The Role of Lithic Raw Material Studies in Kootenay Archaeology

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This paper represents an exploration of the interaction between the prehistoric inhabitants of the Kootenay region and the natural environment. It focuses upon the influence of regional geology on the local stone age technological systems. At the time of writing, considerable archaeological field-work had been accomplished but detailed analysis had not kept pace. The analytical aspect of this paper is confined to the description of specific lithic material types while the discussion of their archaeological significance necessarily consists of observations and speculations. The paper is thus not intended to be a compendium of quantitative archaeological data; rather, the intent is to demonstrate the utility of recognizing the unique pattern of the regional geology as an aid to understanding past human activities.

BACKGROUND

The Kootenay region is an area of great environmental diversity located in the southeastern corner of British Columbia. The mountain ranges and main rivers and lakes of the region all display the influence of the geological structure in their north-north-west — south-south-east trends (Figure 1). The predominating climatic influences, Maritime and Continental, interact with regional physiography to produce marked west to east differences in precipitation and temperature. West of the Purcell Mountains, precipitation values are high but temperatures tend to be moderate. Forests are dense and the aquatic ecosystem comprises a significant proportion of the biomass. Much of the region east of the Purcell Divide is semi-arid and prone to daily and seasonal temperature extremes. Grassland and parkland are extensive, providing forage for a diverse ungulate fauna.

The territory of the Kootenay Indians encompassed all of this wide environmental range. The Lower Kootenay lived west of the Purcells and practised a semi-sedentary valley-bottom mode of living similar to that of Plateau peoples, while the Upper Kootenay, who lived east of the Purcells, practised a more nomadic big-game hunting orientation with con-

