The Bridge River archaeological project seeks to clarify significant issues in the archaeology of intermediate scale societies and general cultural evolution. It continues a process of testing ideas about the nature of the cultural evolutionary process associated with the emergence of complex hunter-gatherer communities begun during 2003 and 2004 (Prentiss et al. 2008). The new research permits us to explore in great depth the roles of demographics, regional ecology, and human decision making in defining this evolutionary process. It also permits us to further explicate the unique history of the indigenous peoples of the Mid-Fraser (see Teit 1906), demonstrating the environmental and social forces that shaped their society.

Debate between Prentiss (Prentiss et al. 2005, 2007, 2008) and Hayden (1997, 2005) has explicated alternative hypotheses about the development of the complex societies of the Mid-Fraser Canyon. In short, Hayden argues for an early development of corporate group households featuring hereditary inequality (prior to ca. 2600 B.P.) and subsequent stability for over 1500 years. Prentiss suggests a later origination for the villages (post 1800 B.P.) and a high degree of subsequent socio-economic and political change. Testing these hypotheses requires extensive sampling of house floors associated with occupation periods BR1-3 (ca. 1800-1100 cal. B.P.) at the Bridge River site followed by interdisciplinary laboratory studies.

This report outlines results of the 2007 investigations of the Bridge River site. Research focused on geophysical mapping at the Bridge River village resulting in a detailed geophysical assessment of housepit 54. Additional studies emphasized identification of potential sources of lithic raw materials used by original inhabitants of the village. This study defined a series of previously unknown sources of toolstone that will be essential in reconstructing ancient technological organization and land use practices. Details of these studies are presented in the Appendices A and B.

Geophysical Investigations

Project goals require examination of variation in a variety of archaeological data within and between different sized households at Bridge River. Based upon ethnographies (Teit 1906), Hayden’s extensive excavations at Keatley Creek and the first phase of investigations at Bridge River, it is clear that hearth-associated activity areas most likely reflect the locations and activities of individual family units on housepit
floors (Hayden 1997). Therefore, to understand variability in the socio-economic status of these domestic units and to extrapolate that understanding to the level of household socio-economy, it is paramount the excavations focus on gaining a substantial sample of materials from the activity area contexts. Hayden (1997) accomplished this task by excavating entire house floors in order to expose activity areas of domestic units. While Hayden’s data are superb the lengthy time required to excavate entire houses was costly and it limited the number of houses that could be explored. Further, it effectively prevented future field investigations associated with these housepit floors. These problems can be avoided by using geophysical methods to identify activity zones associated with major hearth and cache pit features and subsequent excavation sampling.

Geophysical investigations in 2007 focused on high-resolution mapping of housepits utilizing a combination of magnetic, electromagnetic (EM), resistivity and ground penetrating radar (GPR) technologies (Scollar, et al., 1990; Cross, 2004, 2005; Prentiss, et al. 2008). Priority was given to further analysis and assessment of resulting data to establish an optimum data acquisition strategy for identification and delineation of primary household activity areas. Selected anomalous feature areas were resurveyed with further increased spatial sampling density and utilizing extended measurement bandwidth to establish practical limits on resolution. Investigations considered the potential of small-scale galvanic resistivity mapping and localized three-dimensional radar imaging at center frequencies to 1 GHz.

The 2008 field season will focus on excavations of housepits 20, 24, and 54. Since detailed geophysical studies of the kind described in this report were previously conducted (2004) at housepits 20 and 24 (e.g. Figure 1), the 2007 research focused on housepit 54. A combination of magnetic and electrical methods was employed for initial mapping with cross-sectional stratigraphic constraints supplied by localized GPR imaging. Targeted archaeological excavations (2008) will establish associations between observed geophysical signatures and related cultural features. Resulting calibration should progressively improve the predictive potential of remotely sensed data to yield a more productive return on related excavations and to permit the extrapolation of associated findings to additional unexcavated pithouses. Results of the 2007 geophysical investigations are presented and discussed in Appendix A.
A major source of data on household economies, social organization, predation patterns, mobility, and territoriality comes from the study of lithic artifacts. An important part of this study is accurately characterizing lithic raw material sources. While many sources are known, many have not been adequately identified. The 2004 field season at Bridge River included a survey of local lithic sources that could not be completed due to severe fires in the Bridge River Valley. The lithic source survey was continued during the 2007 field season. Results are outlined in Appendix B.

