# THE RECENT INDIAN COW HEAD COMPLEX OCCUPATION OF THE NORTHERN PENINSULA, NEWFOUNDLAND: A GEOCHEMICAL INVESTIGATION OF COW HEAD CHERT ACQUISITION

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by

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# ABSTRACT

This thesis examines the occurrence of Cow Head chert in Recent Indian Cow Head complex lithic assemblages from the Northern Peninsula, Newfoundland. Archaeological research conducted at St. Paul's Bay-2 provided information at a site-specific scale, whereas information collected from seven other, previously excavated Cow Head complex sites, provided a regional analysis.

Drawing upon visual and trace element analysis in the form of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), the geochemical signature of Cow Head chert is first identified and then compared to artifacts sampled from eight sites. The identification of Cow Head chert in all eight lithic assemblages indicates that it was procured through direct and/or embedded procurement from outcrops to sites located within close proximity (50 km), whereas it was brought to sites located over 50 kilometres away from the nearest outcrop through indirect procurement. Based on these results three territorial ranges for the Cow Head complex occupation of the Northern Peninsula was identified.

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# CHAPTER 1

# INTRODUCTION

This thesis examines lithic procurement strategies of Cow Head chert for the Recent Indian Cow Head complex occupation of the Northern Peninsula, Newfoundland. Geochemical data provide the means to identify Cow Head chert at the source and in archaeological assemblages whereas archaeological data regarding the Cow Head complex provide a contextual basis for the investigation of lithic procurement strategies and territorial range. Cow Head chert has been identified in Cow Head complex lithic assemblages throughout the Northern Peninsula suggesting that it was an important resource. The results of geochemical analyses are the basis for reconstructing the territorial range for the Recent Indian Cow Head complex occupation of the Northern Peninsula.

## Project Objectives

The overall purpose of this thesis is to identify lithic procurement strategies of Cow Head chert for the Recent Indian Cow Head complex occupation of the Northern Peninsula. The objectives are addressed at two scales: site-specific and regional. Archaeological excavations conducted by myself at St. Paul's Bay-2 (DlBk-6) in 2008 provide a site-specific analysis to which a comparison is made to archaeological data collected from seven previously investigated Cow Head complex sites: L'Anse aux Meadows (EjAv-1), Peat Garden (EgBf-6), the Gould site (EeBi-42), the Spence site (EeBi-36), Portland

Creek 4 and 5 (EbBj-4 and 5) and the Spearbank site (DlBk-1), which provide information at a regional scale. Furthermore, the use of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), a geochemical technique that has been successful in sourcing lithics elsewhere (Roll *et al.* 2005; Selivanova *et al.* 1998; Tykot 2002), however newly applied to prehistoric artifacts from Newfoundland, is used effectively in the geochemical characterization of Cow Head chert as well as the identification of Cow Head chert in the Cow Head complex lithic assemblages mentioned above.

At a site-specific scale, I argue that St. Paul's Bay-2 is a Cow Head complex lithic quarry/workshop site with a secondary living component. Additionally, through geochemical and visual analysis of artifacts from the site, I argue that approximately 99% of the lithic assemblage comes from the nearby sources of Cow Head chert. At a regional scale, I argue that people occupying Cow Head complex sites located within a 50 kilometre distance to the nearest outcrop of Cow Head chert obtained the chert through direct and/or embedded procurement, whereas sites located more than 50 kilometres away from the nearest outcrop of Cow Head chert obtained the chert through indirect procurement. Based on these results, I construct three territorial ranges for the Cow Head complex.

Overall, this thesis explores the lithic procurement strategies and territorial ranges of the Recent Indian Cow Head complex occupation of the Northern Peninsula, Newfoundland. Past discussion of Recent Indian mobility and settlement patterns in Newfoundland has been limited to the later complexes, such as the Little Passage and

Beothuk (Rowley-Conwy 1990; Schwarz 1984); however, recent evidence indicates that Cow Head complex groups had a high logistical mobility and a low residential mobility (Hartery 2001, 2007; Renouf *et al.* n.d). The information presented in this thesis demonstrates that the earlier Cow Head complex people were not as mobile as their later counterparts, which is reflected in their spatially limited territorial range.

**Significance of Research**

This study represents the first application of a geochemical identification technique that can accurately source Cow Head chert from the Cow Head Group, western Newfoundland. An important objective of this research is to document the cherts geochemical signature. The data gathered will form an important foundation which further research can expand upon to create a more widespread catalogue of lithic raw material resources available on the Northern Peninsula, and even throughout Newfoundland and Labrador. Such a catalogue will enhance quantitative and objective analysis and interpretations of prehistoric lithic use so that researchers will no longer have to rely only upon visually identifying lithic raw material types. Identification of lithic types is basic to a variety of archaeological studies, such as understanding patterns of mobility, trade and establishing territorial ranges.

Overall the analysis of lithic raw material and the sourcing of artifacts undertaken in this study is the first of its kind for the Northern Peninsula, Cow Head chert, and the Cow Head complex. A systematic presentation of the spatial distribution of Cow Head chert from throughout this region has enabled me to reconstruct lithic procurement strategies and territorial range.

**Organizational Framework**

Chapter two examines raw material research in Newfoundland and Labrador, followed by a more focused discussion of existing studies and descriptions of lithic raw materials utilized by the Recent Indian Cow Head complex. The purpose of this chapter is to describe and compare the use of raw material studies in Newfoundland and Labrador and to identify what information various researchers have gained from such studies. Additionally, this chapter serves as a foundation to which data, collected from proceeding chapters, is compared.

Chapter 3 provides a detailed description of the 2008 excavation of St. Paul's Bay-2, a Cow Head complex lithic quarry/workshop and habitation site. Excavation methods, artifact assemblage, features and site function are described and interpreted.

The research methodology and techniques used in this study are outlined in Chapter 4. Chapters 5 and 6 present the results of the visual and trace element characterizations and these data are interpreted, summarized and concluded upon in Chapters 7 and 8.

# CHAPTER 2

## COW HEAD COMPLEX: LITHIC RAW MATERIALS

This chapter focuses on the Recent Indian Cow Head complex of Newfoundland and provides an analysis of the lithic raw material used by this complex. The first half of the chapter provides an overview of lithic raw material studies in archaeology. Within archaeology, lithic raw material analysis has been used for two main purposes: provenience studies (connecting a material to a source), and tool form studies (how raw material influences tool forms and typologies) (Andrefsky 1994, 2001, 2005, 2008; Bamforth 1986, 1990; Ericson 1984; Hoard *et al.* 1993; Jensen and Petersen 1998; Odell 2004; Roll *et al.* 2005; Selivanova *et al.* 1998; Speakman and Neff 2005; Speakman *et al.* 2002; Tykot 2003). The latter are not addressed here, as this thesis focuses on sourcing Recent Indian lithic artifacts found on archaeological sites throughout the Northern Peninsula of Newfoundland. Raw material sourcing is briefly addressed in this chapter and more thoroughly in Chapter 4.

The second half of this chapter begins with a discussion of lithic raw material studies in Newfoundland and Labrador. This is followed by a more focused discussion of the Newfoundland Recent Indian cultural tradition - more specifically the Cow Head complex - which examines existing studies and descriptions of lithic raw material utilized by this complex. This chapter concludes with a comparison of lithic material types found on Cow Head complex sites located throughout the Northern Peninsula.

## Raw Material Sourcing Studies in Archaeology

The term "sourcing" refers to the identifying the origin of specific archaeological materials. Sourcing of archaeological material is based on the assumption that the mineralogical, chemical and physical composition of a lithic outcrop is the same as artifacts made from the same material (Selivanova *et al.* 1998; Tykot 2003). Determining the provenance of archaeological material allows archaeologists to make inferences about cultural processes such as land use, mobility patterns, and social interactions (Burke 1997, 2002, 2006a, 2006b, 2007; Burke and Chalifoux 1998; Close 2000; Deal 2001, 2003; Gramly 1980; Jensen and Petersen 1998; Tykot 2003; Zvelebil 2006). Given that sourcing studies can provide such valuable cultural insights, many different materials have been analyzed, metals, pottery, bone and glass: however, stone, mainly obsidian and chert, has been of primary focus due to its ease of characterization and limited geological occurrence (Rapp and Hill 1998; Speakman *et al.* 2002; Tykot 2003).

Archaeological sourcing and identification of lithic raw materials can be conducted in two ways: visually by looking at colour, luster, texture and structure; and, geochemical, through a variety of analytical techniques. Until recently, the sourcing of archaeological lithic material was conducted primarily by visual means (Calogero 1992; Luedtke 1978, 1979, 1993, 1994). Even today this "eyeball analysis" remains the dominant form of lithic sourcing and is preferred by many archaeologists. Visually sourcing raw material is cheap and fast and it provides a wider range of descriptive attributes when compared to other methods. However, one downside to this method is its potential for errors. Barbara Luedtke (1978, 1979, 1993) suggests that the major problem with visually sourcing raw material is that we learn to recognize lithic raw material types through an unsystematic learning process that does not incorporate any chemical or structural recognition to verify its accuracy. Essentially, we visually identify raw material types which results in the geological authenticity going untested and unknown, therefore leading to potential misidentifications. This point is emphasized by Moholy-Nagy and Nelson (1990) who visually sourced 29 samples of obsidian from Tikal, Guatemala. They subsequently used X-Ray fluorescence (XRF), an analytical technique which identifies the geochemical make-up of a stone, to re-examine the material. The results indicated that the visual sourcing inaccurately classified half of the obsidian samples, whereas XRF accurately associated each sample back to a source. This study highlights the inherent unreliability of visually sourcing raw material.

Due to the work by Luedtke, Moholy-Nagy and Nelson, archaeologists became aware of the inaccuracy inherent in visually sourcing raw materials. Therefore, there was a need for a more accurate approach. As a result, archaeologists began to turn to analytical techniques that were quantifiable and verifiable. Over the past two decades, this area of study has grown with the development and enhancement of scientific investigative equipment and techniques, therefore allowing archaeologists to accurately source archaeological materials (Hoard *et al.* 1993; Moholy-Nagy and Nelson 1990; Roll *et al.* 2005; Selivanova *et al.* 1998; Speakman and Neff 2005; Tykot 2003).

A variety of archaeometric techniques have been used to source lithic artifacts. Some of these techniques are: laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) (Speakman and Neff 2005); X-Ray fluorescence (XRF)

(Pretola 2001; Selivanova *et al.* 1998); thermoluminescence (Akridge and Benoit 2001); and instrumental neutron-activation analysis (INAA) (Aspinall and Feather 1972; Hoard *et al.* 1993). For example, using XRF and INAA, Selivanova *et al.* (1998) analyzed 289 artifacts from 57 archaeological sites in Alaska and compared the results to samples from nine chert outcrops. Approximately 20% of the artifacts analyzed were correlated with an outcrop, whereas the other 80% was left unidentified. Even though such a high percentage of artifacts went unidentified, this study highlights the fact that archaeometric techniques, such as XRF and INAA, have a high degree of precision accuracy which enables researchers to distinguish cherts from different sources (Selivanova *et al.* 1998).

Depending on the quality of data necessary and the material tested, each technique has its own benefits and limitations, which should be examined before analysis begins. Theoretical issues pertaining to the scientific analysis of lithic material are examined in greater detail in Chapter 4.

**Prehistoric Raw Material Sourcing in Newfoundland and Labrador**

Prehistoric raw material sourcing began in Newfoundland and Labrador around 1874, when the geologist T.G.B. Lloyd came to Newfoundland as part of the Geological Survey of Canada (Lloyd 1875, 1876a, 1876b). During this survey, Lloyd collected many "stone implements." He very rudimentarily classified these artifacts and identified them as Beothuk. Because of his geological expertise, he visually identified a potential lithic source for each artifact (Lloyd 1875).

Over the next one hundred years, raw material analysis remained relatively unchanged in Newfoundland and Labrador. Within this time frame, a popular practice by archaeologists was to provide a brief visual description of lithic artifacts, noting colour, shape, morphology and material type (Harp 1951; Howley 1915; Linnamae 1975; Tuck 1971, 1976; Tuck and McGhee 1975; Wintemberg 1939, 1940). Much of this early archaeological work in Newfoundland and Labrador was exploratory and involved the description of cultures through an analysis of stone tools, architecture and burials.

During the mid-seventies, survey and excavation increased significantly in Newfoundland and Labrador. With the generation of all these data, archaeologists began to focus more on cultural inferences, such as communication and trade-networks, social boundaries, and group mobility (Carignan 1975; Fitzhugh 1972). One way in which archaeologists sought to do this was through sourcing lithic artifacts.

The first work of this kind was carried out by William Fitzhugh (1972), who became interested in Ramah chert - a translucent, microcrystalline stone originating in Ramah Bay, Northern Labrador - and its function as a trade and communication item. Found as far south as Maryland (Fitzhugh 1972; Loring 1988, 2002), Ramah chert is a visually distinctive material; however, there are other raw materials in Labrador and Quebec that are at times very similar, such as Mistassini quartzite and Cod Island chert. Therefore, in order to accurately identify Ramah chert, Fitzhugh utilized various archaeometric techniques, such as neutron activation analysis and petrographic thin sectioning, to identify any geochemical differences amongst these materials (Fitzhugh 1972). Testing both archaeological and geological samples Fitzhugh concluded that there was not enough geochemical variation amongst the different samples to positively identify Ramah chert. In addition, Fitzhugh (1972) also concluded that petrographic thin sectioning provided more useful data than neutron activation analysis. Gramly (1978) and Lazenby (1980, 1984), who studied and analyzed Labrador chert sources, particularly Ramah chert, later re-examined and confirmed Fitzhugh's report.

Shortly after this, archaeologists working in Newfoundland began to focus on lithic exchange systems. For example, Nagle (1984, 1985, 1986), who was working on archaeological collections from both Labrador and Newfoundland, became interested in how environmental constraints, such as accessibility to raw material outcrops, affected lithic exchange amongst the Dorset Palaeoeskimo. Using petrographic thin sectioning, Nagle was able to source archaeological specimens from Labrador, Quebec and western Newfoundland. From his studies, he concluded that Newfoundland cherts make up a small portion of lithic assemblages throughout Late Dorset sites in Labrador. He suggests that this is due to the fact that chert outcrops in Newfoundland were more accessible than those in Labrador (Nagle 1985, 1986).

Over the next fifteen years there was a general lack of scientific lithic sourcing studies in both Newfoundland and Labrador. During that time, most archaeologists became habituated to visually sourcing lithic artifacts. This was primarily done to provide a detailed description of lithic material found on sites. For example, in many site reports and articles, archaeologists would provide a breakdown of the different materials found on a site. This would often include a description of colour, texture, luster, inclusions, and banding (Auger 1986; Beaton 2004; Hartery 2001, 2007; Hull 2002; Loring and Cox 1986; Reader 1998; Renouf and Bell 2000, 2001; Teal 2001).

In recent years, however, there have been a number of archaeologists employing scientific sourcing techniques to further augment their work (LeBlanc 2008; O'Driscoll 2003). For example, LeBlanc (2008) utilized petrographic thin sectioning to identify raw material types in order to further her argument of Dorset Palaeoeskimo regionalism in Newfoundland. From her analysis of lithic material she was able to determine that there was a strong reliance on regionally available lithic raw material.

Sourcing studies, asides from those mentioned above are generally lacking in Newfoundland and Labrador archaeology. Although some archaeologists working in this province are starting to take a more quantitative scientific approach to lithic identification, one that provides information of the geochemical makeup of a raw material, the majority still prefer to qualitatively or visually describe an artifact's attributes to determine its provenance. Overall, qualitative and quantitative sourcing of lithic artifacts in Newfoundland and Labrador have aided archaeologists in the understanding of social interactions, trade networks, group mobility, the functionality and technological attributes of material, and the cultural choice and availability of lithic raw material (Fitzhugh 1972, 1978; Gramly 1978; Hartery 2007; Lazenby 1980, 1984; LeBlanc 2008; Loring 2002; Nagle 1984, 1985, 1986; O'Driscoll 2003; Pintal 1998; Robbins 1985; Schwarz 1984; Simpson 1984, 1986). Hopefully, with more studies like these, archaeologists will begin to see the benefits of quantitatively sourcing lithics and incorporate this type of analysis into their own work.

## Newfoundland Recent Indian

The term Recent Indian encompasses all Amerindian populations that inhabited Newfoundland, Labrador and the Quebec Lower North Shore from 2000 BP (years before present) to the death of Shawnadithit, the last known Beothuk, in 1829. The Newfoundland Recent Indian population has been divided into four prehistoric complexes based on technological and chronological characteristics: 1) Cow Head complex, 2000-1050 BP[1]; 2) Beaches complex, 1900-1000 BP; 3) Little Passage complex, 940-400 BP; and 4) Beothuk 400-180 BP (Erwin *et al.* 2005; Hartery 2001, 2007; Hull 2002; Renouf and Bell 2005; Renouf *et al.* 2000; Teal 2001).

There are numerous Recent Indian sites located throughout Newfoundland. The sites are distributed along coastal areas, extending inland along rivers and lakes in some locations. Based on site location and faunal evidence from Boyd's Cove (DiAp-3) and Cape Freels-1 (DhAi-1), researchers have described the Recent Indian subsistence pattern as generalized terrestrial-marine (Cridland 1998; Holly 1997; Hull 2002; Rast 1999; Renouf 2003; Rowley-Conwy 1990; Schwarz 1994). They propose that during the spring, Recent Indian populations were on the outer coast for the harp seal hunt and along inner coastal regions and major rivers during the summer for caribou, fish, shellfish and beaver.

Lithic analysis has shown that Recent Indians utilized a variety of raw material to produce stone tools. Visual analysis of material from archaeological sites has determined that Recent Indians used both exotic raw materials originating outside Newfoundland and domestic lithic materials from within Newfoundland (Hartery 2001, 2007; Holly 1997;

[1] All dates are calibrated radiocarbon years before present (cal BP) (1σ) and rounded to the nearest decade, except where otherwise stated.

Hull 2002; Rast 1999; Reader 1993; Teal 2001). The next section provides a more detailed discussion of the Cow Head complex and their utilization of lithic raw materials.

### Cow Head Complex

The Cow Head complex is the earliest, and also the least understood, of the four Recent Indian complexes. Cultural material relating to the Cow Head complex was originally identified in Bands 1, 2 and 3 at the Spearbank site in Cow Head, the community from which the complex derives its name (Tuck 1978). Tuck (1978, 1988) characterized this material as Recent Indian but noted that specimens were generally larger than Recent Indian artifacts found elsewhere. Tuck associated the material from the Spearbank site with a sub-tradition of the Recent Indian culture, given the stylistical differences with other Recent Indian cultural material (Tuck 1988). For instance, he noted that the projectile points found at the Spearbank site had contracting stems, whereas projectile points found elsewhere were side- and corner- notched. He also found large, leaf shape and bipointed bifaces, large flake scrapers, and linear flakes, which were uncharacteristic of other Recent Indian material (Tuck 1988).