BC STUDIES, no. 48, Winter 1980-81

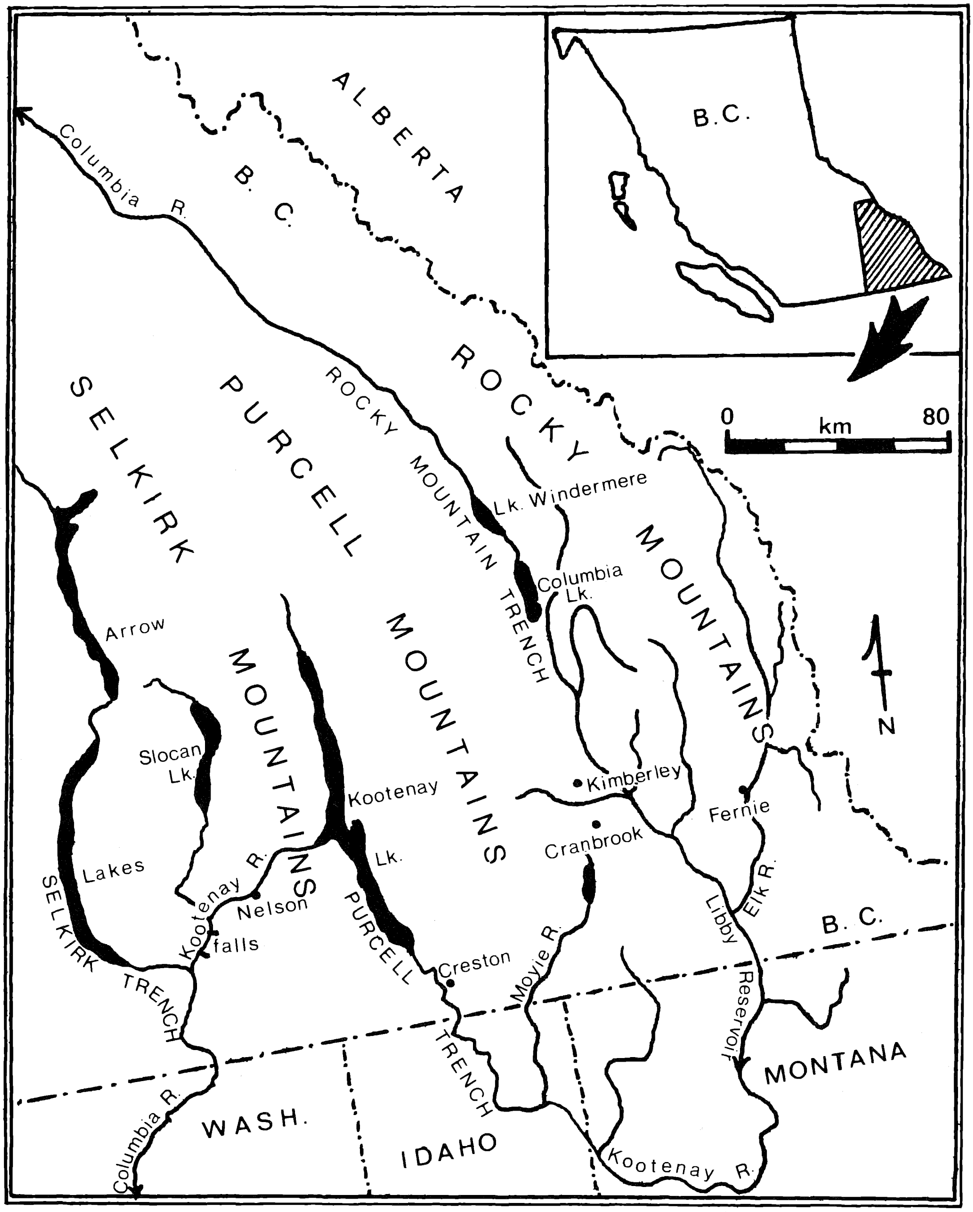


FIGURE 1. Map of the Kootenay region.

siderable affinity to Plains culture. The western margin of the region was historically occupied by a little-known group referred to as the Lakes Salish. That part of the Rocky Mountain Trench drained by the Columbia River was historically occupied by another group of Salish, the Kinbasket Shuswap, who moved eastward in the 1840s to take possession of the salmon fishing grounds at the headwaters of the Columbia.

The prehistoric inhabitants of the Kootenay region had a stone-age economy and their livelihood depended upon being able to find stone suitable for tool manufacture. As many of the activities of these hunting and gathering groups required the use of sharp edges, techniques for producing chipped stone tools were primary in their technological repertoire. Fine-grained silicate rocks are especially suitable for chipped tool manufacture because of their hardness and predictable conchoidal fracture. Although silica is a very common element, not all silicate rocks lend themselves well to chipping, and those that do are not distributed continuously over the earth's surface. They tend to occur at certain locations as a result of specific geologic processes.

The geologic history of the Kootenay region began some 1,200 million years ago when the region consisted of an island surrounded by a broad shallow sea (Alberta Society of Petroleum Geologists, 1964). Erosion, deposition and subsidence kept pace over millions of years, resulting in the accumulation of a thick blanket of sediments. Around 400 million years ago the major period of mountain building in the west commenced. Uplift and igneous intrusion in the western half of the region folded and warped the sedimentary strata which, accompanied by varying degrees of metamorphism, formed the Selkirk and Purcell Ranges. This took a long time, during which a great group of limestone beds were laid down to the east in a practically clear sea (Pardee, 1917). The tectonism spread eastward with strong lateral pressures gradually causing the folding, faulting and uplift of the Rocky Mountains. In marked contrast to the orogeny of the Canadian Rocky Mountains, uplift in present day Montana was accompanied and followed by extensive volcanism during which lavas of diverse composition were extruded. More recently, volcanic activity was also a significant process southwest of the Kootenay region, during the deposition of the Columbia Plateau basalts.

KOOTENAY LITHIC MATERIAL TYPES

Knowledge of the geologic history of the Kootenay region has been valuable in the study of the types of stone utilized by the region's prehistoric inhabitants because it allows the sorting of lithic types in archaeological assemblages on the basis of their potential source locations. The lack of any appreciable volcanism within the Kootenay region is reflected in the colour of the indigenous silicate rocks. In sharp contrast to silicates in contact with ferromagnesian lavas to the south and west, which are brightly coloured by diverse minerals, the colours of micro- and crypto-crystalline silicate rocks in the Kootenay region are confined to shades of green, brown, black and white. Most imported "exotic" stone, being brightly coloured (red, orange, yellow) or of extrusive igneous origin, is thus readily detected.

