. Microblades are found in limited quantities (3% of assemblage) in the Early period at Zone VII of the Nesikep Creek site, estimated to be older than 6,000 years. They are not present, however, in the 2 other Early period components - Zone V at the Nesikep Creek site and Zone III at the Lochnore Creek site. It is not until the lower Middle period components that microblades assume significant proportions in assemblages; at the Lehman site (Zone II), microblades constitute nearly 50% of the 900 excavated artifacts. Sites in the upper Middle period have considerably lower percentages varying from a high of 33% for Zone III at the Pine Mountain site, to less than 5% associated with the 2,600 year old housepit 2 at the Lochnore Creek site (EdRk:7, Zone I). Assemblages dating from the beginning of the Late period are scanty, but present evidence suggests that microblades were loosing popularity by the end of the upper Middle period, and may not have been manufactured in the Lochnore-Nesikep Locality during the last 1,500 years of prehistory. In Appendix I Wyatt compares microblades from the various components and finds relatively slight changes through time. As the pertinent statistics and discussion are included in the Appendix they need not be repeated here. It is worth noting, however, that Wyatt's figures suggest that differentiating components on the basis of the quantitative attributes is difficult.

Microblade cores from the early Middle period components seem generally to illustrate greater consistency of form than do those of later components where more amorphous-shaped cores are found. Core edge angle may be a potentially diagnostic attribute but the sample of measureable cores from the upper Middle period assemblages is too limited to derive any meaningful comparative statistic. It might be possible, however, to measure the equivalent of the core edge angle (striking platform angle) on all microblades in an attempt to discern trends in core manufacture. These figures, when analysed in conjunction with other metrical attributes may reveal some diagnostic trends and time horizon markers. The crude pilot study of striking platform angles (or core edge angles) of the Lehman component microblades suggests no internal differences correlated with depth in the deposit (see Table 35), but it does include the feasibility of determining core edge angle by means of microblade studies.

At present, the available data from the Locality suggest that microblades and cores are present in slight quantities during the Early period, increase to constitute nearly 50% of assemblages by the lower Middle period, and then decrease in numbers to the Late period. According to the analysis of the selected set of attributes, the consistency of form in microblade manufacture must be considered the outstanding feature of this class of artifact. Possibly, further experimentation and computation with as yet un-explored attributes will yield more sensitive delineating mechanisms.

Hafted Scrapers The 38 hafted scrapers appear to constitute one of the most distinctive and useful artifacts in the Locality. Of the 38 specimens, all but 2 are from Zone II of the Lehman site and hence in the lower Middle period. One of the remaining examples, from Zone I at the Lochnore Creek site falls in the upper Middle period, while the other is from a mixed area in the same site and thus could be either of upper Middle or of lower Middle period derivation. The potential usefullness of this class is heightened by the characteristic deep narrow notches and extensive grinding. Temporally, this notching preceeds anything comparable in projectile point technology by 2-3,000 years.

Chipped Bifaces Perhaps the most impressive feature of the formed biface category is the high incidence in the Zone III assemblage of the Lochnore Creek site (EdRk:7) (Table 39). For example, formed bifaces constitute 9% (35 out of 400) of the specimens in the assemblage, whereas they comprise less than 6% (145 out of 2,500 specimens) of the Zone I assemblage at the same time. The most interesting concentrations of formed bifaces from Zone III at the Lochnore Creek site are found in the group 1 elliptical and in the miscellaneous bifaces categories. The peculiar end notched group 6 bifaces are noted only in the Mile 28 Ranch site (EdRk:3), which also has more group 4 pentagonals than any other component. These two groups (4 and 6) may be considered fairly diagnostic of the Late period. No immediately apparent pattern emerges from the non-formed chipped biface category.

Chipped Unifaces Formed unifaces indicate considerable potential as time horizon markers in the Lochnore-Nesikep Locality. Group 1, the round to oval unifaces retouched around the entire edge, are distributed in relatively high percentages throughout the Early and lower Middle period components. Of the 24 specimens in this group only 5 are from the more recent periods. Other groups also reveal this strong tendency towards formed unifaces in the Early and lower Middle periods (Table 42). The 3 Early period components contain 43% of all formed unifaces (78 out of 180), although these Early assemblages constitute less than 20% of the total artifacts in the Locality. Most striking in this respect is Early period Zone VII at the Nesikep Creek site (EdRk:4). Here formed unifaces comprise 19 out of 180 specimens, or 10.6% of the total sample, while non-formed unifaces from the same component constitute 7 out of 500 examples, or only 1.4% of the random sample. In comparison, formed unifaces from the upper Middle period Zone I at the Lochnore Creek site (EdRk:7) make up 29% (53 out of 180) of the total sample, whereas non-formed unifaces from the same component constitute 54% (270 out of 500) of the random sample. Group 5 unifaces are found only in the Early period sites EdRk:4 (Zone V) and EdRk:7 (Zone III).

In summary, it appears from the sample present in the Lochnore-Nesikep Locality that formed unifaces, like the formed bifaces, are more common proportionately in the Early period assemblages. While the samples from the Late period sites are admittedly small, the distributional data suggest that formed bifaces and formed unifaces are very rare in these assemblages.

Burins Burins made on a variety of pre-forms appear to have little diagnostic value, except when the pre-form itself is highly distinctive. Burins on microblades are a product of the Middle period as are the 2 examples discussed under the heading "Burins" (Page 199). Potentially more useful are the burins made on hafted scrapers which are temporally more restricted.

Gravers As suggested earlier, gravers and end-of-the-microblade graving tools appear to have almost mutually exclusive distributions (Table 45). Nearly half of the gravers (8 of 17) come from the non-microblade Early period components Nesikep Creek (EdRk:4) Zone V and Lochnore Creek (EdRk:7) Zone III. When the 5 specimens from the microblade-impoverished Zone I at EdRk:7 are added, three-quarters of the gravers are included. The absence of gravers from the 2 largest microblade collections (EdRk:8, Zone II; and EdRk:9, Zone III) is the anticipated corollary, and nearly identical functions for the gravers and their counterparts on microblades seems likely.

Microblades and Cores These artifacts are limited in the collections to two components - Zone III at the Lochnore Creek site, and Zone II of the Lehman site. Of these, the former component's macroblades and core(s) (1 and possible 2) are the more convincing of a macroblade tradition as the more diminuitive microblades are not present. At the Lehman site the single core fragment and occasional macroblades are sufficiently distinct in size so that there presently seems to be no grounds for assuming them to represent the upper size range of the microblade continuum.

Cobble Tools Although cobble choppers are noted throughout the sequence, there can be little doubt that they are much more frequent in the Early period. The decrease in choppers is continuous from the Early period onwards, but they disappear almost entirely in the upper Middle period with the introduction of polished nephrite adz blades. It is for this reason that I tentatively regard at least some of the functions of choppers and adz blades as overlapping, with the hafted adz eventually replacing the cruder hand-held chopper. Tentatively, then, a high incidence of cobble choppers may be indicative of the lower Middle and Early periods in the sequence. Cobble choppers may be most common in the two Early period components Zone III at the Lochnore Creek site and Zone V at the Nesikep Creek site. Numerous choppers gathered from the surface of wind deflated areas on the latter site were patinated similarly to artifacts from Zone V, and may possibly have derived from that component.

Cobble spalls may also be more typical of the Early and Middle periods, although in the later period Zone III of the Nesikep Creek site (EdRk:4) a substantial number of yellow and orange quartzite spalls were recovered.

Hammerstones are universally present as they are essential to stone flaking techniques. No attempt has as yet been made in the analysis of this class to determine changes in relative frequency or in form.

Ground Stone Artifacts Ground stone is restricted to the upper Middle and Late periods with the exception of edge-ground cobbles. It seems highly probable, however, that grinding stones and other abrasives will eventually be found in Early period components, as bone and antler artifacts have obviously been fashioned by abrasion. Nephrite, ground and polished to a very sharp edge, first appears during the upper Middle period, and continues to the Late period where it is fairly common in burial sites as grave inclusions. As suggested above, the nephrite adz blades may have replaced some of the functions of the cobble chopper. At this time the nephrite collection is too small to discuss changes in form through time.

Steatite objects, such as spindle whorls and pipes, are limited to Late period sites, and the detritus of an industry in steatite has not yet been unearthed in the Locality despite the ready availability of the material.

Stone saws are scarce, and are curiously restricted to upper Middle period components.

Ground slate objects are uncommon and, unfortunately, their provenience is not certain. Tentatively assigned to the upper Middle and Late periods, the earlier presence of ground slate in the Lochnore-Nesikep Locality should not yet be ruled out without further discussions on the subject (see Chapter VII).

Pigments occur in most components with the amount recovered being generally proportional to the area excavated.

The two flat boulder mortars (?) from the surface of the Nesikep Creek site represent the only objects approaching mortars. The scarcity of this artifact class has important implications for subsistence techniques and comparative studies and so will be discussed in the appropriate sections.

Edge-ground cobbles are restricted to the 3 examples from the Lochnore Creek site, 2 of which are definitely of Zone III affiliation. Their presence in the Early period is significant and again meaningful in the comparative section to follow.

Bone Artifacts Bone artifacts are distributed throughout all periods. When discussing the presence or absence of any particular class, however, it is only possible to mention presences, as preservation factors may in part be responsible for the absences. Bone awls, as Table 52 indicates, are found in all periods, as are points, needles and beads. Other bone artifacts, such as whistles, creasers, and perforators, are noted in the upper Middle and Late periods. The high incidence of certain delicate bone pieces, such as needles, in the Mile 28 Ranch burial site (EdRk:3), is undoubtedly a result of the recentness and the nature of the site.

Antler Artifacts Like the bone artifacts discussed above, antler objects are also very susceptible to deterioration. One of the most widespread antler artifact classes is the antler wedge, found in all periods, and especially in Zone VII of the Nesikep Creek site (EdRk:4) where 3 specimens have been recovered. Not unexpectedly however, the bulk of the antler artifacts derive from the Late period burial site EdRk:3.

Tooth Artifacts By far the most common artifact of tooth is the ubiquitous rodent incisor gouging implement which has been noted in all periods. Examples of dog or coyote canine pendants have been recovered from upper Middle period components.

Shell Artifacts Objects of shell are noted mainly in the upper Middle and Late periods, although a piece of *Mytilus californianus*, while apparently unmodified, is present in the Early period Zone III component at the Lochnore Creek site. Other shell objects include limited numbers of *Olivella*, *Dentalium*, and pendants made of fresh water mussel shell. The *Pecten caurinus* shells have been recovered only from the Late period Mile 28 Ranch site.

Metal Artifacts Copper artifacts in the form of tubular copper beads have been recovered from components of the upper Middle period and the Late period.

Wood Artifacts Wooden artifacts, as indicated earlier in the text, are limited to Late period components where preservation is also likely to be the best.

Component Summaries

Although reference to the artifact distribution tables will indicate the location of specific classes and groups within components, very brief summary statements describing the more diagnostic features of the assemblages are in order.

Mile 28 Ranch (EdRk:3) The artifact assemblage of this Late period burial site is typified by narrow-necked, side-notched projectile points, in addition to barbed, basal-notched specimens. Also associated are ground nephrite adz blades, steatite pipes, and stone mauls. Bone and antler artifacts such as wedges, awls, and pendants are plentiful.

Nesikep Creek, Zone I (EdRk:4) This small Late period habitation component includes small triangular side-notched points, and miscellaneous non-formed bifaces and unifaces.

Nesikep Creek, Zone II (EdRk:4) This is a badly disturbed Late period burial component yielding only a few bleached human bones.

Nesikep Creek, Zone III (EdRk:4) Zone III is characterized by large side-notched points with narrow notches (group 9), contracting stem points, nephrite adz blade fragments, antler and bone tools, and quartzite spall tools. A Late period habitation site, Zone III was probably occupied during the summer months as a fish drying station.

Nesikep Creek, Zone IV (EdRk:4) A lower Middle period habitation component, Zone IV is noteworthy for its numerous microblades and large corner-notched points, in a possible housepit context.

Nesikep Creek, Zone V (EdRk:4) Zone V is an Early period habitation component distinguished by the absence of microblades and a wide variation in point forms. Formed and non-formed bifaces and unifaces are made from a grey veinous basalt which is characteristic of this component. Preservation of organic implements is poor.

Nesikep Creek, Zone VI (EdRk:4) Zone VI is known from a few scattered pieces of charcoal, bone, and chipping detritus enclosed in the distinctive white silty sand matrix.

Nesikep Creek, Zone VII (EdRk:4) Possibly the oldest known component in the Lochnore-Nesikep Locality, Zone VII is characterized by the carefully-flaked Plano-like points (group 15), excellent preservation of bone and antler, and a high proportion of formed unifaces. Antler wedges and reground rodent incisor gouges are thought to constitute evidence for the Early period presence of wood working tools.

Cow Springs, Zone I (EdRk:5) This Late period component is represented by a few pieces of non-diagnostic chipped artifacts and detritus overlying the sterile sand separating Zone I and Zone II at the site.

Cow Springs, Zone II (EdRk:5) This single housepit component is considered to represent an early component of the Kamloops phase and thus in the Late period. Zone II has small, side-notched points, basal-notched points, and non-formed bifaces and unifaces. Characteristic of this zone is the excellent preservation of organic remains, especially wood.

McPhee (EdRk:6) The McPhee site is a single component housepit site of the Late period and Kamloops phase. Typical of this small component are small, side-notched points and good preservation of organic remains.

Lochnore Creek, Zone I (EdRk:7) Despite the depth of deposit at this upper Middle period habitation site, the homogeneous nature of the fill, plus the internal consistency of the assemblage, suggests that only one component is represented. Extensive housepit excavation and re-excavation can disturb previous deposits to a considerable degree, however, and the possibility that future work will disclose more than one component should not be discounted. A large number of point styles are present, but the numerically dominant forms are of a general lanceolate outline, some with a single basal notch. Other forms include basal and corner-notched points. Small side-notched points are absent. Microblades are greatly diminished in numbers, and ground stone objects are quite numerous. At specific levels in the component there is an abundance of bone and antler tools. Housepits are deep, being aboriginally excavated to depths of 2 metres.

Lochnore Creek, Zone II (EdRk:7) This is a lower Middle period component buried beneath Zone I in a distinctive soil matrix. Diagnostic of the assemblage is a high incidence of microblades.

Lochnore Creek, Zone III (EdRk:7) Resting in direct contact with the basal gravel at the Lochnore Creek site, this Early period component is distinguished by the absence of microblades, the presence of leaf-shaped points, a large side-notched point, edge-ground cobbles, and macroblades.

Lehman, Zone I (EdRk:8) The upper Middle period Zone I deposits, which are badly disturbed by the plough, represent a housepit component with point styles generally overlapping with those from the Lochnore Creek site, Zone I. A significant difference, however, is the increased frequency of basal-notched points in the Lehman component, and an absence of group 12 points.

Lehman, Zone II (EdRk:8) This lower Middle period site is distinguished by the high incidence of microblades and microblade cores. Projectile points are mostly of the group 3 and 4 corner-notched forms.

Pine Mountain, Zone I (EdRk:9) The uppermost component of housepit 1, this Late period component is distinguished by the absence of microblades and small side-notched points. Points are of various corner-notched and lanceolate forms. A burial may be also associated with this component.

Pine Mountain, Zone II (EdRk:9) No diagnostic artifacts were recovered from this component.

Pine Mountain, Zone III (EdRk:9) This upper Middle period component may represent the earliest definite evidence for semi-subterranean housepits in the Lochnore-Nesikep Locality. The assemblage is typified by a high microblade incidence, and corner-notched, barbed points.

EdRk:10 This upper Middle period component is known from a serious of collections from unsystematic excavations. It appears essentially similar to the other upper Middle period components from the Lochnore Creek site and the Lehman site.

EdRk:11 This little known site consists of two heavily patinated cobble choppers eroded from a small spring.

EdRk:12 This component consists of a series of storage pits surrounding the Cow Springs site.

Settlement Pattern

Introduction The term settlement pattern is used here in a broad sense to refer to size and configuration of housing, numbers and patterns of house clusters, and the various environmental factors effecting the distribution and form of habitations.

Numerous environmental factors are operative in dictating site locations in the Lytton-Lillooet area. First, sites are rarely located where there is not good fresh water within easy walking distance. Judging from the strong tendency for sites to be situated beside springs and tributary streams, it would appear that the silty Fraser was not a desirable water source. The apparent avoidance may be based upon a dislike for the muddy water, or it may be dependent upon certain ritual restrictions pertaining to the "salmon folk". Whatever the reason, habitation sites are usually located beside fresh water sources. This fact alone is sufficient to cluster sites in the semi-arid Fraser Valley, and the archaeologist finds various periods of habitation utilizing the same camping area, thus creating stratified sites.

Another determinant is that of shelter. Winter habitations, especially, tend to be situated in areas offering some protection from winter winds, but at the same time "catching" some of the weak winter sun. The east bank of the Fraser valley is the sunny side during the winter months. Fuel, in the form of fire wood, is a necessary prerequisite to people living in the Interior of British Columbia, and prior to the invasion of the introduced *Artemisia* and related Xerothermic species, wood may have been more plentiful, although continuous habitation would tend to denude the closest stands of pine and fir. Good drainage is a prerequisite to comfortable winter dwelling, as is a sufficiently deep deposit of soft soil overlying the impervious and compact gravel which forms the subsoil in all areas in the Lochnore-Nesikep Locality.

Storage pit locations are selected primarily for drainage and convenience to the dwelling sites. For security some storage pits may have been constructed away from the main village area.

Summer sites should reflect the primary occupation -- fishing. A good summer location should offer fresh water, ready access to fishing areas, such as deep water close to shore, and an open terrace for the drying salmon to be exposed to the hot summer winds. Such a site may be "owned" by a resident of a nearby winter village, or it may be utilized by a family or families from another area.

Burial areas along the Fraser from Lytton to Lillooet are usually located in sandy, easily-excavated terraces, frequently overlooking the Fraser River. Flat spots are preferred but occasionally a sandy hillside, or even a gravelly slope, is utilized.

<u>Site Utilization</u> In the Lochnore-Nesikep Locality there are examples of various forms of sites utilized for different functions. Lacking any evidence to the contrary, it seems reasonable to assume that the semi-subterranean housepits constitute winter dwellings, as they did in early historic times (Teit 1900:192). The winter dwellings include: the Cow Springs site (EdRk:5); the McPhee site (EdRk:6); the Lochnore Creek site (EdRk:7) Zone I; the Lehman site (EdRk:8) Zone I; the Pine Mountain site (EdRk:9) Zones I-III; EdRk:10; and various ploughed areas.

The Cow Springs site, on the west side of the Fraser, is located at the foot of a long hill which affords ample protection from the winds coming off the Coast Range Mountains. Tall fir trees on the Fraser River site of the site screen off winds from the river, and offer plentiful firewood. A short distance away is Cow Springs, from which fresh water could be drawn the year around if necessary. The shortage of winter sun and the narrowness of the terrace probably discouraged more intensive habitation, while the poor drainage position at the base of the slope eventually flooded-out the occupants of the single housepit.

Much less desirable would be the exposed position of the three housepits on the ridge at the McPhee site. These habitations were constantly windy during the summer, and in the winter would be most uncomfortable. Procurring water would also have been a problem, requiring a walk to Nesikep Creek. Three positive features of the McPhee site location would be its easily defended position, its fine vantage point, and the excellent drainage.

The Lochnore Creek site was probably the largest winter village site in the Locality. Nestled at the foot of the hills on the eastern side of the valley, the site combines shelter, sun, a good water supply (Lochnore Creek), and a deep, well-drained, deposit of aeolian sand which allows deeply-excavated, semi-subterranean housepits. Behind the site are stands of pine and fir and a plentiful supply of firewood.

Even more sheltered from winds is the Lehman site located in the valley of Lochnore Creek. A possible disadvantage of this location, however, lies in the shallow deposit of silty sand and the impervious gravel below. The housepits of Zone I at the Lehman site were only shallowly excavated, and water drainage must have been a problem.

While the 6 housepits of the Pine Mountain site are located along a ridge, the location is heavily-wooded and it is not as exposed as the contour map would suggest. Water, fuel, sun, and drainage factors are excellent, but the loose soil cover is thin. At housepit 1 the inhabitants were forced to excavate through very compact gravel deposits. Housepits 2-6 were dug into a shallow mantle of aeolian silty sand and down to the underlying gravel.

The scattered housepits of EdRk:10 in the Lochnore Creek valleys are well-protected from winds, adequately drained, and well-watered. Disadvantages include digging in gravelly soil and a scarcity of winter sun.