Tuck (1978) was the first to recognize that the Cow Head complex material recovered from the Spearbank site was stylistically different from Beaches and Little Passage complex counterparts. He also suggested that the Cow Head complex may have been the predecessors of both the Beaches and Little Passage complexes. However, in more recent years, this has been contested. Hull (2002) suggests, based on temporal and lithic stylistic similarities, that the Cow Head complex is not the predecessor to the

Beaches and Little Passage complexes but ancestral to the *Flèche littorale* complex (2500-1500 BP), first identified in Blanc Sablon on the Quebec Lower North Shore (Pintal 1998), which in turn is related to the North West River phase (ca. 2500-1400 BP), an Intermediate Indian population from Labrador (Fitzhugh 1972; Nagle 1978). Additionally, a re-examination of Recent Indian lithic assemblages from Newfoundland, Labrador and Quebec was undertaken by Hartery (2001, 2007), which corroborated Hull's conclusions (2002).

Artifacts distinctive of the Cow Head complex include broad bladed, contracting stemmed projectile points, large ovate, lancolate or bipointed bifaces and large flake endscrapers (Hartery 2001, 2007; Renouf *et al.* 2000; Teal 2001) (Figure 2.1). Cow Head complex tools are made from a variety of raw materials. Throughout lithic collections exotic and domestic raw materials are found. Ramah chert, the most exotic and distinctive, appears in some lithic assemblages in trace amounts, usually less than 1%. Domestic and local materials comprise the bulk of collections (Hartery 2001, 2007; Teal 2001; Wallace 1989). However, it is important to note that these lithic assemblages were visually classified and therefore it is possible that some of the material has been misidentified.

Figure 2.1: Cow Head complex lithic assemblage from Spearbank and St. Paul's Bay-2 (Photo: D. Lavers).

Our understanding of the Cow Head complex is constantly changing. Currently, thirteen Cow Head complex sites or site components are identified throughout Newfoundland of which eight are on the Northern Peninsula (Figure 2.2). Artifacts characteristic of the Cow Head complex, such as large ovate bifaces, have been found on other sites throughout Newfoundland; however, they appear in most cases to be spot finds.

Figure 2.2: Cow Head complex sites in Newfoundland (Map: PACAP).

Five of the eight Cow Head complex sites on the Northern Peninsula (Figure 2.3) have been excavated and analyzed: Spearbank, Cow Head (Hartery 2001, 2007; Tuck 1971); Peat Garden, Bird Cove (Hartery 2001, 2007; Reader 1998); the Spence and Gould sites, Port au Choix (Renouf 1992, 1993, 2002; Renouf and Bell 1998, 1999, 2000, 2001; Renouf *et al.* 2000; Teal 2001); and L'Anse aux Meadows (Kristensen 2010; Wallace 1989). Two sites are small and disturbed by land erosion: Portland Creek 4 and 5 (Biggin

1985; Thomson 1987). The other site, St. Paul's Bay-2, was excavated during the summer of 2008 and is the focus of this thesis and is discussed in Chapter 3.

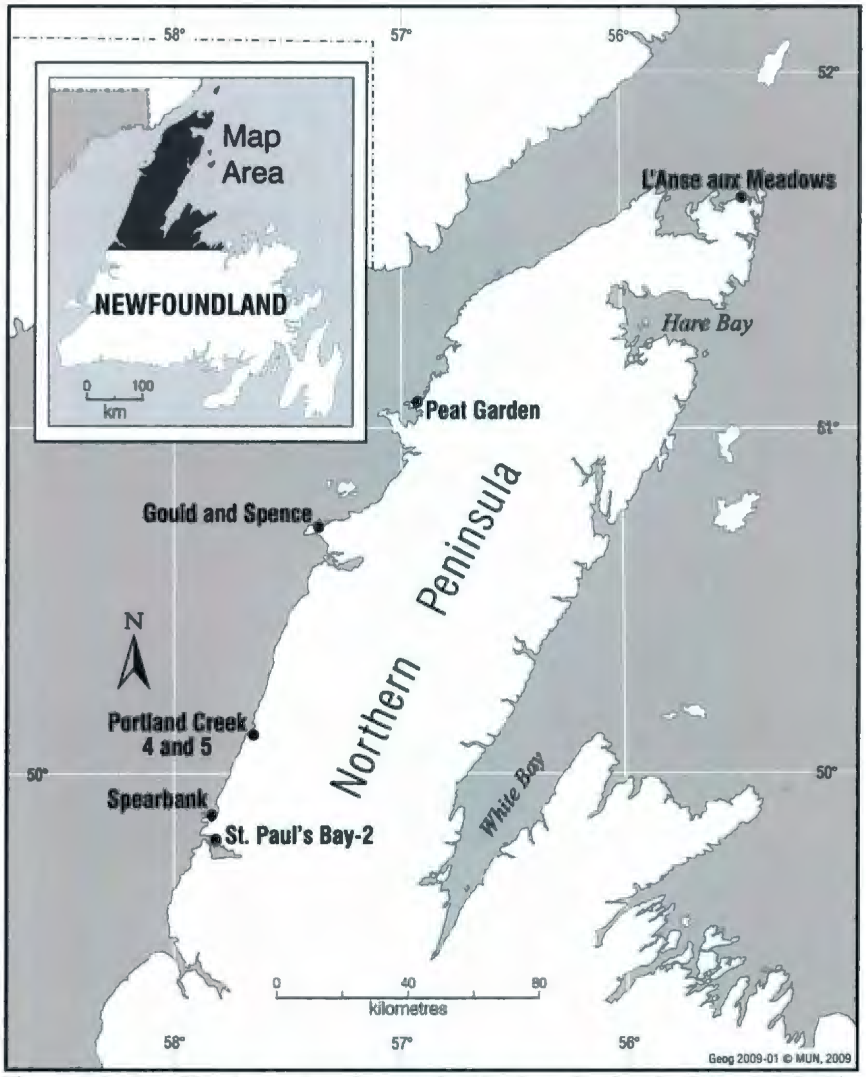

Figure 2.3: Cow Head complex sites on the Northern Peninsula (Map: PACAP).

With the exception of L'Anse aux Meadows and the Gould site, the function of all the Cow Head complex sites on the Northern Peninsula has been interpreted as areas where the primary reduction of lithics occurred; researchers therefore classified these sites as workshop/quarry sites (Hartery 2001, 2007; Kristensen 2010; Renouf 1992, 1993; Teal

2001; Tuck 1978; Wallace 1989). Lithic artifacts and debris suggest a nearby raw material source; however, except for St. Paul's Bay-2 and Spearbank one has not been located (Hartery 2001, 2007; Renouf 1992, 1993; Renouf and Bell 2001; Teal 2001).

The predominant lithic material used by the Cow Head complex on the Northern Peninsula varies at each site. Spearbank, Spence and Peat Garden have been classified as quarry/workshop sites where a local raw material was quarried and manufactured into stone tools. Renouf (1992, 1993) and Hartery (2001, 2007) suggest that these materials are local because at these sites the "local" raw material accounts for 95-99% of the lithic assemblage which is primarily made up of cores and flakes. In the case of Spence and Peat Garden, Renouf (1993) and Hartery (2001, 2007) state that the local raw material source is unknown and that it may have been covered up by vegetation in recent years.

Hartery (2001, 2007) and Nagle (1985) identified the lithic material utilized at the Spearbank site as Cow Head chert (Figure 2.4). Cow Head chert is characterized as fine grained with tiny radiolaria embedded within (Coniglio 1987). Naturally it occurs in many colours, such as yellow, blue, red, brown, black, and green. Cow Head cherts are found in large cobbles located along the coastline near the communities of Cow Head and St. Paul's. Ramah and Iceberg chert (a chert similar in appearance to Ramah chert but with a duller luster and is fine grained-see McGhee and Tuck 1975:68 and Madden 1976: 45-46 for more detailed description), in the form of flakes, a projectile point and a biface fragment, are also present in a small quantity - less than 1% of the total lithic assemblage.

Figure 2.4: Artifacts from the Spearbank site made on Cow Head Chert (Photo: D. Lavers).

At Peat Garden, a very different material dominates the collection. Ninety-seven percent of the assemblage is made from what Reader (1998) called Bird Cove chert, (Figure 2.5) while the rest is made up of Ramah and Cow Head chert (Hartery 2007). Reader (1998) describes Bird Cove chert as a "very distinctive white/light-gray chert with numerous small, square-shaped inclusion holes" (Reader 1998: 18). He also states that this material is "highly similar to the distinctive white cherts from the earlier Maritime Archaic sites in Bird Cove" (Reader 1998:18). In addition, this material is visually similar to what Beaton (2004:105) identifies as Grade 1 Big Brook chert, which is found in Big Brook, northwestern Newfoundland. Furthermore, the cherts colour is believed to be unaltered and unweathered.


Figure 2.5: Flakes from Peat Garden made of Bird Cove chert (Photo: D. Lavers).

The Spence site is identified as a Beaches and Little Passage complex site (Renouf 1993); however recent analysis of the collection has shown a small number of Cow Head complex artifacts to be present (Renouf, personal communication 2009). The Recent Indian people of the Spence site produced their tools from a banded, brown and black medium to fine grained chert similar to that of Spearbank (Figure 2.6). Renouf (1993) suggests that the abundance of cores and primary flakes indicates that the source was probably nearby; however, one has never been found. In addition, Ramah chert and Cow Head chert were identified, although in small quantities (less than 1% of the lithic assemblage).

Figure 2.6: Flakes from the Spence site's Beaches complex (Photo: D. Lavers).

The lithic assemblages at the Gould site and L'Anse aux Meadows show a greater variety in lithic material. The majority of lithic material found at the Gould site has been described as a medium to fine grained chert that is gray to white in colour (unaltered and unweathered) with distinctive square vesicles (Figure 2.7). Ramah and black-brown Cow Head cherts also show up in the assemblage to a lesser extent (Teal 2001). Unlike Spearbank and Peat Garden, the Gould site is not a quarry/workshop site. The presence of a dwelling, ceramics, and a wide range of material culture including preserved animal hide suggest that the site was a base camp or habitation area where domestic activities, such as cooking and hide processing, took place (Teal 2001, Renouf *et al.* n.d).

Figure 2.7: Two projectile points and a biface from the Gould site (Photo: D. Lavers).

Lithic artifacts from L'Anse aux Meadows are made of a green-brown or whitish chert as well as a purplish rhyolite (Figure 2.8) (Ingstad 1977; Wallace 1989). At this site, approximately 200 artifacts can be attributed to the Cow Head complex, with confidence, of which 98% are made from this chert. Based on the work of Cooper (1937), Wallace (1989) suggests that a possible source for these cherts is located within Hare Bay, approximately 50 kilometres to the west. Associated with these artifacts were two large cooking pits which were dated to 1170 ± 100 BP (T-365) and 1170 ± 65 BP (S-1095) (Wallace 1989). The presence of these cooking hearths and relatively few artifacts suggest that the site at L'Anse aux Meadows was a short term occupation site. No Ramah chert was found in association with the Cow Head complex; however, there were a few lithics made from what appears to be banded Cow Head chert (Hartery 2007).


Figure 2.8: Cow Head complex bifaces from L'Anse aux Meadows (Photo: D. Lavers).

The lithic material surface-collected at Portland Creek 4 and 5 sites, is similar to that found at the Spearbank site (Biggin 1985; Thomson 1987). Cultural material is described as made from black fine to medium grained chert, visually similar to raw material found at Cow Head (Figure 2.9) (Biggin 1985). No exotic cherts were noted (Biggin 1985; Thomson 1987).

Figure 2.9: Artifacts from Portland Creek 4 and 5 (Photo: D. Lavers).

Overall, from these descriptions it is evident that lithic raw material analysis in Recent Indian Cow Head complex context is limited to a qualitative description. Although some researchers speculated about the origins of the lithic material the actual source remains unidentified, excluding the Spearbank site.

With the exception of Hartery (2007), archaeologists did not place this information into a larger context. Hartery (2007) examined raw material types from some of the same sites described above and suggested that Cow Head groups preferred local raw materials. She also interpreted this as reflecting a low residential mobility.

Overall, the raw material choices of the Cow Head complex appear to be determined by relative proximity to a tentatively identified source. As shown above, the majority of lithic assemblages are dominated by, possibly local, raw material; this is further examined and tested in Chapters 5 and 6. Exotic, or non-local, material appears only in trace amounts.

**Summary**

This chapter provided a brief overview of raw material sourcing in archaeology and a discussion of its application in Newfoundland and Labrador archaeology. Archaeologists working with Newfoundland and Labrador lithic collections have generally visually/qualitatively sourced lithic artifacts. However, over the past few decades, sourcing of lithic material has become more quantitatively comprehensive with, for example, the work of Gramly (1978), Nagle (1984, 1985, 1986) and Lazenby (1980) who visually and geochemically identified and studied particular lithic materials from throughout Newfoundland, Labrador and Quebec. Collectively, these studies demonstrate the potential of more precise archaeometric, quantitative applications.

To date, archaeometric techniques have only been applied to Palaeoeskimo lithic collections (LeBlanc 2008; O'Driscoll 2003). However, the present study applies one of these archaeometric techniques - laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) - to Cow Head complex lithic collections from the Northern Peninsula. The following chapter discusses a recently excavated Cow Head complex quarry/workshop site in St. Paul's Inlet, including information about raw materials recovered.

## CHAPTER 3

## ST. PAUL'S BAY-2 (DlBk-06): DESCRIPTION AND EXCAVATION

This chapter describes the 2008 field season at St. Paul's Bay-2 (DlBk-06). The field season was conducted over a six week period during the months of July and August and included a survey of the area and a 43 $m^2$ excavation. The first half of this chapter deals with descriptive aspects, such as stratigraphy, features and cultural material of the site, and the second half of the chapter focuses on site function. An analysis of the lithic assemblage, raw materials use and structural evidence indicates that St. Paul's Bay-2 was primarily used as a lithic quarry/workshop site with a secondary living component.

Information and data gathered from the analysis of this site forms the basis of this thesis. As discussed in the previous chapter, lithic raw material from St. Paul's Bay-2 will be compared to seven other Recent Indian Cow Head complex sites located on the Northern Peninsula.

### 2008 Program of Work at St. Paul's Bay-2 (DlBk-06)

#### *1989 Archaeological Survey*

Gerry Penney (1989) discovered this site when testing the area for Newfoundland and Labrador Hydro. Penney and his crew dug fourteen test pits five of which produced 88 chert flakes and some charcoal. To assess further archaeological potential, Penney opened up larger areas (Test Area A, 1 m x 2 m; Test Area B, 1 m x 1 m) which produced three artifacts and 49 flakes (Table 3.1 and Figure 3.1) (Penney 1989).

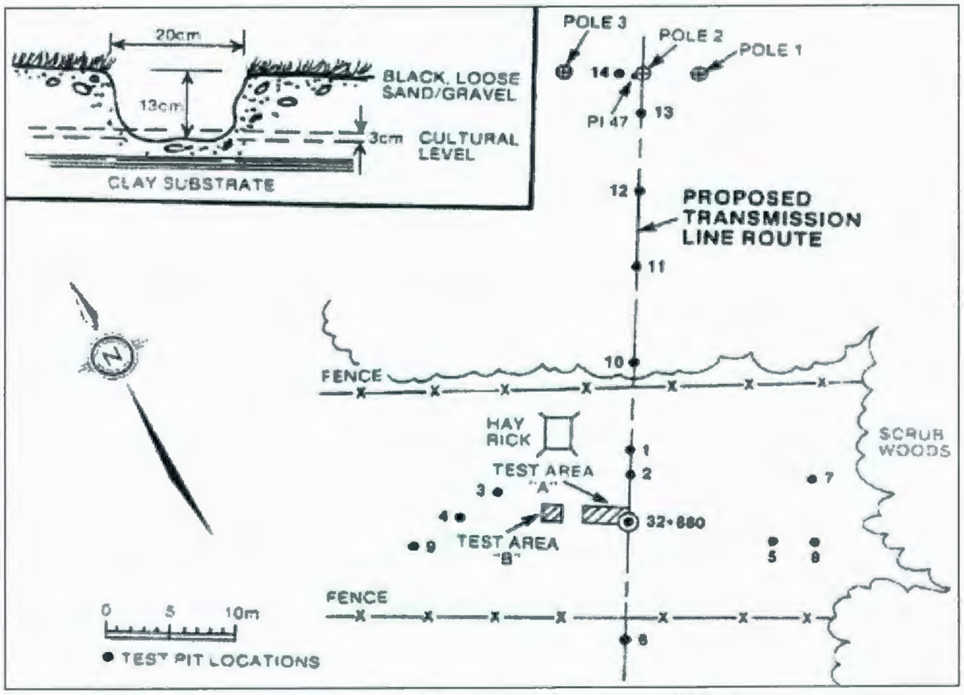

Figure 3.1: Previous archaeological work at DlBk-06 (Penney 1989).

| Test Pit | Cultural Material |
|---|---|
| Test Area A | 44 flakes<br>3 artifacts (microblade, microblade core and a retouched flake)<br>8 chunks of raw material |
| Test Area B | 5 flakes<br>1 block of chert |
| Test Pit 2 | 26 flakes |
| Test Pit 3 | 24 flakes |
| Test Pit 4 | 15 flakes |
| Test Pit 5 | 32 flakes |
| Test Pit 6 | 1 flake |

Table 3.1: Penney's test finds (Penney 1989).

*Other Archaeological Survey*

In addition to Penney's (1989) work, visits by members of the Provincial Archaeology Office (2006), Dr. M.A.P. Renouf (2005) and Lavers (2007) were made to the site. The primary purpose of these visits was to assess damage from a mechanically dug trench, as well as to collect any cultural material present on the surface (Figures 3.2, 3.3 and 3.4). In assessing damage to the site Renouf (2005) noted a hearth feature, identified on the basis of large quantities of fire-cracked rock scattered throughout the trench and in the profile. Renouf collected a carbon sample from this feature that dated to 1390±70 BP (Beta 21132) as well as some calcined bone.


Figure 3.2: PAO members assessing damage to site (Photo: S. Hull).

Figure 3.3: Broken Recent Indian biface surface collected in 2007 (Photo: D. Lavers).

Figure 3.4: Exhausted Recent Indian projectile point surface collected in 2007 (Photo: D. Lavers).

**Objectives of the 2008 Field Season**

The overall strategy for the 2008 field season entailed the survey and test pitting of St. Paul's Bay-2 and then the opening of a small excavation. The primary objectives in partially excavating St. Paul's Bay-2 were: 1) to determine the function and occupation of the site, and 2) to determine if the site was associated with the nearby source of Cow Head chert located in St. Paul's Inlet (Figure 3.5). Once answered, this information would then be used to 1) identify the presence of Cow Head chert in other Recent Indian Cow Head complex sites on the Northern Peninsula, and 2) to identify a Cow Head chert lithic procurement strategy for each of these sites.