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Appendix A

Report of 2007 Geophysical Investigations at the Bridge River Site

(EeRI4)
Bridge River

Archaeological Project

Geophysical Investigations

Phase IIb – Final Report

Prepared for:

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20 April, 2008

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Terrascan Geophysics
1.0 BACKGROUND - SCOPE OF WORK
A multiphase geophysical investigation of the Bridge River site (EeRI 4 – Figures 1 and 2) was initiated in June 2003 in coordination with preliminary archaeological excavations and related dating of recovered materials. As previously reported (Cross, 2004), an initial phase of geophysical investigations entailed site-wide surveys to map known and previously unidentified features and to guide subsequent archaeological sampling and interpretation. Phase I results are summarized in Figures 3 and 4, depicting the spatial variability of electrical conductivity and vertical magnetic gradient, respectively.

In addition to establishing a generally consistent geophysical signature in connection with pit house features, preliminary investigations also revealed potentially significant and meaningful variability from house to house. To further resolve and define the patterned distribution and variability of smaller-scale and more subtle features, Phase II geophysical investigations were initiated in 2004 and involve focussed acquisition of higher-density measurements within selected house floors. In particular, high-resolution surveys, utilizing electromagnetic (EM) conductivity, gradient magnetic and ground penetrating radar (GPR) methods were previously carried out within and surrounding Housepits 11, 20, 24 and 36 with results reported in Cross (2005). The current report describes a further expansion of Phase II investigations to include Houepit 54 (HP54), with related survey area outlined in Figures 2, 3 and 4. Following clearance of surface vegetation within the delineated survey area, temporary reference marks were placed at 1.0 x 1.0 m intervals. Fieldwork was carried out during the period September – October, 2007.
Finally, in addition to high-density conductivity and gradient magnetic investigations of HP54, selected ground radar profiles acquired in 2004 have been reprocessed with topographic correction for direct comparison with corresponding electromagnetic and magnetic data. Subsequent sections provide a factual description of specific procedures and findings for current investigations. For more detailed discussion of geophysical methodologies see (Cross, 2004, 2005).

2.0 METHODS - PROCEDURES

2.1 Electromagnetic Terrain Conductivity

To provide enhanced spatial resolution, EM conductivity measurements were acquired via a Geonics EM-38 terrain conductivity meter. In contrast with the Geonics EM-31 (employed for Phase I site-wide reconnaissance), the horizontal offset between transmitter and receiver coils is substantially reduced, providing a more focused subsurface measurement and related improvement in spatial resolution. The measurement frequency is 14.6 kHz compared with 9.8 kHz for the larger-scale EM-31. EM conductivity measurements were acquired at 0.5 m intervals, with the instrument at ground level and parallel to east-west transects separated by 0.5 m. Conductivity survey of HP54 was initiated from the southeast grid corner. Measurements and associated grid coordinates were digitally recorded via an Omnidata DL-720 data logger and subsequently downloaded to a portable field computer for processing and analysis.

2.2 Magnetic Gradient

Magnetic measurements within and surrounding HP54 were acquired using a Scintrex-EDA OMNI IV proton precession gradiometer. Vertical gradient readings were acquired at 0.5 m intervals along east-west transects separated by 0.5 m. As for the conductivity survey, data acquisition was initiated from the local southeast grid corner. Measurements and associated grid coordinates were digitally recorded via integrated memory and subsequently downloaded to a portable field computer for processing and analysis.

It is notable that initial magnetic survey of HP54 on 25 September was abandoned due to apparent instrument malfunction. Repeat readings at a given grid location were observed to vary dramatically and the meter’s automated quality control indicators warned of low signal levels and excessive field gradients. However, on returning to Vancouver, standard checks on instrument function indicated normal operation and the apparent malfunction was attributed to anomalous magnetospheric conditions as reported by the US National Oceanic and Atmospheric Administration (NOAA). Unexpectedly, on returning to Bridge River (24 October) to complete the survey, the problem re-occurred and with instrument malfunction ruled out by substituting a second magnetometer, the source of interference was soon recognized to be radio
transmissions from frequent logging truck traffic on local route 40 that parallels the site. As a result, future magnetic work at Bridge River will need to avoid peak radio traffic periods.