The open habitation sites in the Lochnore-Nesikep Locality include all components of the Nesikep Creek site, Zone II of the Lehman site, and EdRk:11. Viewed as a potential winter dwelling locality, the Nesikep Creek site is exposed to winds, represents an awkward climb to drinking water, and is devoid of floral cover. The latter observation may be a comparatively recent phenomenon, however. It is as a summer fish drying station that the Nesikep Creek site excels, and the numbers of salmon vertebrae in Zone III indicate this occupation. Teit (1900:234) notes that during the summer salmon were dried with the vetebral column separated from the meat, while in the fall fish was stored with the backbone intact. The presence of salmon vertebrae strengthens the likelihood that the Late period Zone III was being used as a summer fish drying site. The presence of a deer antler taken while "in velvet" is corroborative evidence for summer occupation. Zone I at the Nesikep Creek site contains numerous deer bones in an otherwise shallow deposit, which does not appear to represent a winter occupation, although the fall and winter are the primary deer hunting seasons. The other occupation zones at the site are of indeterminant season, and other than the fact that as an open winter site the terrace would be most uncomfortable, there is nothing to suggest the season of occupation. Associated faunal remains are nearly all of deer and small unidentified mammals. Similarly, only inferential evidence can be mustered for the Zone II and III at the Lochnore Creek site, and Zone II at the Lehman site. The location of these sites, so far from the river, may indicate that they were in fact the scene of winter domiciles, or at a season when access to the hills for hunting or vegetable food foraging overshadowed the importance of proximity to the fishing stations along the river.

House Structures Evidence for house superstructure is less complete than desirable and the reconstructions must lean heavily on the ethnographic data. Most obvious, of course, are the semi-subterranean housepit excavations which so clearly advertise the presence of habitation sites in the Plateau. Although I once considered that changes in depth of housepit excavation could be correlated with time (Sanger 1966), and although the record can still be interpreted in this fashion, it now seems reasonable to adopt a more pragmatic approach. The main advantage of the semi-subterranean structure, I think, is the insulating value of the soil of the house walls. Heat loss through radiation from such a structure is less than in a house wholly above ground level. Such an advantage would probably be apparent to the aboriginal occupants of the Fraser valley. As mentioned in the discussion of prerequisites for habitation sites, a certain depth of loose soil above the gravel is most advantageous. Even with picks and shovels, excavation into the compact basal gravel is an arduous undertaking, and one even more difficult to the iron-less prehistoric inhabitants. With the sole excavation of housepit 1 at the Pine Mountain site, no housepits in the Lochnore-Nesikep Locality are excavated into the gravel, although superstructural members were occasionally set in shallow holes in the subsoil. The two deepest excavated housepit sites, Cow Springs and Lochnore Creek, were both in loose soil requiring a minimum of effort to displace. Indeed, the soil at the latter site was so loose that it created certain problems for the inhabitants.

Teit (1900:192-4) discusses the ethnographic Thompson housepit in some detail, and it is instructive to compare the Lochnore-Nesikep examples with Teit's description. A circular house plan of between 6 and 14 metres was preferred. Women excavated the earth, heaping it to one side. Four major upright supports were dug into the soil beneath the house floor and tamped into place. These posts in turn supported four hip rafters running from the outer edge of the excavation, and joined by a square to rectangular frame at the apex of the roof. The opening served as the smoke hole, entrance, and skylight. Admittance into the living area was gained by descending a notched log ladder. Poles were lashed across the hip rafters and the whole was covered with the previously excavated earth. A firehearth area was located in the centre of the living floor.

At the Cow Springs site the housepit measured approximately 10 metres across and was excavated to a depth of 1 metre. The cross trench intercepted 2 major upright post moulds in addition to evidence of several smaller moulds. The central firehearth was not contacted. Perhaps the greatest variation from Teit's (1900:193; Figure 135) illustration is the deeply-excavated central area of the Cow Springs housepit. The sloping walls of the latter diverge from the illustration, but it seems reasonable to assume that the neat angle in Teit's illustration represents a generalized form rather than any actual housepit profile.

The more complete excavation of housepit 2 at the Lochnore Creek site yielded evidence of upright post holes dug into the gravel. Unfortunately, the several reconstructions of housepit 2, plus the shifting centre of the pit, has resulted in a confusion of posts. The dwellings occupying housepit 2 were evidently oval rather than circular, and the junction of the walls and floor rounded instead of angular as they appear in Teit's illustration. A large, rectangular central hearth area was located. Perhaps the most interesting innovation of housepit 2 is the rock retaining wall erected against the uphill side wall of the pit.

Discouragingly little is known of the shelters erected in the non-housepit sites. Teit (1900:195-8) describes temporary mat lodges and lean-toos which would leave little trace in the shifting sands of the excavated sites.

Storage Pits Storage pits are fairly common although few have been excavated. The pits examined in conjunction with the McPhee site project conform closely to those described by Teit (1900:198,9) even to the wrapping of food in birch bark.

Burials Burials from the Lochnore-Nesikep Locality are limited to the fragmentary example beneath a buried cairn at the Lochnore Creek site, the individual from the Pine Mountain site, the group from the Mile 28 Ranch site, and fragments from the Nesikep Creek site. In addition to these, Mr. Lehman uncovered human burials from among housepits in the vicinity of his home. These latter probably represent Zone I of the Lehman site.

The burials from the Mile 28 Ranch site conform to the general ethnographic pattern of flexed, primary inhumations with grave inclusions (Teit 1900:328). Since the Mile 28 Ranch burials date in the Late period the general similarity with the ethnographic account is not surprising, although the rock cairns mentioned by Teit are absent.

Little is known of the Nesikep Creek burial pattern, but on the basis of amateur reports the pattern may have been essentially similar to that found at the Mile 28 Ranch site.

The flexed inhumation without grave goods placed between Zone I and Zone II at the Pine Mountain site presently represents the oldest known example of this basic practice in the Interior Plateau.

Probably older in time is the buried cairn burial at the Lochnore Creek site. Unfortunately, only the cranium was preserved, and nothing is known of the position of the body. The presence of the rock cairn over the burial is reminiscent of the ethnographic practice and the burial may, therefore, be intrusive into the site. On the other hand, the accumulation of 100 cm of sand over the cairn (assuming it to have been on the surface at the time of inhumation) suggests that the burial may be contemporaneous with the Zone I occupation.

Subsistence Techniques

Introduction Subsistence techniques is used here to encompass the general topic of man's utilization of his environment. This is the very essence of most archaeological reports from western North America because in a sense almost the entire artifact description is interrelated with the general topic of subsistence techniques. In Chapter II a partial listing of available food resources was listed; in this section the actual evidence for resource exploitation will be considered.

Mammal Resources Given the close proximity of large mammals such as deer, elk, bear, mountain sheep and goat, it seems axiomatic that a non-agricultural society will make extensive use of these large protein sources. In almost every site remains of cracked and crushed long bones, teeth, and ribs of these large mammals were recovered. The majority of these bones undoubtedly represent deer. The Fraser Valley between Lytton and Lillooet is poor elk country, while goat and sheep are rarely common enough to compete on the menu with deer.

Deer antler, frequently manufactured into wedges, is noted in some assemblages. A few of these wedges may be of elk, which suggests either the occasional presence of this mammal in the Fraser Valley, or else hunters went further afield into elk range along the Thompson River. Alternately, this more sturdy antler might have been traded into the area.

Smaller mammals formed a very minor portion of the diet, by bone weight these constitute an estimated average of much less than 1% of the total bones. From surviving teeth it appears that marmot, woodchuck, and beaver, were occasionally hunted. Some of the small furbearers may have been trapped, but evidence is lacking.

It would probably be a wasted effort to count and tabulate all the split and crushed deer bones in an attempt to compute calories or even numbers of humans occupying a site. The numbers of unknowns are greater than the knowns, and the end result is likely to be of dubious value. Factors of preservation are sufficiently different from site to site, and even within single housepits, depending upon the depth from the surface. Almost invariably, the best preserved faunal remains occur in the lowest levels of the Nesikep Creek, Lochnore Creek, and Lehman sites, and then again in some of the Late period sites. Bones from the Early and lower Middle period sites which rest on the gravel tend to be partially mineralized and covered with a protective sheath of sand and calcium carbonate. Over 1000 grams of broken deer bones was recovered from the limited test pitting in the Lehman site, and almost all of that weight derived from the Zone II deposit. A similar quantity of deer bone came from Zone VII of the Nesikep Creek site. The excellent preservation in the Cow Springs site has already been discussed and attributed to the washed-in silts, sands, and gravels, which sealed off the deposit. Good preservation in Zone I at the Nesikep Creek site and in the McPhee site is credited to the Late period date of these sites.

A site like the Lochnore Creek site presents a special problem. Here food bones are scarce in the upper levels of housepit 2 and increase noticably in the middle and lower levels. An east-west section of housepit 2 yielded 504 food bones which were arranged by 25cm levels from the surface to 225cm below surface. Over 70% of the bones were recovered from the levels between 125 and 200cm below the surface, although the chipping detritus chart (Figure 8) indicates that as much or more stone chipping activity took place in the 50-75 and 75-100cm below surface levels as it did in the lower deposits. The deposits above 100cm have been extensively leached, while those bones from near the base of the site are partially mineralized and covered with a sheath of sand and carbonate. Crushed food bones from all but 2 of the 2 by 2 metre column in housepit 2 totalled over 3,500 grams in weight.

<u>Fish Resources</u> Fish, together with deer, constitute the bulk of the meat diet. Fish remains are more susceptible to decay than the heavy mammal remains; nevertheless, fish vertebrae, presumably salmon or steelhead trout, were noted in nearly every component. Again, fish remains assume significant proportions in the Late period. The near absence of fish bones in sites where there is otherwise good preservation of organic materials does not constitute evidence that fishing was not an important aspect of the subsistence quest. Teit (1900:234) notes that fish caught during the summer are frequently dried with the skeleton extracted, whereas fish taken later in the year are often preserved and cached with the vertebral column and ribs intact. Assuming the ethnographic model to have pertained for at least part of the prehistoric era, the inhabitants of a winter housepit could have eaten quantities of fish without leaving a trace in the archaeological record.

Although in ethnographic times the use of fresh water shell fish was looked upon with some distaste (Teit 1900:231), the inhabitants of Zone III at the Lochnore Creek site made some use of the fresh water mussel Margaritifera margaritifera.

Vegetable Foods There is no evidence of vegetable foods having been eaten. In some regions of the Plateau antler root digging sticks are present in assemblages, but these artifacts are not represented in the Lochnore-Nesikep Locality. The scarcity or even absence of mortars suggests the absence of food grinding, although wooden mortars might have been used.

Birds A few small, unidentified bird bones, mostly re-worked into beads and tubes, have been recovered. Some are bones of small birds while others are large enough to be of eagle. Unfortunately, all epiphyses are cut and ground, making identification very difficult.

Utilization Techniques Most of the various resource utilization techniques described in this section probably have a long history in the area. The diminuation in projectile point neck width (see discussion earlier in this Chapter) through time, culminating with the very narrow-necked, side-notched triangular point of the Late period, probably reflects the Late period introduction of the bow and arrow. The effects of this new weapon upon the basic hunting patterns could be speculated at length without any real supporting evidence. Traps and ambushes of various types are probably very old and in the arsenal of the first hunters into the area.

Fishing paraphenalia is practically non-existent, a not unexpected situation considering the nature of the ethnographic fishing kit. The dip net, which is so efficient in the Fraser, is made entirely of organic materials - wood, bone or antler, and twine, while the fish spears and leisters are composite wood and bone (or antler). A few of the bone points recovered in excavations might be side barbs of leister spears, but the evidence is not conclusive. Large gill nets were rarely used on the river, and those employed in lakes were weighted with naturally-rounded, unmodified cobbles encased in fabric pouches (Teit 1909:495). Neither composite hooks nor gouges have been recovered.

From the culture historian's point-of-view, the importance of the discovery of the dip net and the efficient drying techniques cannot be overestimated. With these techniques in hand, the Fraser River assumes the proportions of a bountiful source of almost unlimited food upon which the Indians could depend. Yearly fluctuations in salmon population are recorded in recent times, but it seems highly unlikely that these could have concerned the Indians living in the middle reaches of the Fraser River to any significant degree. According to Teit (1900:230,1) the four year cyclical fluctuation of sockeye (_O. nerka_) caused the Thompson River groups to turn to humpback, a generally less desirable fish, but the Fraser groups always had ample king (or spring) salmon and sockeye.

Lithic Raw Materials From the preceeding chapter it is evident that the vast majority of surviving implements are of stone, specifically, chipped stone. While the various cherts, chalcedonies, jaspers, and obsidians are preferred varieties of lithic raw material in many areas of the Plateau, the prehistoric sites of south central British Columbia are characterized by the extensive, and sometimes almost exclusive, use of a fine-grained basalt. Counts of basalt _versus_ all other chipping detritus indicate that even in the Lochnore Creek site, where chalcedony and jasper chips are considerably more plentiful than usual, basalt comprises between 70% and 92% of the total, depending upon the section examined. In a one metre wide east-west section consisting of 5 two by one metre pits through housepit 2, a total of 2,497 pieces of chipping detritus were counted, of which 609, or less than 25% were of non-basaltic materials. One of the lower Middle period assemblages (Zone II of the Lehman site) contains a total of 916 chips, of which 886, or 97% are of basalt. Most components are midway between these extremes with no obvious temporal significance evident in the analysis to date. A trend towards the use of increasingly finer-grained basalt is apparent, however, and some of the material utilized in the Late period is very vitreous. Teit (1900:241) records that the Thompson were obtaining the vitreous basalt from the range north of the Thompson River, which would place the source east of the Lochnore-Nesikep Locality. Outcrops of vitreous basalt are present in the hills behind Lochnore Creek and may have provided the quarry source (B. Lehman: personal communication).

For the greatest part of the prehistoric period the inhabitants of the Lochnore Nesikep Locality utilized basalt occurring as boulders in the glacial drift material. While a limited number of cryptocrystallines (chalcedonies and jaspers) can be located in drift material, some artifacts were fashioned from jasper and chalcedony imported from the Upper Hat Creek range, a valley running parallel to, and east of, the Fraser Valley. The less than a dozen chips of obsidian in the Locality were probably from sources to the north and east around the town of Clinton.

Stone suitable for shaping by grinding and polishing is available locally. Nephrite boulders ("jade") are still sought by collectors along the banks of the Fraser from Lytton to Lillooet. Some of the nephrite artifacts may have been imported from Lytton which seems to have been an important dispersion point for the hard stone. Steatite or soapstone is readily available from a large outcropping on the west bank of the Fraser a few miles south of the Locality, while slate is present in several regions around Lytton. Native copper, found in limited quantities, is apparently available in nugget form in the Fraser River (B. Lehman; personal communication).

Comparisons

Introduction The preceeding chapters consider the prehistoric cultural remains from the Lochnore-Nesikep Locality in a vertical island model. By this I mean, an idealized theoretical construct which views the assemblages interrelated chronologically, but dis-articulated from any extra-local cultural manifestations. My aims were two-fold: first, I was interested in presenting a body of factual data which could be interpreted as a developing local tradition; and second, because by historical accident the Lochnore-Nesikep sequence is unique in the British Columbia Interior Plateau, extra-local comparisons must often be with areas hundreds of miles removed. The purpose of this section is to place the Lochnore-Nesikep sequence within the general body of archaeological literature pertaining to the Pacific Northwest.

The delicate task of comparative studies is difficult enough when abundant local sequences are available, but as the spatial distances increase the problems multiply. With expanded comparative horizons the analyst cannot expect the minute degrees of similarity found between assemblages in a narrower sphere. Grafted onto these methodological problems is the absence of prehistoric ceramics in the Plateau and the heavy comparative burden placed upon projectile point analysis.

This is not intended to be an apology for the following comparisons, but archaeologists are severely handicapped by the near absence in their discipline of an effective method of expressing degrees of confidence in any drawn comparison. Well-defined metrical attributes from similar-sized, statistically-valid samples, can be compared with considerable confidence; poorly-defined, qualitative statements derived from small samples make comparisons extremely hazardous. In addition, statistical confidence limits acceptable to zoology may not be applicable for anthropology.

Regional comparisons are derived from site surveys between Kelly Creek about 40 miles north of the Lochnore-Nesikep Locality on the Fraser River, and the town of Lytton, approximately 24 miles south of the Locality. The 20 mile stretch of river between Lillooet and Kelly Creek was surveyed by a geologist Leonard Hills, who has made available descriptions of the sites and photographs of the collections. From Lillooet to Lytton I depend upon my own work and that of Harlan I. Smith (1899) primarily around Lytton. For the remainder of the southern Interior of British Columbia it is necessary to rely upon Smith's work along the Thompson River to Kamloops (Smith 1900), Borden's excavations at Cache Creek (Sanger n.d.), and the report of the Chase site (Sanger n.d.). South of the International Boundary there are various site reports and regional reconstructions, many of which are still in field note form or in manuscripts of very limited circulation. One of the most useful reports is an unpublished report on the Aderdale site by R.S. Kidd (1965). Comparisons to the East include Borden's (1956) survey of the Kootenay Region in southeastern British Columbia, the work in Alberta, and the excavations in the Northwest Plains of the United States. Geographically, the closest sequence is that developed by Borden in the Fraser Canyon, only 80 river miles south of the Lochnore-Nesikep Locality. It is to the North, however, that the most severe comparative problems are encountered, and until extensive work is done in central and northern British Columbia, most cultural comparisons with that region will have to be of a very general and tenuous nature.

Projectile Points The Nesikep Creek Zone VII projectile points of the Early period are characterized by extremely fine workmanship, a high length to width ratio, careful parallel and diagonal flaking, grinding of the stems, and very thin cross sections. It should be emphasized that (a) not every point manifests all these attributes, and that (b) these reflect primarily technological rather than form attributes. Comparable examples from British Columbia are scarce. The Clinton Museum, approximately 40 miles north of the Lochnore-Nesikep Locality, has a single Scottsbluff-like projectile point in its collection, and some points from the grounds of St. George's School near Lytton share some of the attributes. A point described as a "Scottsbluff-Eden" has been reported from southeastern British Columbia (Duff and Borden 1954). In the American Plateau Osborne (1956) has reviewed some of the scattered finds of points with general Paleo-Indian and Plano affinities. The finely-fashioned Lind Coulee points (Daugherty 1956) with thin cross sections, some basal grinding, and careful parallel flaking, may technologically be the most closely related Columbia Plateau points, although in many other attributes, especially the long, contracting blunt stem form, the points appear quite distinct. Projectile points from the Northwestern Plains share many of the Nesikep Complex point attributes, although no known assemblage of the Plano Tradition has been excavated with the wide range of forms occurring together in the Nesikep Creek Zone VII component (Wormington, personal communication). I might tentatively suggest that the Nesikep Complex point are related technologically to the projectile points of the Plano Tradition. The estimated date of 6,000 or more years ago for the Nesikep Creek site points is probably more recent than the youngest Prairies and Plains Plano materials. This, combined with the apparent geographical separation from the Plains and Prairies sites, may have resulted in a late persistence of manufacturing techniques with a changed overall form. Certainly, the Nesikep Creek complex points share many more attributes with the Plano Tradition than they do with the near contemporaneous Old Cordilleran tradition of the West.

The generalized leaf-shaped bi-points from the Zone II of the Lochnore Creek site may be related to an early Plateau development of bi-points which Butler (1961) has termed "Cascade Points". While some may argue that there is too much variation within the original definition to warrant a single Type, the early and widespread distribution of these points in the Northwest cannot be denied. It is not only the presence of these bi-points which is significant in the earliest contexts, but also the absence of other point styles. To encompass those more recent situations where other point styles. To encompass those more recent situations where other point styles are associated with bi-points, Butler (1961) has defined the Cold Springs Horizon, which contains, among other things, bi-points in conjunction with large (wide-necked) side-notched points. This combination is found at Zone III of the Lochnore Creek site. Many of the Cold Springs Horizon components probably post-date the Mazama ash fall, and are therefore more recent than 6,500 years (Kidd 1965:58,9). The recent limits of the complex have not yet been established, but again vestiges could survive for some time away from the Columbia - Snake River centre, even as they did in the Weis Rockshelter in Idaho (Butler 1962). Bi-points are early in British Columbia as the 8,150 and 9,000 year old dates from the lowest cultural levels of the Milliken site (DjRi:3) attest (Borden 1961). Elsewhere in British Columbia bi-points resembling "Cascade Points" have been noted in a collection said to have come from the Chase region east of Kamloops (Kidd: personal communication).

The third assemblage of the Early period, Zone V at Nesikep Creek, contains points for which no convincing similarities have been discovered.

Comparisons must await more excavations in the Interior Plateau.

The lower Middle period projectile points, typified by groups 3 and 4, are characterized by expanding stems created by broad corner notching, straight to concave bases, and by heavy grinding on the lateral and basal edges. More than one-half of the points are shouldered, and the majority are of medium length. Collections between Kelly Creek and Lillooet contain a few points which are comparable, while in the Jones Ranch collection, 5 miles south of Lillooet, there are several examples. Points of this style are not presently known from Lytton either in Smith's report (1899), or in the National Museum of Canada's considerable collection from the area.