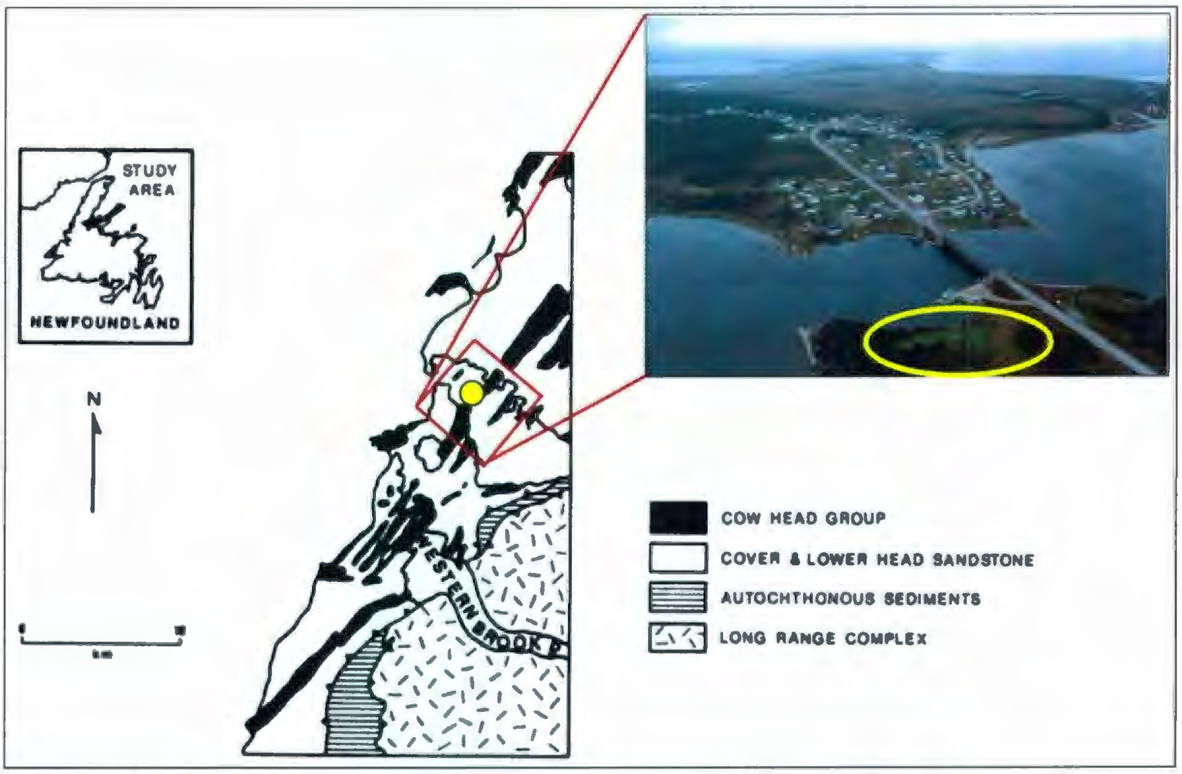


Figure 3.5: Cow Head chert source locations (Yellow circle indicates location of St. Paul's Bay-2) (Map: based on Coniglio 1987).

### Description of 2008 Excavations

The excavation of St. Paul's Bay-2 took place over a six week period, beginning in mid-July and ending in late-August. A total of 43 $m^2$ was excavated down to sterile bedrock.

To begin, however, we opened up 52 30 cm x 30 cm test pits (Figure 3.6). This was done to explore the site and to locate areas rich in cultural material, such as lithic debitage. Based on the findings from Test Pit 1 and Test Pit 6, we decided to open up a small 5 m x 6 m excavation area, which we called Area 1 (Figure 3.7). Units N115 E104, N114 E102-104 and N113 E100-101 were partially removed by site disturbance. It took four weeks to complete this excavation. An additional 13 $m^2$ excavation was opened to the south of the first one, which we called Area 2 (Figure 3.7). The drainage trench that ran through the site divided these two areas.

*Excavation, Test Pitting and Cataloguing Procedures*

Excavation procedures were modeled after the Port au Choix Archaeology Project's (PACAP) protocol (Renouf 1985:41-42, 1986:2-5, 1987:3). A total station was used to map the excavation and surrounding surface topography. The location of test pits, artifacts, features, fire-cracked rock and soil horizons were recorded. Photographs were taken to document features and finds as well as to record daily progress.

*Test Pitting Procedures*

The strategy for test pitting entailed sinking test pits every five meters over the entire site. The test pits measured approximately 30 cm by 30 cm. Any cultural material encountered in the test pits was noted. The test pit was subsequently filled back in.

*Excavation Procedures*

An area was chosen for excavation and gridded out in 1 $m^2$ units. Excavation of this area involved the removal of each natural soil horizon by trowel and dry-sifting all the dirt through a four millimetre mesh screen. Elevations were recorded for each soil horizon. A plan of the excavation was drawn, noting the location of all features, rocks, and fire-cracked rocks. Profile drawings were also made to record the stratigraphy.

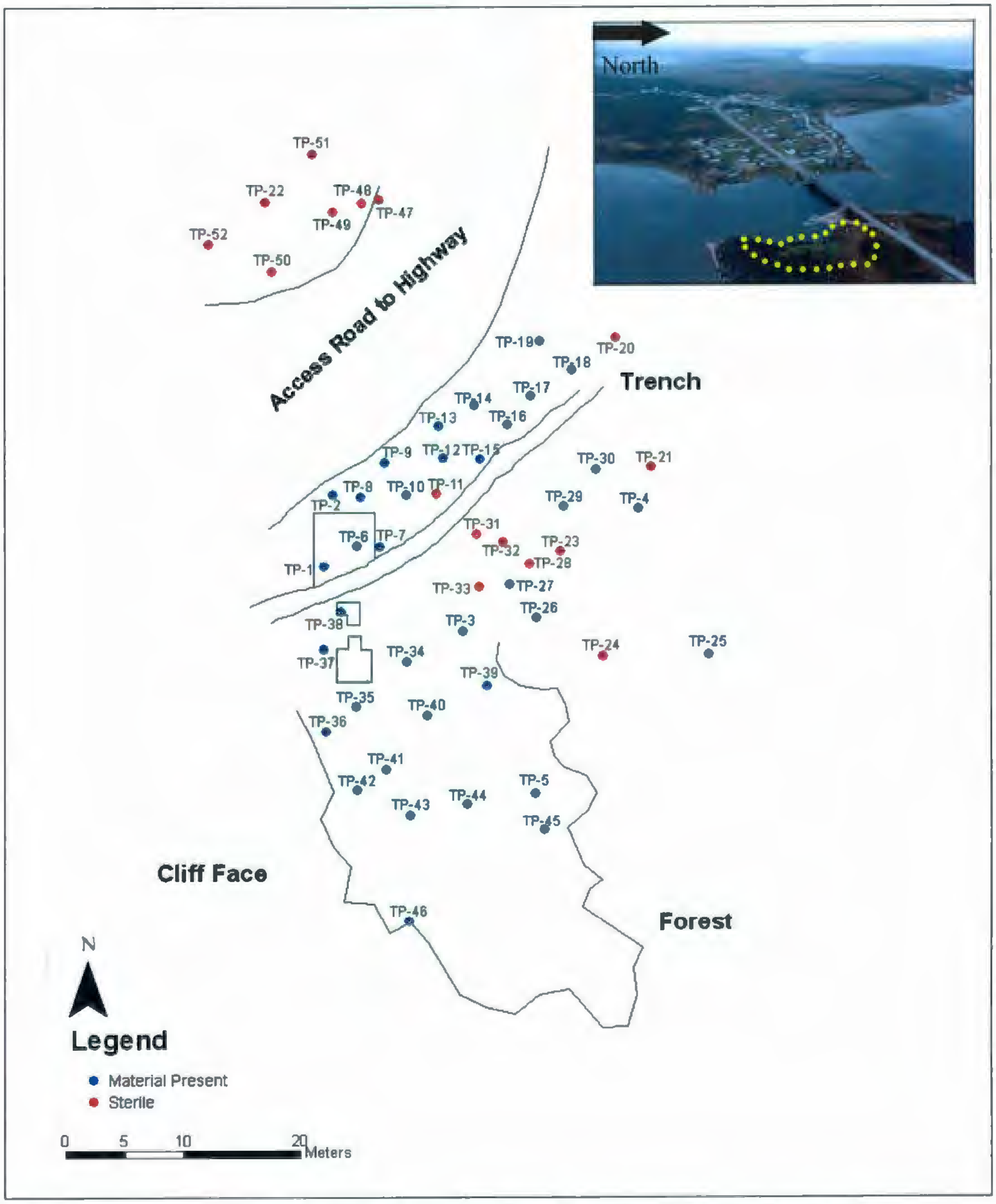


Figure 3.6: Location of test pits (TP), showing sterile and positive for cultural material.

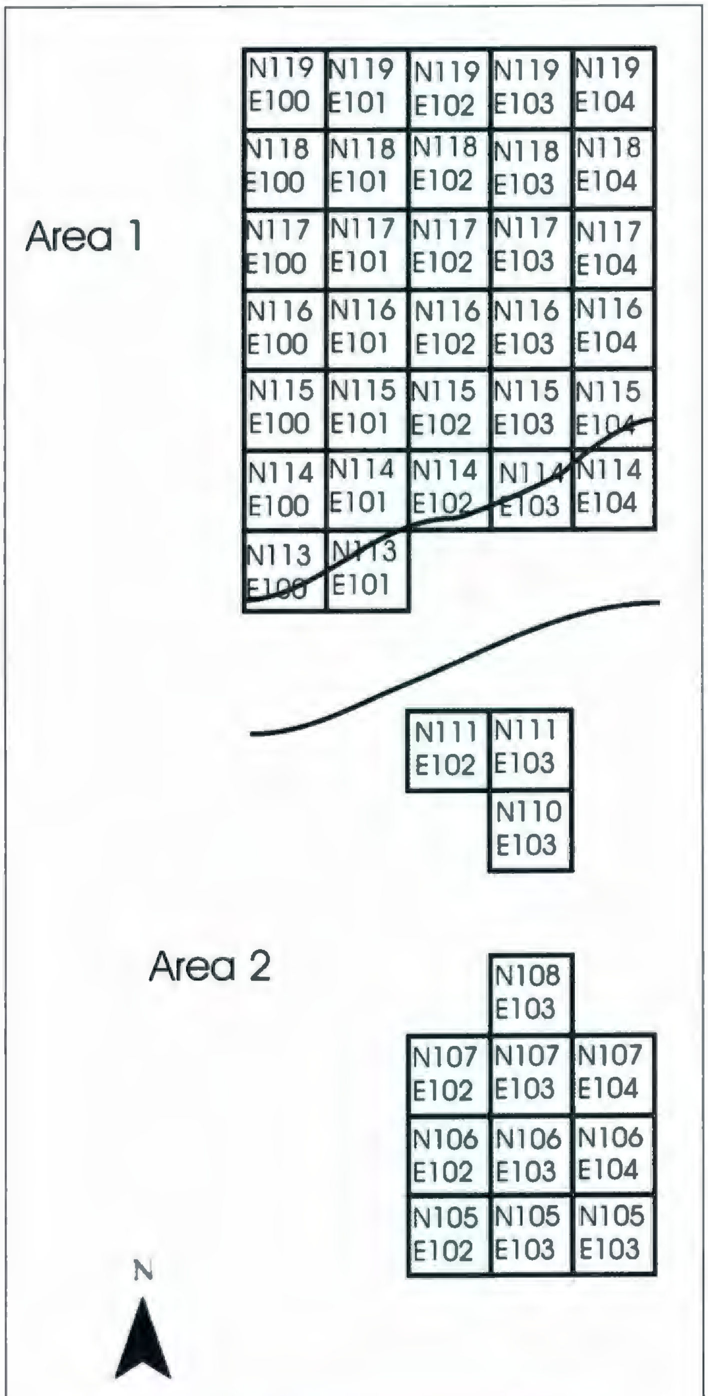


Figure 3.7: Excavation area. Units named at their southwest corner.

*Cataloguing Procedures*

Cataloguing procedures were modeled after Provincial Archaeology Office guidelines (PAO 2008a). Each artifact was given a catalogue number in the field and was separately bagged. All artifacts were brought back to the Northern Peninsula Collections Lab at Memorial University for labelling and cataloguing. The artifacts were catalogued according to the standards and guidelines of the Provincial Archaeology Office (PAO 2008b).

*Description of Test Pitting*

Archaeological testing of the site took place on June 15$^{th}$ and 16$^{th}$. The primary objective of testing was to determine site boundaries as well as to locate any areas that were particularly rich in cultural material, primarily lithics. A total of 52 30 cm x 30 cm test pits was dug (Figure 3.6).

Our strategy for testing the site was to systematically test, by shovel, approximately every five meters. We started by digging test pits near areas which we already knew produced cultural material, such as the drainage trench and Penney's test pits. If cultural material was found, then it was noted, flagged and recorded using the total station. When found, cultural material, such as charcoal, fire-cracked rock, and flakes, were placed back into the test pit and covered up. When diagnostic tools, such as bifaces, were found they were collected. Test pits which did not yield cultural material were also noted, flagged and recorded.

Later, additional test pits were dug around the site to establish the site boundary. Test pits dug to the north of the site and on the opposite side of the road cut did not produce any cultural material. Test pits were also dug in the forested area around the site. Sixteen of the 52 test pits were sterile (Figure 3.6 and Table 3.2). They are primarily located to the north-west and east of the site. From test pitting, only the northern boundary of the site was located. The other boundaries were not located due to the area being heavily forested. Overall, the testing of the site was very successful. Two areas of particular interest were located. These areas became the focus of our excavation.

| **Test Pit Number** | **Cultural Material** |
|---|---|
| 1 | Fire-cracked rock, a preform, and charcoal |
| 2 | Flakes |
| 3 | Flakes |
| 4 | Flakes |
| 5 | Flakes and a biface |
| 6 | Fire-cracked rock, a biface, and charcoal |
| 7 | Fire-cracked rock, a preform, and charcoal |
| 8 | Fire-cracked rock, a preform, and charcoal |
| 9 | Fire-cracked rock, a preform, and charcoal |
| 10 | Flakes |
| 11 | Sterile |
| 12 | Flakes |
| 13 | Flakes |
| 14 | Flakes |
| 15 | Flakes |
| 16 | Flakes |
| 17 | Flakes |
| 18 | Flakes |
| 19 | Flakes |
| 20 | Sterile |
| 21 | Sterile |
| 22 | Sterile |
| 23 | Sterile |

| | |
|---|---|
| 24 | Sterile |
| 25 | Flakes and cores |
| 26 | Flakes and cores |
| 27 | Preform |
| 28 | Sterile |
| 29 | Charcoal and cores |
| 30 | Flakes and cores |
| 31 | Sterile |
| 32 | Sterile |
| 33 | Sterile |
| 34 | Flakes |
| 35 | Charcoal |
| 36 | Fire-cracked rock and a microblade |
| 37 | Flakes |
| 38 | Fire-cracked rock and flakes |
| 39 | Cores and flakes |
| 40 | Cores and flakes |
| 41 | Sterile |
| 42 | Fire-cracked rock and flakes |
| 43 | Flakes |
| 44 | Fire-cracked rock and flakes |
| 45 | Flakes |
| 46 | Flakes |
| 47 | Sterile |
| 48 | Sterile |
| 49 | Sterile |
| 50 | Sterile |
| 51 | Sterile |
| 52 | Sterile |

Table 3.2: Test pit finds.

### Description of Excavation Area 1[2]

In total, we opened up 27 $m^2$ including the five partial units (Figure 3.7) disturbed by the drainage trench which ran through the site (Figure 3.8). This area was chosen because

[2] For the purposes of this thesis, only Area 1 will be discussed here in detail. For a more detailed account of Area 2 and the Groswater Palaeoeskimo cultural material refer to Lavers (2008).

Test Pit 1 and Test Pit 6 produced many lithics, including flakes and cores. Also, we wanted to excavate near the trench because a great deal of cultural material, such as fire-cracked rock, flakes, cores and projectile points, was eroding from its banks (Figures 3.3 and 3.4). The excavation area was approximately 5 m x 6 m and adjacent to the drainage trench. Area 1 was excavated down to sterile soil, by following each soil horizon. Each soil horizon was photographed and measurements were recorded. In addition, a plan excavation was drawn (Figure 3.9).

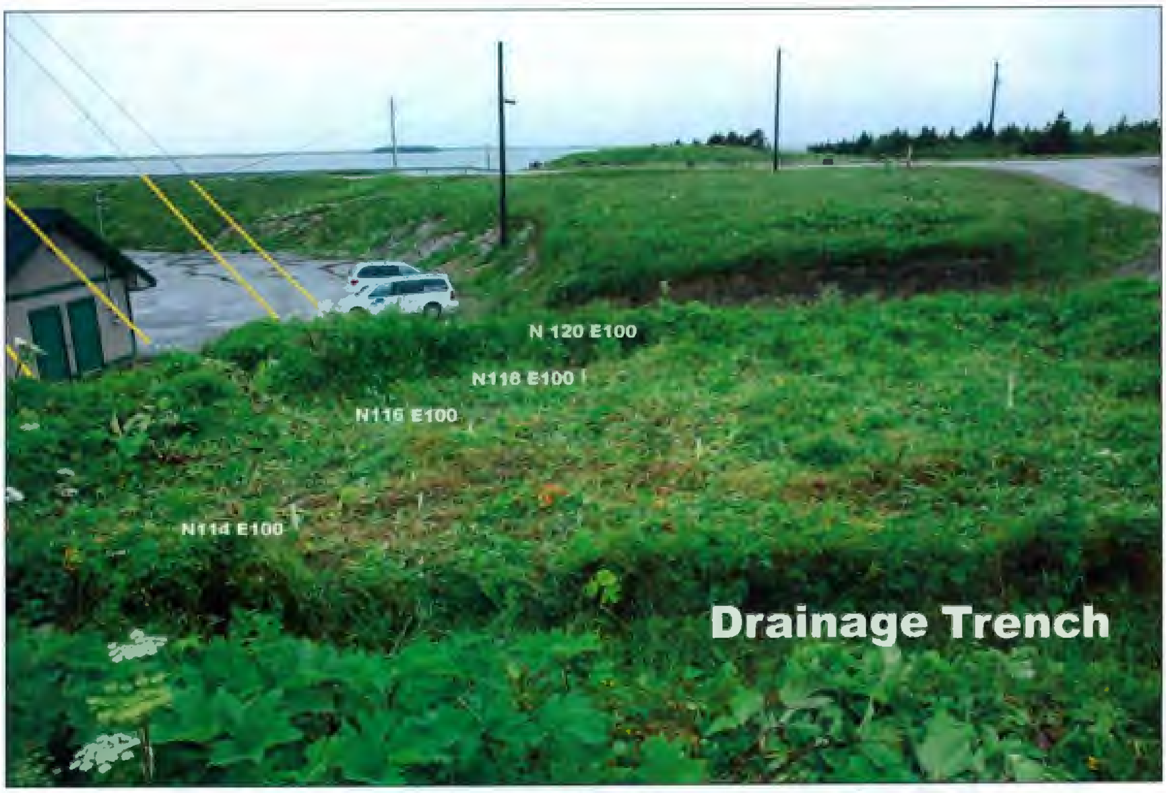


Figure 3.8: Location of Area 1 indicating location of drainage trench (Photo: D. Lavers).