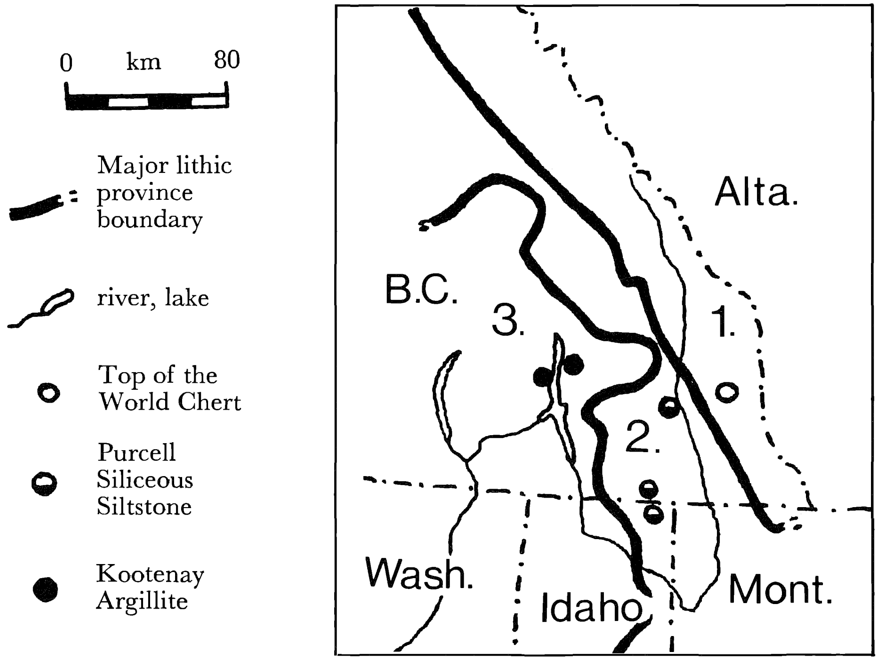
The variety of chipped stone debitage left in the Kootenay region by prehistoric people is great. However, most of the chipped stone artifact sample is accounted for by three major types (Table 1) which correlate in structure and source locations with a division of the Kootenay region into three gross lithic provinces (Figure 2).

Because there is a strong correlation between the geologic structure of the region and environmental factors, and because there is also a strong correlation between the geologic structure and bedrock lithology, investigation of the archaeological occurrence of specific rock types having distinct source localities is proving to be a highly productive approach to understanding the prehistoric cultural-ecological dynamics of the region. The remainder of this paper consists of a discussion of the three major lithic types defined in Table 1 and their archaeological occurrences.

1) *"Top of the World" Chert*

Major quarry and workshop complexes originating from exploitation of this stone were discovered above 2,150 m above sea level in the Van Nostrand Range of the Rocky Mountains in 1973 and 1974. Quarries consist of exposures at near vertical cirque headwalls of horizontally stacked lenses of chert encased within limestone, tentatively assigned to the basal Beaverfoot formation of Ordovician-Silurian age. The limestone has weathered back, exposing the harder chert which was pried or pounded off in angular blocks by prehistoric quarrymen. The blocks were reduced on the spot to useable cores and preforms. Ample water and level ground for campsites are adjacent to both quarries.

Use of this material ties in strongly with inferred utilization of Top of the World Pass as a travel route and seasonal ungulate range. Top of the World is an extensive area of alpine meadowland at the headwaters of Lussier River and Coyote and Galbraith Creeks (Figure 3). Debitage is



LITHIC PROVINCES:

1. Relatively recent carbonates and unmetamorphosed clastics of the Rocky Mountains.
2. Slightly metamorphosed Precambrian formations making up the bulk of the Purcell Mountains.
3. Strongly metamorphosed clastics associated with igneous instrusions in and adjacent to the Selkirk Range.

FIGURE 2. Bedrock geology of the Kootenay region, showing major archaeologically defined lithic provinces and quarry locations.

TABLE 1

Petrographic Characteristics of Major Kootenay Lithic Raw Material Types

Lithic Type	1. *Top of the World Chert*	2. *Purcell Siliceous Siltstone*	3. *Kootenay Argillite*
Structure	cryptocrystalline.	siliceous clastic (silt-sized).	lamellar siliceous metasediment; clay-to-silt sized particles deformed parallel to bedding plane; prone to step fracture, small surface, potlid fractures common.
Inclusions	occasional dendrites, irregular banding, mottling.	occasional fracture planes lined with crystalline quartz; occasional pyrite crystals or casts.	none.
Colour	white through grey to black.	khaki green to brown, grey, blue-grey, rusty weathering common.	typically pale green; minor frequency of purplish-brown.
Optical Properties	translucent, highly vitreous lustre.	slightly translucent to opaque, slightly vitreous lustre.	translucent, flat lustre.
Source	basal Beaverfoot formation, Van Nostrand Range, British Columbia Rocky Mountains (Lithic Province 1).	Belt Series formations, (Aldridge in Canada, Prichard in U.S.), Purcell Mountains, British Columbia and Idaho (Lithic Province 2)	Milford Group, Blue Ridge, British Columbia (Lithic Province 3).