2.3 Ground Penetrating Radar

Radar scans originally acquired in 2004 were recorded using a GSSI SIR-2000 digital radar system with 400 MHz transceiver. Scans were acquired on orthogonal transects at 175.5N and 19.5W, the earlier scan located to intersect a 2003 reconnaissance excavation at approximately 21W. Data were recorded in continuous mode together with fiducial marks at 1.0 m interval to constrain location along transect. It is estimated that an acquisition rate of 32 traces/second yielded a spatial sample interval of approximately 1-5 cm per trace, at least ten times the spatial density of conductivity or gradient magnetic surveys.

3.0 RESULTS

Plans displaying measured apparent electrical conductivity and vertical magnetic gradient are presented in Figure 5. Indicated colour levels are based on interpolations and extrapolations from discrete measurements on 0.5 m x 0.5 m centers. Selected ground radar transects are also indicated for reference. As expected, results are generally consistent with preliminary site-wide surveys. However, increased acquisition density has yielded substantially improved detection and resolution of smaller-scale house-floor features (e.g. note central magnetic gradient anomaly not resolved by preliminary survey). Although meaningful and confident interpretation of these features requires further investigation and assessment in connection with subsequent archaeological excavations, observed spatial distribution and patterning of geophysical signatures suggests that these features are potentially significant.

In general, overall geophysical patterns associated with HP54 are anomalously asymmetric and there are interesting correlations between conductivity and magnetic gradient features. In particular, and consistent with a relative lack of topographic definition, it is noted that a relatively irregular and less well-defined magnetic response is recorded over northern and northeastern sections of the structure’s rim. There is also a related and subtle suggestion of parallel rim-like deposits internal to the structure and of possible breaches. In general, these features appear to be negatively correlated with related conductivity features.

To accentuate these features and, generally, with a view toward revealing patterned variability on a smaller-scale, spatial filtering was applied to the raw data in Figure 5, to yield corresponding plans of residual deviation as displayed in Figure 6. As expected, resulting plans clarify and confirm the complimentary nature of electrical and magnetic signatures, and generally provide an enhanced view of smaller-scale signatures to further refine the focus subsequent excavations. Of course, it must also be appreciated that residual filtering
simultaneously accentuates the response due to natural soil variability and other
non-cultural signatures on a smaller-scale. Ground radar profiles are displayed in Figure 7. As reported in Cross (2005), ground radar investigations were undertaken in HP54 to assess the nature and potential continuity of a particularly thick sequence of stratified deposits encountered by preliminary excavations (Prentiss, et al., 2005). In general, radar scans suggest well-defined stratification comprising semi-continuous stratigraphic horizons sub-parallel to current topography. There are potentially significant deviations from this general character, however, particularly in proximity to rims and near the center of the structure.

The upper W-E scan (GPR-1) was acquired at roughly 175.5N and intersects the 2004 excavation unit at approximately 21W (white highlighting). The near-surface expression of the excavation is evident (Note: as recorded, the radar signature of the excavation trench is offset approximately 0.25 m east of 21W, suggesting that the endpoint GPR-1 may be mislocated by as much as 0.5 m) as identified. Results suggest that the 2004 excavation penetrated a relatively localized zone of anomalously strong reflectivity and although this anomalous reflectivity might be due in part to the excavation itself, the same radar scan indicates zones of similar albeit less pronounced reflectivity at approximately 17W and 14W.