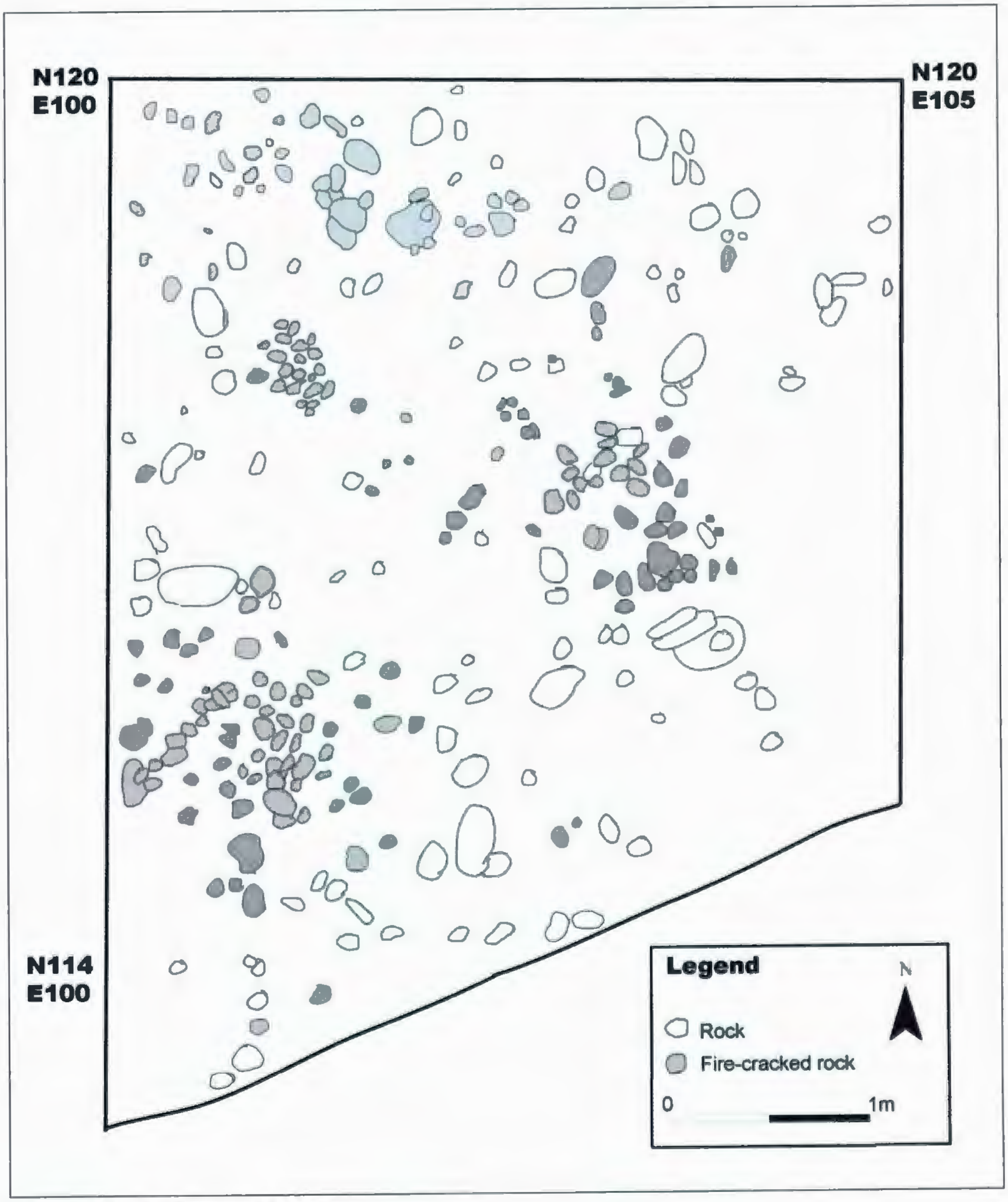


Figure 3.9: Plan drawing of Area 1.

*Stratigraphy*

The site is covered by sod with long grass, which we designated as Level 1. On average this layer is 10 cm thick. Underlying Level 1 was a thick layer of dark brown peat. This peat layer was designated as Level 2. On average Level 2 was 20 cm thick. Below this level were the cultural levels, designated as Level 3 and Level 4 respectively (Figure 3.10). Level 3 was characterized as a matrix consisting of gray clay, with fire-cracked rock, charcoal, and artifacts. In addition, we noted that mixed in with this level were lenses of charcoal, which we designated as Level 3a. This level was not present throughout the whole excavation area, just in units associated with hearths. Level 3 matrix ranged from 5 to 10 cm thick, whereas Level 3a ranged from 1 to 2 cm thick. Level 4 was characterized as a matrix made up of pink clay, also with charcoal and artifacts. Level 4 ranged from 1 to 5 cm thick. Below this cultural level was a compact pink matrix. No artifacts were found in this layer, but some features, such as the hearths, were resting on top of it. This layer was designated as Level 5 (Figure 3.11) and ranged from 1 to 5 cm thick. Finally below this layer was a shale substrate which makes up the bedrock in the area. Also, the east section of Area 1 was disturbed. The matrix was unlike the undisturbed areas in that it was very dry, crumbly and loose. The matrix was light brown in colour and yielded a small quantity of 20$^{th}$ century European ceramics. This layer was designated as Level D.

Only one profile of Area 1 was drawn (Figure 3.12). This was due to the fact that the south side was not present because of the drainage trench and the north and east walls were fully disturbed by previous activity on the site; these walls were approximately 25 to 30 cm deep.

Figure 3.10: Excavation Area 1 showing Levels 3 (gray matrix), 3a (black matrix), and 4 (pink matrix) (Photo: D. Lavers).

Figure 3.11: Excavation Area 1 showing Level 5 (sterile) (Photo: D. Lavers).

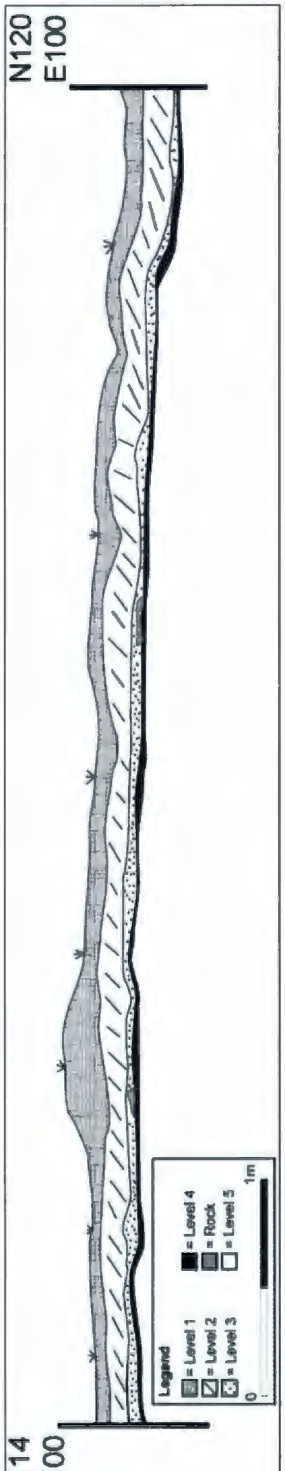


Figure 3.12: Area 1 profile (west wall).

*Features*

Feature 1

This was an ovate hearth structure in Level 3 and on top of Level 4 in units N114 E100, N115 E100, N116 E100, N114 E101, N115 E101 and N116 E101 (Figure 3.13). Feature 1 consisted of a large 2 m x 1.5 m concentration of fire-cracked rock. However this measurement is not the full extent of the hearth. The hearth continued into the west wall, and therefore was not fully excavated. Feature 1 ran west-east and the matrix within this feature was Level 3a. Many of the fire-cracked rocks were stained with this black charcoal lens. Associated with this feature were many Recent Indian artifacts. The hearth dates to 1100 ± 70 BP (Beta-252627). In addition, upon the excavation of the hearth, Groswater Palaeoeskimo artifacts were found beneath it in Level 4.

Figure 3.13: Feature 1 (outlined by yellow string) (Photo: D. Lavers).

Feature 2

This was an ovate hearth structure in Level 3 and partially on top of both Level 4 and Feature 3 in units N116 E102, N117 E102, N116 E103, and N117 E103 (Figures 3.14). Feature 2 consisted of a large 2 m x 1 m concentration of fire-cracked rocks. It ran northwest-southeast and the matrix within this feature was Level 3a. Much of the fire-cracked rock was stained with this black charcoal lens. Associated with this feature were many Recent Indian artifacts, mainly cores. This feature dates to 1330 ± 50 BP (Beta-252628).

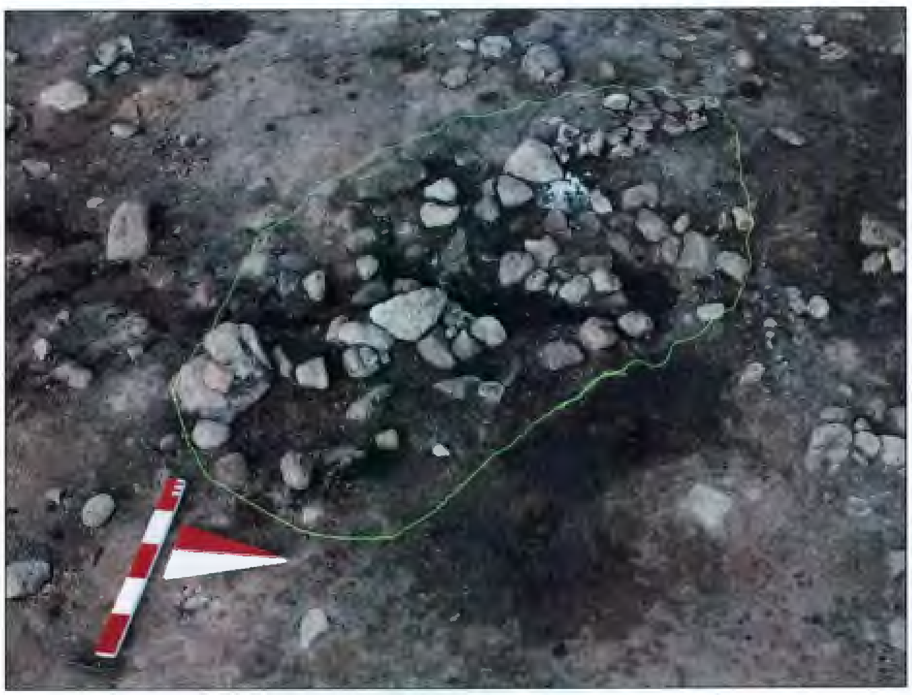

Figure 3.14: Feature 2 (outlined by yellow string) (Photo: D. Lavers).

Feature 3

Feature 3 is interpreted as a platform structure. It extends into units N116 E100, N117 E100, N118 E100, N116 E101, N117 E101, N118 E101, N116 E102, N117 E102, N118

E102, N116 E103, N117 E103, and N118 E103 (Figure 3.15). The feature is characterized by a 10 to 15 cm thick mound of pea-gravel. Feature 3 was directly under Level 2 and on top of Level 4. It measures approximately 3 m x 2 m. Recent Indian artifacts and flakes were found underneath this feature and mixed within the pea-gravel were Groswater Palaeoeskimo artifacts and flakes. Feature 2 and Feature 4 are on top of Feature 3 (Figure 3.15). This feature dates to 1810 ± 40 BP (Beta-252630).

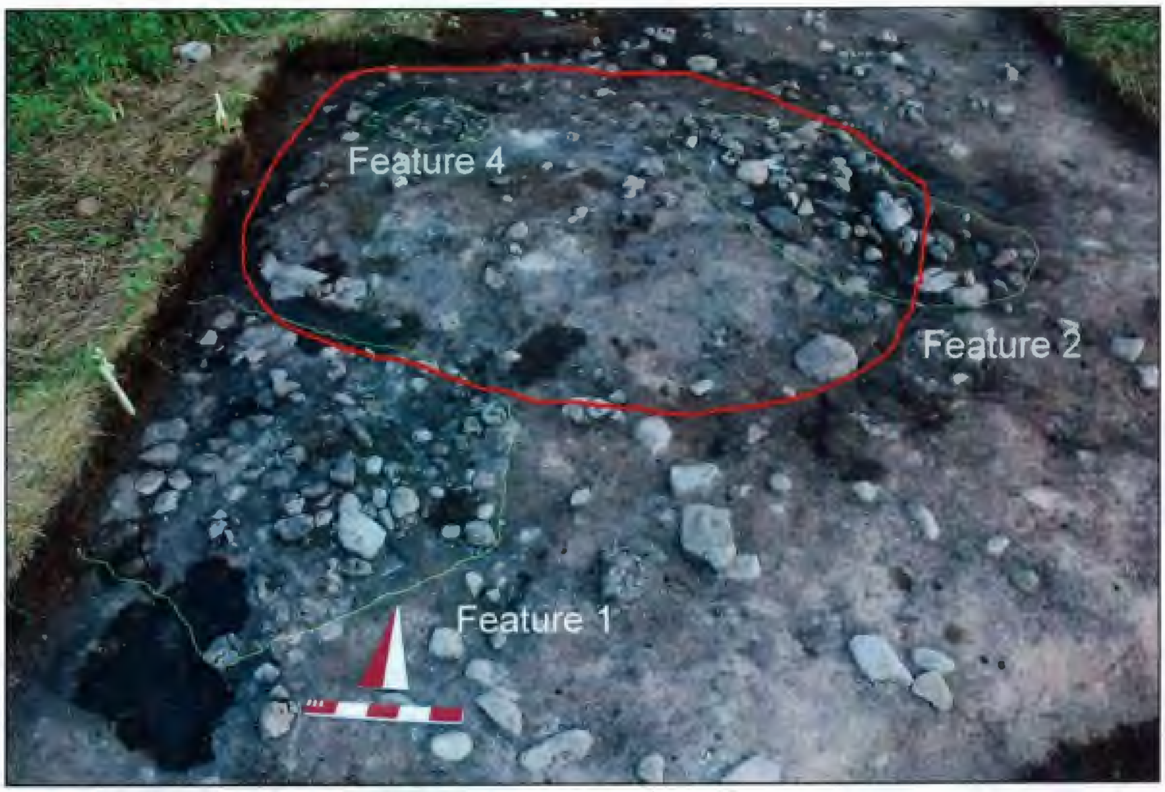


**Figure 3.15: Feature 3 (highlighted in red) (Photo: D. Lavers).**

<u>Feature 4</u>

This was a small circular hearth structure in Level 3 and on top of Feature 3 (Figures 3.15 and 3.16), in units N117 E100, N118 E100, N117 E101 and N118 E101. Feature 4 consisted of a small concentration of fire-cracked rock, measuring 50 cm x 50 cm. The matrix within this feature was Level 3a. Much of the fire-cracked rock was stained with this black charcoal lens. Few artifacts, mainly burned cores and flakes, were associated with this hearth.

Figure 3.16: Feature 4 (outlined by yellow string) (Photo: D. Lavers).

Feature 5

This was an ovate hearth structure located in Level 3 and on top of Level 4 in units N118 E101, N119 E100, N119 E101 and N119 E102 (Figure 3.17). Feature 5 consisted of a large concentration of fire-cracked rock, measuring 1.5 m x 60 cm. It ran northwest-southeast and the matrix within this feature was Level 3a. Much of the fire-cracked rock was stained with this black charcoal lens. Associated with this feature were many Recent Indian artifacts, mainly cores, as well as a few Groswater Palaeoeskimo artifacts.

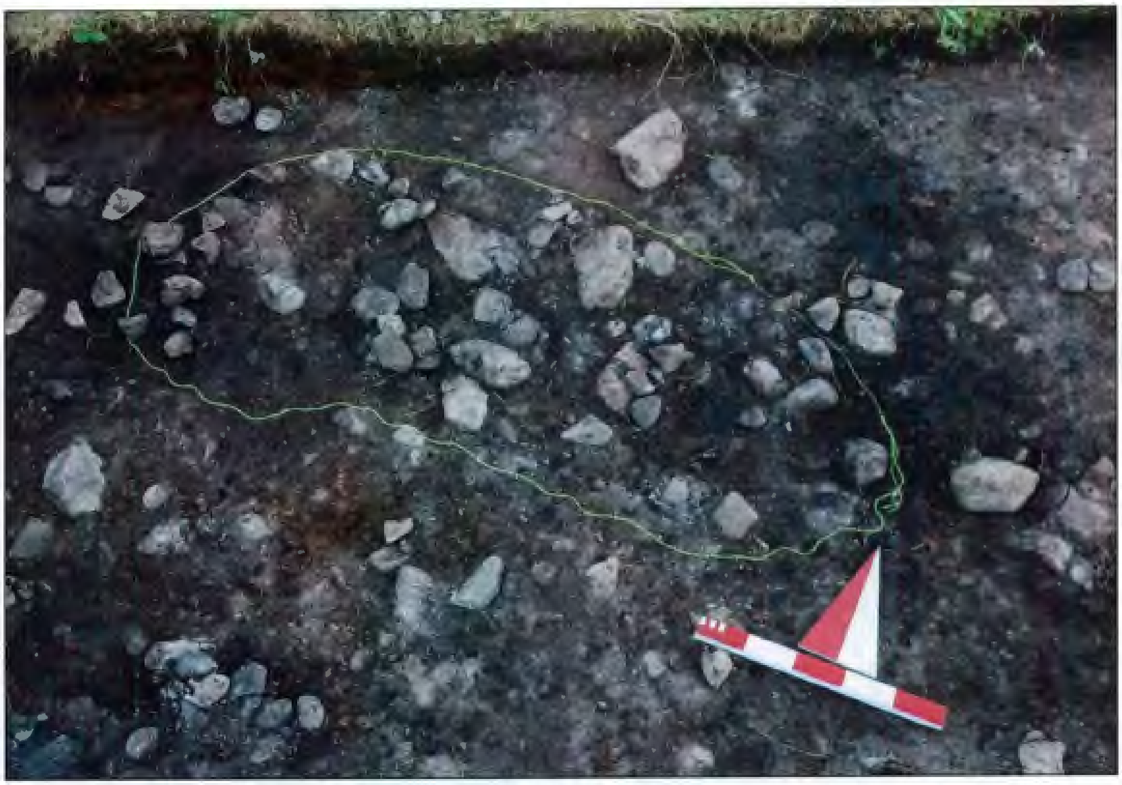

Figure 3.17: Feature 5 (outlined by yellow string) (Photo: D. Lavers).