scattered widely over an area 20 km in diameter, even in places presently under water. The major directions of transport for Top of the World Chert were to the south and west, and secondarily to the north and east. An idea of distances involved in the prehistoric utilization of the material may be obtained from the exotic lithic types found at a major campsite at Top of the World (DlPu 7). The bright golden and red materials were easily identifiable as Montana cherts, while Kootenay Argillite, Purcell Siliceous Siltstone and a number of other Rocky Mountain lithic materials were also observed. Use of Top of the World quarries extends well back into prehistory, as indicated by finds of basally indented lanceolate projectile points of Top of the World Chert at DlPu 7, and cores of Top of the World Chert associated with Late Paleo-Indian deposits (ca. 7000-9000 B.P.) in the Crowsnest River valley on the east slope of the Rockies (J. Driver, pers. comm., 1976). Evidently the quarries were even used during the early Historic Period, as suggested by the find of a hand-forged prospector's pick at the major quarry (DlPu 12).

Top of the World Chert is quite distinct in the Kootenay region, being the most vitreous of the indigenous cherts (Figure 4). It is called a chert because its source has been located and the material found to be a percolation solute of silica deposited in limestone. It is characterized by an amphorous ground mass of chalcedonic silica which contains scattered quartz crystals and fibrous microfossil relics (Figure 7a). It is translucent and highly vitreous, and occurs in a continuum only from white through grey to black, with minor occurrences of banding, mottling and, very rarely, a slight pinkish cast. Its qualities of great hardness and isotropic structure make it ideal for the manufacture of chipped tools, although potential tool size is limited to a maximum of 8-10 cm in dimension by the highly brecciated nature of the source lenses. This chert is superior to obsidian because it is less prone to shatter, thereby keeping a sharp cutting edge for a longer period of time. Prehistoric man was very much aware of the value of this stone, as is attested by the abundance of archaeological sites in the vicinity of the outcroppings and by the widespread occurrence of Top of the World Chert in archaeological sites in southeastern B.C., southwestern Alberta and northwestern Montana. It seems to have been especially valued for the manufacture of projectile points and bifaces, although it is frequent in most other artifact classes as well.

An idea of the utility of studying distributions of specific lithic types can be obtained from preliminary analyses of Canadian Libby Reservoir excavated assemblages. Top of the World Chert is not indigenous to the Libby Reservoir area (Norford, 1969), where it occurs in archaeological sites as rare isolated core nuclei, preforms and blanks, and most commonly as pressure sharpening flakes and finished tools. This is indicative of tool manufacture elsewhere, and only local use and resharpening. Excavations at DhPt 9 disclosed a change in lithic frequency from an early use of dark opaque siliceous mudstone locally obtained as pebbles in the Elk River gravels, to a later predominant use of Top of the World Chert (Choquette, 1973a). This change in lithic types from basal deposits of the site (which likely date around 5000 B.P.) to upper strata was associated with other extensive changes. Faunal remains in lower levels were predominantly deer, while upper level samples included a considerable quantity of sheep, elk and bison (remains of the latter providing conclusive evidence of the prehistoric presence of bison west of the Continental Divide in intermontane British Columbia).

Concurrent with the changes in lithics and fauna was the replacement of large expanding stemmed atlatl points by small sidenotched arrow points and changes in settlement pattern and intensity of cultural deposition. The reason for these changes is not clear, but it is felt that lithic analysis provides a valuable starting point, for it provides insights into relationships between environmental and technological subsystems. A change in lithic raw material preference from a valley bottom source to stone only available in the alpine ecozone suggests a major adjustment in the seasonal movements of the resident population at DhPt 9, perhaps in response to climatic change and associated differences in the spatial arrangement of subsistence resources. Top of the World Chert, found associated in a site on the floor of the Rocky Mountain Trench with the bones of big game species which migrate to summer alpine pastures, suggests increased overall importance of the Rocky Mountains as part of the group's hunting territory, and may further indicate an increased geographic orientation to the east. This pattern begins around 2000 years ago and is accompanied by apparently increased Plains manifestations in the prehistoric cultural remains of the Upper Kootenay.