Meaningful and confident correlation of GPR signatures with electromagnetic and magnetic data requires additional work in connection with subsequent excavations to establish the origin of related signatures. In general, however, radar reflectivity is expected to be relatively insensitive to the magnetic characteristics of archaeological deposits and more closely related to the level and distribution of moisture content and related electrical properties. Thus, although the 2004 excavation unit was located on the basis of anomalously low magnetic gradient levels detected on the interior flank of the structure’s southern rim (a consistent pattern for the vast majority of Bridge River pithouses), related anomalous reflectivity is unlikely due to magnetic properties but, rather to associated anomalous moisture levels and related electrical contrasts. However, with reference to Figures 5 and 6, specific and/or precise correlations between anomalous reflectivity and localized electrical conductivity signatures are not immediately evident. Although the lower S-N scan (GPR-2) at 19.5W displays generally similar reflectivity characteristics, anomalously “bright” reflectivity zones (as identified for GPR-1) are not observed. There is, however, a subtle zone of apparently anomalous reflectivity suggesting a potential localized structure roughly midway within the floor area of HP54 at approximately 179N.

Finally, it is notable that the two radar scans display very similar and potentially significant features immediately interior of the rim’s crest at the southwest of HP54 (yellow highlighting). There is also some subtle indication at the east rim on GPR-1. With reference to Figure 8 form Hayden (2005), illustrating postulated formation processes for earth-roofed pithouses, it is anticipated that observed GPR signatures might be indicative of initial excavations into native sediments in
connection with original pithouse construction or possible re-excavation into roof deposits as part of a subsequent renovation phase.

As previously noted, observed radar stratigraphy in Figure 7 is largely suggestive of stratified deposits (likely roof deposits), with semi-continuous stratification subparallel to current topography. There is no evident indication of a more nearly flat-lying basal floor horizon as might be expected. Budget permitting, it is planned to further investigate the general morphology and structure of Bridge River housepits by acquiring radar cross-sections through a representative sample of pithouses.

4.0 CONCLUDING REMARKS

Together with results of previous Phase II investigations, it is anticipated that current findings for HP54 will provide an effective basis for guiding the selection of target features for focussed and productive excavation during the 2008 field season. On the basis of preliminary geophysical mapping and initial excavations in 2003, a consistent correlation was identified between carbon-datable features and anomalously low magnetic gradient signatures. On the basis of this initial experience, similar signatures were effectively exploited during the 2004 field season to efficiently target excavations with favourable results.

In view of proven success, there is clearly good reason to carry forward with the foregoing approach. However, it strongly recommended that a reasonable proportion of excavation units be reserved and located to investigate the presumed archaeological origin of other prominent and consistently observed geophysical signatures. Finally, to the extent that it is practical, consideration should also be given to locating one or more units at locations that are neutral or non-anomalous with respect to available geophysical data. We trust that this report of expanded Phase-II geophysical investigations satisfies your current requirements and look forward to a cooperative effort on related targeting of 2008 excavations. Should you require additional information or clarification regarding activities or findings presented herein, please contact the undersigned at your convenience.

Yours truly,
Terrascan Geophysics
Guy Cross, Ph.D.
Geophysicist

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NOTE: Colour scale distributions are approximate and based on interpolation-extrapolation from discrete data.
VERTICAL MAGNETIC GRADIENT (RESIDUAL)

APPEARANT ELECTRICAL CONDUCTIVITY (RESIDUAL)

NOTE: Colour scale distributions are approximate and based on interpolation-extrapolation from discrete data.
Formation Processes for Earth-Roofed Pithouses

Excavation

Occupation

Soil plus garbage, ash, and charcoal

Heath Central Activity Zone

Storage and Proximal Discard Area, Fine Sediment Traps, Wall Rough Accumulations

Tear Down and Salvage

Main Roof Timbers Removed and Roof Thrash Pulled toward Rim Than Merging Roof Sediment

Burning

Remaining Wood Burned

Re-excavation

Re-excitation Down to Stable Merging Roof Sediments

Re-occupation

Replacement of Sediments on Roof, Once Again Merging Them

Many Iterations

Salvage & Final Burning, Abandonment, & Post Depositional Surface Accumulation

Accumulation of Sands and Silts from Wind and Attraction

Homogenized Roof and Roof-Like Rim Sediments

Appendix B

2007 Lithic Raw Material Sourcing Report
Bridge River Lithic Raw Material Sourcing Report (2007 Field Season)

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Introduction and Background

Goals of Research

During the month of July, 2007 a lithic raw material sourcing survey was completed in the area surrounding Bridge River, British Columbia. Two graduate students from the University of Montana conducted the survey as part of a larger archaeological project funded by the National Science Foundation, and led by Anna Prentiss of the University of Montana. The main goals of this portion of research were:

1. To assess lithic resource procurement strategies associated with the Bridge River village (EeRl4) with a particular focus on procurement of nephrite, chert, slate, dacite, steatite, copper and obsidian.
2. To create a comparative collection of available sources to allow specific sourcing of artifacts recovered during excavation.
3. To add to lithic sourcing data collected by Austin (2007) and Rousseau (2000)
4. To create a methodology to be implemented in later phases of the Bridge River project.