*Lithic Material and Artifacts*

A total of 797 artifacts as well as 48,289 flakes was recovered from Area 1. Artifacts diagnostic of both the Recent Indian Cow Head complex and Groswater Palaeoeskimo cultures were found. A total of 211 Recent Indian and 201 Groswater artifacts were recovered. In addition, three Dorset Palaeoeskimo artifacts, one Maritime Archaic Indian axe and three pieces of European ceramic were recovered. Undiagnostic artifacts such as microblades, cores, flakes and hammerstones have been categorized as culturally undetermined. In the following sections, only the Cow Head complex and culturally undetermined material are discussed in detail. For a description of all other cultural material refer to Lavers (2008).

The dominant lithic material found at St. Paul's Bay-2 consists of a siliceous, microcrystalline chert. This material type is characterized as fine grained, with a glossy luster and an opaque translucency. Colours include: black, brown, green, yellow, purple, red, light blue and blue with white speckles. Radiolaria can be seen on some specimens. These siliceous cherts account for approximately 99% of the lithic assemblage and are visually similar to nearby chert outcrops, which have been identified as Cow Head chert (Coniglio 1978). Other lithic materials present include: Ramah chert, quartz crystal, rhyolite, quartzite and a white less-siliceous material. These materials are characterized as having a medium grain size with a glossy to dull luster and a clear to opaque translucency. These materials are present mainly in the form of complete or broken tools; few flakes were associated with these materials.

Recent Indian Cow Head complex

*Biface*

A total of 14 bifaces and biface fragments was found (Figure 3.18). The bifaces are primarily made from a non-siliceous material and rhyolite. These specimens have a dull luster with a medium grain size. The bifaces are characteristic of the Cow Head complex. Two of the bifaces are bi-pointed and leaf shaped and five have an expanding stemmed base. Colours present included: white, light blue/gray, and black.

*Preform*

A total of 164 preforms was recovered (Figure 3.19). Preforms for bifaces, projectile points and scrapers were identified. Preforms were made from siliceous cherts. These specimens have a fine grain size and a glossy to dull luster. Colours present include: black, a combination of black with brown swirls, black with white swirls, and blue with white speckles.

### *Projectile Point*

A total of 12 projectile points was recovered (Figure 3.20). The projectile points are diagnostic of the Recent Indian Cow Head complex. They are small, broad-bladed and have a straight, stemmed base (Figure 3.20-two on the left). A few non-stemmed projectile points with straight bases were also found (Figure 3.20-two on the right). These projectile points are made from a variety of raw materials which included Ramah chert, siliceous cherts and non-siliceous materials. Colours present include: white, black, blue with white speckles, tan with visible radiolaria, and orange.

### *Scraper*

A total of 21 scrapers was found (Figure 3.21). All specimens are large and made from either rhyolite or siliceous chert. The scrapers are long and wide. Some specimens have a thick cross-section. Colours include: black and brown.

Figure 3.18: Bifaces (Photo: D. Lavers).

Figure 3.19: Preforms (Photo: D. Lavers).

Figure 3.20: Projectile points (Photo: D. Lavers).

Figure 3.21: Scrapers (Photo: D. Lavers).

Culturally Undetermined

*Cores*

A total of 313 cores was found, two of which were microblade cores (Figure 3.22). Material type and quality of the cores varies with each specimen. Material types present are siliceous chert, quartzite, non-siliceous materials and rhyolite. Cortex is present on some specimens. Several colours are present and include: yellow, purple, white, black, brown, green, gray, blue with white speckles and red.

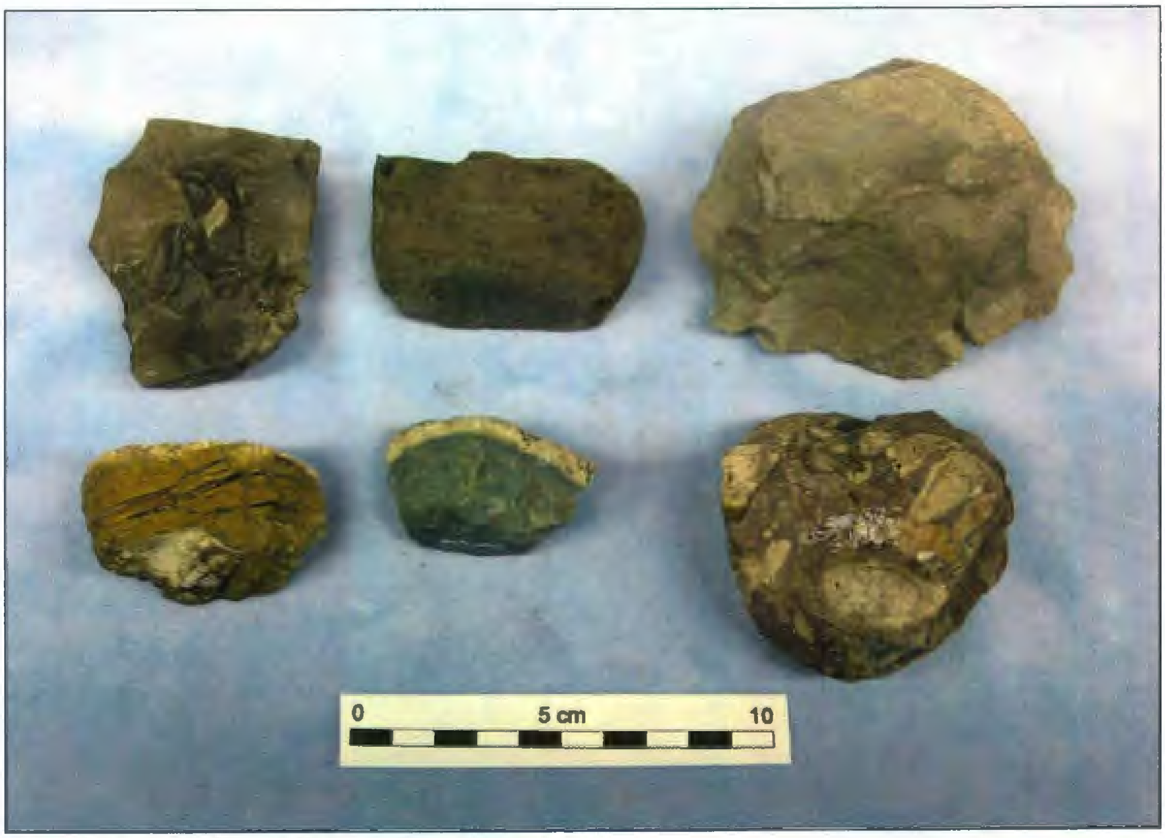


Figure 3.22: Cores (Photo: D. Lavers).

*Flakes*

A total of 48,289 flakes was recovered from Area 1 (Figure 3.23). Material types present include siliceous chert, Ramah chert, rhyolite, pink quartzite, silicified slate, quartz crystal and non-siliceous materials. Over 99% of the flake assemblage is made from siliceous chert. Colours include: black, brown, blue with white speckles and white, purple, yellow and green.

Figure 3.23: Flakes (Photo: D. Lavers).

*Hammerstones*

A total of nine hammerstones was recovered (Figure 3.24). The hammerstones range from the size of a golf ball to fist size. They are all made from granite and show signs of pecking. One specimen has the diameter of a basketball and may perhaps be an anvil stone (Figure 3.25).

Figure3.24: Hammerstones (Photo: D. Lavers).

Figure 3.25: Anvil stone (Photo: D. Lavers).

*Microblades/Linear Flakes*

A total of 56 microblades and microblade fragments was found (Figure 3.26). They are long and narrow and are made from fine grained, siliceous cherts. The chert has a glossy luster and is highly colourful. Colours include: red, green, blue, yellow, black, blue with white speckles and white. One microblade is made from clear quartz crystal.

Figure 3.26: Microblades (Photo: D. Lavers).

**Site Function**

St. Paul's Bay-2 is a dual-component Recent Indian Cow Head complex and Groswater Palaeoeskimo site; artifacts diagnostic of both cultures were recovered. In the following section, only data pertaining to the Cow Head complex are discussed. Information presented in the previous sections is examined and analyzed to determine site function. Structural evidence, raw material use and the lithic assemblage indicate that the site was primarily used as a lithic quarry/workshop site where secondary domestic activities occurred. This hypothesis is tested in the following sections and chapters and the data are compared to other Cow Head complex sites located on the Northern Peninsula.

*Artifact Assemblage Comparison*

The Recent Indian component of St. Paul's Bay-2 is attributed to the Cow Head complex. A total of 211 Recent Indian artifacts (Table 3.3) was recovered. Diagnostic artifacts recovered included: large, leaf-shaped, bipointed bifaces, large, contracting-stemmed bifaces, broad bladed projectile points and large endscrapers (Figures 3.18-3.21). Culturally undetermined artifacts included: 313 cores, nine hammerstones, 56 microblades/linear flakes and 48,289 flakes.

| **Artifact** | **Total** | **Percent** |
|---|---|---|
| **Biface** | 14 | 6% |
| **Preform** | 164 | 78% |
| **Projectile Point** | 12 | 6% |
| **Scraper** | 21 | 10% |
| **Total** | 211 | 100% |

Table 3.3: Diagnostic Recent Indian artifact count and percentage.

The lithic assemblage found at St. Paul's Bay-2 is characteristic of Gramly's (1980) definition of a lithic workshop site. Gramly (1980:825, 1984) states that there are three major classes of artifacts recognized at a lithic workshop/habitation site: 1) debitage (waste flakes, cores and uncompleted tools, such as preforms); 2) tools of manufacture (hammerstones); and 3) curated tools (finished tools that may or may not be broken).

These classes of artifacts have also been noted at other workshop/habitation sites (Brumbach and Weinstein 1999; Burke 2007; Parker 1925; Petraglia 1994; Stevenson 1985; Stoltman *et al.* 1984). It is evident that these classes of artifacts occur in the St. Paul's Bay-2 tool assemblage.

Furthermore, Gramly (1980, 1984) goes on to discuss that these tool classes are so specific to workshop sites that their numbers should not be matched at task-specific sites and residential locations. Therefore, the Cow Head complex lithic assemblage from St. Paul's Bay-2 will be compared to the Cow Head complex lithic assemblage from a habitation site, the Gould site (see Chapters 2 and 7). In addition, these artifact assemblages will be compared to a known Cow Head complex lithic quarry/workshop site, Peat Garden. This will determine if the St. Paul's Bay-2 lithic assemblage is more similar to a workshop or habitation site.

By comparing lithic assemblages from the Gould site and Peat Garden to the lithic assemblage from St. Paul's Bay-2, it is evident that St. Paul's Bay-2 is more similar to a workshop site than a habitation site (Table 3.4 and Figure 3.27). At both St. Paul's Bay-2 and Peat Garden there is a high relative proportion of preforms, greater than 50%; no preforms were found at the Gould site. When compared to the Gould site, all other artifact types found at St. Paul's Bay-2 and Peat Garden are present in small numbers. Bifaces, projectile points and scrapers make up 100% of the lithic assemblage at the Gould site, whereas they only make up 22% at St. Paul's Bay-2 and 50% at Peat Garden. Overall, based on this comparison it is apparent that the Cow Head complex lithic assemblage from St. Paul's Bay-2 is more similar to that of a quarry/workshop site than a residential base.

| | St. Paul's Bay-2 | | Gould Site | | Peat Garden | |
|---|---|---|---|---|---|---|
| **Artifact** | **Total** | **Percent** | **Total** | **Percent** | **Total** | **Percent** |
| Biface | 14 | 6% | 28 | 70% | 15 | 15% |
| Preform | 164 | 78% | 0 | 0% | 47 | 50% |
| Projectile Point | 12 | 6% | 11 | 28% | 6 | 6% |
| Scraper | 21 | 10% | 1 | 2% | 27 | 29% |
| **Total** | **211** | **100%** | **40** | **100%** | **95** | **100%** |

Table 3.4: Comparison of relative frequency of artifact types from St. Paul's Bay-2 and the Gould site.

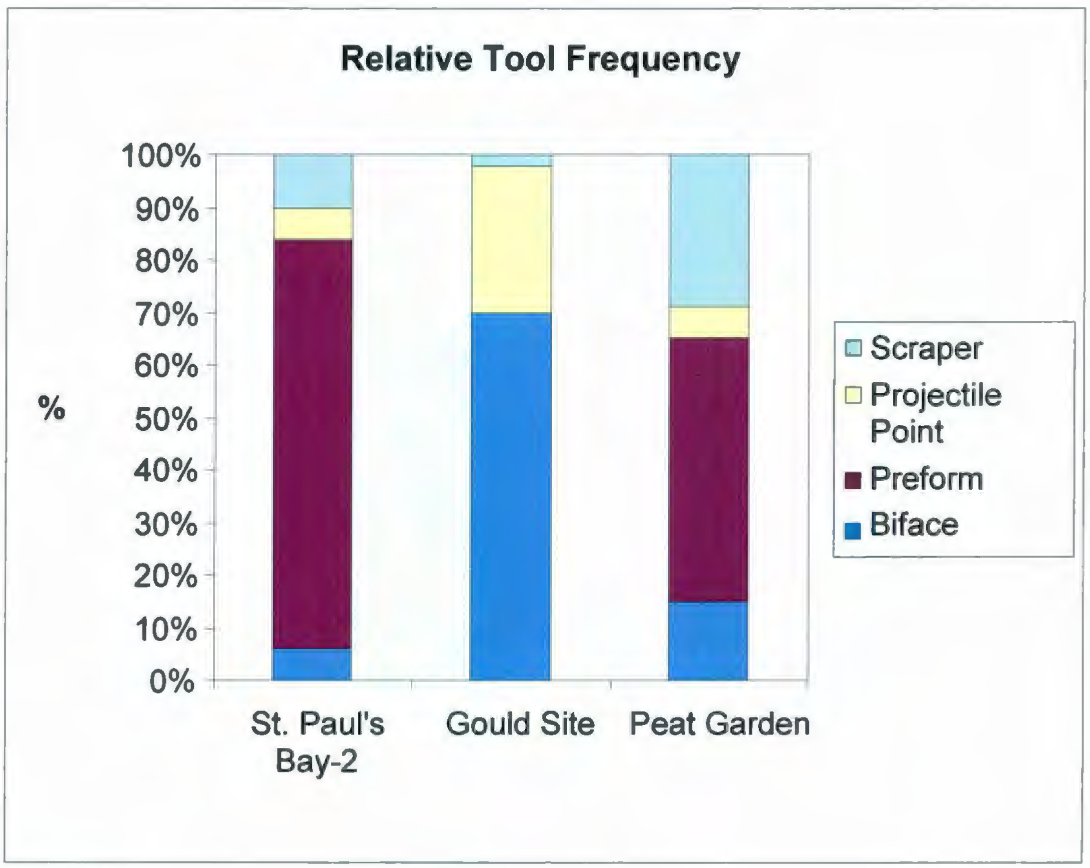


Figure 3.27

*Raw Material*

As previously mentioned, approximately 99% of the St. Paul's Bay-2 lithic assemblage is made from siliceous chert. This chert has been characterized as having a fine grained, glossy luster, and an opaque translucency. The chert is present in many colours, which includes: black, brown, purple, green, yellow, red and blue with white speckles. More importantly, lithic materials found at St. Paul's Bay-2 are visually identical to raw materials found at nearby outcrops of Cow Head chert in St. Paul's Inlet (Figure 3.5).

Survey of the Cow Head chert outcrop in St. Paul's Inlet, which is approximately 20 meters south of St. Paul's Bay-2, has revealed artifacts associated with quarrying/workshop activities, such as hammerstones, cores and preforms. In Chapter 5, geochemical and visual comparison of artifacts from St. Paul's Bay-2 to raw material samples of Cow Head chert collected from two outcrops, one in St. Paul's Inlet and the other in Cow Head, will determine if the majority of the site's lithic assemblage is made up of Cow Head chert. Additionally, the use of these techniques will aid in the association of St. Paul's Bay-2, an identified lithic quarry/workshop site (see above section), to a lithic outcrop.

Non-local and exotic raw materials have also been found at St. Paul's Bay-2. Ramah chert, quartzite, rhyolite and quartz crystal have been found in small quantities, approximately 1% of the total assemblage. These materials show up in the form of finished tools, or what Gramly (1980, 1984) refers to as *Class 3* (see above section). Researchers studying and analyzing lithic material from other similar quarry/workshop sites have noted that complete artifacts made from non-local or exotic materials turn up in small amounts (Brumbach and Weinstein 1999; Gramly 1980, 1984; MacDonald 1995; Parker 1925; Petraglia 1994). The recovery of these finished tools made from non-local and exotic lithic material has been interpreted by Gramly (1980, 1984) as resulting from tasks carried out elsewhere where the tool is later discarded at a quarry/workshop site in favour for newly manufactured ones. At St. Paul's Bay-2 this is the case as finished tools made from non-local and exotic materials were either broken or exhausted (Figure 3.3 and 3.4). Furthermore, Hartery (2001, 2007) has noted a similar artifact assemblage occurring at two other Cow Head complex lithic quarry/workshop sites, the Spearbank site and Peat Garden. Hartery also noted that these tools account for less than 1% of the total assemblage.

Overall, the dominating presence of one material type, which occurs primarily in the form of debitage, cores and preforms, strengthens the above statement that St. Paul's Bay-2 is a lithic quarry/workshop site. In Chapter 5, a sample of artifacts from the site is geochemically and visually compared to samples taken from the two nearby sources of Cow Head chert in order to determine if these outcrops are the source of the site's lithic material.

*Structural Evidence*

Four hearth features and a dwelling found at St. Paul's Bay-2 are associated with the Recent Indian occupation of the site (Table 3.5). The presence of these structures suggests that St. Paul's Bay-2 had a domestic or living component.

| Lab Number | Site Name and Sample | Context | C14 years BP Uncalibrated |
|---|---|---|---|
| Beta-252627 | DlBk-06:98 | Feature 1 | 1100 ± 70 |
| Beta-252628 | DlBk-06:310 | Feature 2 | 1330 ± 50 |
| Beta-252629 | DlBk-06:442 | Feature 5 | 1250 ± 70 |
| Beta-252630 | DlBk-06:809 | Feature 3 | 1810 ± 40 |

Table 3.5: Summary of radiocarbon dates from St. Paul's Bay-2.

Feature 3, a platform structure, has been interpreted as a dwelling based on the construction of the feature and its associated and non-associated cultural material. The dwelling is defined by a raised semi-circular platform approximately 2 m x 3 m. Very little cultural material was associated with this structure. There was, however, Groswater material found throughout the pea-gravel lens that comprises the structure. This suggests that the Recent Indians gathered the pea-gravel elsewhere and deposited it on the site, as pea-gravel was not found on any other part of the site. In addition, underneath the pea-gravel layer, in Level 4, were many Recent Indian and Groswater flakes and artifacts. No hearths or other structural remains were directly associated with this dwelling. However, a date of 1810 ± 40 BP is associated with the dwelling (Table 3.3), which indicates that the structure is Cow Head complex in origin.