2) *Purcell Siliceous Siltstone*

This rock type is known from four separate sources at present, three of which have been documented. The quarries all occur in the Aldridge (Prichard in the U.S.) formation of Late Precambrian age. The sedimentary origin of the stone is indicated by some interbedding of sand and silt grade particles (Figure 5). In marked contrast to Top of the World Chert, individual grains are clearly visible with the naked eye, as well as

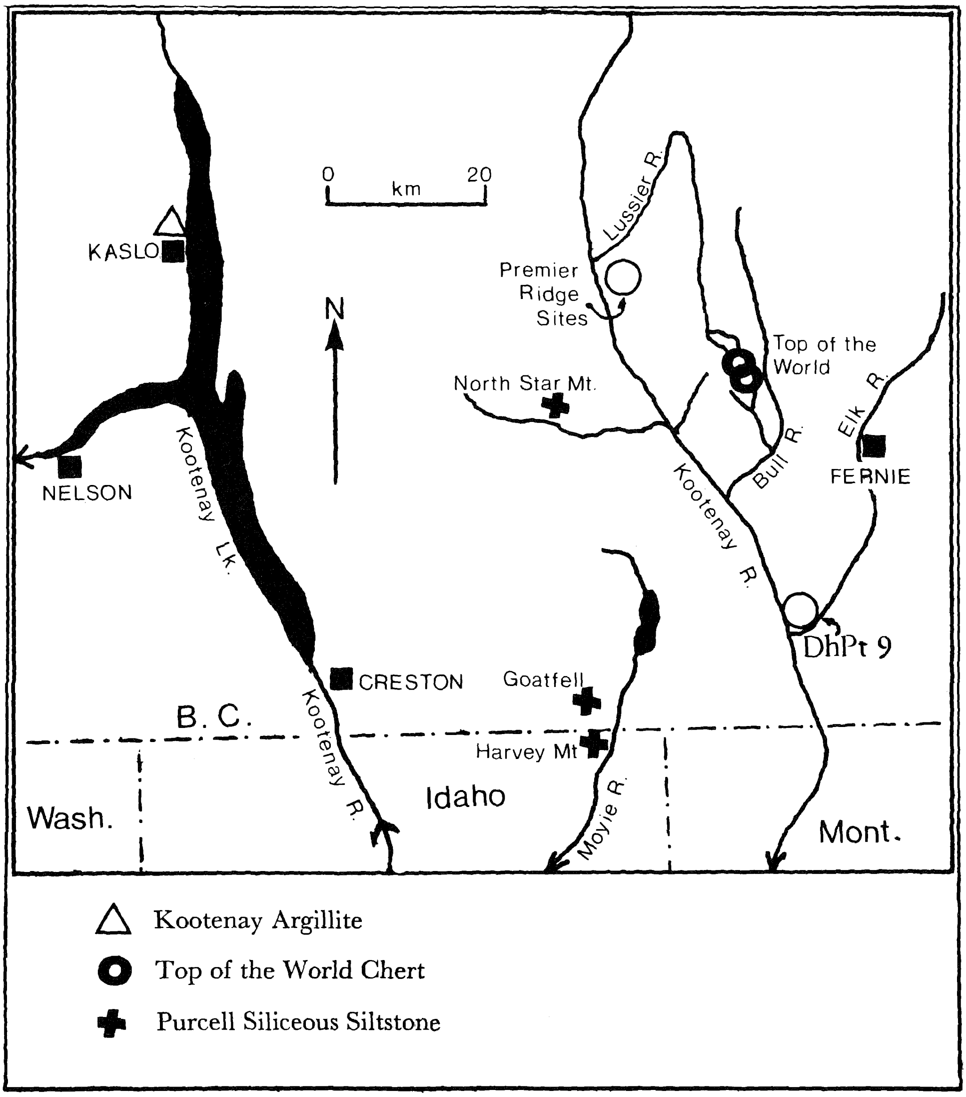


FIGURE 3. Quarry locations for three major Kootenay region lithic types.

FIGURE 4. Top of the World Chert flake blanks from the Canadian Libby Reservoir Area.