Wheeler (1954), who has defined the Hanna Point Type for the Plains, illustrates four Hanna points which share many attributes with group 3 lower Middle period points. The Hanna points exhibited have straight to excurvate blade edges with shoulders produced by wide corner notches. According to Wheeler, some examples are slightly barbed. The stems are expanding with stem edges "usually smoothed by retouching or grinding", and the base is markedly concave. The temporal span of the Hanna is uncertain, but it is one of the common point forms in the Plains' Middle Prehistoric Period, which seems to overlap in time with the lower Middle period in the Lochnore-Nesikep sequence. Wedel includes the Hanna-Duncan-McKean continuum in a category he labels "Hunters and Gatherers" beginning as early as 7,000 years ago (1964:199,200). Hanna points are present in some numbers in Alberta (Wormington and Forbis 1965), with many specimens manifesting more extensive basal grinding than is usually seen on Hanna points further south (Wormington 1963:113). Despite the basic similarities between the group 3 and 4 points and Hanna, the barbing on group 4 points, coupled with the occasional tendency to serration, puts some specimens out the Hanna Type range. Neither barbing nor serration are dominant Northwest

Plains or Prairies projectile point attributes at any time period.

The upper Middle period points from the Lochnore-Nesikep sequence display a wide range of form. Most diagnostic, perhaps, is a series of leaf-shaped points with a single basal notch (group 12; Plate XIV: a-g) which have close affinities with the McKean Lanceolate point (Wheeler 1952) of the Northwestern Plains and the Prairie Provinces. Included in group 12 are points with definite shoulders, straight stems, and a single basal notch (Plate XIV: g) which are reminiscent of Duncan points again defined by Wheeler (1954). The distinct separation of these McKean-like points from the Hanna-like points of the lower Middle period is something of a mystery, as all three types are reputed to occur together in some Plains' sites. In the Lochnore-Nesikep sequence there is reason to consider the McKean variations to be later in time, although some of the expanding stem Hanna-like points persist up into the upper Middle period. The Pelican Lake point (Wettlaufer 1955), originally defined in Saskatchewan, is found in Alberta and in collections from southeastern British Columbia, (Borden 1956: Plate V). A somewhat similar grouping of attributes is found in the Lochnore-Nesikep sequence among the group 6 points featuring wide corner notches, expanding stems, convex bases, and straight blade edges (Plate XIII: d-g). The barbed and basal-notched points (2 notches) forming group 13 (Plate XIV: h-l) are noted at similar time periods along the Columbia River at the Alderdale site (Kidd 1965) and at Hobo Cave (Shiner 1961: Plate 46:a) where they precede the more delicate late Columbia River point forms.

Also in the upper Middle period are many corner-notched points, some barbed and other shouldered, which appear to represent a morphological development out of the lower Middle period corner-notched specimens. A somewhat comparable development may have taken place to the east of the

Rockies, where similar points from Alberta are simply labelled "small corner-notched" and "large corner-notched" (Wormington and Forbis 1965:30).

Although the corner and basal-notched points continue into the first millennium of the Late period, the last 800 to 1,000 year segment of prehistory is characterized by the introduction of the small, side-notched triangular point. These ubitquitous points show up with great frequency at the Chase site east of Kamloops (Sanger n.d.) where they constitute over 50% of the sample of 110 specimens. In the National Museum of Canada's collections from Lytton these points predominate. Small basal and corner-notched points, similar to those found in quantities along the Columbia River at this time period, are virtually absent from the Lytton and Kamloops area collections. A Canadian Plateau trait of potential significance is the presence on side-notched points of two or more notches on one blade edge and a single notch of the opposite edge. Multi-notched points such as these comprise 15% of the sample of 110 points at Chase. Small side-notched points are widely distributed over the Prairies and Plains, where some analysts see many subgroupings (Kehoe 1966).

Summary From this brief discussion it is evident that projectile points from the American Plateau and the Northwest Plains and Prairies form the bulk of the comparisons. This is not to say that there are no similarities to the North or to the West, but these areas are poorly documented in the literature. With the publication of the important Fraser Canyon sequence, however, this comparative section may have to be greatly expanded and generally modified.

Many Prairies and Northwest Plains point styles are represented in the Lochnore-Nesikep sequence. Most conspicuous are points reminiscent of the Hanna-Duncan-McKean continuum which stress the concave or indented base. Later styles, the "large and small corner notched" points, which may have developed out of the last named series, are strongly represented in British Columbia. The Late period small, side-notched, triangular point is widespread across the Interior of British Columbia.

The Prairies and Plains point sequence contains point styles which are not present in the Lochnore-Nesikep Locality. Most obvious, of course, are the fluted points and the well-known Plano forms, although some of the technology of the latter may be present in British Columbia. The large side-notched points (Wedel 1961:87) are found in the Plains but rarely in British Columbia. Around the beginning of the Late period Avonlea and Besant points are fairly common in Alberta (Wormington and Forbis 1965). Although Borden (1956) collected some Besant-like points from his survey of southeastern British Columbia, they are not present in the Lochnore-Nesikep sequence, and I have not seen Avonlea points in collections from southern British Columbia.

Projectile point relationships with the American Plateau are noted during the Early period with the possible northern extension of the Cold Springs Horizon point complex. The next close relationship is seen in the joint presence of medium-sized, basal-notched points producing medium to long barbs. The very latest components of the Columbia River sites contain a certain number of small, side-notched triangular points generally similar to those of the Canadian Plateau.

There are some notable dissimilarities, however, between the American and Canadian projectile points. With the exception of the Lochnore Creek site (Zone III) specimen, and possibly one or two examples from the Lehman site (Zone II), large side-notched points do not occur in the Lochnore-Nesikep sequence. Alternately called Northern Side-Notched (Gruhn 1961), and Bitterroot Side-Notched (Butler 1962), these points are widely distributed along the Columbia River and to the East and South, where they apparently form a continuum with similarly notched specimens east to the Mississippi River. Following the large side-notched points, which may have persisted up to 4,000 years ago on the Columbia, is the Rabbit Island Stemmed point, a parallel to contracting stemmed form, which has been dated at 3,000 years ago at the Schaake site near Vantage (Kidd 1965:59). Points of the general Rabbit Island form are not present in the Lochnore-Nesikep sequence. The Rabbit Island points are in turn replaced by basal and corner-notched points which become diminuitive by the Christian Era and persist up into historic times.

The following attempt to quantify the differences between the Lochnore-Nesikep sequence and a Columbia River sequence is based upon projectile points recovered from the Priest Rapids and Wanapum Reservoirs near Vantage, Washington. Excavated over a period of several seasons by the University of Washington under the direction of Robert E. Greengo, the sample numbers 1,000 specimens ranging in time from about 6,000 years ago to the historic period. For the following statistical data on this unpublished sequence I am indebted to Brian Holmes for making the tallies, and to R.E. Greengo for permission to use the figures. Of the sample of 1,000 points, which does not include leaf-shaped specimens, 173 or 17% manifest contracting stems. Eliminating leaf-shaped group 1 and 2 points from the Lochnore-Nesikep sequence, the incidence of contracting stem points is 23 out of a revised sample number of 201 or 11%. Incurvate blade edges comprise 17% of the Priest Rapids-Wanapum points, whereas only 1.5% of the Lochnore-Nesikep points exhibit this attribute. Long and large barbs are noted on 40% of the Columbia River specimens, while this trait is noted on only 8% of the British Columbia points. Basal grinding is said to be absent in the Priest Rapids-Wanapum group, whereas it occurs on approximately

50% of the Lochnore-Nesikep projectile points. The above discussion is summarized in Table 58 below.

TABLE 58

COMPARISONS OF SELECTED PROJECTILE POINT ATTRIBUTES FROM THE PRIEST RAPIDS-WANAPUM COLLECTION AND THE LOCHNORE-NESIKEP COLLECTION

Attribute	Priest Rapids-Wanapum (Sample=1000)	Lochnore-Nesikep (sample=255)
Contracting stem	17%	11%
Incurvate blade edges	17%	1.5%
Long and large barbs	40%	8%
Basal grinding	absent	50%

The figures presented in Table 58 cannot be used without some additional comment. The high incidence of long and large barbed specimens in the Priest Rapids-Wanapum collection may be a reflection of the Late period context of many of the sites. Other traits, such as the parallel and contracting stems on the Rabbit Island points, occur at about the same time that expanding stems are dominant in the Lochnore-Nesikep Locality. The great variation in the blade edge form and in the technique of stem grinding must be considered significant differences which, taken with other dissimilarities, indicates a wide degree of differentiation in point styles for much of the prehistoric period.

Microblades and microblade cores Although Nelson's 1937 paper drew attention to the widespread presence of microblades and microblade cores in the Pacific Northwest, Borden's (1952a) survey report of central British

Columbia provided the first documentary evidence for an excavated site. Since then microblades, and less frequently microblade cores, have been recovered from numerous localities in the Northwest. Recently, Borden (1962) has traced microblades and cores from Alaska south into British Columbia, and thence to the mouth of the Fraser River and adjacent Vancouver Island. Carlson (1960) has reported microblades from the San Juan Islands and a few examples have been unearthed from the Merrymoor Farm site near Seattle. A small series of microblades and microblade cores was recovered from central Washington (Butler 1958) and more recently microblades have been discovered in a site near Vantage (Grabert: personal communication). Claims of microblades come from other sites in Washington, but the finds are incompletely documented and too few to be convincing. Dumond has carefully examined a number of parallel-sided flakes and cores from Oregon. A fair percentage of the flakes could be called blades in a very general sense, but as Dumond admits, "between the blade-core technique of The Dalles and that of Cape Denbigh is obviously a technical giant-step" (Dumond 1962:424).

There is obviously a relationship between many of these finds and the Lochnore-Nesikep microblade and core complex, but until the coastal British Columbia and Washington specimens are fully analyzed, little else can be said.

Work in the Arctic and sub-Arctic has produced quantities of microblades and cores. At present it is a little difficult to compare many of the microblades, but it is becoming evident that painstaking analysis, such as that of Wyatt's in Appendix 1 and similar projects being conducted elsewhere, are indicating subtle differences between microblade and microblade core manifestations. The general similarities between Old World and New World microblades cores were pointed out by Nelson (1937), but it remained for Irving (1962) to offer a formal set of attributes associated with the so-called "tongue" or "wedge-shaped" cores. According to Irving, the near 90 degree angle at the junction of the striking platform and the fluted surface, the narrow fluted surface, and the knife-like edge opposite the striking platform, are diagnostic traits. This cluster of attributes is present on many of the group 1 cores from the Lochnore-Nesikep Locality and it seems likely that the latter are generically related to the northern specimens. Discussing the distribution of microblades and microblade cores on the basis of data available in 1964, Irving notes:

> " Microblade cores and microblades have been reported from nearly all parts of the American Arctic where archaeology has been carried on. Exceptions are the southern Barren Grounds and parts of coastal Alaska between Cape Denbigh and the south side of Bristol Bay. However, classifications of cores have been proposed only by Irving (1953, 1962) and MacNeish (1960) and these are of but limited use. Microblade cores have been reported from some interior sites in the Boreal Forest, and may have a continuous distribution from Fairbanks (Nelson, 1937, Rainey, 1939, 1940) through the Cordilleran and adjacent regions to southern British Columbia (Borden, 1952) and perhaps to Oregon (Dumond, 1962). Irving and MacNeish (<u>ibid.</u>) both have commented on core types from the interior, attributing most of them to an uncertain entity, the Northwest Microblade tradition."
> (Irving 1964:250,1).

The Lochnore-Nesikep Locality microblade core and microblade complex is probably related to the northern complexes, but in a yet undefined manner. MacNeish (1959) has proposed a Northwest Microblade Tradition which includes many of the more interior northern sites and those in British Columbia, and Irving (1962) has included a series of artifact classes which are associated with the microblade cores and microblades. Until more is known of northern British Columbia and southern Yukon, however, it may be advisable to divorce the southern British Columbia and Washington State microblades from the Northwest Microblade tradition as defined by Irving (1962). The data presently available from the southwest peripheries of the general microblade distribution suggests to me that the microblades were grafted onto numerous local traditions of a diverse nature. A concept like the Northwest Microblade tradition, is acceptable with reference to southern British Columbia provided tradition is used in its narrowest sense to define a single artifact class (in this case 2 closely related classes - microblade cores and microblades) which occurs over a considerable period of time and in varying cultural contexts. Even so, complex is probably a better term to describe the phenomenon.

The numerous artifacts based upon the distal ends of complete and broken microblades can hardly be a unique situation in the vast area in which microblades occur. Giddings (1964:208,9) notes the presence of some microblades used as end scrapers, and other modified by burin blows, but he gives no indication of the incidence within the sample. A surprisingly few retouched or utilized microblades are described in MacNeish's (1964) southwest Yukon collection. Perhaps with the increasing interest in microblades as potentially diagnostic implements the incidence of end-of-the-blade tools in northern assemblages will become greater.

Microblades have been recovered from numerous sites between Kelly Creek and Lytton. Perhaps the most interesting discovery is that of a microblade stratified beneath volcanic ash at the Drynoch Slide site

(EcRi:1) located 18 miles up the Thompson River from Lytton. A complete description of the site, written in conjunction with the geologist Robert Fulton who discovered the microblade, is currently in preparation. Briefly, the microblade (Plate XVIIa: g), a scraper, a few associated flakes, fish and animal bones, and charcoal, came from a grey sand which overlies Thompson River gravels. Above the cultural materials is a seam of white volcanic ash which is Mazama ash, thought to have been deposited about 6,600 years ago. A radiocarbon date on the charcoal associated with the microblade yielded a date of 7530 ± 270 (GSC 530) years ago. Stratified above the ash is approximately a metre of laminated sand, and then up to 20 metres of a mud slide deposit - the Drynoch slide. A piece of wood caught up in the slide has been radiocarbon dated to 3175 ± 150 years (I-462). Thus microblades are among the earliest dated artifacts in south central British Columbia.

Hafted Scrapers Hafted scrapers, similar to those from the Lehman site (Zone II) are known from the Lilloet to Kelly Creek survey where 2 examples have been recovered. The notion of hafting a scraping tool by means of side notches seems alien to the Columbia Plateau, but not unknown in the area east of the Rockies. I have not seen any other scrapers hafted with notches as deep or as pronounced as those of the Lochnore-Nesikep Locality, however.

Bifaces Many of the formed bifaces are of generalized form and hence of wide distribution. The unspecialized oval and triangular bifaces can be matched in many assemblages throughout British Columbia and in the Columbia Plateau. The pentagonal bifaces occur in Late period contexts in both the Interior and Columbia Plateau and may be considered a hallmark of that period. The biface illustrated in Plate XX: p, bears some superficial resemblance to the so-called Cody knife (Wormington 1957:266) of the Plains, but the similarities are probably fortuitous. The high incidence of the oval bifaces in the Zone III assemblage of the Lochnore Creek site appears to complement the concentration of bi-points in that component, thus strengthening the already suggested ties with the Cold Springs Horizon of the Columbia Plateau. To date no comparable analysis of non-formed bifaces is available.

Unifaces Included in the formed unifaces category is the ubiquitous end scraper with the steep working edge. Distributions by time for this class of artifact are rare in the Plateau literature, but it seems highly unlikely that the Early period to Late period decrease in the utilization pertains in the Columbia Plateau. At the Late period Harder site on the Snake River (Kenaston 1966) "snub-nosed end scrapers" formed a high proportion of the total artifact inventory. Group 5 scrapers (Plate XXI: i-k) in the Lochnore-Nesikep sequence have not been seen in regional comparative literature.

One of the few Columbia River assemblages in which the non-formed unifaces have been analysed according to the nature of the retouched edge, or edges, is the Alderdale site report prepared by Kidd (1965) and assisted by Browman. Out of a small sample of 167 non-formed unifaces, Kidd and Browman noted that 67% of the sample exhibited a single retouched edge. This is compared with a figure of approximately 50% for the Lochnore-Nesikep non-formed, single edge retouched, unifaces. Of the single edged class Kidd noted that the convex-edged specimens occurred with the greatest frequency with 44% of the sample in this class. The most common form in the Lochnore-Nesikep sequence is the straight edged uniface with an incidence of 52%. Concave-edged specimens occur in comparable numbers with

14% and 17% for the Alderdale and Lochnore-Nesikep Locality respectively.

While this kind of data appears to lend itself to more elaborate statistical analysis, it must be remembered that (a) the sample sizes are quite disparate; (b) the Alderdale materials are probably not scattered through 6,000 or more years of time; and (c) there was no prior agreement on precise definition of attributes. Despite these and other factors, I believe this kind of analysis has considerable potential as it utilizes a category of implement which occurs with great frequency in all Plateau sites.

Burins Burins are not typical to southern British Columbia or the State of Washington. This does not negate the possibility of an occasional specimen in a large assemblage, but by and large burins are a feature of the Arctic and sub-Arctic components. It is probably no coincidence, then, that most of the Lochnore-Nesikep burins are based on microblades or hafted scrapers which are associated with microblades. The various non-microblade sub-Arctic burins forms apparently never diffused to southern British Columbia in any appreciable quantity. Burins appear to be even more scarce in the Northwestern Plains and Prairies.

Gravers Widely distributed throughout the Northwest Plateau, gravers never assume the proportions of artifacts commonly designated as knives and scrapers or even projectile points. Few of the gravers witnessed in typical Columbia River assemblages are as meticulously formed as some of the early period gravers from the Lochnore-Nesikep Locality (Cressman 1960:93, Fig. 46; Kidd 1965).

Macroblades Problems of terminology abound when discussing macroblades. As it is used in this study, the term refers to a robust version of the microblade, being over 10cm in width and exhibiting intentional core edge preparation, which manifests itself in the battered and ground proximal end of all macroblades. Butler (1961) has called attention to macroblades along the Columbia, and some of Dumond's (1962) blades are probably in this category. Some blade-like flakes have been observed from the early Milliken Phase (8,000-9,000 years old) of the Milliken site in the Fraser Canyon. The distribution of macroblades in time and space has not been rigidly defined for the Northwest, but there may be a nebulous connection between these artifacts and generally early assemblages. The presence of macroblades in an Early period component at the Lochnore-Nesikep Locality (Zone III Lochnore Creek) may be significant in this context. Close comparative studies of macroblades are presently hindered by inadequate description and lack of agreement on nomenclature.

Cobble Choppers and Spall Tools Although choppers are common Plateau artifacts, little in the way of comparative analysis has been attempted, and again it is necessary to use the unpublished report on the Alderdale site (Kidd 1965). Of the 121 choppers recovered from the Alderdale site, roughly one-third are similar to the group 1 single transverse edge choppers from the Lochnore-Nesikep Locality which account for a little over one-third of the sample. More significant, perhaps, is the fact that almost twice as many choppers were recovered from the Alderdale site environs as were collected in the Lochnore-Nesikep Locality. In both areas a high percentage were recovered in unstratified circumstances. Cobble choppers are a dominant artifact class in the Milliken Phase, while choppers and their derivatives constitute almost the entire assemblage of Borden's Pasika Complex (Borden 1965b) in the lower Fraser Canyon.

Cobble Spall tools are widespread but thus far little attempt has been made to define potentially diagnostic attributes. It may be significant, however, that only 9 cobble spalls were collected at the Alderdale site (Kidd 1965:46), whereas 62 spalls are included in the Lochnore-Nesikep collection. The ratio of choppers to spalls in the Alderdale site is 9 spalls to 121 choppers, while in the Lochnore-Nesikep Locality, the ratio stands at 62 spalls to 67 choppers. Even assuming that the definition of spall was more all-inclusive in the latter collection, the disparity is sufficiently pronounced to suspect an entirely different cobble spall tool utilization pattern.

Ground Stone Stone objects fashioned by grinding and abrasive techniques are common in the Late period and in the closing centuries of the upper Middle period. As suggested in an earlier paper in which distributions are more thoroughly traced (Sanger n.d.) the incidence of ground stone artifacts may be higher in the Interior Plateau than in the Columbia Plateau. Nephrite adz blades are present in many Northwest sites during the Late period, and adz blades of British Columbia nephrite have been found in Alberta (Wormington and Forbis 1965:107).

The Steatite Carving Complex The term steatite carving complex is assigned to a unique style of steatite or soapstone carving which is centred in southern British Columbia, both in the Interior and on the Coast. Exhaustively studied by Duff (1956), the most elaborate manifestations of this complex are well-known and highly prized, but still practically nothing is known of the temporal factors involved. Borden (1965a) has reported carved steatite figures dated to approximately 2,900 years ago in the Fraser Canyon sites, while at the recent end of the time continuum, intricately sculptured steatite figurines were recovered from the late prehistoric Chase burial site (Sanger n.d.). It seems likely that steatite pipes and spindle whorls should also be included within the general bounds of the complex, but all evidence suggests that these latter artifacts are products of the Late period in southern British Columbia. Pipes have a Plateau-wide distribution and apparently occur made in catlinite on the Plains (Wedel 1961:176).