Only one other Cow Head complex dwelling has been found to date, at the Gould site in Port au Choix (Teal 2001). The dwelling is defined as a shallow depression recognized by a thin, charred peat layer measuring 3 m x 2 m (Teal 2001) which dated to 1500 ± 40 BP (Beta-134156). Associated with the dwelling were numerous pieces of pottery, calcined bone, shell, red ochre, fire-cracked rock, flakes, cores, biface and biface fragments, ground stone fragments, and contracting stemmed projectile points (Teal 2001). Teal (2001) associated this house with domestic activities and tool maintenance.

The dwelling at St. Paul's Bay-2 differs greatly from the Gould site dwelling. Although these two structures have similar dimensions, they differ in construction and use. Whereas the structure at the Gould site is a shallow depression, the dwelling at St. Paul's Bay-2 is a raised platform made of pea-gravel. In addition, surrounding the dwelling at St. Paul's Bay-2 were eight large stones, measuring from 50 cm x 25 cm to 20 cm x 30 cm (Figure 3.28), which may have been used to hold down a skin tent. The two dwellings also differ from each other in terms of associated material. Whereas a wide range of cultural material and flakes were found in the dwelling at the Gould site, hardly any artifacts or flakes were found in direct context with the dwelling at St. Paul's Bay-2. This suggests that the floor may have been covered with skins or that most activities, such as cooking and tool manufacture, took place outside. From this, the dwelling at St. Paul's Bay-2 is unique in comparison with the Gould site dwelling; however, this could be due to differing dwelling function.

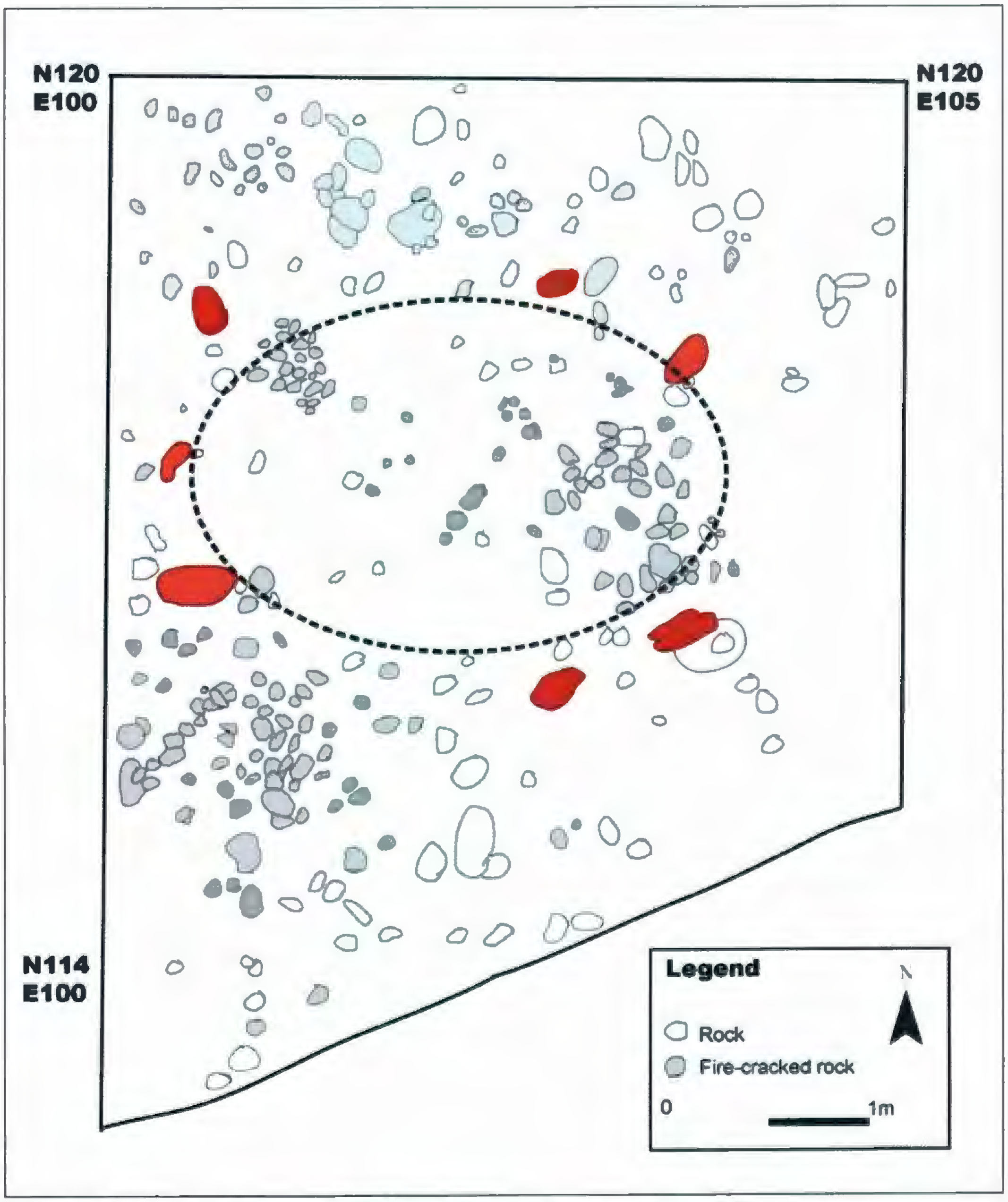

Figure 3.28: Outline of Feature 3 (dwelling) showing large rocks (in red).

## Summary

The 2008 archaeological investigations at St. Paul's Bay-2 provided sufficient information to fully address one of my research objectives, which was to determine site function.

St. Paul's Bay-2 was occupied by two cultural groups, the Groswater Palaeoeskimo and the Recent Indian Cow Head complex and served primarily as a quarry/workshop site for the production of stone tools; a secondary living component is also noted.

Based on the artifact assemblage and raw material analysis provided in the above sections, St. Paul's Bay-2 appears to have a similar site function as other Recent Indian Cow Head complex sites located on the Northern Peninsula. The large amounts of debitage (48, 289 flakes) and artifacts, primarily preforms (78%), and the lack of others, such as projectile points (6%) and scrapers (10%), indicates that St. Paul's Bay-2 served primarily as a lithic quarry/workshop site where the Cow Head complex people manufactured stone tools.

To answer my second objective, which is to associate St. Paul's Bay-2 with the nearby quarry of Cow Head chert I hypothesized that the majority of the artifacts from the sites lithic assemblage was manufactured from stone procured from the nearby source of Cow Head chert at St. Paul's Inlet (Figure 3.5). This hypothesis is examined later in this thesis (Chapter 5).

In the following chapter, the method and techniques used to investigate this objective are discussed and explained.

# CHAPTER 4

# METHODOLOGY

This chapter discusses and explains the methodological and technical aspects of this thesis. As mentioned in the previous chapter, another objective of this research is to connect chert artifacts from St. Paul's Bay-2, a Recent Indian Cow Head complex quarry/workshop site, to a known source. The methodology employed in this research is therefore centered on this objective.

This objective is concerned with the sourcing of lithic artifacts from St. Paul's Bay-2, therefore provenance analysis is the method applied. Two different techniques that aid in the identification and sourcing of artifacts are utilized, visual characterization and laser ablation inductively coupled plasma mass spectrometer (LA-ICP-MS). This combined approach is introduced in this chapter and, in the following chapters, applied to archaeological lithic material recovered from Recent Indian Cow Head complex sites on the Northern Peninsula in order to determine if Cow Head chert is present in their lithic assemblages. Overall, this will aid in the identification of Cow Head chert lithic procurement strategies amongst the Cow Head complex, which is the overall objective of this thesis.

## Methodology[3]: Provenance Analysis

One of the overall objectives of this research is to connect chert artifacts from St. Paul's Bay-2 to a known source; therefore, the primary method used in this study is provenance analysis. The provenance of an artifact refers to the "location, site, or mine that is the origin of an artifact's material" (Rapp and Hill 1998:134). In geoarchaeological terms, this refers to "a specific geologic deposit – usually a quarry, mine, geologic formation, outcrop, or other coherent and bounded geological features" (Rapp and Hill 1998: 134), from which an artifact was made. Provenance analysis is the main method applied to this research using the LA-ICP-MS technique. This provides the means to identify the presence of Cow Head chert in Recent Indian Cow Head complex lithic assemblages therefore aiding in the identification of its lithic procurement strategies.

### *Lithic Provenance in Archaeology*

In many cases within the archaeological literature, a discussion of lithic raw material is usually limited to a sentence or two. For example, when describing the lithic assemblage from Clam Cove (BhDc-5), a Late Woodland site on Cape Split, Bay of Fundy, Nova Scotia, Halwas (2006:28) states that "lithic artifacts found at Clam Cove are made from pink green jasper/agates." In addition, some researchers go a step further and include interpretations regarding the origins of the lithic material. Halwas (2006:28) states that "a total of 175 chipped stone artifacts were recovered from the four excavations. The Davidson's Cove quarry site, across Scots Bay, is the likely source of the raw material

[3] "Methodology," in the context of this research, refers to the systematic process by which an investigation is carried out; for example, provenance studies. This is not to be confused with the term "technique," which refers to the actual physical process by which the method is undertaken, such as LA-ICP-MS.

used for the lithics at Clam Cove" (see also Deal 2001, 2003). However, in many cases such as this one, logistical inferences are based on a visual inspection of the lithic artifacts and analytical analyses such as petrography and INAA are not utilized to justify the findings. Lithic provenance analyses like these are very rudimentary and are often included to provide some basic form of information that is not directly related to the overall objective of the research. On the other hand, when a lithic provenance study is useful or important to the research objectives, more investigative measures will be undertaken, such as those aiding in the characterization or sourcing of lithic artifacts. These provenance techniques range from basic (recording colour, texture, and translucency) to complex (using scientific equipment to determine the chemical composition of an artifact).

Until recently - that is, within the past two decades - provenance analysis usually involved comparing the visual and/or qualitative attributes such as colour, texture, and translucency of lithic artifacts with samples from known geological deposits. As documented by some researchers, this visual technique had proven to be successful (Bailey 2002; Ferguson and Warren 1992; Hess 1996; Luedtke 1979), but with others it has not (Calogero 1992; Jackson and Love 1991; Moholy-Nagy and Nelson 1990). Therefore, as mentioned in Chapter 2, due to the unreliability of visually characterizing lithic artifacts alone, some researchers began to incorporate archaeometric techniques such as INAA and LA-ICP-MS into their research (Hoard *et al.* 1993; Moholy-Nagy and Nelson 1990; Roll *et al.* 2005; Selivanova *et al.* 1998; Speakman and Neff 2005; Tykot 2003).

In recent years, provenance analysis has evolved to include many archaeometric techniques that comprise of chemical and biological parameters such as trace elements, isotopes, microfossils and diagnostic minerals (Rapp and Hill 1998; Shackley 2008; Tykot 2003, 2004). These techniques increase the accuracy in lithic provenance studies and provide data that researchers can quantify (Milne *et al.* 2009: 430), as opposed to visually sourcing lithics, which does not provide quantifiable data and is generally subjective. As a result of the onset of these new technologies, researchers began to generate large databases of information which in turn resulted in an increase in scholarly articles pertaining to lithic sourcing (Shackley 2008).

In addition, with these technological advances came improvements in sample handling, precision, accuracy and developments in data reduction (Tykot 2003, 2004). In conjunction with this, researchers started to combine various techniques, such as ICP-MS (elemental) and petrographic thin-sectioning (visual) (Hess 1996). Researchers found that when various qualitative and quantitative techniques were combined the probability of connecting a lithic artifact to a known source increased (Hoard *et al.* 1992; Hoard *et al.* 1993; Pollok *et al.* 1999; Roll *et al.* 2005; Selivanova *et al.* 1998; Shackley 2008; Wilson 2007). For example, by examining visual, microscopic and mineralogical concentrations, Hess (1996) was better able to connect artifacts from the Mack Canyon site (Oregon) to a known source. From this study, Hess (1996) demonstrated that both accuracy and reliability of provenance analysis, as well as personal confidence, increased when data were subjected to a combination of various techniques. The effectiveness of combining various analytical techniques has been demonstrated by other researchers as well (Hess

1996; Hoard *et al.* 1993; Milne *et al.* 2009; Roll *et al.* 2005; Selivanova *et al.* 1998; Shackley 2008; Wilson 2007). The reliance on a single technique for artifact characterization is generally not recommended (Diethelm 2004; Hess 1996; Luedtke 1978, 1979, 1987a, 1993; Perry 1993; Tykot 2003).

Like the above example, the research presented in this study incorporates data collected from two types of techniques: visual and chemical (LA-ICP-MS). The combination of these techniques, which will be discussed later in this chapter, will further help in the identification of Cow Head chert. Given that provenance analysis is a major concept in this study, the following section will provide a general overview of the prerequisites for a successful study of this nature.

*Prerequisites of Provenance Studies*

Certain conditions must be met for a provenance study to be effective (Luedtke 1987b, 1992; Rapp and Hill 1998; Selivanova *et al.* 1998; Shackley 2008; Tykot 2003, 2004). These include:

1) locating and taking adequate samples of all potential geologic source deposits for the specific material in question. This also includes analyzing the extent, density, geological setting and variability of the geological deposit(s);

2) when multiple geological deposits are known, measurable and statistical differences must exist between them. Visual properties such as colour, texture, and elemental or isotopic concentrations must be characterized for each deposit;

3) the artifact(s) to be analyzed must not have undergone any chemical or physical modifications. The material, from which the artifact(s) is made, must retain the visual, chemical, or mineral characteristics of its geologic deposit;

4) the analytical method chosen must have the sensitivity and scope to provide diagnostic signatures for each geologic deposit as well as the artifact(s) in question;

5) the artifact(s) to be analyzed must meet the prerequisites of the analytical technique(s) to be used. These may include minimum and maximum sample size and the state of the sample. For example, in LA-ICP-MS the artifact(s) to be analyzed needs to be smaller than 7.6 by 2.5 centimetres in order to fit into the laser cell. Also, some analytical techniques, require the artifact to first be ground in to a powder form before analysis;

6) the statistical or data analysis to be used must have the capacity to evaluate the data and process it in such a way as to assign the artifact(s) to a geologic deposit; and

7) the technique(s) employed must meet the requirements of the project, which include timeframe, cost, and research objectives.

Ideally, one would want all prerequisites to be met; however this may not reflect reality. For some case studies, not all possible raw material sources were known; therefore some of the artifacts did not match the known source(s) (Moholy-Nagy and Nelson 1990; O'Driscoll 2003; Roll *et al.* 2005; Selivanova *et al.* 1998; Tykot 2003, 2004). In other instances, multiple prerequisites were not met. For example, in her study of soapstone from a sample of Dorset Palaeoeskimo contexts, O'Driscoll (2003) was only able to identify one location as a Dorset soapstone quarry (Fleur de Lys), something that had already been noted by Erwin (2001), based on associated cultural material and radiocarbon dates. O'Driscoll (2003: 114-115) concluded that one of her major problems in sourcing soapstone was due to many unfulfilled prerequisites, primarily inadequate sample size and sample location.

O'Driscoll's (2003) sample size, both archaeologically and geologically, was small which affected her overall results. In some instances only one sample was collected and analyzed from archaeological and geological context. Secondly, in some examples, the geological sample location was incompatible with that of archaeological specimens. For instance, geological samples of Fleur de Lys soapstone was not taken at the Dorset Palaeoeskimo soapstone quarry site, but rather at another location in the town. This caused O'Driscoll (2003) some discrepancy as one of her research goals was to link various archaeological samples back to the Dorset Palaeoeskimo soapstone quarry in Fleur de Lys.

In this research, the majority of the necessary prerequisites have been met. However, concern lies with the small number of samples analyzed for some sites, such as Portland Creek 4 and 5 and L'Anse aux Meadows, as well as the uncertain context from which some of these artifacts were obtained (discussed below).

## Sampling Techniques

Each of the following sections describes and discusses the sourcing techniques employed in this research. The flow chart below (Figure 4.1) illustrates the steps that comprise the methodology applied in this study. This chapter will discuss outcrop and artifact sampling and how these samples were analyzed. The following two chapters discuss the results of this analysis, correlating the sampled artifacts to known and tested outcrops.

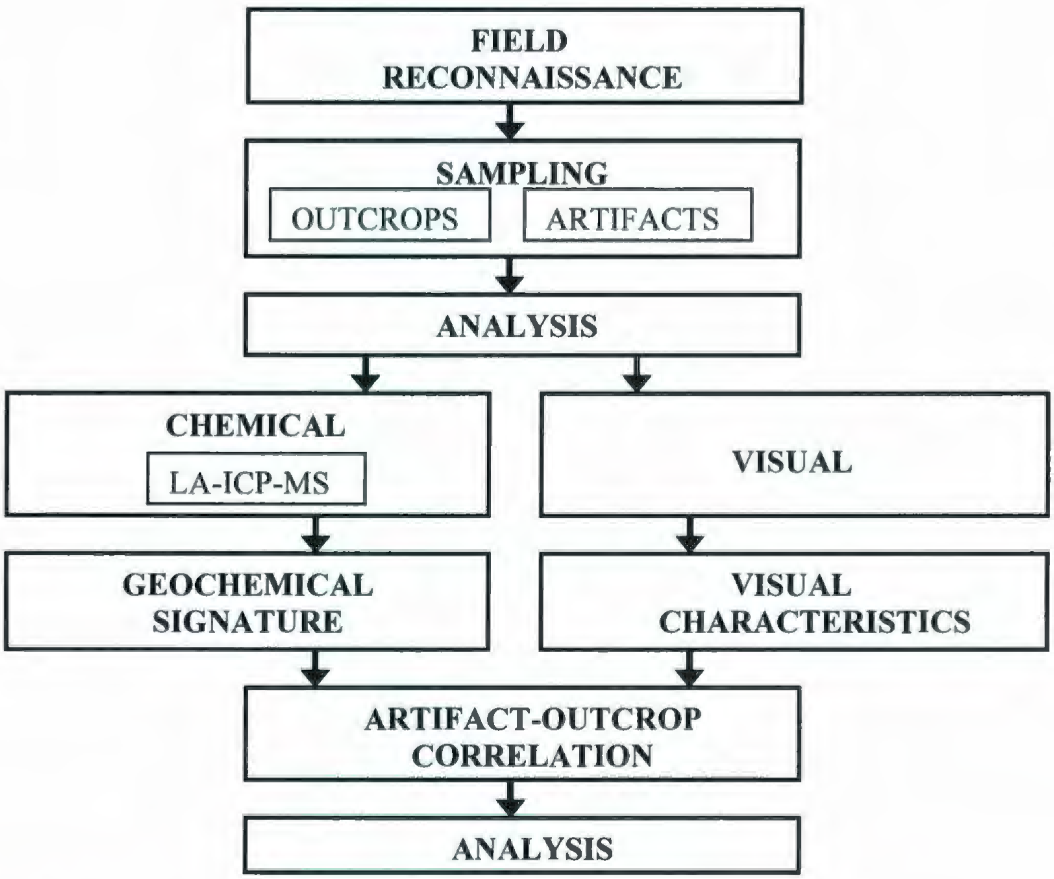


Figure 4.1: Schematic flow chart of the methodology used in this research (Adapted from Selivanova *et al.* 1998:678 and Burke 2000:269).