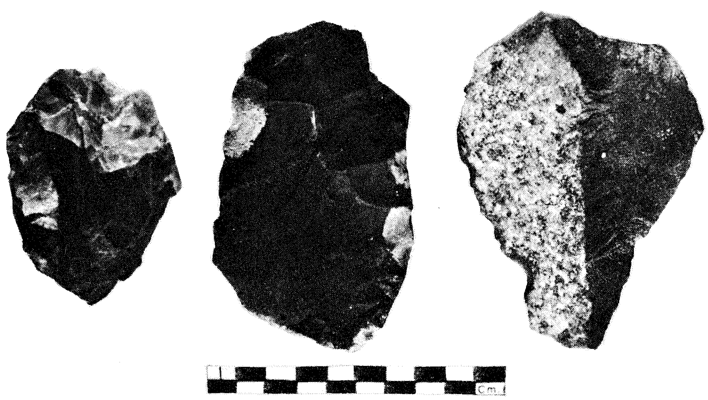


FIGURE 5. Artifacts of Purcell Siliceous Siltstone from Goatfell Quarry. Left to right: core nucleus, biface preform, flake blank. Note textural change from fine to coarse-grained from left to right; also note lichen on worked edges of biface preform.

FIGURE 6. Bifaces of Kootenay Argillite from the Kootenay region, illustrating this material's tendency to step-fracture.

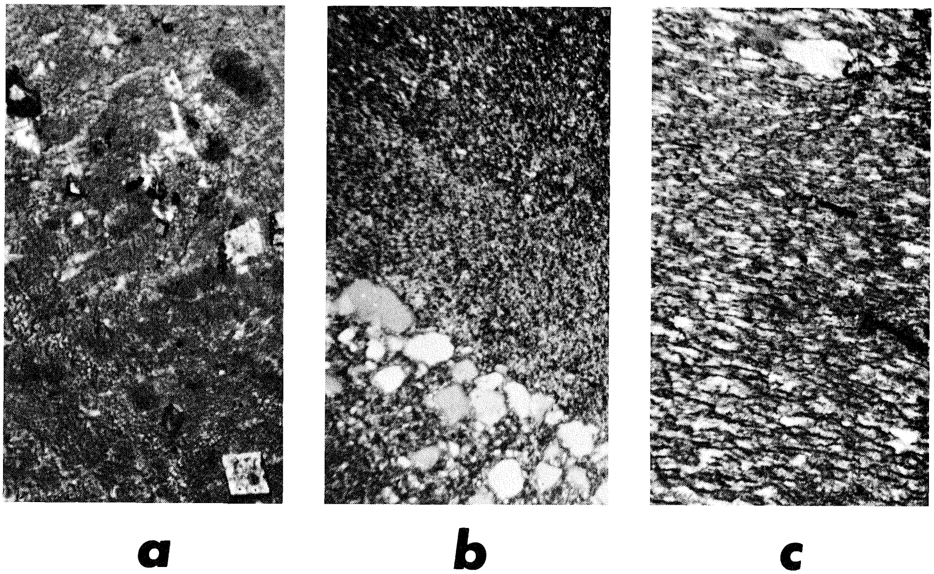


FIGURE 7. Photomicrographs of thin-sections of major lithic types from the Kootenay region. (a) Top of the World Chert, showing quartz-crystals in a fibrous chalcedony groundmass; width of field approximately .33 mm. (b) Purcell Siliceous Siltstone. Note gradation in grain size; width of field approximately 1.0 mm. (c) Kootenay Argillite, showing elongated grains; width of field approximately .40 mm.

in microscopic thin section (Figure 7b). There are distinctions between much of the material from separate quarries that may offer the potential for eventual sorting on a sub-type level. For example, some of the material from the North Star Mountain Quarry (DkQa 1) near Kimberley contains tourmaline and is extremely hard.

The Goatfell Quarry (DgQb 3) is situated west of the Moyie River valley, just north of the international boundary; and the Harvey Mountain Quarry (10By12) is located in Idaho, 1 km south of the border, at an elevation of 1900 m on Harvey Mountain (Figure 3). Both quarries have well-defined adits, with the second largest at Harvey Mountain representing the removal of an estimated thirty-five tons of rock (G.

Mason, pers. comm., 1974). Goatfell material is almost all black, and grades from a medium grained siliceous sandstone, through siliceous siltstone, to siliceous argillite in texture (Figure 5). Harvey Mountain siliceous siltstone is olive-green to brown in colour, although dark to light greys also occur. The great amount of material removed from both these quarries suggests that efficient methods of extracting this very hard rock were well known.