Literature Review

This study follows procedures outlined by Rousseau (2000). The majority of lithic sources examined were located based on oral interviews with members of the Lillooet community and Bridge River band members. This was augmented with geologic data from published sources providing information about the area.

Austin (2007) provides information about which minerals were culturally important and basic descriptions of each. He also includes a map of known nephrite sources in the area. Darwent (1998) deals specifically with nephrite, its cultural importance, and prehistoric mining techniques. He offers larger scale maps than Austin, including areas with concentrations of redeposited nephrite along with outcrops. Hudson (2006) provides site specific and mapped mineral information about known outcrops and mines. It is aimed toward the lay rockhound, but includes many of the more important mineral sources in the area including chert, steatite, and nephrite. Howes (1971) provides an overview of the areas geology including formation, faulting, and rocks present. He also creates a typology of quaternary glacial sediments and describes what minerals may be found in each type of sediment.

Research Methodology

Identifying all traditionally available lithic resources in the mid-Fraser Valley
would be the work of a lifetime. People who have spent their entire lives hiking the area do not know where all or even most of the lithic sources are located. The geology of the area is exhibited over its steep mountainous terrain with igneous, metamorphic, and sedimentary zones as well as transitional areas. This creates an unusual variety of rock types in both bedrock deposits and large areas of alluvially downgraded glacial kames and moraines. The traditional territory of the Bridge River band is much larger than the current reservation lands and reports obtained speak of utilized nephrite sources as far as 100 km away.

Sampling strategy

In the short time period available, it was impossible to sample every location of potentially utilizable resources. Because of this, sample loci are given greater priority with proximity to the heart of the Bridge River people’s traditional area, the current site of the Bridge River Site, and contemporary village. Samples taken from farther away are from known or suggested areas of great mineral wealth. An effort was made to retrieve samples from every source mentioned during interviews and those mentioned in the literature that are known to contain utilizable stone.

Most samples were taken from the Bridge and Yalakom river valleys and the ridges surrounding them. Special attention was given to river and creek beds since lack of vegetation and accessibility make prehistoric utilization and present day identification of these resources more likely.

1. Bedrock Samples- The forbidding terrain makes accessing many visible outcrops unsafe for inexperienced climbers. For this study it is assumed that Native peoples would not be utilizing any resources that we could not get to without special equipment. Bedrock samples were taken from road cuts, accessible outcrops, and mines. An effort was made to reach outcrops in all areas since the Bridge River people were known to utilize all resources in the area.

2. Glacially Deposited Materials- These resources are near ubiquitous throughout the Bridge River valley. It is locally stated that the river provided much of which was needed, including lithic materials. There are twelve identified layers of glacial sediments located in the Bridge River and Yalakom valleys, each containing a variety of materials (Howes 1971). Due to erosion and glacial movement these have been redeposited so that, at any given site, between one and twelve of the strata are represented or several may be mixed together. An attempt was made to assess which of these layers are present in which areas and what materials this would allow access to. Access issues precluded a broad spectrum sampling of each strata at a single location but many strata of were examined singly or in small groups throughout the area.

Processing of Samples

For each culturally important material source a sample bag was collected. Sizes of samples varied greatly depending on abundance and size of available materials at each source. Smaller samples were taken from areas on private land or active mining claims since claimants or owners are legally invested in the procurement of minerals, especially
nephrite. Each sample bag was labeled on a 3 x 5 index card within the bag containing: the mine name (when taken from a formal prospect) or a location description. UTM’s are provided for sources that do not have specific landmark locations. Each bag is also labeled with the identified materials within, the date, if it is from a glacial or bedrock context, and any other pertinent information.