The overall success of chert sourcing depends heavily on the representative sampling of both the geologic deposits and archaeological lithic assemblage(s) in question. A representative set of samples will reflect the compositional variability and geochemical signature within each geologic deposit and artifact. Selivanova *et al.* (1998) suggest that 15-20 samples provide a reliable range of chemical variability of chert within a source. Therefore, where possible, 20 artifacts from each site and geologic deposit were taken for the present analysis.

However, factors such as assemblage size, availability of artifacts, and other factors described below affected the number of artifacts that could be analyzed. For example, although there are over a hundred artifacts in the assemblage from L'Anse aux Meadows, only six could be geochemically analyzed. This was due to the fact that the majority of artifacts from the site were too large to be tested by the chosen technique, LA-ICP-MS.

*Outcrop sampling*

Based on geological maps and literature, two areas were chosen for collecting chert samples: the beach at Cow Head (Figure 4.2) and St. Paul's Inlet (Figure 4.3). The chert located on these beaches has been classified as Cow Head chert (Coniglio 1987). These locations were also chosen because of their easy accessibility as well as their association to nearby Recent Indian Cow Head complex sites, Spearbank and St. Paul's Bay-2. Furthermore, LeBlanc (2000a, 2000b, 2008) suggests that the chert quarry at Cow Head was heavily exploited by past prehistoric cultures primarily because it was easily accessible all year around.

Many lithic specimens were collected from both beaches to maximize the coverage for any potential compositional variability within each deposit. As well, each sample was comprised of one or more distinctive colours. The specimens collected were brought back to the Northern Peninsula Collections Lab at the Archaeology Unit, Memorial University, where they were analyzed.

Figure 4.2: Cow Head beach. Many of the cobbles shown are Cow Head chert (Photo: D. Lavers).

Figure 4.3: Beach at St. Paul's Inlet. Chert is available in both cobble and banded forms (Photo: D. Lavers).

*Artifact Sampling Strategy*

The primary objective of the artifact sampling strategy was to obtain a sufficient number of specimens to represent the full range of chert varieties present in each site's artifact assemblages. Selivanova *et al.* (1998) suggest that each type of chert visually distinguishable in the assemblage, both by colour and texture, should be sampled. Where possible, this was accomplished for each site assemblage. In addition, other criteria had to be met before an artifact was chosen for analysis. These were:

1) each artifact had to have been associated with a Recent Indian Cow Head complex occupation;

2) each artifact had to have been recovered from primary context. An exception is Portland Creek 4 and 5, which were surface collected. These are categorized as Cow Head complex Recent Indian based on associated cultural material;
3) each artifact had to be smaller than 3 cm by 5 cm by 0.5 cm so that it could fit within the size limitation of the laser ablation instrument;
4) those artifacts associated with an associated radiocarbon date should be given priority and;
5) the interior or unaltered parts of the artifact should be selected for analysis.

Ninety-three artifacts and outcrop samples were analyzed by LA-ICP-MS at the Memorial University CREAIT (Core Research Equipment and Instrument Training Network) Lab in St. John's, Newfoundland, to determine chemical composition. Also, all samples were characterized visually by the author using the Munsell Colour Charts (2000). The techniques and procedures by which this was done are discussed below.

**Technique: Visual and Chemical Analysis**

In this research two sourcing techniques are used: visual and LA-ICP-MS (chemical characterization). These techniques were chosen for this research based on many factors. The two primary reasons for the use of LA-ICP-MS was its ability to detect virtually any element in the periodic table in trace amounts, as well as micro-destructive nature. These were very important factors in this research as it is the trace elements present within the Cow Head chert that help determine its source. Other techniques, such as petrography, XRF and INAA were available; however factors such as their detection limits eliminated their use as well as their sometimes destructive nature. The specimens analyzed in this research are rare to the understanding of Newfoundland's prehistory and therefore could not be destroyed. Visual analysis was also used because it has been proven to compliment LA-ICP-MS studies (Hess 1996; Milne *et al.* 2009; Selivanova *et al.* 1998), is free-of-charge and is fast and non-destructive.

The following section discusses and explains both techniques and the processes involved for each. Results of these analyses will be presented and discussed in Chapters 4 and 5.

*Visual Characterization*

Characteristically, the analysis of lithic artifacts and raw material starts with visual observations. Qualitative attributes such as colour, texture, luster, translucency, inclusions, density, and hardness are commonly noted and described. In some instances, these properties alone are enough to connect an artifact to a known source. For example, Bailey (2002) was able to connect a number of olive green chert artifacts from various Paleo-Indian sites in Western Wisconsin to a known source by analyzing colour, texture, translucency, luster and inclusions.

For this study, six visual attributes were examined: colour, colour pattern, translucency, inclusions, texture, and luster[4]. These attributes were also examined by past researchers to characterize and identify Cow Head chert (Hartery 2001, 2007; LeBlanc 2008; Nagle 1984, 1985, 1986; Reader 1993; Simpson 1984, 1986). All of the attribute

[4] Raw material type was not examined in this research because all specimens have been identified as chert.

states discussed in this chapter are modelled after Luedtke (1992). These qualitative attributes are described below.

Colour is the most obvious visible and documented characteristic of chert; however, it is one of the least diagnostic means of identifying raw material. The most common colours of chert are black and gray; however, other colours, such as blue, green, white, red, purple, orange, yellow, pink, gold and brown, have been noted. Like many other studies, colour in this research was examined using the Munsell Colour Chart (2000).

When studying colour of lithics researchers have to be aware of environmental or cultural factors which may affect the true colour of the artifact, such as weathering and heat treating. Colour, in this study, was analyzed in three aspects: chroma, hue, and value. Chroma refers to the intensity of the colour, hue is the general colour, and value is the lightness or darkness of the colour.

Colour pattern or structure, on the other hand, is a very distinctive aspect of chert. When sedimentary layers are undergoing different rates of silicification and replacement during chert diagenesis various color and color patterns are formed within the chert. These processes can cause stripes, spots, streaks, or splotches to form. Three categories of colour pattern were examined: solid, mottled/speckled, and banded/striped.

Translucency is the degree to which light can pass through the artifact edges. An artifact is considered transparent if light can pass through its edges, translucent if light can pass partially through the edges and opaque if no light passes through the edges. To assess the degree of translucency specimens are held up to a light source.

Inclusions, such as fossils or impurities, are other attributes which are often used to determine provenance because they can be highly indicative of a geologic deposit. Documented by geologists and archaeologists (Coniglio 1987; LeBlanc 2008; Nagle 1984, 1985, 1986), Cow Head cherts are often characterized by the presence of sponge spicules or radiolaria. These sponge spicules can be seen with the naked eye and are visible as circular spots that are darker or lighter that the ground mass; their presence or absence will be recorded for each specimen sampled.

Texture refers to the size of the grain particles that constitute a raw material. Three categories make up this attribute. Coarse grained materials have large, very noticeable grains, visible to the naked eye, medium grained materials have grain particles that are not noticeable to the naked eye and can only be seen with a 10x hand lens, and fine grained materials have very small grain particles that are not noticeable with the naked eye or a 10 x hand lens.

Luster is the degree to which light is reflected off the surface of the material. Two categories make up this attribute. Dull luster has minimal reflection and waxy luster has a high reflection that causes the material to look slick. Luster is determined by looking at the specimen under a good light source.

These six attributes were systematically recorded for each of the chert artifacts analyzed in this research. Artifacts were examined under natural light and information was recorded on a data sheet (Appendix A). The results of this analysis are presented in Chapters 5 and 6.

*Archaeometric Analysis*

To complement the visual analysis of chert artifacts, a preliminary study of trace elements found in Cow Head chert was undertaken utilizing LA-ICP-MS. Samples of chert artifacts from seven Recent Indian Cow Head complex sites from the Northern Peninsula as well as samples collected from geologic deposits from the Northern Peninsula were tested. Results will indicate if the chert on these sites is Cow Head chert, therefore providing a connection between them.

The following section will begin with a description of the LA-ICP-MS technique, followed by a description of the procedure used. Results of the testing will be presented in the following chapters.

*LA-ICP-MS Technique*

Since its emergence in the early to mid 1980s, LA-ICP-MS has evolved into one of the most powerful analytical tools used to source lithics (Gratuze *et al.* 2001; Speakman *et al.* 2002; Speakman and Neff 2005). Over the past two decades, researchers have used this technique to chemically characterize a variety of materials such as glass, pottery, metals, stone and glazes.

Within archaeology, LA-ICP-MS has become one of the foremost techniques for sourcing lithic material. One of the primary reasons for its success is its ability to provide compositional data for almost any element in the periodic table (approximately 50-60 elements), whereas other techniques, such as INAA, can only provide compositional data for 30 elements (Gratuze *et al.* 2001; Speakman *et al.* 2002; Speakman and Neff 2005). In addition, LA-ICP-MS has the capacity to read these elements in parts-per-million (ppm) and parts-per-trillion (ppt). This capability to detect a wide range of elements at minute amounts is very important to researchers dealing with somewhat homogenous materials such as chert and obsidian because LA-ICP-MS offers the potential to provide high resolution data on trace elements. When dealing with homogenous materials, such as chert and obsidian, it is trace elements that are used to characterize the material (Speakman *et al.* 2002; Speakman and Neff 2005).

Another important factor for the use and success of LA-ICP-MS is that it provides point specific characterization, whereas other techniques, such as X-Ray Florescence (XRF) provide bulk characterization (Neff 2003; Speakman *et al.* 2002; Speakman and Neff 2005). Point specific is useful for researchers who want to analyze particular spots, minerals, or inclusions on a sample, whereas bulk characterization analyzes the whole specimen. Related to this factor is the micro-destructive nature of LA-ICP-MS (Neff 2003; Speakman *et al.* 2002; Speakman and Neff 2005). LA-ICP-MS can analyse artifacts or samples in their solid state which therefore enables rare and important artifacts to be tested. Other archaeometric techniques, such as INAA and XRD, are very destructive as they require the artifact or sample to be in powder form. LA-ICP-MS also has the ability to process many samples at one time and is cost effective. For these reasons, this technique was chosen for this study.

*Procedure*

The testing for this study was performed in the CREAIT Lab at Memorial University under the supervision of Mike Tubrett, the LA-ICP-MS technician. In LA-ICP-MS, the sample(s) is mounted onto a glass slide which is then placed inside a laser cell where the ablation takes place (Figure 4.4 and 4.5). A camera inside the laser ablation unit projects an image of the laser cell onto a computer screen which allows the analyst to magnify areas of interest and to identify loci on the sample to be targeted for ablation by the laser. Computer software designed for the laser ablation system allows the analyst to superimpose a series of spots, lines or raster patterns over an area of interest that the laser will target during ablation. Laser parameters, such as laser intensity, scan speed, and repetition rate, can be set accordingly.

The size of the ablated area varies in size depending on the sample size; however, it is usually smaller than 1000 X 1000 μm and less than 30 μm deep (Speakman *et al.* 2002). The ablated material is flushed from the laser cell using argon gas where it passes through Tygon tubing and is introduced into the ICP-MS torch where argon gas plasma is used to ionize the injected sample. The ions are then passed through a two-stage interface designed to enable the transition of the ions from atmospheric pressure to the vacuum chamber of the ICP-MS system. Once inside the mass spectrometer, the ions are accelerated by high voltage and passed through a series of focusing lenses, an electrostatic analyzer, and a magnet. This information is then sent to a computer where software provides calibrated data regarding elemental composition and how much is present in the sample (Figures 4.6 and 4.7)[5]. Data collected from this analysis will then be examined with IGPET, a tool that allows researchers to use data files and graphics to discover and

[5] For a more detailed description of the LA-ICP-MS procedure refer to Appendix B.

interpret geochemical variation. This data, combined with data collected from the visual analysis will be examined and interpreted in the subsequent chapters.


Figure 4.4: Samples mounted on glass slide (Photo: D. Lavers).

Figure 4.5: Laser cell (Photo: D. Lavers).


Figure 4.6: Laser ablation instrument (Photo: D. Lavers).

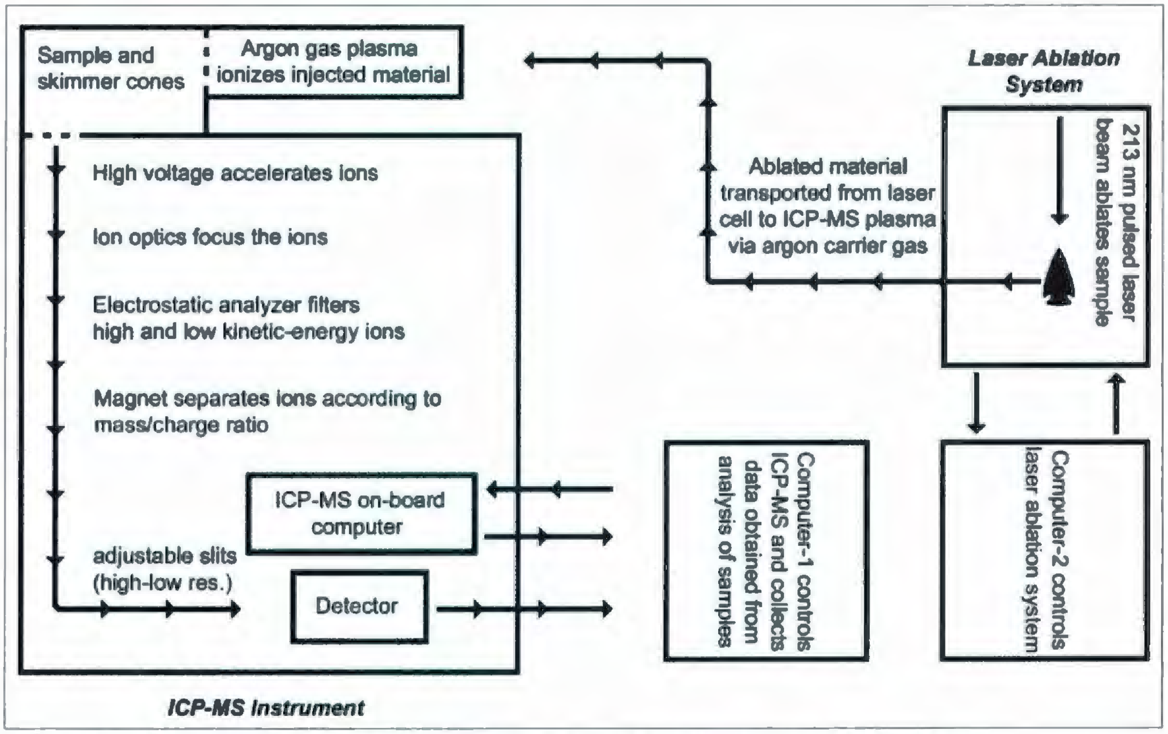


Figure 4.7: Schematic of LA-ICP-MS procedure (adapted from Speakman and Neff 2005).

### Summary

The information presented in this chapter is meant to serve as a preliminary exploration into the combined visual and geochemical analysis of Cow Head chert. Although Cow Head chert has undergone visual analysis before, this research represents the first time that the material has undergone trace elemental analysis. Although this testing is preliminary, the LA-ICP-MS coupled with visual analysis produced some interesting results; these results are presented in Chapters 5 and 6.

# CHAPTER 5

# ST.PAUL'S BAY-2: LITHIC SOURCE IDENTIFICATION

Using the method and techniques discussed in Chapter 4, this chapter analyses chert artifacts associated with the Recent Indian Cow Head complex occupation of St. Paul's Bay-2 to determine whether there is a connection between the raw material used at this site and the nearby source of Cow Head chert. Samples of chert artifacts from St. Paul's Bay-2 are visually and geochemically compared to raw material samples collected from two nearby geological sources of Cow Head chert, Cow Head and St. Paul's Inlet. It is hypothesized that chert artifacts from St. Paul's Bay-2 were made of Cow Head chert. Therefore the qualitative and quantitative attributes of these artifacts should be similar to Cow Head chert samples collected from the Cow Head and St. Paul's Inlet localities. In the next chapter, this information is compared to chert artifacts from seven other Cow Head complex sites located on the Northern Peninsula of Newfoundland. This chapter concludes with an interpretation of the results.

## Cow Head Chert

Outcrops of fine-grained Cow Head chert from the west coast of the Northern Peninsula of Newfoundland attracted many prehistoric populations to that region. This chert resource was very important to prehistoric populations given that it has been found on sites located throughout Newfoundland and Labrador, Quebec and Saint-Pierre (LeBlanc 2008; Nagle 1984, 1985; Pintal 1998).

The Cow Head Group is located within and around the community of Cow Head and its surrounding areas such as St. Paul's Inlet and Western Brook Pond (Figure 3.5). Geologically, the Cow Head Group has been classified and identified based on its formation period, formation processes, associated geological material, and petrography (Coniglio 1987; Coniglio and Stevens 1988; Draskoy 1971; Hiscott and James 1985; Hubert *et al.* 1977; James and Stevens 1986; Kindel and Whittington 1958). Geologists have described the Cow Head Group as a series of deep-water limestones and shales containing a variety of bedded and nodular cherts that were formed during the Cambro-Ordovician Period (Coniglio 1987; James and Stevens 1986). This chert, which is commonly referred to as Cow Head chert, is the focus of this chapter and the subsequent one.

Throughout its region, Cow Head chert can be found in two areas: along the beaches at St. Paul's Inlet and Cow Head. At these locations, the chert occurs in two forms: nodular and bedded. The chert nodules range from 10 to 50 cm in length, whereas bedded bands can be meters in length (Figure 5.1 and 5.2). The accessible nature of these deposits may have made Cow Head chert of particular interest to prehistoric cultures (LeBlanc 1996, 2000b, 2008; Nagle 1985, 1986).

Figure 5.1: Chert boulder at St. Paul's Inlet (lens cap for scale) (Photo: D. Lavers).

Figure 5.2: Band of chert at St. Paul's Inlet (lens cap is for scale). Note hammerstone to bottom left (Photo: D. Lavers).

Archaeologically, Cow Head chert has been classified and identified based on visual and microscopic analyses of texture, colour, luster, translucency and inclusions.

Archaeologists have described Cow Head chert as having a fine texture, glossy luster, and an opaque translucency (LeBlanc 1996, 2008; Nagle 1984, 1986). Other defining characteristics include its broad range of colours, including reds, yellows, browns, blacks, oranges, blues, and greens. The presence of visible radiolaria and siliceous sponge spicules, which are embedded within the chert, have also been used by archaeologists as a means of identification (Auger 1986; Coniglio 1987; Hartery 2001, 2007; LeBlanc 1996, 2000a, 2000b, 2008; Nagle 1984, 1985, 1986); however, radiolaria are not present in all samples and therefore should not be used as the predominant identifying characteristic.