In addition to the local interest of the steatite carving complex, there is the distinct possibility that in many of the pieces prototypes of classic Northwest Coast art can be seen (Duff 1956). Although it is not manufactured in steatite, the zoomorphically decorated hand maul from the Lehman site (Figure 13: h) is extremely interesting in this context. The eye on this carving seems to be a forerunner of the strongly re-curved distinctive Northwest eye style. As the maul dates to the upper Middle period, it would seem to suggest at least 2,000 or more years of this art style. Unfortunately, no evidence of technology in steatite was recovered from the Lochnore-Nesikep dwelling sites, and the only examples of the complex are of finished objects which derive from the Late period Mile 28 Ranch site.

Ground Slate The presence of only limited quantities of ground slate in the Lochnore-Nesikep sequence represents one of the most important negative traits in the Locality. Prior to excavations with any appreciable time depth in the Interior Plateau, Borden (1962) hypothesized a diffusion of slate grinding techniques from Asia to the New World. Once into the New World the technique was said to have diffused south into the Interior Plateau following the Fraser River to its mouth. Slate artifacts, both chipped and ground, are present more than 4,000 years ago in the Fraser Canyon sequence (Borden 1965a). The scarcity of ground slate objects in the Lochnore-Nesikep sequence, combined with the presence of only one or two pieces found in survey, does not appear to support the Fraser River diffusion route hypothesis (see Chapter VII).

Edge-Ground Cobbles Cobbles with extensive grinding along the edges have been noted in a number of Columbia Plateau assemblages where they frequently occur with bi-points and large side-notched points (Butler 1962:244-6). The presence of edge-ground cobbles with the Zone III assemblage at the Lochnore Creek site is in general agreement with the associations found further to the South in the Columbia Plateau.

Bone and Antler Artifacts At present bone and antler objects seem to have little comparative significance in the Plateau. Antler wedges (called beveled faces) are present in the assemblage attributed to the earliest occupation in The Dalles region (Cressman 1960), and may have been part of the artifact inventory whenever wood splitting was an important industry. Antler and bone artifacts generally increase in the Late period (Sanger n.d.) where better preservation is a factor.

Tooth, Shell, and Wooden Artifacts Never present in large enough quantities for adequate comparisons, the majority of these artifacts were probably widespread. Beaver and rodent incisor implements probably have a long history in the Plateau, although the Lochnore-Nesikep sequence is possibly one of the longest yet demonstrated. Beaver incisor gambling dice are probably a product of very late prehistoric times, however. Trade in sea shells is present in the Early period both at the Lochnore-Nesikep Locality and in the American Plateau, where Daugherty (Borden 1964) has reported *Olivella* shells in close stratigraphic proximity to Mazama ash in the Marmes rockshelter located on the Palouse River near the junction with the Snake. The fragment of *Mytilus californianus* in the Early period at the Lochnore-Nesikep Locality may be one of the oldest known occurrences of this sea shell in the Plateau. Wooden artifacts are scarce everywhere, although they have undoubtedly been in use for millennia in the Plateau.

At the late prehistoric Chase burial site east of Kamloops (Sanger n.d.) a small wooden mask, and a birch bark pouch containing artifacts were among the wooden objects recovered.

Conclusions

The foregoing pages have presented an analysis of the archaeological and pertinent environmental data in the Lochnore-Nesikep Locality. It now remains to integrate this body of data into a summary statement. At the Lochnore-Nesikep Locality a cultural sequence, representing over 6,000 years of prehistory with at least 20 habitation and burial components, has been recognized. Although there may be gaps in the record, the 20 components probably provide an almost continuous picture of the important prehistoric developments in the Locality. At present, it seems unlikely that any of the components represent the earliest evidence of man into the area. The sequence is the first of its kind in the British Columbia Interior Plateau, a fact which places restrictions on establishing an accurate chronology. A second weakness involves the necessity of seeking cultural comparisons over great distances.

The cultural sequence in the Lochnore-Nesikep Locality can be viewed as a developing local cultural tradition, by which I mean, a way of life or culture adapted to a specific geographical and ecological region, and showing persistence in form over an extended period of time. During the Early period, there is evidence of two distinct traditions in the Lochnore-Nesikep Locality. The first, represented in the Locality by Zone VII at the Nesikep Creek site (EdRk:4), can be regarded as the earliest manifestation of a long cultural tradition which can be traced right into the historic period. Throughout the greater part of the 6,000 or more years represented by this tradition, the microblade and microblade core complex provides a central and dominating influence on the lithic industry which manifests itself not only in the actual presence of microblades, but in the entire stone chipping technique. Projectile points in this tradition begin with the carefully-flaked Plano-like points from Zone VII at the Nesikep Creek site. Among the Lehman site (Zone II) expanding stem, concave base styles, there are a few points with parallel-sided stem edges (Plate XII: o) which may represent a development out of the Early period Nesikep Creek Complex points. Zone IV points at the Nesikep Creek site also seem closely related to those from Zone VII at the same site (see Sanger 1964:148). Points reminiscent of those from the Lehman site are present in the Lochnore Creek site, Zone I assemblage. This assemblage also contains basal and corner-notched points which persist into the Late period sites such as the Mile 28 Ranch site (EdRk:3) and other components in which the small side-notched triangular point is noted. The latter point style was the predominant form by historic times.

This sequence of projectile point forms did not, of course, develop in complete cultural isolation. Comparisons with other archaeological areas suggest that the point sequence is remarkably similar to that found in the Northwest Plains and Prairies. Other point styles are apparently derived from the Columbia Plateau, which in turn shares much with the Great Basin Region (Cressman 1960, Daugherty 1962).

Linking this tradition is the microblade complex which begins in the Locality with the Zone VII component at the Nesikep Creek site, and persists up to 1,500 or 2,000 years ago, with very little change in form. Statistical calculations indicate certain trends operating within the microblade complex, but the conservative nature of the complex is far more impressive than the changes.

One of the concomitants of the microblade complex is the general small size of the associated stone cutting and scraping implements, and the economical use of raw materials displayed by microblade users. This latter aspect of the stone chipping industry especially impressed me after viewing Columbia River artifacts and chipping detritus. One of the few published reports from the Columbia Plateau which gives frequencies of artifacts and chipping detritus is Butler's Contributions to the Prehistory of the Columbia Plateau (1962). By totalling the artifacts described in the chipped stone discussion, I arrived at a figure of 409 chipped stone artifacts from the Weis Rockshelter, which also yielded 5,154 pieces of chipping detritus, for an average of approximately 12.5 pieces of detritus for every chipped stone artifact. By comparison, in the Lochnore Creek site (Zone I) where microblades form a very small percentage of the total chipped stone inventory (less than 5%), a count from a typical 2 by 1 metre excavation unit provided 123 chipped stone artifacts and 645 pieces of chipping detritus for an average of 5.25 flakes per artifact. A typical 2 by 1 metre excavation unit from Zone II of the Lehman site contained 113 chipped stone artifacts (counting microblades as artifacts) and only 141 pieces of chipping detritus, for an average of 1.26 pieces of detritus per artifact. More exhaustive tests, under more carefully controlled conditions, would be necessary to categorically state that these figures are conclusive; but they certainly are suggestive, and they may support the initial impression that the microblade technique and related technologies tend to be very economical with respect to the use of lithic raw materials.

The second cultural tradition recognized shows certain similarities with Butler's (1961, 1962) Cold Springs Horizon. This complex, which was defined largely on the basis of the Cold Springs component in the McNary Reservoir near the mouth of the Snake River (Shiner 1961), is characterized by bi-points (Cascade points) in association with large side-notched points, and sometimes edge-ground cobbles. The occurrence of Cold Springs Horizon assemblages in post-Mazama ash fall times suggests that 6,500 years ago should be considered the earliest dates for the Horizon. Butler (1962) employs assumed rates of rockshelter soil accumulation to suggest that distinctive artifacts of the Cold Springs Horizon were present in Idaho almost to the Christian Era (105 B.C.).

Cold Springs Horizon-like material occurs in the Early period Zone III component at the Lochnore Creek site. The bi-points, the large side-notched point, the elliptical formed bifaces (group 1) (Plate XX: a-c), and the edge-ground cobbles are considered related to the Cold Springs Horizon. In addition, there are the macroblades which are again reminiscent of Columbia Plateau cultural materials. Work along the Columbia River has indicated the reliance place upon river mussels; Zone III at the Lochnore Creek site is the only site in the Locality with river mussel shells appearing as an item of food. Zone III differs from the previously discussed tradition in that it has no microblades, does not stress the minute implements found in other components, features a form of edge retouch and general flake trimming which is distinctive, and utilizes a grey basalt which is less vitreous than that used in other components.

Culturally allied to Zone III at the Lochnore Creek site is the Zone V assemblage at the Nesikep Creek site. Like Zone III at the Lochnore Creek site, it is without microblades (despite the fact that components stratigraphically above and below are microlithic), utilizes essentially the same type of basalt, manifests something of the same chipping technique, and is linked by the group 5 formed unifaces (Plate XXI: i-k) which are found only in these two components. Zone V does not have the same point complex, or macroblades, however.

In conclusion, there seems to be two distinct cultural traditions represented in the Lochnore-Nesikep Locality. One is dominated by microblades, Plains and Prairies point styles, and distinctive flaking techniques. This is the most prominent tradition and it can be traced through 6,000 or more years of prehistory. The microblade component at the Drynoch Slide site, dated to 7,500 years ago, may be related. If so, there is a possibility that the tradition can be witnessed through 7,000 plus years of prehistory in the Lytton-Lillooet region. The second tradition, which appears only during the Early period, is related to the Cold Springs Horizon of the Columbia Plateau, and features bi-points, elliptical bifaces, edge-ground cobbles, large side-notched points, macroblades, and a distinctive stone flaking style.

Looking at the entire Lochnore-Nesikep sequence, it appears that for most of the prehistoric era the closest cultural relationships are with the Prairies and the sub-Arctic. Affinities with Columbia River components are present in the Early period, and occur sparodically in projectile point similarities up until the Late period, at which time a number of traits seem to be shared. Among these, we might list the intensive use of semi-subterranean housepits, projectile point styles, the wood working complex, and perhaps other traits. It is also during the Late period that relationships with the Coastal cultures are noted. The significance of these affiliations is the subject of the following chapter.

CHAPTER VII

SPECULATIONS AND CONCLUSIONS

This chapter is labelled "Speculations" in order to stress its speculative nature. In many ways the most interesting and even the most exciting aspect of any report, speculative statements only rarely stand the stress of further excavation and re-thinking. Despite this failing, it is really only in such statements that the archaeologist can reduce the technical descriptions of soil strata and artifacts to the events of human history, the explanation of which should be his primary task.

The Interior Plateau of British Columbia was probably deglaciated between 9,000 and 10,000 years ago depending upon elevation and latitude. It seems certain that no cultural assemblage in the Lochnore-Nesikep Locality represents evidence of the initial population into the area, and to date no known assemblage from elsewhere in the Interior Plateau qualifies as a likely candidate. Quite possibly, the first migrants into the area will be shown to have a culture generally reminiscent of that found in the Milliken Phase in the Fraser Canyon (Borden 1961, 1962, 1965b) where basalt and argillite bi-points occur with a variety of flake tools and cobble choppers in an assemblage dated between 8,000 and 9,000 years ago. If such a way of life did exist in the Interior Plateau, a Columbia Plateau, rather than a Fraser Canyon, cultural source is suspected. The earliest evidence currently available from the Interior Plateau is the small assemblage from the 7,500 year old Drynoch Slide site with its distinctive microblade. From this time onward the microblade-bearing tradition dominates the prehistoric scene.

Microblades are known far to the North at this and earlier times (Laughlin 1963) and it currently seems reasonable to assume that the concept diffused from that region and into southern British Columbia. Borden (1962) has amassed evidence to show a continuous distribution of microblades from the Arctic and sub-Arctic right into southern British Columbia. This view appears to be substantially correct, although the absence of any appreciable time depth in Interior sites, together with the late radiocarbon dates for microblades in the Fraser Canyon and on the Coast, induced Borden to bring microblades into the southern Interior Plateau approximately 5,000 years after they first appeared.

The apparent time lag of close to 5,000 years between microblades at the head of the Fraser Canyon and microblades in assemblages near the mouth of the canyon only 60 miles away, illustrates the effectiveness of the canyon as a barrier to the movement of man and ideas. In this trait, and possibly others, the canyon served not as a passageway, but as an obstacle to the passage of ideas. This probably related to a drastic environmental change between the semi-arid Interior and the wet Coast.

The functions of microblades are still only poorly understood, and for this reason it may be futile to hypothesize on the reasons for their extinction. Nevertheless, microblades diminish gradually, and there is no evidence of a revolution in technique or of a non-microblade tradition sweeping into the Interior Plateau. Possibly, the microblade disappearance may be connected with the realization that the manufacturing technique is inefficient in terms of energy expended and useful tools produced. If the microblade complex and related chipping tradition is functionally linked with economy of lithic raw material, one of its major reasons for existence may be partially nullified by the abundant basalt in the Fraser Valley. Even so, the complex flourished for over 4,000 years and other factors were undoubtedly operative. This suggestion does not, and indeed is not intended to, explain the disappearance of microblades in the Arctic and sub-

Arctic. Given large enough samples, future work may demonstrate a suitable alternative implement, or series of implements, whose increase can be correlated with the microblade's demise in south central British Columbia.

The notion (Borden 1962) that slate grinding techniques diffused through the Interior of British Columbia and out to the Coast via the Fraser Valley is not presently supported by our limited knowledge of the archaeology of the Interior. Whenever ground slate is found in the Interior Plateau under controlled circumstances it occurs in the Late period, and only rarely in quantity. At present a Coast to Interior diffusion of the trait is suspected in order to explain the Interior finds. As alternatives to Borden's hypothesis, I would suggest that: (a) the emphasis on slate grinding represents an indigenous lower Fraser Valley development requiring no outside stimulus; or (b) the slate grinding represents a remnant of an ancient circum-North Pacific trait which appears at the Ocean Bay site on Kodiak Island by 5,500 years ago (3553 ± 78 B.C.) (P-1034) (Clark 1965); or (c) there is a more direct historical connection between early slate on Kodiak Island and southern British Columbia coastal manifestations. The present paucity of evidence from sites between Kodiak Island and the southern coast of British Columbia makes further speculation hazardous.

The projectile point sequence, as it is presently known from the Interior of British Columbia, shows a remarkable similarity to the general sequence from the Prairies, and prehistoric movements of people and/or ideas across the Rocky Mountains seem indicated.

During the Late period the Interior Plateau was strongly influenced by ideas coming from the Coast. At the Chase site a small wooden mask remiscent of the Coast Salish Sxwaixwe mask was unearthed, and pierced Pecten caurinus shells, some of them probably forming rattles, are associated with late prehistoric sites (Sanger n.d.). Other items of

Coastal origin include sea shells of various types and whale bone clubs. Coast Salish notions of above the ground burial boxes, burial sheds, and corpse re-wrapping, may also have been spreading inland around the end of the prehistoric era.

It is tempting to contemplate the cultural distributions and the linguistic pattern in the Plateau. The exercise is not original; Swanson (1962:157) notes a "correspondence between the Old Cordilleran and Penutian", while Daugherty (1962:149) suggests that, "The remarkable correspondence, both temporally and spatially, between the concept of a Northwest Cordilleran Area tradition and the apparent distribution of early Salishan languages, suggests a relationship." Garth (1952) attempted to differentiate Salish from Sahaptin prehistory on the Columbia River and was severely criticised for his efforts (Osborne and others 1961).

Looking at the Plateau in broad perspective, there is the possibility that the major archaeological break between the Columbia Plateau and the Interior Plateau coincides with the distribution of Interior Salish to the north and Sahaptin to the south. Ray (1939) considered this distinction on the ethnographic level in an attempt to explain the cultural break, but he was concerned with the southernmost Salish groups which were distributed to the Columbia River and in a broad band running south and east across to Idaho and Montana. Suttles and Elmendorf (1962), and more recently Elmendorf (1965), have presented evidence to suggest a late southward and eastward push of Interior Salish, presumably at the expense of the Sahaptin speakers.

Working with glottochronology and shifting ecological boundaries Elmendorf (1965) suggests that Interior Salish language speakers and culture began moving south into the Columbia Plateau as early as 4,000 years ago, with the onset of the Medithermal climatic phase. The movement seems adequately documented although the date is not presently corroborated by archaeology. Recent excavations at the confluence of the Okanogan and Columbia rivers suggest that in the First Millennium B.C. sites at the mouth of the Okanogan affiliated more with Columbia Plateau components downstream, although a 2,000 or 3,000 year old housepit has been reported with a cultural assemblage with seems related closely to Columbia River sites (Grabert 1966), and not to the Interior Plateau of British Columbia.

Thus the long cultural tradition reflected at the Lochnore-Nesikep Locality by the microblades, Prairies' point styles, housepits, and certain subsistence techniques, may represent the prehistory of Interior Salish speaking peoples, while the culturally distinct Columbia River assemblages may represent the prehistory of Sahaptin speakers.

Unfortunately, careful linguistic research into proto-Salish and its origins has only just begun. Commenting on the external relations of Salish, Suttles and Elmendorf (1962:246,7) note:

"Evidence for genetic relationship of Salish with Wakashan and Chemakuan, in a "Mosan" grouping, was first suggested by Boas, although his interpretation of the resemblances was not a genetic one. Frachtenberg later proposed the name (taken from a common stem for <u>four</u>) and the possibility of genetic connections. Sapir accepted the grouping and tentatively joined it with Kutenai and Algonkian to form a Macro-Algonkian or Mosan-Algonkian superstock. The supposed Mosan-Algonkian connections were never really documented, although in 1953 Swadesh presented structural and lexical evidence for Mosan".

Suttles and Elmendorf conclude their discussion on external relationships by preferring to "defer judgement on the validity of the Mosan grouping."

More recently C.F. and F.M. Voegelin (1964) have followed Sapir by listing an Algonquian-Wakashan Phylum in which there are four language families, Salish, Chimakuan, Algonquian, and Wakashan. The precise relationship of Salish to Algonkian is crucial for the Plateau prehistorian, but it is, of course, a question that only linguists can answer. Viewing the prehistory of the Plateau and adjacent Northwest America in its broadest perspective, I would suggest that the present archaeological picture tends to support a generic relationship between Algonkian and Salish, just as the same evidence reinforces the relationship of Sahaptin to Uto-Aztecan and the Penutian Phylum.

<u>Plateau Sub-areas</u> Verne Ray's 1939 monograph on the Plateau cultures stands not only as the principal integrative work, but it also contains within it a hypothesis concerning the aboriginal cultural subdivisions in the Plateau (see Chapter 3). Recently I have attempted to demonstrate the presence of these subdivisions in the late prehistoric record of projectile points and other subsistence-oriented artifacts, and ceremonial paraphenalia (Sanger n.d.). Demonstrating the archaeological subareas is one thing; explaining their presence is something else. With the Lochnore-Nesikep sequence and the perspective it offers, we may now be in a position to make some suggestions elucidating the ethnographic situation.

In the previous chapter some of the prehistoric relationships between the Lochnore-Nesikep sequence and surrounding areas were considered. The conclusion at present is that the Lochnore-Nesikep Locality seems to share more with the sub-Arctic and Prairies than it does with the Columbia Plateau cultures. Elements thought to have been derived from the Columbia River are seen during the Early period, but the strong cultural tradition, which may be traced to the historic inhabitants of the area, is dominated by influences from the North, East, and later, the West.

With the present pioneer stage of archaeological research in the Interior Plateau of British Columbia, it cannot be stated with any confidence that the Lochnore-Nesikep Locality is representative of the entire Interior Plateau. However, the presence of the sub-Arctic microblade complex and the similarities to Prairies' point styles suggest that other areas of the Interior were subjected to the same influences. Borden (1962: 17) has traced microblades from the sub-Arctic through the Interior, and has reported microblade cores from the Shuswap Lakes area east of Kamloops. Fulton (personal communication) has collected a microblade core near the northern headwaters of the Okanogan Lakes drainage system. The northern limit of Prairie-style points in the Interior Plateau is not known, but these points are common in southeastern British Columbia (Borden 1956). Work in several late prehistoric sites from the Shuswap Lakes to Lillooet has led to the formulation of the Kamloops Phase, a way of life quite similar to that known ethnographically for the Upper Thompson (Teit 1900) and the southernmost divisions of the Shuswap (Teit 1909) (Sanger n.d.). Components of this phase in the Lochnore-Nesikep Locality include: the Mile 28 Ranch site, the Nesikep Creek site (Zones I-III), the Cow Springs site, and the McPhee site. While the area covered by any cultural unit such as a phase can change through time, and while the borders are always fluid, it seems possible that the area encompassed by the Kamloops Phase participated in the same general cultural tradition which led to the Kamloops Phase components in the Lochnore-Nesikep Locality.

The culture-historical influences discussed above indicate some of the diverse directions from which various other cultures influenced the Interior Plateau groups. This is not to say that the Interior Plateau cultures never developed a flavour of their own, but the unique cultural elements, like those in most areas, consist of combinations and recombinations of outside stimuli and local innovations which gradually become typical to the area. As an example I might note the blend of micro-blades and Prairies' point styles. To a certain extent, chance alone may be responsible for any particular combination of traits at any one time, but over the long term I suspect that selective environmental factors have a strong orienting, but not necessarily determining, role. The following discussion, which attempts to explain the long term differentiation between the Columbia and Interior plateaus, combines both historical and environmental factors to arrive at a general explanatory hypothesis.