Results

Commercial Mine Sites

Historic and present day mines are considered to be probable sources of prehistoric raw materials since many of them were originally located by native people for a fee and then worked by incoming miners. This system began because it was originally illegal for First Nations Members to own mining claims (Jack, 2007; Boersma, 2007). As many mines were sampled as the literature suggested were likely and time allowed.

1. Blue Creek

The Blue Creek Site is a present day mine known for its significant nephrite deposits (Hudson 2006). It is located east of the Elizabeth Mine, north of Blue Creek in a north/west direction. It is said that nephrite can be found by looking for white rocks in an area with serpentine bedrock. Much serpentine bedrock was located along with many areas that had been explored by a bulldozer. A thorough exploration of the area and the adjacent rock outcrops was conducted but did not produce nephrite. Numerous samples of the serpentine were collected.

2. Brett Creek

This site is located several miles north of the intersection of Brett Creek and Marshall Creek. It is accessed by taking the 40 road up the Bridge River to the Carol Lake Road. The Brett Creek site is known for having contained nephrite in abundance. The remaining nephrite is probably not of workable quality but exists in significant amounts. The majority is of pebble to cobble size. Several samples were collected.

3. Horseshoe Bend Placer Mine

Although nephrite was in abundance at this mine historically (Hudson 2006), only two large boulders remained. No smaller cobbles of nephrite were located; therefore a sample was not obtained. Serpentine was extremely prevalent at this location. It is speculated that the miners thoroughly extracted the valuable nephrite. However, many sources indicate that prehistorically it would have been a great place to obtain nephrite (Darwent 1998, Boersma 2007, Jack 2007). It is located approximately 100 meters southwest of the confluence of the Yalakom and Bridge Rivers. This would have been a productive locale to procure a number of other resources as well.

Sites located through Interviews

Interviews were conducted with the people known to be most experienced with the geology of the area. Our main informant was Bobo Jack (a.k.a. Gerald Michel), Band
Archaeologist, resource advisor and tribal councilor. Along with having years of experience with the areas resources Mr. Jack had day to day contact with the Nation’s elders. Most of the sites tested were based on information he had or collected for us from people not as likely to open up to outside researchers. Also of import was Daniel Boersma, the owner of the Lilooet rock shop/amateur geologist and Bradley Jack, Chief of the Bridge River Band. All three of these people were trained in how to find and recognize lithic sources. Combined, they provide a tremendous amount of traditional knowledge of the area and the most reliable sources of lithic information.

4. Arbor Materials Source
This is the site of the Bridge River Band’s arbor. It is a ceremonial site, picnic area and campground located immediately down slope from the new Band Office. This would have been a very easy site for the Bridge River Band to exploit prehistorically because of its close proximity to the village. Due to its proximity and probable use, this locus was more heavily sampled. Samples were collected from the shelf break, mid-slope and along the Bridge River beneath the arbor.

The site contains both bedrock and glacial components. The bedrock consisted of a fine grained slate outcropping just above the north side of the Bridge River, below the Bridge River Site. Rich glacial deposits were located on the shelf where the arbor is located and on the slope leading to the Bridge River. These deposits included; gray quartzite, slate, brown chert, light gray chert, dark gray flakeable igneous material (possibly dacite), and nephrite/serpentine. All of these materials were plentiful and found in cobble form.

5. Duffy Lake Road
UTM Zone 10N, 5610204N, 0567990E
A plethora of soapstone samples were located on a bluff overlooking the Cayoosh River and up the Duffy Lake Road. This area is known for its quality steatite, though much of what was left was of considerably poorer quality. The samples are talc rich highly foliated soapstone. Further examination of the area may lead to the discovery of a quality steatite site.

6. Fraser River Outcrop, south of BR Bridge
UTM Zone 10N, 5622868N, 0575164E
Numerous rock outcrops were explored between the bridge spanning the Bridge River and the town of Lilooet. These contained no traditionally utilized materials with one exception. An outcrop immediately to the south side of the Bridge River bridge was comprised of a large slate bedrock outcrop. Around the base of the outcrop several pieces of rose quartz (or pink quartzite) were noted.