Although (or perhaps because) this material is so hard, Purcell Siltstone seems to have been a favoured material by craftsmen of local versions of two highly developed lithic technological traditions: Paleo-Indian and Avonlea. In the Kootenay Region, siliceous siltstone and fine-grained quartzite comprise more than half of the Paleo-Indian projectile point sample. The black Goatfell material appears to have Windust and Agate Basin associations, and a possible Scottsbluff point of obsidian was found at the North Star Mountain Quarry. In addition, the Eden point found near Windermere, B.C. (Duff and Borden, 1953), is made of material which seems macroscopically identical to that from the Harvey Mountain Quarry. While the overall sidenotched arrow point sample from the Libby Reservoir area is greatly dominated by Top of the World Chert, most Avonlea points from the same area are made of Purcell Siliceous Siltstone.

In the Creston vicinity, and in the Rocky Mountain Trench north of the Libby Reservoir, Purcell Siliceous Siltstone in local projectile point collections is confined to atlatl points of Middle Prehistoric styles. In the central Trench, a major workshop/hunting camp complex occurs around the base of Premier Ridge. Several cores and quantities of biface thinning flakes and broken preforms were found beneath a blanket of sterile silt, in association with fossil lake terraces and extinct watercourses.

Purcell Siliceous Siltstone occurs in significant quantities on the east slope of the Rockies and within the Rockies themselves (Lifeways, 1974; Choquette, 1974c), yet it has not been identified by the writer at all in major surface collections from the Selkirk Trench or in the Arrow Lakes area, despite easy access via Kootenay Lake and River. This is probably another manifestation of a cultural division which has existed between ancestral Kootenays and salmon fishing people for thousands of years.

3) *Kootenay Argillite*

Little archaeological research has been done in the Kootenay Lake vicinity; however, a very high proportion of the chipped stone in numerous large private collections is of a single distinctive green argillitic rock-type. One quarry of this material (named Kootenay Argillite by Reeves, 1972) was located by Harlan I. Smith in the early 1900s atop Blue Ridge on the west shore of Kootenay Lake (Figure 3) (Smith, 1928). There is at least one other quarry location near the northeast end of Kootenay Lake (Weir, 1968), and considerable use was likely made of float pebbles in stream and beach gravels. Almost all of the Kootenay Argillite known from sites in historic Kootenay territory is light coloured, being of pastel shades of blue-green, yellowish or pinkish-green, but mostly pale green. However, test excavations and surface collections in the area west of Kootenay Lake have yielded a considerable proportion of dark purplish and brownish Kootenay Argillite. It is possible that several quarries of the stone were utilized prehistorically, and that intra-type sorting could yield important information about prehistoric population movements and territoriality. Kootenay Argillite has elongated grains and a distinctive platey structure which strongly influences its flaking properties, causing a pronounced tendency to step fracture (Figures 6, 7c). However, it is the only fine-grained siliceous rock available in the central West Kootenay, and as mentioned it forms the bulk of local artifact assemblages. Its utilization as a raw material seems continuous from the Paleo-Indian period up to the latest prehistoric times. The local scarcity of good stone results in a suitable environment for trade as another means of obtaining silicate rocks, and much valuable information regarding trade routes, the phenomenon of curation, and geographic orientation of the resident cultural groups will likely be gained from tracing exotic lithic types in this area.

In spite of its poor flaking qualities, Kootenay Argillite has shown up in lithic assemblages at considerable distances in all directions. It is not uncommon on the east slope of the Rockies (for example, Reeves, 1972; Lifeways, 1974), providing further support for the theory that this was Kootenay Indian territory prehistorically. From present data, it appears that this stone had its widest spatial distribution during the Middle Prehistoric Period, implying that the West Kootenay area may have been a cultural centre during that time, relative to surrounding areas.

FUTURE DIRECTIONS FOR KOOTENAY REGION LITHIC STUDIES

The study of lithic typology is a fruitful approach in Kootenay archaeology because the geology of the region has created a definite pattern of lithic resource distribution. Sources of stone suitable for tool manufacture are not so common that every site contains extractive and productive workshops of *in situ* local material, nor are they so scarce that all chipped stone is of a single variety. Eight quarries and three major float sources have been documented, and approximate locations of five additional quarries are known. This total of ten lithic types accounts for almost all chipped stone in the Kootenay Region. Certain aspects of regional geology facilitate both the segregation of types on the basis of structure and identification of exotics on the basis of colour. The folding trends and erosional/depositional loci shifts which characterize the geologic history have resulted in the distribution of distinctive stone types in a grid-like fashion, making possible the delineation of source areas in quite restricted spatial units. This provides an excellent basis for archaeological investigation of the distribution of lithic types, which are more empirically detectable than stylistic traits or inferred technological systems.