Over thirty years of dam construction and river ponding has resulted in many salvage excavations along the Columbia, Snake, and other rivers of the Columbia Plateau. A fairly typical and widely-quoted reconstruction of Columbia Plateau prehistory is that submitted by Daugherty (1962) which views the area as the northern extension of the Intermontane Western Tradition. As such it shares basic culture elements with the Great Basin to the South. It is only in the Late period (A.D. 1 - Historic Period) (Daugherty 1962:147) that the Northwest Riverine Area Tradition emerges as a counterpart to the Southwest Agricultural Area Tradition. Working with 9,000 - 11,000 years of prehistory at The Dalles, Cressman (1960) also sees strong early ties with the Great Basin. In a recent summary of the Desert West, which includes the Columbia Plateau and the Great Basin, Jennings (1964:168) comments, "Actually, I do not see important differences between the Plateau and the Great Basin until after A.D. 1."

A reconstruction of the recent prehistory of the Columbia Plateau is presented in Swanson's Emergence of Plateau Culture (1962). Working with data from a series of components from the Vantage region of the middle Columbia, Swanson sees a rather sudden change in settlement pattern, community pattern, and subsistence techniques around A.D. 1200 to A.D. 1300. According to this hypothesis, the subsistence pattern changed to more intensified river fishing accompanied by more extensive use of river floodplains, the presence of larger village sites (housepits), and increased contact with the Coast as evidenced by trade relations. The origins of this "Plateau Culture" are thought not to be indigenous to the middle Columbia River, but to have been derived from the "forested hills and valleys of the Cascade Range" (1962:81).

The emphasis on the riverine resources and accompanying change in floodplain utilization may well be due to increased salmon fisheries. Also in the Vantage area, housepits at the Schaake site occur together with notched net weights and salmon bones, whereas earlier components in the same site contained little if any fish bone (Holmes: personal communication). Salmon bones generally appear during the Late period in most Columbia River sites. Correspondence with several archaeologists working in the Columbia Plateau, and a review of the literature, has yet to disclose any concentration of salmon bones in sites dated earlier than the beginning of the Christian era and during the preceding 4,000 years. Salmon fisheries were important in early and middle post glacial times, however, as the masses of vertebrae at The Dalles sites attest (Cressman 1960). For a somewhat similar time period Borden (1960) has made a case for salmon fisheries during the Milliken Phase on the Fraser River dated between 8,000 and 9,000 years ago. The earliest Fraser River system skeletal evidence, however, comes from the Drynoch Slide site dated at 7,500 years. Fish vertebrae, presumably salmon, continue in components of the Lochnore-Nesikep Locality. In summary, the present evidence suggests that salmon were fished in early post glacial times on both the Fraser and Columbia rivers, but during the period between 6,500 years ago and the Christian era, there is very little evidence of salmon fisheries in Columbia River components upstream of The Dalles, and nearby Celilo Falls. Indians on the Fraser system, on the other hand, appear to have enjoyed salmon throughout this period.

The geological history of the lower Columbia River suggests a possible environmental explanation for the apparent scarcity of salmon remains in Columbia Plateau sites upstream of The Dalles. Prior to the construction of the Bonneville and The Dalles hydroelectric dams, the Columbia River poured through the Columbia Gorge over a series of waterfalls and rapids. Between the head of Celilo Falls at The Dalles, and the foot of the Cascade Rapids, the Columbia River fell 123 feet in 60 miles. This drop was far from a uniform gradient, however, as Table 59 indicates.

TABLE 59

ELEVATIONS AND GRADIENTS OF THE COLUMBIA RIVER BETWEEN CELILO FALLS AND THE CASCADE RAPIDS

Locality	Distance (Miles)	Elevation Drop (Feet)	Gradient (ft. per mile)
Head Celilo Falls	0	0	0
Foot of 3 Mile Rapids	11.5	82	7.1
Head Cascade Rapids (Dam)	41.5	4	0.096
Warrendale	7.0	37	5.3
TOTALS	60.0	123.0	

Date from Hodge 1938:919

As Hodge has pointed out, the gentle gradient (less than one tenth of a foot per mile) between the foot of 3 Mile Rapids and the head of the Cascade Rapids is due to the ponding of the Columbia River behind the Cascade Landslide which raised the river levels about 300 feet, forming what Hodge has called "The Lake of the Gods" (1938:915). When the river overflowed it began down cutting through the slide debris, but by historic times it still had not attained its previous gradient, thus creating the Cascade Rapids and a drop of thirty-seven feet.

Early explorers noted the Lake of the Gods, particularly the presence of drowned tree stumps covered with silt and standing far out from the then existing shore lines. In a study of the origins of the "drowned forests" Lawrence and Lawrence (1958) (D. Lawrence: personal communication) correlated the ponding of the Columbia River by the Cascade Landslide with the drowning of the submerged trees. Samples of wood from two of the trees yielded radiocarbon dates of A.D. 1,250 ± 200 (M-761) and A.D. 1,280 ± 300 (M-722) for an average date of about A.D. 1265 for the Cascade Landslide. The Lawrences make the observation that the damming of the Columbia effected the upstream gradient and reduced the height of Celilo Falls from a drop of sixty feet to a lesser one passable by salmon. Thus the Cascade Landslide resulted in two ladders assisting the anadromous fish up through the Columbia Gorge and over the previously impassable Celilo Falls. Salmon are famous for returning to streams where they themselves were hatched, but up to fifteen per cent of a "run" can stray into new or alternate streams (Shapovalov and Taft 1954:91). Once Celilo Falls was passable, it would have taken only a few years to establish upriver spawning beds.

Summary and Conclusions

Following Cressman (1960), Daugherty (1962), and Jennings (1964) the Columbia Plateau is thought to have shared in the Intermontane Western

Tradition, although an early adaptation to the riverine resources is evident from the numbers of salmon bones from The Dalles sites dating to perhaps 11,000 years ago. Sometime during the "Early Period" and before the "Transitional", dated by Cressman (1960:60) between 8,000 and 6,000 years ago, all evidence of salmon vanishes. A comparable situation may be present in the Cold Springs site upstream of The Dalles, where Shiner (1961:190) reports an increased reliance on river mussels in the "early midden" (Cold Spring Horizon), and suggests the possibility of a failure of the annual salmon runs. It may be about this time that increased aridity in the Columbia Plateau (Hansen 1947), combined with a rapidly downcutting Columbia River, created a drop at Celilo Falls which was too high for salmon to ascend.

From 6,000 years ago to the Christian Era, the inhabitants of the Columbia Plateau may have been obliged to re-orient their riverine economic patterns, and adopt a way of life remiscent of the Desert Culture (Jennings and Norbeck 1955). It is at this time period that Daugherty (1962:145,7) notes similarities between the Great Basin and the Columbia Plateau in point styles and in the food grinding complex. This change probably reflects not the migration of Great Basin refugees, but rather the borrowing of Desert Culture traits in order to cope with the new salmon-less environment. Thus an economy adapted to the Columbia Plateau, but sharing important elements of the Desert Culture, persisted up into the Christian Era. Then a basic change in subsistence and settlement patterns, perhaps equated with Swanson's "emergence", occurred at <u>roughly</u> the same time that salmon once again began ascending the Columbia River past Celilo Falls. Coincident with this was an influx of Interior Salish speakers from the Interior of British Columbia bringing with them new notions of subsistence and settlement patterns, in the form of intensive salmon fishing and housepit villages. The new arrivals evidently did not entirely displace older indigenous cultural patterns; Ray's (1939) evidence indicated that in the elements of culture he examined, the line of demarcation separating the Canadian from the Columbia Plateau cultural sub-areas was 180 miles north of the linguistic divide. Subsequent influences from the downriver Chinook (Osborne 1957) and the horse-equipped Plains Indian cultures resulted in the Plateau Culture recorded by the 19th century explorers. The great importance in historic times of The Dalles as a meeting place may well have its roots in the old upriver limit of the salmon.

The Interior Plateau of British Columbia was probably populated initially by groups coming out of the ice-free South. There is good reason to believe that south central British Columbia was largely deglaciated by 9,000 to 10,000 years ago (Fulton 1965: personal communication). This is 1,500 to 2,500 years prior to the first archaeological evidence of man in south central British Columbia. Artifacts of northern affiliation, such as microblades, appeared by 7,500 years ago, and might represent people moving into the deglaciated Interior Plateau from the North. Contacts with the western Prairies were evidently maintained from this period until historic times. In the Late period, British Columbia groups, now speaking Interior Salish, pushed southward, possibly through the Okanogan Valley and then into the Columbia Plateau. The Interior Salish brought with them a culture adapted to the riverine resources and the forested hills of the Fraser drainage system. Near the end of the prehistoric era the Interior Salish were strongly influenced by ideas coming inland from the Northwest Coast. A version of the Plains culture also made an impact upon the Interior Plateau, but as Kroeber (1939:56) has remarked, the influences were weakened as they were passed on second hand through the Columbia Plateau. The Okanogan Valley evidently functioned as a major communication route, and archaeological investigations in this culturally and environmentally intermediate area should be very rewarding.

This general hypothesis is offered as one possible explanation for the origins of the ethnographic Plateau Culture Area and the subareas defined by Ray (1939). The events suggested here to account for the homogeneity recognized in the late period were undoubtedly not synchronic but, bearing in mind the potential range of error inherent in radiocarbon and stratigraphic dating, I might suggest a Late period date between A.D. 800 and A.D. 1300. The occasional indications of Interior Plateau influences in the Columbia River sites at an earlier time are expected given the contiguity of the two prehistoric culture areas. I suggest, however, that it is not until around A.D. 1000 that numerous similarities appear, and from that period on to the Historic Era we may be justified in speaking of a single Plateau Culture Area.

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APPENDIX A

STATISTICAL ANALYSIS OF LOCHNORE-NESIKEP LOCALITY MICROBLADES

by David Wyatt

Introduction

The more than 700 microblades excavated in the Lochnore-Nesikep Locality in 1962 and 1964 form one of the larger microblade collections from northwestern North America. Microblades are characteristic of six components in Locality sequence (Sanger 1966), and a single microblade was found *in situ* at the Drynoch Slide site (EcRi:1). The purpose of this study is to present descriptive data and discuss statistical comparisons of microblades from the Locality. The total sample considered here, which for comparative purposes consists of microblades of definitely known provenience, numbers 683 specimens.

Collection and statistical analysis of Lochnore-Nesikep Locality microblade samples comprised four steps:

(1) In the field, crew members were alert to the possibility of finding microblades. During screening care was taken to avoid, as much as possible, losing microblades through the one-quarter inch mesh screen. Smaller mesh did not prove practical. All artifacts were identified and labeled in the field or at the University of Washington.

(2) At the University of Washington, in the fall and winter of 1964-5, the total artifact collection was examined, and microblades separated from other artifacts.

(3) Qualitative and quantitative attributes to be studied were identified. Measurements were taken with sliding calipers and dimensions recorded to the nearest one-tenth millimeter.

(4) Statistical comparisons of attribute distributions were performed.

Computations were done on a Friden model STW desk calculator. Tests used were chi-square (discussed by Spaulding 1953, 1960; Walker and Lev 1953: 426-7), and Kolmogorov-Smirnov (Goodman 1954; Walker and Lev 1953:77-79). Correlation and regression analysis techniques were used (Mack 1954:149-66; Wallis and Roberts 1956:524-36). Various null hypotheses were tested against alternates; the maximum acceptable probability of rejecting a hypothesis when it is true (level of significance) was .05. Use of the .05 level as the division between significant and non-significant differences is convention in many fields (Wallis and Roberts 1956:395). Recognizing, however, that it may not be suitable for use with archaeological data (Spaulding 1953:310), smaller levels of significance are also recorded in this paper.

Terminology

Preparation of cores and the blade-core technique have been discussed by Barnes (1947), Nelson (1937), Semenov (1965:44-55), Witthoft (1957), and others. In the American literature there exists terminological confusion regarding artifacts produced by the techniques. Terms identifying these artifacts should: (1) refer to a specific technique of manufacture, not to artifact function (in this sense "blade" refers to an artifact removed from a prepared core, not to a knife blade -- whose blade edge is used for cutting); (2) keep discrete the two categories flake and blade (Solecki [1955] points out that "lame" and its derivatives do not strictly indicate the blade category), blade thus being preferable to "prismatic flake." For these reasons <u>blade</u> is used here, in the generic sense, to refer to artifacts produced by the blade-core technique.

Although the flake and blade categories are distinct, a blade may be seen as a specialized flake -- an artifactual flake manufactured from a specially prepared core by the blade-core technique. Burkitt (1949: 44) defines a blade as "a long, narrow flake with more or less parallel sides, thin and flat relative to its length, and sometimes quite large..." White (1963:8) notes a definitive width:length "ratio" of less than 0.35.

There is generally recognized a type-difference between larger and smaller blades. Taylor (1962) plotted blade widths at the Arnapik site, Northwest Territories, and found a trough in the bimodal distribution curve at 11 mm. He therefore classed blades narrower than 11 mm as "microblades" and suggested the term "macroblade" to denote the wider artifacts. MacNeish (1964:409) recognized a width-boundary at 10mm among blades he collected from the Southwest Yukon.

Although dimension distributions may dichotomize blade assemblages, distribution bimodality is probably indicative of underlying differences between the manufacture of macroblades and microblades; information concerning such manufacturing differences should, if possible, be used in conjunction with dimension distributions to divide blade samples. Dimension distributions of Lochnore-Nesikep Locality assemblages are unimodal; manufacturing technique appears to be relatively uniform throughout. It seems, then, that the microblade and macroblade categories (Taylor's [1962] terms are used here) cannot be distinguished and that the artifacts should be called, less specifically, blades. However, because blades in this Locality are associated with cores of types from which microblades are thought to have been produced at sites with large <u>and</u> small blades, and because they are in the usual size range of microblades (under 10mm in width), they are called <u>microblades</u>.

Watanabe (Okada 1951) lists five traits of "Mongolian-type lames" (microblades):

1. The lames were flaked from one definite direction.

2. The edges and ridges are straight and parallel.

3. The lames are relatively thin and the width-thickness index thickness/width index is relatively constant and within a narrow range.

4. The angle formed by the striking-platform and flake scar is approximately 90°.

5. Polyhedral cores are to be found in association with lames.

These traits are characteristic of Lochnore-Nesikep Locality microblades with reservations: (1) The angle formed by the striking platform and fluted-surface is not always near 90-degrees. (2) It is assumed Watanabe means, in his trait 3, microblades are thin _relative to their widths_ -- that their thickness/width indices are small. Mean thickness/width index of Lochnore-Nesikep microblades is about 27, the range from 13.8 to 50.0. The mean is close to that of Watanabe's control group from North China (mean = 28).

Side, front, and cross-section views in Figure 12 (see Sanger 1967)[1] identify microblade morphological features: a microblade's _bulb of percussion_ is on its _ventral face_; the opposing _dorsal face_ was at one time microcore exterior. In cross-section, the ventral face is flat or slightly convex, while the dorsal face, which is formed by planes intersecting in ridge-like _arrises_, is angled. Junction of ventral and dorsal faces forms lateral _edges_. Microblades are thought to have been produced by pressure or a blow at the edge of the micro-core striking platform. The microblade end at or nearest the point of pressure or blow is the _proximal end_, the opposite end the _distal end_.

1 Sanger 1967 refers to the text preceding this appendix.

Attributes

Description and comparison of microblade assemblages entail identification of attributes for study, and the examination of their distributions and associations. Each artifact comprises a vast number of attributes. Those selected for examination, which were suggested by perusals of Lochnore-Nesikep Locality microblades and published descriptions of microblades from other areas in northwestern North America (mentioned below), were those thought to be "culturally dependent qualities" (Binford 1963:195). Since only Lochnore-Nesikep microblades were studied, attributes known only from other areas were of no concern. In a sense, then, the attribute list was not as "complete" as would have been one facilitating comparisons over a larger geographical area.

Four quantitative attributes were investigated: length, width, thickness, and thickness/width index. Length is the maximum distance from proximal to distal end. Width, the maximum distance between lateral edges, and thickness, the maximum distance between dorsal and ventral faces, were measured at the same point, midway between proximal and distal end. A microblade's thickness/width index expresses its thickness in terms of percent of its width. This attribute has been called "width/thickness index", but thickness/width index better indicates the computation involved:

$$\text{thickness/width index} = \frac{\text{thickness}}{\text{width}} \times 100.$$

The thirteen qualitative attributes were grouped into five attribute-classes; attributes within each class are mutually exclusive. Table I lists qualitative attributes and attribute-classes. Microblade morphology was the primary criterion for determining the presence or absence of any qualitative attribute; microblade manufacture and modification, the secondary criteria, often were implied by morphology.

Attributes of the outline attribute-class (i.e. outline in front view) were identified from examinations of microblade proximal and distal ends. The proximal end of a microblade whose outline has not been modified subsequent to its removal from a core characteristically has a ventral bulb of percussion and dorsal scars of micro-core preparations (Plate XVIII in Sanger 1967). In front view, it is rounded or slightly waisted. At the distal end of these complete microblades, dorsal and ventral face converge to form a knife-like edge, or in a very few instances, a faceted distal edge. In many cases, the lateral edges and arrises meet at this end to form a pointed tip, and, in side view, convexity increases markedly toward the tip. The different morphologies of proximal and distal ends could have been considered two different attributes, but were considered definitive of the single attribute, complete microblade.

Characteristic of the other attributes of the outline attribute-class is the square end. Definitive of this end type is a plan perpendicular to the ventral face. This plane is very often perpendicular to the long axis, and thus to the lateral edges and arrises (since they tend to parallel the long axis). Breaking (snapping) of a complete microblade almost certainly produced a square end. Sanger has snapped several complete microblades and noted the resultant square end (Sanger 1967). Location of the square end defines the attributes proximally square microblade, distally square microblade, and proximal-distally square microblade (e.g. a microblade snapped at the distal end is distally square, one snapped at both ends, proximal-distally square). Microblades with the various outline class attributes are pictured in Plate XVII (Sanger 1967). Giddings pictures complete microblades from the Denbigh Flint Complex at Iyatayet (1964: Fig. 47, No. 20; Plate 65, Nos. 4,10,15) and describes microblades here termed proximal-distally square, "...straight sections of microblades where neither the thick, bulbous end nor the thin, curved tip would interfere with insertion into a slot as a side blade" (1964:205). The attribute distally square microblade is present in the Pointed Mountain collections:

> "The rounding and fine flaking at the rounded end are due to the preparation of the core near the striking platform before the bladelet was removed. The opposite end is usually broken off sharply at right angles to the long axis of the flake." (MacNeish 1954:240)

Microblades from the Imaigenik site, which have "had the section with the percussion bulb at the proximal end broken off...", (Irving 1953:63), are probably proximally square.

Two attributes are included in the cross-section attribute class; a microblade with triangular cross-section has one arris on its dorsal face, microblade with non-triangular cross-section, more than one. In a few cases, arrises and blade scars which do not run the full length of the microblade made it difficult to identify attributes of the class, but the problem was not a severe one. MacNeish calls triangular cross-sectioned microblades from the Southwest Yukon "prismatic", and non-triangular specimens "truncated" (1964:418-9).

Retouched microblades show minute scars of intentional or use retouch, almost always along lateral edges. The retouch, edge of retouch, and face of retouch attribute classes are not mutually exclusive; only retouched microblades have attributes of the latter two classes. Location of retouch defines edge of retouch and face of retouch attributes. If flake scars are present on the dorsal face, the microblade is dorsally retouched; ventrally retouched microblades have flake scars on their ventral faces. If a microblade is retouched dorsally on one edge, and ventrally on the other, or both dorsally and ventrally along either edge, it has the attribute dorso-ventral retouch. At the Pointed Mountain site MacNeish found microblades worked along one and both lateral edges (1954:241), and Giddings pictures dorsally retouched (1964: Fig. 47, Nos. 5,6,13), ventrally retouched (Fig. 47, No. 15) and dorso-ventrally retouched specimens (Fig. 47, Nos. 22,25).

Material used for an artifact is very often a culturally dependent quality. All of the 683 microblades studied are basalt; the few non-basaltic microblades were not studied.

Lehman Component (EdRk:8, Zone II) Microblades

Of the sample's 683 microblades, 444 came from Zone II of Lehman site, called herein the Lehman component (EdRk:8). Tables 2 through 5 present data describing the Lehman component microblade sample. Because of its greater size the sample was examined in more detail than were samples from other components. It was felt that limitations imposed on statistical comparisons by small sample size (e.g., special chi-square computation techniques are required when expected frequencies are small) precluded certain comparisons among the smaller samples.

Three questions of attribute association are asked: (1) are some qualitative attributes associated with other qualitative attributes? (2) are some qualitative attributes associated with some quantitative attributes? and (3) what is the nature and strength of the relationship between quantitative attributes?