7. Bridge of the 23 Camels
The Bridge of 23 Camels crosses the Fraser River in downtown Lilooet. Samples were collected from under the west side of the bridge where Jasper and Nephrite are known to have been found. No jasper was located, but there was abundant quartzite in numerous colors, highly vesicular pumice and a possible nephrite cobble.
8. Applespring

Applespring Creek is located 19 km outside of Lillooet on the Bridge River road, on the north side of the river. There is a path going up Applespring creek from the road which was thoroughly examined. Access issues prevented the examination of the area between the road and the Bridge River. Samples of chert and arrowstone (dacite) were obtained from Applespring. The majority of these materials were found in pebble and cobble form.

9. Camoo Rock Pit

The Camoo rock pit is located on the north side of the Bridge River north of the 40 road, between Antoine and Applespring Creeks. It is a borrow pit for road maintenance. The pit contained a wide variety of traditionally utilized materials. Abundant samples of jasper, a purple chert, chalcedony, and a number of different grades of arrowstone (dacite) were found here. Access to lower Camoo near the Bridge River was prevented due to a gate and a posted no trespassing sign, however would be worth exploring in the future.

10. Confluence of the Fraser and Cayoosh Rivers

The Cayoosh River drains into the Fraser on the south side of Lillooet. This area has a large plain of transported alluvial gravels to the south which contained a myriad of rock types. The confluence itself was a traditional fishing spot. Many community members suggested that prehistoric people would be likely to get their lithics from the rivers they were already fishing. Located here were small amounts petrified wood, soapstone, slate and some fine grained light gray quartzite. A wider search of the area would likely procure a wider variety of samples.

11. Confluence of the Bridge and Yalakom Rivers

There is an abundant amount of glacially redeposited chert located at this site. There are numerous cobbles and pebbles of chert of varying quality and colors (black, banded gray, and brownish gray). Small samples of soapstone were also located here. The presence of the Horseshoe Bend mine on the south side of the river and the serpentine rich geology indicate a bedrock nephrite source, but no nephrite was located in the streambed. Samples were collected from the middle of the river meetings, the slope immediately between the rivers and the mine site on the south side of the Bridge River (See Horseshoe Bend).

Independently Discovered Sources

Low speed vehicular surveys were conducted of all major roadways in the study area. These were used to identify geologic zones that may contain utilizable material. Most of the valley was filled with glacial sediments though several bedrock areas were located. All roadcuts and any place that allowed access to the riverbed was examined.

12. Upper Hell Creek Road Slate Outcrops

Hell Creek drains into the Bridge River several kilometers above the confluence with the Yalakom River. However, access to the headwaters is by way of a dirt road on
the south side of the Yalakom River between Shulaps and La Rochelle Creek. A number of slate outcroppings were located along the road leading to Hell Creek on the north facing aspect of the ridge between the Bridge and Yalakom rivers. Some quartz was also located on this road but no samples were taken.

13. Lower Hell Creek Road
UTM Zone 10N, 5640992N, 0552667E
Serpentine rich metamorphic rocks were located in numerous outcroppings along the Yalakom River near Hell Creek Road. Pebble sized rocks of a dark glassy nature were also found in these outcroppings. No nephrite was located in our limited examination, but its presence is suspected.

14. Yalakom River Moraine Deposit
UTM Zone 10N, 5640636N, 0552692E
A very fruitful deposit was located near the base of Hell Creek road on the south side of the Yalakom River. Two different types of chert (reddish-brown and light green), slate and serpentine with possible jade inclusions were located in this deposit. The deposits usually consisted of pebble and cobble size rocks. This moraine was located up the Yalakom River Road near the south side of the river.

Discussion

More than one interviewee stated that anything needed would have been found in the riverbeds (Jack, Boersma). Would there have been a prehistoric preference between bedrock and redeposited materials? This study attempted to locate both but placed particular importance on the original sources of lithic materials. This was based on the assumption that abundance and quality of material would be greater at the bedrock source. This assumption should be examined using the material data recovered in the 2008 test excavations. This can be accomplished by looking at the ratio of stones ubiquitous in glacial deposits (cherts, quartzite) to stones not available in glacial deposits (dacite, obsidian). For this study nephrite and slate need to be left out since they are available in both locations in varying amounts.