Preferences for specific types of stone may be culturally, technologically or territorially conditioned, and in addition are often temporally discrete. Lithic types therefore may be sensitive indicators of many aspects of prehistoric aboriginal life, and can be as equally helpful in examining cultural process as in constructing a basic culture sequence.

A change in lithic preference from dark, opaque, flat-lustred lithic materials to vitreous translucent types characterizes the Late Prehistoric Period (A.D. 400 to A.D. 1750) in much of western North America. This may reflect a transition from generalized, local resource-oriented economies to economies characterized by greater specialization and increased geographic range. This pattern holds true for the Kootenay Region, with Top of the World Chert replacing all types in the East Kootenay and becoming more common in West Kootenay Late Prehistoric assemblages. The cultural distinction of the Selkirk Trench inhabitants is apparent in this trend, for here the colourful jaspers, agates and petrified woods of the Columbia Plateau become more prevalent, perhaps marking the incursion of the Lake Salish.

The archaeologically observed shift in preference from Purcell Siliceous Siltstone to Top of the World Chert finds support in modern ethnographic data. Mission Creek, which drains the north and west slopes of Harvey Mountain, is a famous berry-picking locality, so productive that Lower Kootenay Indians from Creston travelled some 40 km by horse and buggy in the early and mid-1900s to pick berries there (S. Pierre, pers. comm., 1974). The slopes of North Star Mountain were a preferred berry-picking locality of some Upper Kootenay Indians (L. Morgan, pers. comm., 1975). Yet the existence of the quarries on these mountains was not known to any of the informants. Neither was the fact that stone for tool manufacture was prehistorically obtained from Goatfell Quarry on the very distinctive and accessible knob in the middle of Meadow Creek valley and transported to Creston, 25 km to the west. In addition, apparently no place name is known for this knoll (S. Pierre, pers. comm., 1974). In contrast, Andrew Michel, an Upper Kootenay Indian of the St. Mary's Band, stated that he knew of Top of the World as a place to get stone for arrowpoints (L. Morgan, pers. comm., 1975).

Of great interest also is the potential for the spatial distribution of specific lithic types to yield valuable insights into prehistoric seasonal-subsistence cycles. For several years much of the writer's research has been guided by a hypothesis which postulates that the exploitation of stone resources is closely articulated with the exploitation of specific seasonally available food resources. This hypothesis was first expressed in connection with the use of Top of the World as both a stone source and a summer hunting territory (Choquette, 1973a). The ties of Harvey Mountain and North Star Mountain with extensive berry patches and the Premier Ridge workshops with hunting sites and an important winter range are provocative. The mere elevations of the Harvey Mountain and Top of the World quarries (1,900 and 2,150 m above sea level respectively) place a very definite seasonality on their use. Pronounced asymmetrical distributions of lithic specimens as they radiate from a quarry, especially if artifacts of functional classes corresponding to the postulated seasonal resource exploitation are associated, should indicate patterns of prehistoric seasonal transhumance. Temporal differences in such patterns will provide important foci for the examination of various processual problems such as those concerned with population pressure and consequent territorial encroachment; increased cultural and technological specialization leading to focus on specific resources; and the effects of environmental changes. It may even be possible to use rock-types to define the territories and movements of specific social units. Turney-High states that "the locations of the flint quarries were well known. For instance, that preferred by the Libby band was in Flathead country, a few miles south of the present city of Missoula, in the Bitter Root . . ." (Turney-High, 1941:84) while "the Upper Kootenay also used one in Canada near Fernie which they said was better" (Turney-High, 1941: 87). Pronounced colour differences between Montana cherts and Top of the World Chert will facilitate sorting once such studies are initiated.

The present data base, formulated into hypotheses such as these, should guide future salvage excavation and survey in the Kootenay Region. To be successful, it is, of course, essential that efficient and sensitive sampling schemes and accurate analytic frameworks accompany this approach.

ACKNOWLEDGEMENTS

The writer gratefully acknowledges support of field-work by the B.C. Water Resources and Parks Branches, Dr. B. Reeves and the University of Calgary, the National Museum of Man, the Archaeological Sites Advisory Board of B.C., Inland Natural Gas Company, Kaiser Resources and Crowsnest Industries, the B.C. Forest Service, and the National and Historic Parks Service. The assistance of Ed Montgomery of the University of British Columbia Geosciences in preparing the photomicrographs and of Gerry Mason of Cominco Limited is also greatly appreciated.