Spaulding (1953) discusses techniques for treating the first question: chi-square tests are used to find attribute clusters (associations of two or more qualitative attributes). Attributes are clustered (associated) if they appear in combination significantly more often than would be expected on the basis of chance alone. Clusters are probably attribute combinations favored by the artifact makers.

Spaulding's techniques were not used to determine clusterings of microblade attributes, but rather to find associations of attribute classes. Table 12 lists the frequency and percentage of each Lehman component qualitative attribute. If chance alone is responsible for attribute combinations, the expected proportion of microblades with a given combination of two attributes is the product of the proportions of the two attributes. For example retouched microblades form 0.408 (40.8%) of the Lehman sample, and distally square microblades 0.532 (53.2%). The proportion of retouched distally square microblades should be 0.408 x 0.532, or 0.217. In Table 6 expected proportions have been converted to expected frequencies (E) and observed frequencies (O) have been tabulated. Differences between expected and observed frequencies of all possible combinations of single attributes from one given class with single attributes from a second given class were used to calculate a chi-square value measuring the association of the two classes. For any two classes, the number of possible combinations is the number of attributes in the first class multiplied by the number in the second class (e.g., 4 outline attributes x 2 retouch attributes = 8 possible combinations of single outline and retouch attributes). For each possible combination the statistic $\frac{(O - E)^2}{E}$ was calculated, that is, the square of the difference between observed and expected frequencies divided by the expected frequency. The test statistic chi-square, which increases as observed frequencies depart more and more from those expected, is the sum of the statistics for all the possible combinations of two attribute classes. If a table of chi-square distribution shows the test chi-square to be significantly large (level of significance less than or equal to 0.05), the two attribute-classes are said to be associated, and some cultural factor is assumed to be responsible for some of the possible attribute combinations.

Table 7 lists chi-square values and levels of significance for Lehman component attribute-class combinations. It was found that only the edge of retouch and face of retouch attribute-classes are associated. In Table 6 it may be seen that the combinations one edge - ventral retouch and two edges - dorso-ventral retouch have much greater observed than expected frequencies. It is likely that these two combinations were favored by the makers of Lehman component microblades.

To answer the question of qualitative-quantitative attribute association, dimensions of microblades with the various qualitative attributes were examined. For convenience, dimensions will be spoken of as features of the qualitative attributes themselves, rather than of microblades possessing the attributes.

If only chance determines qualitative-quantitative attribute associations, dimension distributions of all qualitative attributes within an attribute-class should be the same. If there are significant differences between distributions, cultural factors may be assumed to be responsible. The Kolmogorov-Smirnov test was used to compare dimension distributions. Walker and Lev describe this test:

> A two sample test which is sensitive to <u>any</u> kind of difference in the distributions from which the samples are drawn is one based on the sample cumulative percentage polygons. If two samples have, in fact, been drawn from populations with the same continuous distribution, then both cumulative percentage distributions should resemble the parent distribution and should resemble each other. If the distributions are too far apart at any point it is cause for rejecting

> the null hypothesis. The test statistic is D = the maximum vertical difference between the two polygons. (1953:426-7)

Figures 1-8 show curves derived from cumulative percentage polygons and smoothed using a method described by Schmid (1954:138-43). The curves resemble one another in shape, but are shifted horizontally in relation to one another. This shifting indicates that microblades with some qualitative attributes tend to be larger than those with others. Because shiftings appeared to be the major factor affecting the size of D, a Kolmogorov-Smirnov test particularly sensitive to shifting was used (details in Goodman 1954:166-8). It tested the hypothesis that two samples compared represent populations with equal distributions against the alternate that the population values from which the first sample was taken are larger than those from which the second sample was taken. Because differences between means are greater among the outline and retouch classes, than among the other classes, comparisons were carried out in the former two classes.

Among outline class attributes, significant differences were found in length, width, thickness, and thickness/width distributions. Length and thickness differences are especially great and numerous. It was hypothesized above that the square ends of distally square, proximally square, and proximal-distally square microblades were produced by the breaking of complete microblades. The pattern of length distribution differences supports this hypothesis: complete microblades tend to be longer than those with square ends, and proximally square and distally square specimens, which tend to be of the same length, tend to be longer than proximal-distally square microblades. Snapping of complete microblades is probably, then, the cultural factor responsible for length distribution differences. The pattern of thickness distribution differences -- that complete microblades are significantly thicker than those broken at one or both ends — indicates that microblade makers preferred to break thin complete microblades.

Among the retouch class attributes, test comparisons showed retouched microblades to be longer and thicker than unretouched microblades. It is probable that Lehman component toolmakers preferred to retouch long and thick specimens and that longer and thicker specimens were better suited to the purpose for which they were retouched than were shorter and thinner ones.

It was hypothesized that relationships between quantitative attributes would be linear. To evaluate the hypothesis, correlation coefficients were calculated for the dimension relationships width: length, thickness:length, and thickness:width. The correlation coefficient (Pearson _r_) may have a value from -1 to +1. Its absolute value indicates the strength of the linear relationship: a coefficient near zero indicates a weaker linear relationship than does one near -1 or +1. (Table 10 gives the qualitative meaning of _r_). If the coefficient's sign is positive, the magnitude of one dimension tends to increase as magnitude of the other dimension increases; if it is negative, the first dimension tends to _decrease_ as the other increases.

Examining Table 11, it may be seen that the linear relationships between dimensions of Lehman component microblades are, in general, weak. Although the relationship is weak, the positive values of _r_ establish the tendency for any dimension to increase as any other increases. If there were not this tendency, some negative _r_ values could be expected on the basis of chance.

Lochnore-Nesikep Locality Microblades

Tables 12 through 17 present data describing the microblade samples from components in the Lochnore-Nesikep Locality. In five of these components, the sample size is large enough to allow comparative statistical analysis. This analysis comprises two parts: first, the distribution of qualitative attributes in the Locality is examined; and second, the quantiative attribute distributions of the components are compared.

In examining the distribution of qualitative attributes, the question is asked, "are the components homogeneous with respect to distribution of attributes of each attribute-class?" Chi-square tests are utilized to test the homogeneity of attribute distribution in each attribute class. Table 19 shows expected and observed attribute frequencies, and Table 20 shows chi-square values measuring homogeneity of attribute distribution. Attributes of the outline and cross-section attribute-classes are unequally distributed in the components. In the outline attribute-class the greatest discrepancies between expected and observed frequencies occur in Zone IV of the Nesikep Creek site (EdRk:4), and in the cross-section class they are great in that component and Zone III of the Pine Mountain site (EdRk:9). A trend to lesser proportions of proximal-distally square and proximally square microblades in components of more recent date probably contributes to the heterogeneity of outline class attribute distribution. However evidence for the trend is not great. The cross-section class data suggest no trend. There appears to be a trend to greater proportions of retouched microblades in more recent components, but this trend does not significantly effect the homogeneity of retouch class attribute distribution. A z-test was used to compare the proportions of retouched microblades among the components, and only the 0.204 difference between the proportions in Zone IV of the Nesikep Creek site and Zone III of the Pine Mountain site was found to be significant.

Quantitative attribute distributions of the components were compared using the form of Kolmogorov-Smirnov test that was used in examining Lehman component qualitative-quantitative attribute relationships. In figures 9 through 12 the cumulative percentage distribution curves are graphed. Table 20 presents the results of test comparisons. The differences between distributions are greatest in width and thickness. The data indicate a trend to greater dimension magnitudes in more recent components than in earlier components.

Conclusions

The following statements summarize the results of comparative statistical analysis of Lochnore-Nesikep Locality microblade collections:

1. Lehman Component (Zone II)

A) The only clustering of qualitative attributes occurs among combinations of attributes of the edge of retouch and face of retouch attribute-classes. The attribute combinations two edges retouched--dorso-ventral retouch and one edge retouched--ventral retouched may have been favored by the microblade makers, or the combinations one edge retouched-- dorso-ventral retouch and two edges retouched--ventral retouch avoided.

B) Complete microblades tend to be longer and thicker than those with square ends (proximally square, distally square, and proximal-distally square microblades). Proximally square and distally square microblades, which tend to be of the same thickness and length, are longer and thicker than proximal-distally square specimens. Retouched microblades tend to be longer and thicker than unretouched microblades.

C) There is a general tendency for any microblade dimension to increase in magnitude as any other dimension increases.

2. Lochnore-Nesikep Locality

A) The components are not homogeneous with respect to distribution of attributes of the outline and cross-section qualitative attribute-classes. With respect to the other attribute-classes distribution of attributes among the components is homogeneous.

B) Quantitative attribute distributions are not the same in the components. Thickness distributions are most often not the same, and the dimension distributions from Zone IV at the Nesikep Creek site differ most from those of other components.

H.B. Collins believes microblades are "...too widely distributed to be of diagnostic value except in a very broad sense" (1956:76). If statistical analyses of microblade collections from individual components are used as the bases for comparisons with other components, the diagnostic value of microblades may be increased. Qualitative attributes rarely or never found at one component may be present and common at another. Attributes and attribute-classes may be significantly associated (clustered) at one component and not at another. The relationships between qualitative and quantitative attributes and between dimensions may vary from component to component.

Statistical analyses of microblades and microcores (especially in conjunction with microscopic analyses of artifact wear traces) may produce information concerning microblade manufacturing techniques and methods of microblade use.

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TABLE 1

QUALITATIVE ATTRIBUTE-CLASSES AND ATTRIBUTES

Attribute Class	Attribute
Outline	Complete Microblade Distally Square Microblade Proximally Square Microblade Proximal-distally Square Microblade
Cross-section	Triangular Non-triangular
Retouch	Retouched Unretouched
Edge of Retouch	One Edge Retouched Both Edges Retouched
Face of Retouch	Dorsal Retouch Ventral Retouch Dorso-ventral Retouch

TABLE 2

LEHMAN COMPONENT MICROBLADES
LENGTH STATISTICS (mm)

Attribute	Number	Mean	s.d.	Median	Mode	Range
Complete microblade	87	21.3	4.8	20.6	18.5	11.8-34.8
Distally square	236	17.7	4.4	17.5	18.5	7.5-32.2
Proximally square	54	17.7	3.9	17.5	18.5	10.9-30.8
Distal-proximal square	67	15.0	3.8	14.4	12.2	7.9-28.4
Triangular	229	17.9	4.2	17.5	18.5	7.5-32.2
Non-triangular	210	18.0	5.0	18.1	18.5	7.9-34.8
Retouched	181	20.0	5.0	19.3	18.5	7.5-34.8
Unretouched	263	16.6	3.9	16.2	18.5	7.9-28.1
One edge retouch	120	19.7	5.3	19.1	18.5	7.5-32.2
Both edges retouch	61	20.5	4.9	20.1	18.5	11.0-34.8
Dorsal retouch	93	20.1	4.8	20.0	18.5	10.7-32.2
Ventral retouch	61	19.5	5.6	18.9	18.5	7.5-34.8
Dorsal-ventral retouch	27	20.7	4.4	19.4	18.5	14.3-28.4
TOTAL	444	17.9	4.9	17.7	18.5	7.5-34.8

TABLE 3

LEHMAN COMPONENT MICROBLADES
WIDTH STATISTICS(mm)

Attribute	Number	Mean	s.d.	Median	Mode	Range
Complete microblade	87	6.3	1.1	6.1	5.2	3.6-9.6
Distally square	236	6.3	1.0	6.2	6.2	3.7-9.7
Proximally square	54	5.8	1.1	5.8	5.2	3.5-8.2
Distal-proximal square	67	5.9	1.3	6.0	-	3.5-12.2
Triangular	229	6.1	1.1	6.0	5.7	3.5- 9.7
Non-triangular	210	6.3	1.1	6.2	6.2	3.5-12.2
Retouched	181	6.4	1.1	6.1	6.2	3.5- 9.6
Unretouched	263	6.1	1.1	6.1	6.2	3.5-12.2
One edge retouch	120	6.3	1.1	6.3	6.2	3.5- 9.6
Both edges retouch	61	6.3	1.1	5.6	5.7	4.5- 9.5
Dorsal retouch	93	6.5	1.1	6.4	6.2	4.5- 9.6
Ventral retouch	61	6.1	1.1	5.9	-	4.5- 9.3
Dorsal-ventral retouch	27	6.3	1.1	5.9	5.7	4.5- 9.2
TOTAL	444	6.2	1.1	6.1	6.2	3.5-12.2

TABLE 4

LEHMAN COMPONENT MICROBLADES
THICKNESS STATISTICS (mm)

Attribute	Number	Mean	s.d.	Median	Mode	Range
Complete microblade	87	1.8	0.4	1.8	-	1.1- 2.8
Distally square	236	1.6	0.4	1.6	1.65	0.8- 3.1
Proximally square	54	1.6	0.4	1.5	1.25	1.0- 2.5
Distal-proximal square	67	1.5	0.3	1.4	1.45	0.8- 2.7
Triangular	229	1.7	0.4	1.7	1.65	0.8- 3.1
Non-triangular	210	1.6	0.3	1.6	1.45	0.8- 2.7
Retouched	181	1.7	0.4	1.7	1.65	1.0- 3.1
Unretouched	263	1.6	0.4	1.5	1.45	0.8- 2.7
One edge retouch	120	1.7	0.4	1.7	1.65	1.0- 3.1
Both edges retouch	61	1.8	0.4	1.8	1.85	1.2- 2.7
Dorsal retouch	93	1.8	0.4	1.8	-	1.0- 3.1
Ventral retouch	61	1.6	0.1	1.6	1.65	1.1- 2.5
Dorsal-ventral retouch	27	1.8	0.4	1.8	1.85	1.2- 2.6
TOTAL	444	1.7	0.4	1.6	1.45	0.8- 3.1

TABLE 5

LEHMAN COMPONENT MICROBLADES
THICKNESS/WIDTH INDEX STATISTICS

Attribute	Number	Mean	s.d.	Median	Mode	Range
Complete microblade	87	29.3	6.7	28.5	28.9	17.8-45.8
Distally square	236	25.9	5.9	25.4	24.7	13.1-47.6
Proximally square	54	27.5	4.9	26.9	24.7	19.2-39.6
Distal-proximal square	67	25.8	5.9	25.2	22.6	13.9-42.2
Triangular	229	28.1	6.4	27.2	24.7	13.1-45.8
Non-triangular	210	25.2	6.0	25.1	22.6	13.9-41.2
Retouched	181	27.2	7.3	26.7	24.7	13.1-47.6
Unretouched	263	26.3	5.9	25.8	-	13.9-45.8
One edge retouch	120	26.3	7.3	25.6	24.7	13.1-47.6
Both edges retouch	61	29.4	6.0	29.4	28.9	18.0-41.5
Dorsal retouch	93	27.6	6.0	24.9	24.7	16.1-47.6
Ventral retouch	61	26.0	7.9	24.4	24.7	13.1-39.6
Dorsal-ventral retouch	27	29.6	7.3	28.2	22.6	19.0-41.5
TOTAL	444	26.9	6.0	25.8	24.7	13.1-47.6

TABLE 6

LEHMAN COMPONENT MICROBLADES
EXPECTED AND OBSERVED FREQUENCIES OF
QUALITATIVE ATTRIBUTE COMBINATION

		Complete	Distally Square	Proximally Square	Distal-Proximal Square	Triangular	Non-Triangular	Retouched	Unretouched	One Edge Retouch	Both Edges Retouch	Dorsal Retouch	Ventral Retouch	Dorso-Ventral Retouch
Complete	E	x	x	x	x									
	O													
Distally Square	E	x	x	x	x									
	O													
Proximally Square	E	x	x	x	x									
	O													
Distal-Prox. Square	E	x	x	x	x									
	O													
Triangular	E	45	121	28	35	x	x							
	O	48	125	23	32									
Non-Triangular	E	42	112	26	32	x	x							
	O	38	108	31	35									
Retouched	E	35	96	22	27	93	87	x	x					
	O	39	102	17	23	92	88							
Unretouched	E	52	140	32	40	135	125	x	x					
	O	48	134	37	44	136	124							
One Edge Retouch	E	26	67	11	15	60	58	x	x	x	x			
	O	22	68	13	16	64	54							
Both Edges Retouch	E	13	35	6	8	32	30	x	x	x	x			
	O	17	34	4	7	28	34							
Dorsal Retouch	E	20	52	9	12	47	45	x	x	61	31	x	x	x
	O	19	55	8	11	49	43			64	29			
Ventral Retouch	E	13	34	6	8	31	30	x	x	40	21			
	O	14	31	7	9	28	33			52	9			
Dorso-Ventral Retouch	E	6	15	3	3	14	13	x	x	18	9	x	x	x
	O	6	16	2	3	14	13			3	24			

E - Expected frequency

O - Observed frequency

TABLE 7

LEHMAN COMPONENT MICROBLADES
CHI-SQUARE TEST OF ATTRIBUTE CLUSTERING

Attribute		Outline	Cross-Section	Retouch	Edge of Retouch	Face of Retouch
Outline	Chi-Square	x	3.08	3.57	2.85	1.60
	Degrees Freedom	x	3	3	3	6
	Lev. of Sig.	x	☆	☆	☆	☆
Cross-Section	Chi-Square	3.08	x	0.06	1.34	0.93
	Degrees Freedom	3	x	1	1	2
	Lev. of Sig.	x	x	☆	☆	☆
Retouch	Chi-Square	3.57	0.06	x	x	x
	Degrees Freedom	3	1	x	x	x
	Lev. of Sig.	x	☆	x	x	x
Edge of Retouch	Chi-Square	2.85	1.34	x	x	47.20
	Degrees Freedom	3	1	x	x	2
	Lev. of Sig.	x	☆	x	x	0.001
Face of Retouch	Chi-Square	1.60	0.93	x	1.60	x
	Degrees Freedom	6	2	x	6	x
	Lev. of Sig.	x	☆	x	☆	x

☆ Level of Significance > 0.05

TABLE 9

LEHMAN COMPONENT RETOUCH ATTRIBUTE-CLASS KOLMOGOROV-SMIRNOV TEST COMPARISON OF RETOUCHED (SAMPLE 1) AND UNRETOUCHED (SAMPLE 2) MICROBLADE DIMENSION CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Length	Width	Thickness	Th./Wi. Index
D	29.7	10.0	18.2	11.1
SIG	.001	☆	.001	☆

SIG - Level of significance

☆ - population values represented by sample 1 <u>not</u> greater than those represented by sample 2.