To better determine the maximum distance of travel for gathering of lithic materials an effort should be made to determine whether gathering was a matter of embedded procurement, specialized procurement or both (Alexander 1992:147). Interviews with the Bridge River Band members could begin to answer this question.

Suggestions for Future Research

The initial phase of the project focused only on the west side of the Fraser River. In successive levels of this project a determined effort should be made to find the large arrowstone sources known to exist to the north of the Bridge/Fraser confluence and on the ridgelines to the east of the Fraser River. This work was started by Rousseau (2000) but several of their potential sites were not visited.

No bedrock sources were located for the numerous cherts that were well represented in the redeposited glacial sediments. An attempt should be made to locate
the chert sources up the Yalakom valley. This may be difficult since these materials may have been carried hundreds of kilometers from the original source. A maximum distance of travel for procuring resources needs to be charted from the Bridge River Site.

There is an unsampled nephrite mine near the headwaters of Jim Creek. The access road stops after about 500 meters, or if there was a road it was overgrown with mature trees. Hudson (2006) states that the mine was initially accessed by tractor, but examination proved that all vehicle access is now impossible. Identification of the site will require hiking to the top, a trip of 3,000 vertical feet in 5.5 km.

There is an important nephrite source mentioned by both the literature and interviewees. It is located at the headwaters of Hell Creek. The access road was attempted three times but was blocked by a logging project at different levels each time. A topographic map is recommended for this trip since not all of the roads are marked on the local road maps.

There is no consistent vocabulary between researchers studying the lithic materials. An effort should be made to test materials and determine exactly what they are. This applies particularly to “arrowstone” which this study found to be called basalt, dacite, and ignimbrite. This could also help to trace the source of igneous samples.

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Jack, Bobo a.k.a. Gerald Michel Band Archaeologist, resource advisor and tribal councilor,
2007 Numerous interviews during the month of July

Jack, Bradley Chief of the Bridge River Band
2007 Interview July Second.

Rousseau, Mike in Hayden, Brian
2000 Results of the Keatley Creek Lithic Source Study. in The Ancient Past of Keatley Creek, Volume 1: Taphonomy. University of British Columbia Press, Vancouver

<table>
<thead>
<tr>
<th>Lithic Raw Material</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalcedony</td>
<td>Camoo</td>
</tr>
<tr>
<td>Chert</td>
<td>Arbor, Applespring, Camoo, Confluence of Bridge and Yalakom Rivers, Yalakom River Moraine Deposit</td>
</tr>
<tr>
<td>Dacite</td>
<td>Arbor, Applespring, Camoo</td>
</tr>
<tr>
<td>Jasper</td>
<td>Camoo</td>
</tr>
<tr>
<td>Nephrite</td>
<td>Brett Creek, Horseshoe Bend, Arbor</td>
</tr>
<tr>
<td>Petrified Wood</td>
<td>Confluence of Fraser and Cayoosh Rivers</td>
</tr>
<tr>
<td>Pumice (?)</td>
<td>Bridge of 23 Camels</td>
</tr>
<tr>
<td>Quartz</td>
<td>Fraser River OutCrop(?) , Upper Hell Creek Road</td>
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<tr>
<td>Quartzite</td>
<td>Arbor, Bridge of 23 Camels, Confluence of Fraser and Cayoosh Rivers</td>
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<tr>
<td>Serpentine</td>
<td>Blue Creek, Horseshoe Bend, Arbor, Lower Hell Creek Road, Yalakom River Moraine Deposit</td>
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<tr>
<td>Slate</td>
<td>Arbor, Fraser River Outcrop, Confluence of Fraser and Cayoosh Rivers, Upper Hell Creek Road, Yalakom River Moraine Deposit</td>
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<td>Soapstone</td>
<td>Duffy Lake Road, Confluence of Fraser and Cayoosh Rivers, Confluence of Bridge and Yalakom Rivers</td>
</tr>
</tbody>
</table>

Table 1. Lithic raw materials and their locations