TABLE 10

QUALITATIVE MEANING OF r

± r	Linear Relationship
0 to 0.2	none
0.2 to 0.5	weak
0.5 to 0.7	moderate
0.7 to 0.9	strong
0.9 to 1.0	very strong

After Sidney F. Mack
Elementary Statistics (1960), P. 156

TABLE 11

LEHMAN COMPONENT MICROBLADES -
DIMENSION CORRELATION COEFFICIENTS

Attribute	n	r Width: Length	r Thickness: Length	r Thickness: Width
Complete mbl.	87	+0.13	+0.31	+0.22
Distally square	236	+0.21	+0.34	+0.34
Proximally square	54	+0.50	+0.08	+0.57
Distal-proximal square	67	+0.24	+0.35	+0.03
Triangular	228	+0.51	+0.57	+0.35
Non-triangular	212	+0.23	+0.51	+0.31
Retouched	181	+0.32	+0.38	+0.35
Unretouched	263	+0.15	+0.31	+0.27
One edge retouch	119	+0.32	+0.49	+0.37
Both edges retouch	62	+0.28	+0.12	+0.34
Dorsal retouch	93	+0.24	+0.59	+0.33
Ventral retouch	61	+0.47	+0.39	+0.43
Dorso-ventral retouch	27	+0.14	+0.37	+0.14
TOTAL	444	+0.29	+0.47	+0.31

TABLE 12

LOCHNORE-NESIKEP LOCALITY MICROBLADES -

QUALITATIVE ATTRIBUTE DISTRIBUTION

Attribute	Nesikep Cr. site EdRk:4, Zone IV		Lochnore Cr. site EdRk:7, Zone II		Lehman site EdRk:8, Zone II		Pine Mt. site EdRk:9, Zone III		Lochnore Cr. site EdRk:7, Zone I	
	n	%	n	%	n	%	n	%	n	%
Complete mbl.	5	11.4	10	20.8	87	19.8	17	18.9	13	23.6
Distally square	14	31.8	24	50.0	236	53.2	49	57.0	29	52.8
Proximally square	9	20.4	7	14.6	54	12.2	10	11.6	6	10.9
Distal-proximal square	16	36.5	7	14.6	67	15.1	10	11.6	7	12.7
Triangular	16	36.3	22	45.8	228	51.5	27	31.4	26	47.2
Non-triangular	28	63.7	25	52.0	212	47.9	58	67.5	28	52.8
Retouched	12	27.3	16	33.3	181	40.8	41	47.7	25	45.4
Unretouched	32	72.7	32	66.7	263	59.2	45	52.3	30	54.6
One edge retouch	10	22.7	15	31.2	119	26.8	27	31.4	15	27.3
Both edges retouch	2	4.5	1	2.1	62	14.0	14	16.3	10	18.2
Dorsal retouch	8	18.2	9	18.7	93	21.0	29	33.7	13	23.6
Ventral retouch	2	4.5	6	12.5	61	13.8	7	8.3	4	7.3
Dorso-ventral retouch	2	4.5	1	2.1	27	6.2	5	5.8	8	14.5
TOTAL	44	100.0	48	100.0	444	100.0	86	100.0	55	100.0

TABLE 13

LOCHNORE-NESIKEP LOCALITY MICROBLADES - LENGTH STATISTICS (mm)

	Nesikep Cr. site EdRk:4, Zone IV	Lochnore Cr. site EdRk:7, Zone II	Lehman site EdRk:8, Zone II	Pine Mt. site EdRk:9, Zone III	Lochnore Cr. site EdRk:7, Zone I
n	44	48	444	86	55
Mean	17.0	16.7	17.9	18.9	18.9
s.d.	5.8	4.5	4.9	5.6	4.9
Median	16.2	16.4	17.7	17.2	18.2
Mode	16.4	16.4	18.5	16.4	16.4
Range	8.4-32.8	8.5-30.0	7.9-34.8	11.1-35.7	9.7-31.2

TABLE 14

LOCHNORE-NESIKEP LOCALITY MICROBLADES - WIDTH STATISTICS (mm)

	Nesikep Cr. site EdRk:4, Zone IV	Lochnore Cr. site EdRk:7, Zone II	Lehman site EdRk:8, Zone II	Pine Mt. site EdRk:9, Zone III	Lochnore Cr. site EdRk:7, Zone I
n	44	48	444	86	55
Mean	5.7	6.0	6.2	6.3	6.9
s.d.	1.4	1.0	1.1	1.0	1.4
Median	5.7	6.1	6.1	6.7	6.7
Mode	5.7	6.7	6.2	6.7	6.7
Range	2.4-8.5	3.9-8.7	3.5-12.2	5.0-9.0	4.6-10.4

TABLE 15

LOCHNORE-NESIKEP LOCALITY MICROBLADES -

THICKNESS STATISTICS (mm)

	Nesikep Cr. site EdRk:4, Zone IV	Lochncre Cr. site EdRk:7, Zone II	Lehman site EdRk:8, Zone II	Pine Mt. site EdRk:9, Zone III	Lochnore Cr. site EdRk:7, Zone I
n	44	48	444	86	55
Mean	1.4	1.6	1.7	1.7	1.9
s.d.	0.4	0.4	0.4	0.4	0.5
Median	1.3	1.5	1.6	1.6	1.8
Mode	1.25	1.45	1.45	1.65	1.85
Range	0.7-2.5	0.7-3.0	0.8-3.1	1.1-2.8	1.1-3.7

TABLE 16

LOCHNORE-NESIKEP LOCALITY MICROBLADES -

THICKNESS/WIDTH INDEX STATISTICS

	Nesikep Cr. site EdRk:4, Zone IV	Lochncre Cr. site EdRk:7, Zone II	Lehman site EdRk:8, Zone II	Pine Mt. site EdRk:9, Zone III	Lochnore Cr. site EdRk:7, Zone I
n	44	48	444	86	55
Mean	24.7	26.8	26.9	27.4	28.0
s.d.	5.7	6.5	6.0	5.7	6.5
Median	23.7	26.8	25.8	25.9	27.1
Mode	20.5, 26.8	24.7	24.7	24.7, 26.8	22.6, 24.7, 28.9
Range	13.8-39.0	17.1-42.3	13.1-45.8	14.4-48.2	15.7-50.0

TABLE 17

ATTRIBUTES OF MICROBLADES FROM ZONE VII NESIKEP CREEK SITE (EdRk:4) AND DRYNCOH SLIDE SITE (EcRi:1)

	Quantitative				Qualitative
Artifact Number	Length	Width	Thickness	Th/Wi Index	
EdRk:4-					
843	16.2	8.5	1.8	21.2	Proximal-distally Sq., Triang., Unret.
850	26.0	6.1	1.5	24.6	Dist. Sq., Non-tri., Ret., 2 edges Ret., Dors Ret.
870	30.2	9.4	1.6	17.0	Dist Sq., Triang., Unret.
889	14.7	6.4	1.0	15.6	Dist Sq., Non-tri., Unret.
904	22.7	5.9	1.4	23.7	Dist Sq., Non-tri., Unret.
EcRi:1-					
2	17.5	5.6	1.9	34.0	Dist Sq., Non-tri., Unret.

TABLE 19

LOCHNORE-NESIKEP LOCALITY MICROBLADES -

EXPECTED AND OBSERVED QUALITATIVE ATTRIBUTE FREQUENCIES

Attribute	Nesikep Cr. site EdRk:4, Zone IV		Lochnore Cr. site EdRk:7, Zone II		Lehman site EdRk:8, Zone II		Pine Mt. site EdRk:9, Zone III		Lochnore Cr. site EdRk:7, Zone I	
	E*	O*	E	O	E	O	E	O	E	O
Complete mbl.	9	5	9	10	87	87	17	17	11	13
Distally square	23	14	25	24	252	236	45	49	29	29
Proximally square	6	9	6	7	56	54	11	10	7	6
Distal-proximal square	6	16	8	7	70	67	14	10	9	7
Triangular	21	16	23	22	211	228	41	27	26	26
Non-triangular	23	28	25	25	233	212	45	58	28	28
Retouched	19	12	19	16	180	181	35	41	22	25
Unretouched	25	32	29	32	264	263	51	45	33	30
One edge retouch	8	10	11	15	122	119	28	27	17	15
Both edges retouch	4	2	5	1	59	62	13	14	8	10
Dorsal retouch	7	8	9	9	100	93	23	29	14	13
Ventral retouch	3	2	5	6	53	61	12	7	7	4
Dorso-ventral retouch	2	2	3	1	28	27	6	5	4	8

*E = Expected
O = Observed

TABLE 20

LOCHNORE-NESIKEP LOCALITY COMPONENTS -

CHI-SQUARE TEST OF HOMOGENEITY OF

QUALITATIVE ATTRIBUTE DISTRIBUTION

	Outline	Cross-Section	Retouch	Edge of Retouch	Face of Retouch
Chi-square	22.8	13.7	8.5	8.6	14.07
Degrees freedom	12	4	4	4	8
Level significance	.05	.01	*	*	*

* Level of significance > .05

TABLE 21

LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
LENGTH CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 2							
	Complete Mbl.		Distally Square		Proximally Square		Prox-dist. Square	
Sample 1	D	SIG	D	SIG	D	SIG	D	SIG
Complete mbl.	--	--	29.3	.001	36.3	.001	55.4	.001
Distally square	29.3	*	--	--	10.8	*	26.1	.001
Proximally square	36.3	*	10.8	*	--	--	28.0	.01
Proximal-distal square	55.4	*	26.1	*	28.0	*	--	--

SIG - Level of significance

* - Population values represented by sample 1 not greater than those represented by sample 2

TABLE 22

LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
WIDTH CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 2							
	Complete Mbl.		Distally Square		Proximally Square		Prox-dist. Square	
Sample 1	D	SIG	D	SIG	D	SIG	D	SIG
Complete mbl.	--	--	11.7	*	15.4	*	11.9	*
Distally square	11.7	*	--	--	19.1	.05	17.6	.05
Proximally square	15.4	*	19.1	*	--	--	5.4	*
Proximal-distal square	11.9	*	17.6	*	5.4	*	--	--

SIG - Level of significance

* - Population values represented by sample 1 not greater than those represented by sample 2

TABLE 23

LOCHNORE-NESIKEP LOCALITY COMPONENTS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
LENGTH CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 1									
	EdRk:4 Zone IV		EdRk:7 Zone II		EdRk:8 Zone II		EdRk:9 Zone III		EdRk:7 Zone I	
Sample 2	D	SIG	D	SIG	D	SIG	D	SIG	D	SIG
EdRk:7, I	25.9	*	25.6	*	16.1	*	10.6	*	x	x
EdRk:9, III	16.8	*	16.6	*	7.2	*	x	x	10.6	*
EdRk:8, II	12.4	*	17.9	*	x	x	7.2	*	16.1	.05
EdRk:7, II	7.8	*	x	x	17.9	*	16.6	*	25.6	.05
EdRk:4, IV	x	x	7.8	*	12.4	*	16.8	*	25.9	.05

Sig - level of significance
* - population values represented by sample 1 not greater than those represented by sample 2.

TABLE 24

LOCHNORE-NESIKEP LOCALITY COMPONENTS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
WIDTH CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 1									
	EdRk:4 Zone IV		EdRk:7 Zone II		EdRk:8 Zone II		EdRk:9 Zone III		EdRk:7 Zone I	
Sample 2	D	SIG	S	SIG	D	SIG	D	SIG	D	SIG
EdRk:7, I	31.2	*	26.2	*	21.7	*	8.9	*	x	x
EdRk:9, III	35.0	*	23.2	*	26.8	*	x	x	8.9	*
EdRk:8, II	22.1	*	13.2	*	x	x	26.8	.001	21.7	.01
EdRk:7, II	16.3	*	x	x	13.2	*	23.2	.05	26.2	.05
EdRk:4, IV	x	x	16.3	*	22.1	.02	35.0	.001	31.2	.01

Sig - level of significance
* - population values represented by sample 1 not greater than those represented by sample 2.

TABLE 25

LOCHMORE-NESIKEP LOCALITY COMPARISONS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
THICKNESS CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 1									
	EdRk:4 Zone IV		EdRk:7 Zone II		EdRk:8 Zone II		EdRk:9 Zone III		EdRk:7 Zone I	
Sample 2	D	SIG	D	SIG	D	SIG	D	SIG	D	SIG
EdRk:7, I	49.2	*	31.6	*	27.3	*	24.5	*	x	x
EdRk:9, III	30.9	*	14.6	*	5.5	*	x	x	24.5	.01
EdRk:8, II	25.5	*	9.2	*	x	x	5.5	*	27.3	.001
EdRk:7, II	27.1	*	x	x	9.2	*	14.6	*	31.6	.001
EdRk:4, IV	x	x	27.1	.05	23.5	.01	30.9	.01	49.2	.001

Sig - level of significance
* - population values represented by sample 1 <u>not</u> greater than those represented by sample 2.

TABLE 26

LOCHMORE-NESIKEP LOCALITY COMPONENTS
KOLMOGOROV-SMIRNOV TEST COMPARISONS OF
THICKNESS/WIDTH INDEX CUMULATIVE PERCENTAGE DISTRIBUTIONS

	Sample 1									
	EdRk:4 Zone IV		EdRk:7 Zone II		EdRk:8 Zone II		EdRk:9 Zone III		EdRk:7 Zone I	
Sample 2	D	SIG	D	SIG	D	SIG	D	SIG	D	SIG
EdRk:7, I	20.7	*	10.1	*	6.7	*	6.7	*	x	x
EdRk:9, III	22.7	*	11.6	*	13.0	*	x	x	6.7	*
EdRk:8, II	14.0	*	6.9	*	x	x	13.0	*	6.7	*
EdRk:7, II	20.8	*	x	x	6.9	*	11.6	*	10.1	*
EdRk:4, IV	x	x	20.8	*	14.0	*	22.7	.05	20.7	*

Sig - level of significance
* - population values represented by sample 1 <u>not</u> greater than those represented by sample 2.

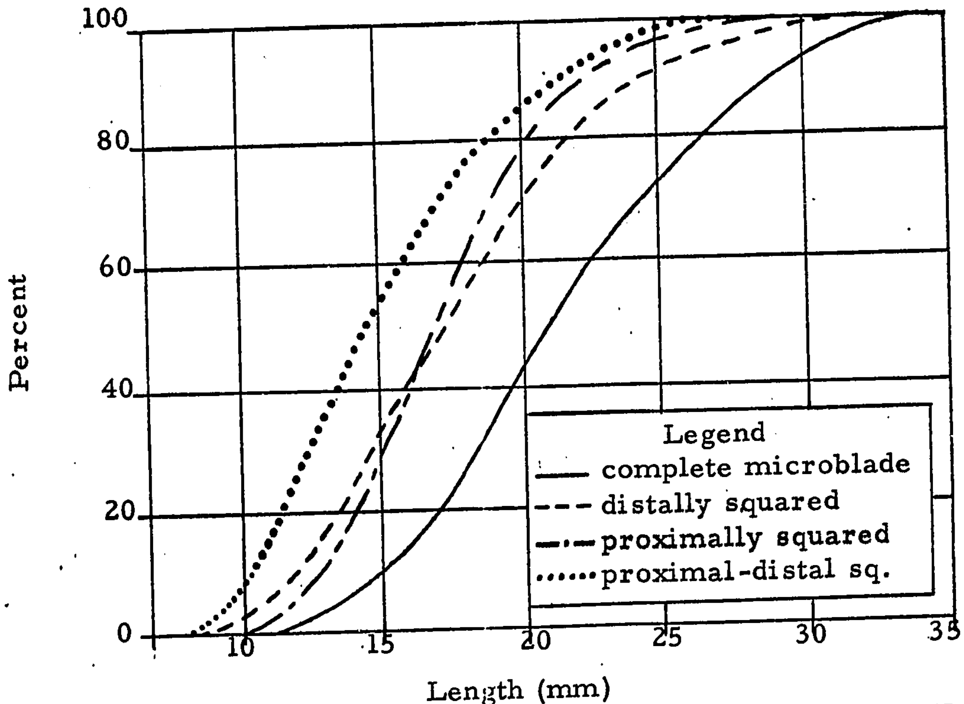

FIGURE 1. LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS
MICROBLADE LENGTH --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

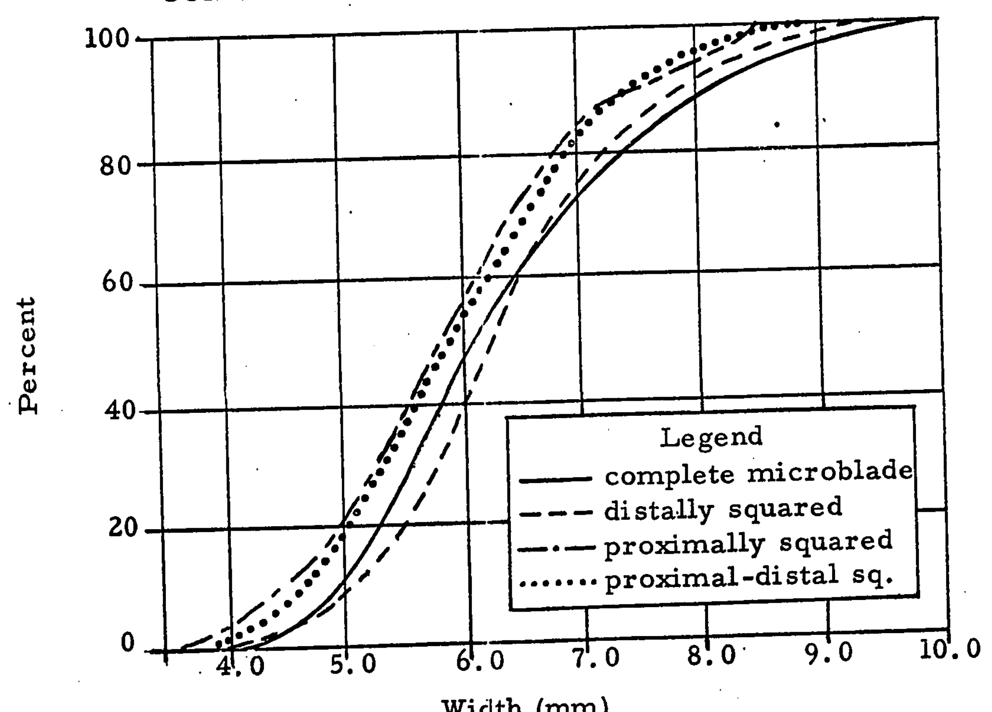

FIGURE 2. LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS
MICROBLADE WIDTH --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

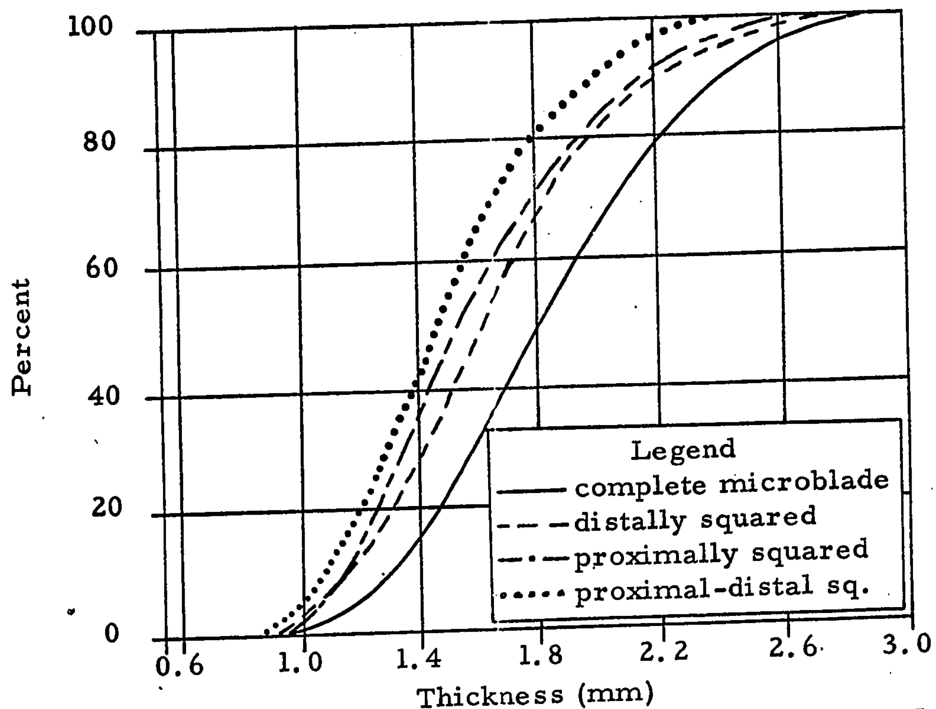

FIGURE 3. LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS MICROBLADE THICKNESS -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

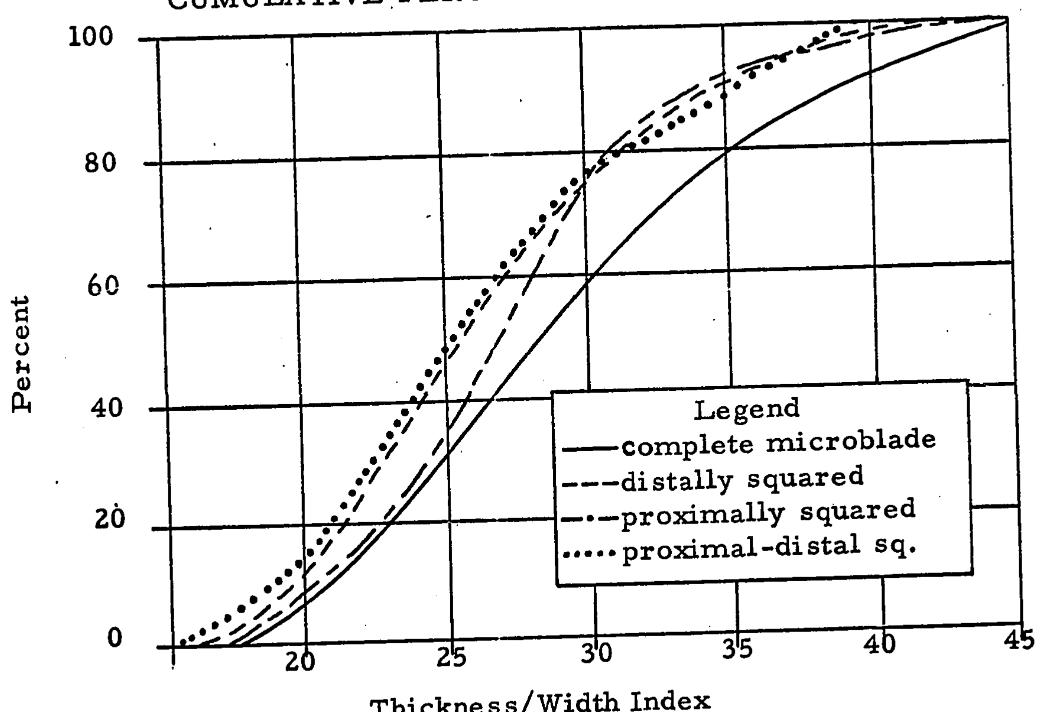

FIGURE 4. LEHMAN COMPONENT OUTLINE ATTRIBUTE-CLASS MICROBLADE THICKNESS/WIDTH INDEX -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

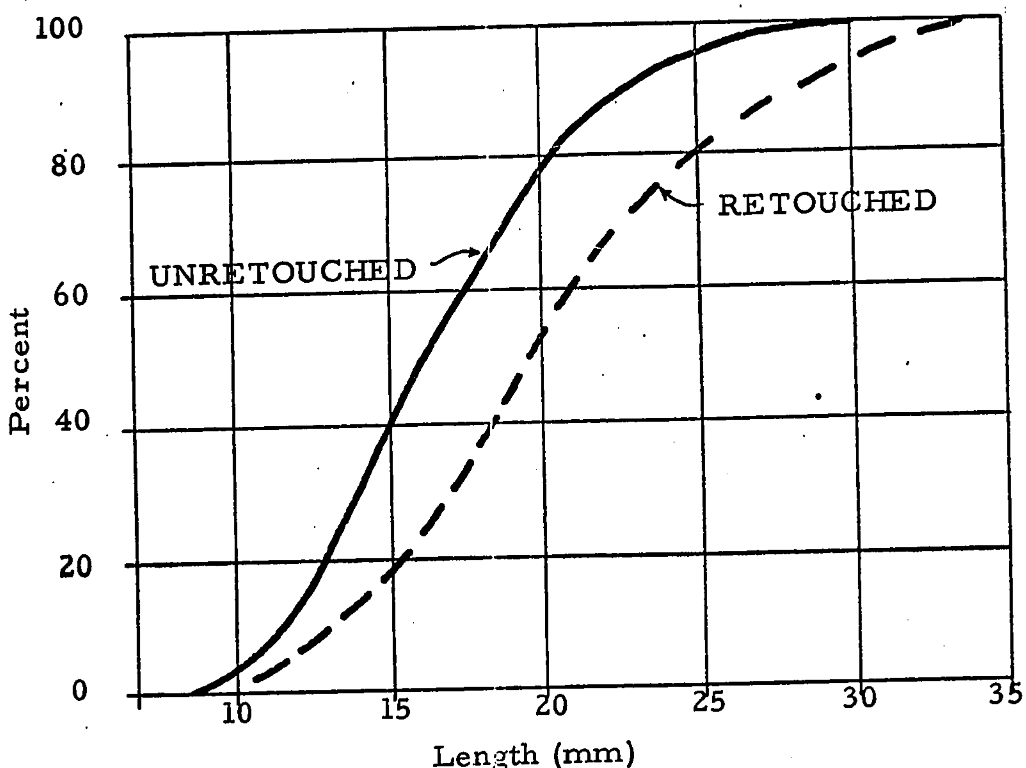

FIGURE 5. LEHMAN COMPONENT RETOUCH ATTRIBUTE-CLASS MICROBLADE LENGTH -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

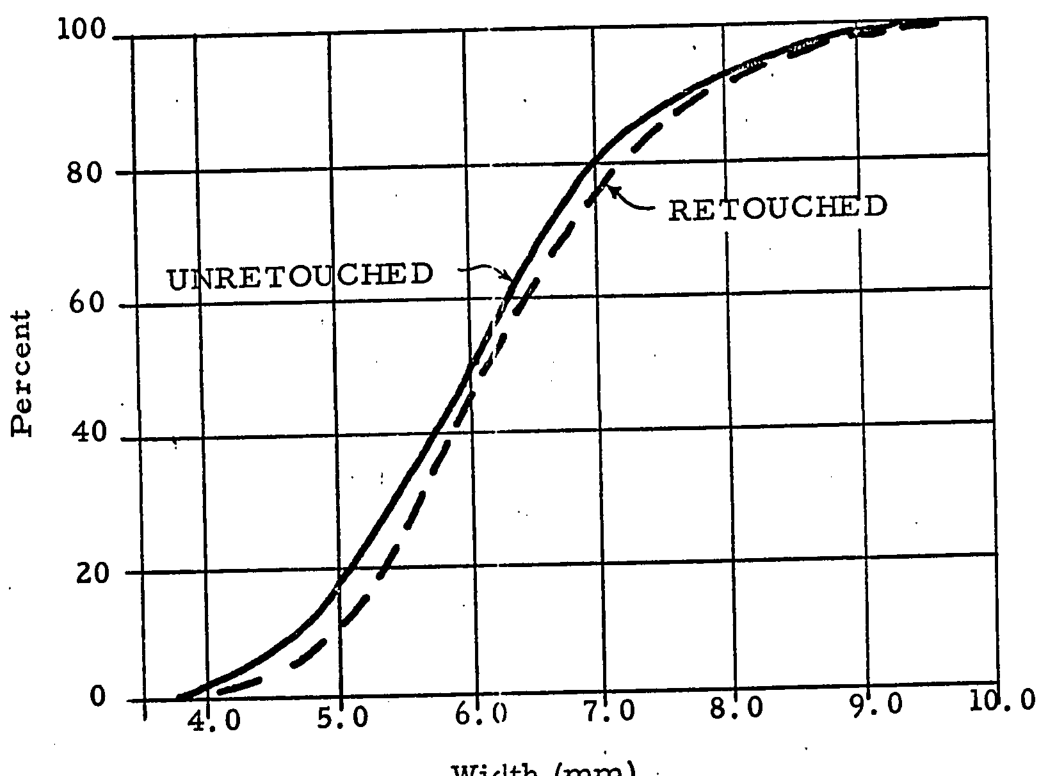

FIGURE 6. LEHMAN COMPONENT RETOUCH ATTRIBUTE-CLASS MICROBLADE WIDTH -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

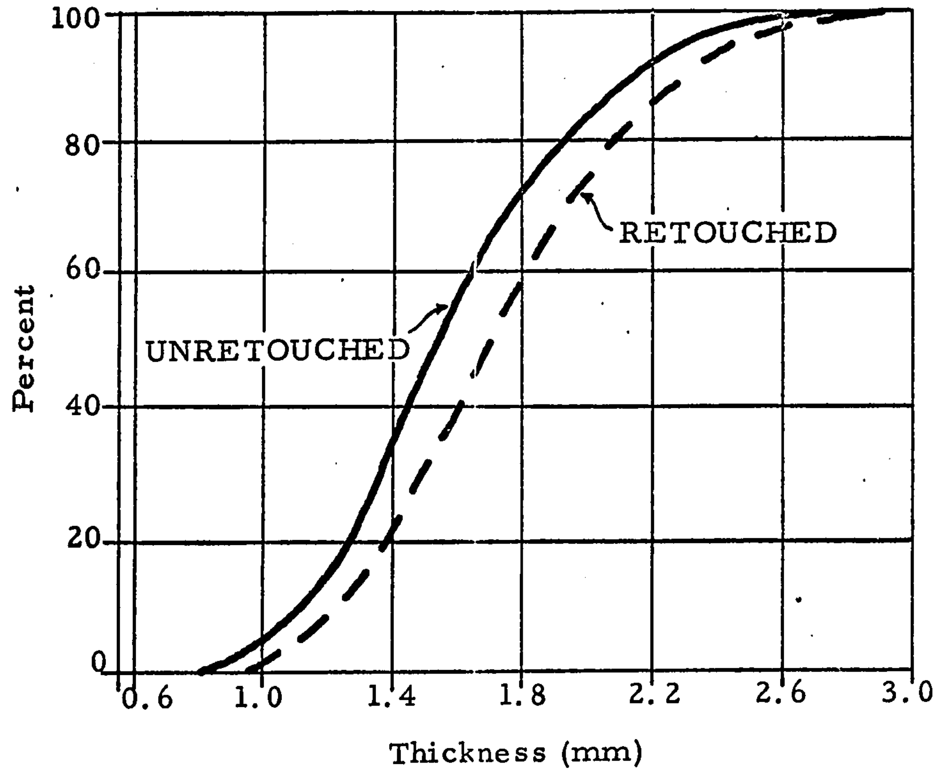

FIGURE 7. LEHMAN COMPONENT RETOUCH ATTRIBUTE-CLASS MICROBLADE THICKNESS -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

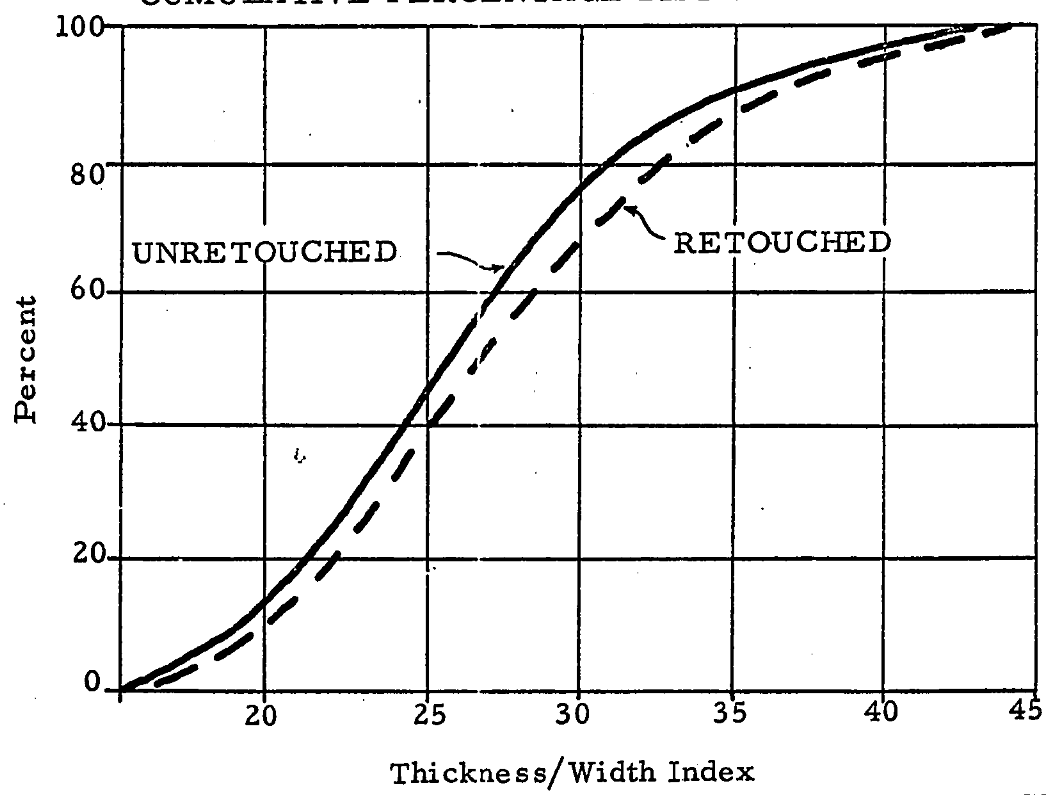

FIGURE 8. LEHMAN COMPONENT RETOUCH ATTRIBUTE-CLASS MICROBLADE THICKNESS/WIDTH INDEX -- CUMULATIVE PERCENTAGE DISTRIBUTIONS

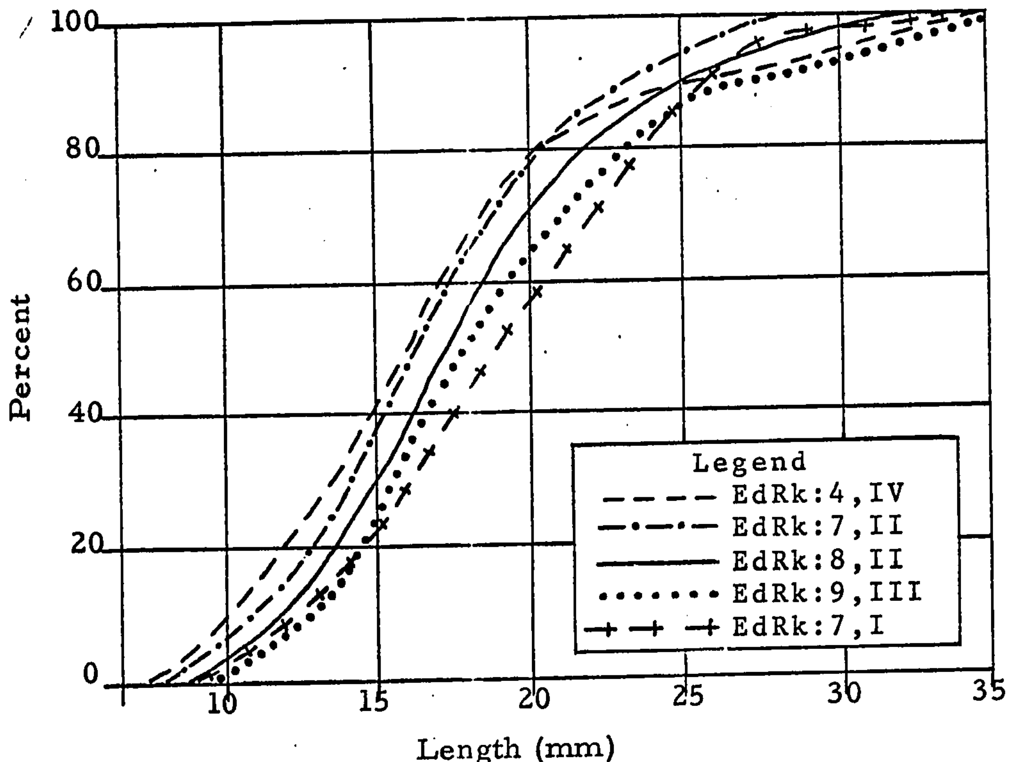

FIGURE 9. LOCHNORE-NESIKEP LOCALITY COMPONENTS
MICROBLADE LENGTH --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

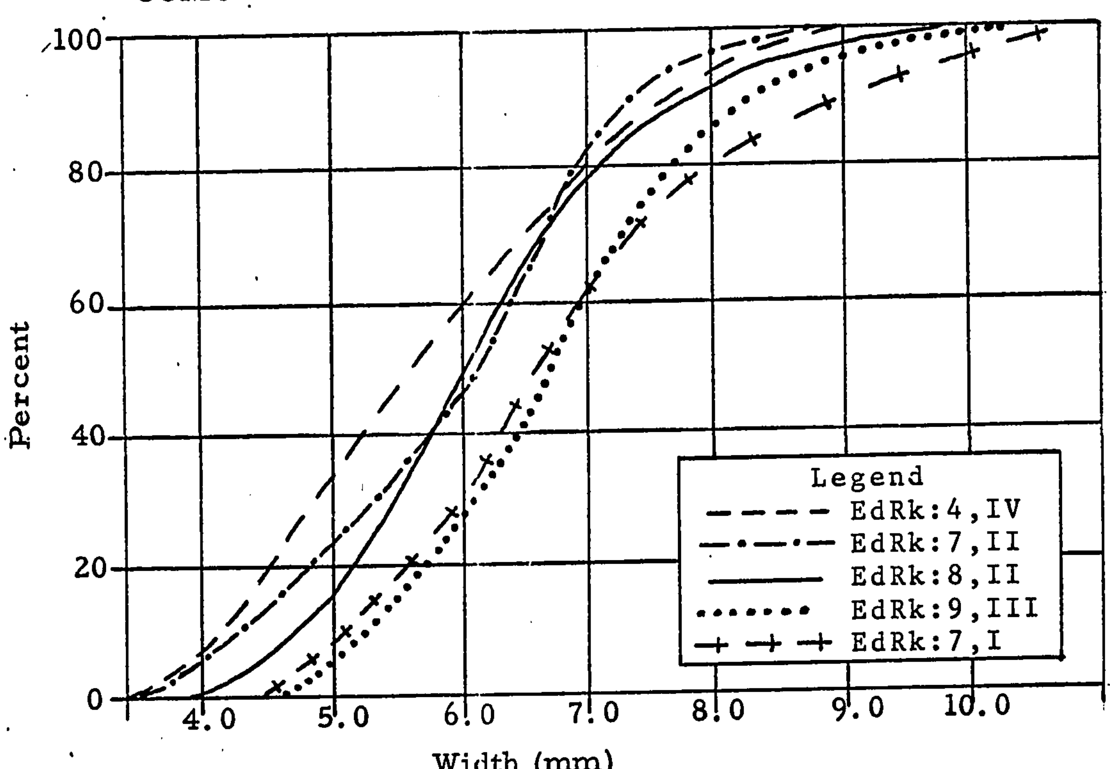

FIGURE 10. LOCHNORE-NESIKEP LOCALITY COMPONENTS
MICROBLADE WIDTH --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

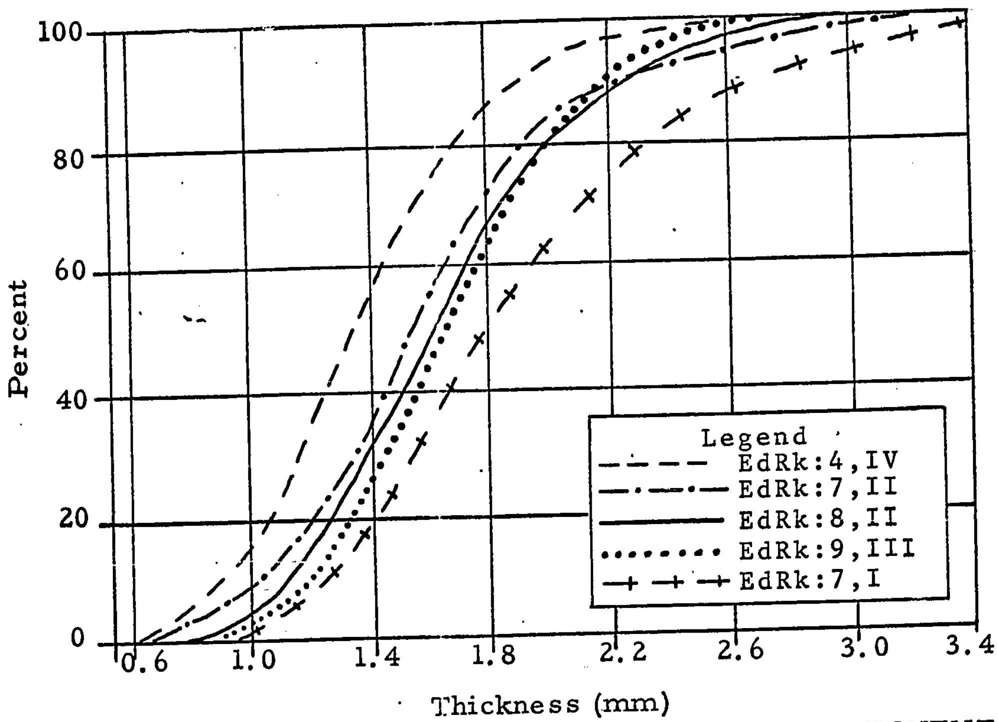

FIGURE 11. LOCHNORE-NESIKEP LOCALITY COMPONENTS
MICROBLADE THICKNESS --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

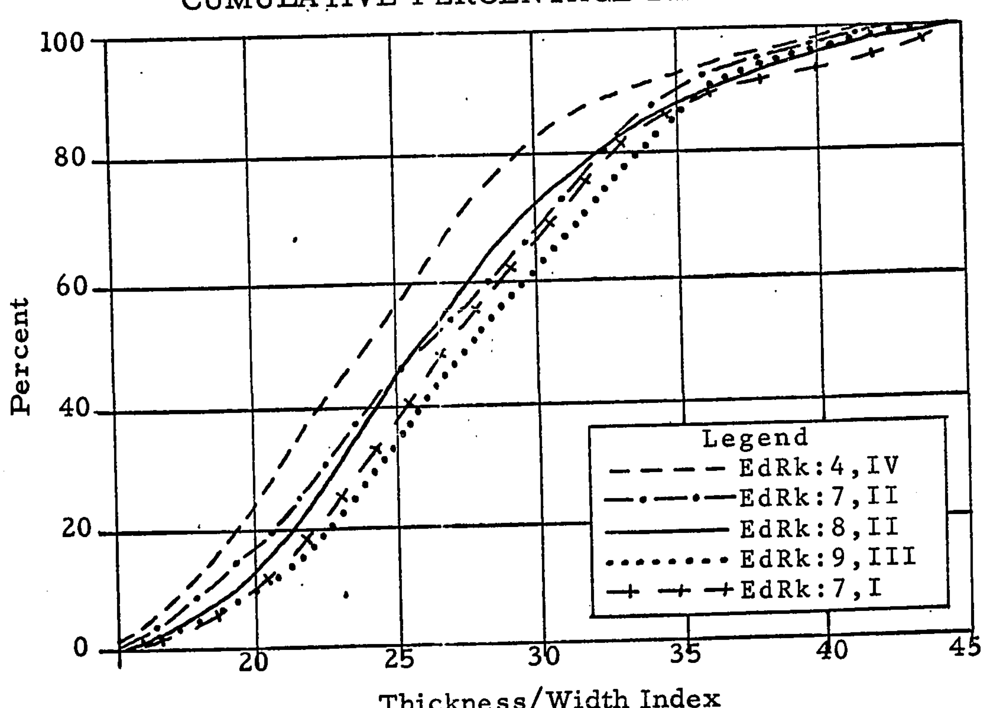

FIGURE 12. LOCHNORE-NESIKEP LOCALITY COMPONENTS
MICROBLADE THICKNESS/WIDTH INDEX --
CUMULATIVE PERCENTAGE DISTRIBUTIONS

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