In terms of microscopic attributes, Nagle (1984:109) and LeBlanc (2008:42, 192-214) describe Cow Head chert as consisting mostly of a microcrystalline or cryptocrystalline quartz groundmass. Round and cubic opaque minerals (pyrite $FeS_2$) and carbonates, such as dolomite $CaMg(CO_3)$, are present within this groundmass. These minerals range from 0.01 to 0.5mm in size. In some samples, radiolaria and sponge spicules can also be seen and are generally smaller than 0.5 mm.

Additionally, LeBlanc (1996, 2000b, 2008) and Nagle (1984) describe Cow Head chert in terms of its fracturing capabilities and the accessible nature of its outcrops. LeBlanc (2000b:24) states that:

> Cow Head cherts are hard and exhibit regular conchoidal fractures characteristic of highly silicified cherts. The silica content of Cow Head chert ranges from 65% to more than 90%. Cow Head cherts are relatively pure in texture, with few internal fractures, which makes it highly

predictable and reliable to use. The high percentage of silica allows the chert to fracture and break easily, creating a clean, sharp edge.

As well, LeBlanc (1996, 2000b) and Nagle (1984) suggest that due to its high quality, abundance and accessibility, Cow Head chert was highly sought after and utilized by various prehistoric cultures.

Overall, Cow Head chert has been primarily described and characterized in terms of its visual and microscopic characteristics. Keeping this in mind, this research will take the analysis of Cow Head chert a step further. Samples of Cow Head chert collected from the beaches at Cow Head and St. Paul's Inlet are geochemically and visually compared to chert debitage from various Cow Head complex sites located throughout the Northern Peninsula in order to connect the material to a known source. In this chapter, however, only artifacts from St. Paul's Bay-2 will be examined.

*Visual Characterization of Cow Head Chert outcrop samples*

In terms of attributes examined, the visual analysis presented here is very similar to the methodologies of past researchers; however, it differs from their work in terms of analysis. Past researchers who analyzed and examined Cow Head chert did not collect raw material samples for comparison to archaeological material. For example, LeBlanc (2008:38-39) did not utilize any geological samples to compare to a set of sampled artifacts for her analysis of artifacts from Phillip's Garden (a Dorset Palaeoeskimo site near Port au Choix); instead, she sent archaeological specimens to various geologists who classified them to lithic origin, based on colour, texture, structure and literature comparison (LeBlanc 2008:39-40). Although this is an acceptable way to identify raw material it is limited since no comparison was made to any geological specimen of known source. Similarly, Nagle (1984:107-108) utilized samples of Cow Head chert that were available in existing geological and archaeological collections as a basis of comparison to each other and to geological maps. Unlike these studies, the research presented here goes directly to the source to obtain as much information as possible about Cow Head chert. In the following sections, geological samples of Cow Head chert are described in terms of visual and geochemical attributes. Data gathered from this analysis are then used as a foundation to which archaeological specimens, sampled from St. Paul's Bay-2, are compared.

Cow Head Locality

A total of six Cow Head chert samples were collected from bedrock outcrops at the beach in Cow Head. All of these raw material samples fell into one colour category: *bluish gray to bluish black*[6] (Table 5.1 and Figure 5.3). Even though samples that displayed a variety of colours were specifically chosen, examination with the Munsell Colour Chart (Munsell Colour 2000)[7] indicated that they were all comparatively indistinguishable. In addition to similar colours, all samples can be described as having a *fine* texture and a *waxy/glossy* luster. The colour pattern for these samples was equally divided between *solid* and *banded.* In addition, all samples were relatively homogenous

[6] These colour categories were identified based on like colour descriptions using the Munsell Colour Chart (Munsell Colour Chart 2000).
[7] The Munsell Colour Chart (Munsell Colour 2000) was used to distinguish colour, hue, chroma and value for each lithic sample analyzed in this research. For a description of the Munsell Colour Chart coding system refer to Munsell Colour Chart (2000:1-4).

with no internal fractures; however, some samples had large inclusions of iron pyrite (visible in Figure 5.3 on the sample to the far right).

| Sample | Colour Description[8] | Colour Pattern | Texture | Luster |
|---|---|---|---|---|
| 1 | Dark-bluish gray (Gley 2 5B 4/1); very dark bluish gray (Gley 2 10B 3/1); bluish gray (Gley 2 10B 6/1) | Banded | Fine | Waxy |
| 2 | Dark bluish gray (Gley 2 5B 4/1) | Solid | Fine | Waxy |
| 3 | Dark bluish gray (Gley 2 5B 4/1); dark bluish gray (Gley 2 10B 3/1) | Banded | Fine | Waxy |
| 4 | Bluish black (Gley 2 5PB 2.5/1) | Solid | Fine | Waxy |
| 5 | Bluish black (Gley 2 5PB 2.5/1); dark bluish gray (Gley 2 10B 3/1) | Banded | Fine | Waxy |
| 6 | Bluish black (Gley 2 5PB 2.5/1) | Solid | Fine | Waxy |

Table 5.1: Visual attributes of chert samples from the Cow Head locality.

Figure 5.3: Raw material samples collected from the Cow Head locality (Photo: D. Lavers).

[8] Refer to the Munsell Colour Chart (Munsell Colour Chart 2000:1-4) for a description of the colour category coding system.

St. Paul's Inlet Locality

A total of 11 Cow Head chert raw material samples were collected from the St. Paul's Inlet locality. Samples were collected from bedrock outcrops. The samples collected fell into two colour categories: *bluish gray to bluish black* and *yellowish red/browns to dusky red* (Table 5.2) (Figure 5.4). All samples under the *bluish gray to bluish black* colour category have a *fine* texture and *waxy/glossy* luster. Colour patterns present in this colour category include: *solid, banded, solid with speckling* and *banded with speckling*. Within this colour category, all samples were homogenous with no internal fractures or inclusions.

Samples under the second colour category – *yellowish red/browns to dusky red* - all have a *fine* texture with a *waxy* luster. Colour patterns present in this colour category are: *solid* and *banded*. All samples were homogenous with some internal fractures.

| Sample | Colour Description | Colour Pattern | Texture | Luster |
|---|---|---|---|---|
| 1 | Bluish black (Gley 2 5PB 4/1) | Solid | Fine | Waxy |
| 2 | Dark bluish gray (Gley 2 10PB 4/1) | Solid and Speckled | Fine | Waxy |
| 3 | Dark bluish gray (Gley 2 10PB 4/1) and dark bluish gray (Gley 2 5PB 4/1) | Banded and Speckled | Fine | Waxy |
| 4 | Dark bluish gray (Gley 2 10PB 4/1) and dark bluish gray (Gley 2 5 PB 4/1) | Banded | Fine | Waxy |
| 5 | Very dark bluish gray (Gley 2 10PB 3/1)and dark bluish gray (Gley 2 10PB 4/1) | Banded and Speckled | Fine | Waxy |

| | | | | |
|---|---|---|---|---|
| **6** | Dark bluish gray (Gley 2 10PB 4/1) | Solid and Speckled | Fine | Waxy |
| **7** | Dark bluish gray (Gley 2 10PB 4/1) | Banded and Speckled | Fine | Waxy |
| **8** | Bluish black (Gley 2 5PB 2.5/1) | Solid | Fine | Waxy |
| **9** | Dark yellowish brown (10YR 4/4) and very dusky red (2.5 YR 2.5/2) | Banded | Fine | Waxy |
| **10** | Yellowish red (5YR 4/6) | Solid | Fine | Waxy |
| **11** | Dusky red (10R 3/3) | Solid | Fine | Waxy |

Table 5.2: Visual attributes of chert samples from the St. Paul's Inlet locality.


Figure 5.4: Colour and colour patterns from St. Paul's Inlet locality (Top Row: *bluish gray to bluish black*; Bottom Row: *yellowish red/browns to dusky red*) (Photo: D. Lavers).

Cow Head chert then, is relatively homogenous in terms of colour, colour pattern, luster and texture (Table 5.3). For example, samples collected from both the Cow Head and St. Paul's Inlet localities are identical in terms of texture and luster. Additionally, the colour category *bluish gray to bluish black* is available at both localities. The only difference amongst this homogeneity is that samples from the St. Paul's Inlet locality have a different colour pattern than those from the Cow Head locality. Some samples from St. Paul's Inlet display a *speckled* (refer to Figure 5.4 top right) colour pattern, whereas samples collected from Cow Head do not.

Although Cow Head chert samples collected from St. Paul's Inlet and Cow Head are similar in terms of colour, a singular, unique colour category is present only at St. Paul's Inlet. Samples with a *yellowish red/brown to dusky red* (Figure 5.4) colour were only found at this location (no raw material samples of this colour grouping were found at Cow Head). All samples within this colour category were relatively uniform, having a *fine* texture and a *waxy* luster.

| | **Cow Head Locality** | **St. Paul's Inlet** |
|---|---|---|
| **Colour Category** | Bluish gray to bluish black | Bluish gray to bluish black<br>Yellowish red/browns to dusky red |
| **Colour Pattern** | Solid<br>Banded | Solid<br>Banded<br>Banded and speckled<br>Solid and speckled |
| **Texture** | Fine | Fine |
| **Luster** | Waxy | Waxy |

Table 5.3: Summary of visual attributes of Cow Head chert.

*Chemical Characterization of Cow Head Chert outcrop samples*

Chert, commonly characterized as a microcrystalline silicate, is composed primarily (70-99.9%) of silicon dioxide ($SiO_2$) (Luedtke 1979:746). The balance consists of impurities such as calcite, hematite, dolomite and organic matter, or trace elements such as Al, Fe, Mn, Na, K, Mg, Ni, Cu, Ti, Sr and Ba (Luedtke 1992: 38-39). It is these trace elements that researchers most often examine and analyze to determine the provenance of a chert sample. Luedtke (1979:746) states that "these trace elements reflect the original sources of the sediments making up the cherts…therefore the proportions in which these elements are found should be specific to each formation."

In this research, the chemical characterization of Cow Head chert relies heavily on the analysis of trace elements and major/minor oxides. Using various statistical and visual techniques, trace element and major/minor oxide contents are examined to determine their level in each chert sample (Appendix B). By plotting these concentrations, patterns and/or variations within the chert can be discerned, therefore revealing specific elemental concentrations or a chemical structure for that sample or artifact. In this research, it is these element concentrations that will be examined and compared. Elemental concentration data defined from the raw material analysis of Cow Head chert will be later compared to those for chert artifacts analyzed from the seven Recent Indian Cow Head complex sites on the Northern Peninsula. This will help to ascertain whether Cow Head chert is present within the lithic assemblages of these sites.

As discussed in the previous chapter, the trace element contents were determined using LA-ICP-MS analysis at the CREAIT Lab, Memorial University; 35 elements were analyzed. Preliminary examination of these elemental data revealed that Cow Head chert samples from both the Cow Head and St. Paul's Inlet localities had similar contents; most of the element concentrations are within a similar range. For example, the concentration for Lutetium (Lu) in all Cow Head chert raw material samples is between 0.016 and 0.086 ppm. Of all the elements tested, two minor oxides, $Al_2O_3$ (aluminum oxide) and CaO (calcium oxide) most effectively separated samples into discrete groupings or clusters (Figure 5.5). Using these elements as a standard measure, results from the LA-ICP-MS testing of the Cow Head chert samples are discussed below.

An X-Y scatterplot displays the results from the LA-ICP-MS testing of samples. Ellipses are drawn around distinct data clusters to highlight samples/artifacts with similar elemental concentrations. All samples which fall outside of these clusters are referred to as outliers and are discussed later.

Plotting of the LA-ICP-MS results for the Cow Head samples defines two distinct clusters: Group 1 and 2 (Figure 5.5). Group 1 has the greatest number of samples present within its ellipse. From the samples tested, 83% of the samples from Cow Head and 64% of the samples from St. Paul's Inlet fell in to this cluster; in total, this represents 71% overall of the raw material samples of Cow Head chert tested. The high percentage of raw material samples located within this grouping demonstrates that samples collected from both localities have a similar chemical structure, which therefore confirms that they are of the same material (Cow Head chert) and geological source (Cow Head Group). Element concentrations for Group 1 are as follows: 0.02-0.70% CaO and 0.50-1.30% $Al_2O_3$.

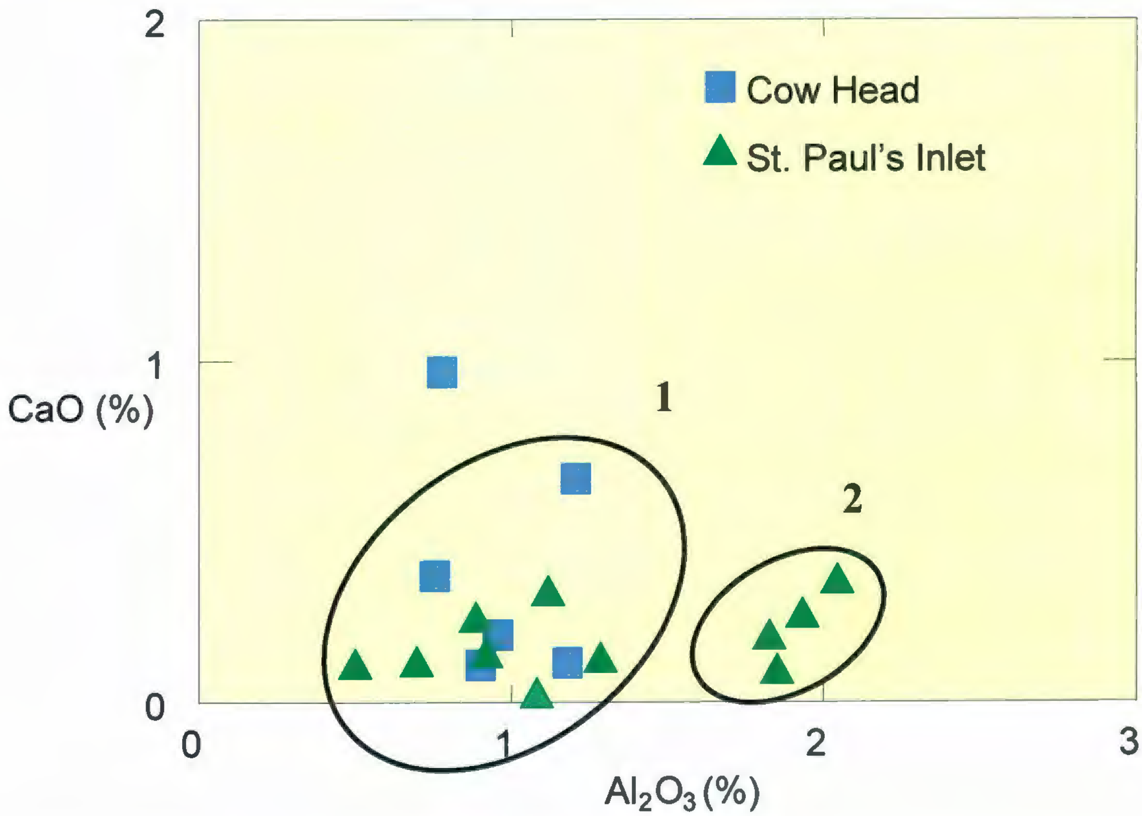


Figure 5.5: CaO vs. $Al_2O_3$ data plot for raw material Cow Head chert outcrop samples. The ellipses are drawn to map the area representing each compositional group, Group 1 and 2.

On the other hand, only samples from St. Paul's Inlet are present in Group 2, representing 36% of the samples from St. Paul's Inlet and 23% of the total overall samples tested. Group 2 has similar levels of CaO (0.1-0.4%) as Group 1; however it differs from Group 1 in the amount of $Al_2O_3$ present. Group 2 has 0.5 to 2.0% more $Al_2O_3$ than Group 1. This higher percentage of $Al_2O_3$ suggests that some of the Cow Head chert obtainable at St. Paul's Inlet has a higher amount of $Al_2O_3$ than samples from Group 1. Chert collected from both Cow Head and St. Paul's Inlet are comparable.

The elements $Al_2O_3$ and CaO separate the Cow Head chert samples into two groupings. Chert samples that do not fall within these clusters are classified as outliers.

Outliers can result from many reasons: 1) the outlier is not the same material as the clustered group(s); 2) during the ablation process, the detection of a particular element may have resulted from the laser beam hitting an inclusion of that element, therefore causing a spike in that element's level and; 3) the outlier could be a result of cultural or natural processes, such as heat-treating or chemical leaching, that may have changed the elemental composition of the sample.

The most likely explanation for the outlier within Figure 5.5 is the ablation of an inclusion during the analysis. One way to test this hypothesis is to examine the raw numbers collected from the mass spectrometer. The raw data collected for the outlier in Figure 5.5 demonstrates that during one of the ablation runs an inclusion was hit. This can be recognized by examining the data collected for the element in which the spike occurred, in this case CaO. As a whole, the CaO levels for the samples that fall within Group 1 range from 0.02 to 0.711%. This differs considerably from the CaO levels for the outlier which range from 0.33 to 1.55%. This difference indicates that during one or more of the data acquisition runs a carbonate inclusion was hit by the laser, causing a spike in the CaO levels and therefore causing the sample to be classified as an outlier. This is the likely explanation given that this type of chert formed within limestone bedrock and small pieces of this limestone may have been trapped within the chert during its formation processes (Derek Wilton, personal communication 2009).

Overall, from the trace element analysis it has been recognized that the chemical nature of Cow Head chert is reasonably uniform - trace element compositions of Cow Head chert derived from different localities within the same geological formation are comparable. No matter from which outcrop a sample of Cow Head chert was collected, its chemical composition should be similar to Cow Head chert samples gathered elsewhere. All samples analyzed in the above sections were known samples of Cow Head chert; data gathered from the visual and chemical analysis of these samples further indicated that all samples were comparatively similar to one another in terms of inter-source variability.

*Summary of Cow Head Chert outcrop analysis*

For the most part, these visual and trace element analyses establish that Cow Head chert raw material samples - collected from Cow Head and St. Paul's Inlet - are similar. Even though some of the chert samples from St. Paul's Inlet are visually different - in terms of colour and colour pattern - than those from Cow Head, trace element comparison demonstrates that all samples of Cow Head chert have a similar chemical structure. These results suggest that all of the Cow Head chert material tested is derived from a single geological source near the communities of Cow Head and St. Paul's. Additionally, the clustering of outcrop samples shows that colour and colour pattern should not be used as a sourcing technique to provenance Cow Head chert. For example, samples within Group 1 and 2 (Figure 5.5) contain a variety of colours and colour patterns that would not be grouped together in visual analysis; only through chemical analysis were their common nature identified. Therefore, when identifying Cow Head chert visually, one should not rely exclusively on colour and colour pattern, but rather on a range and variety of visual characteristics, such as luster and texture, and other provenance techniques, such as LA-ICP-MS.

Information gathered from the above sections is meant to serve as an initial exploration into the chemical structure and visual characterization of Cow Head chert. While the trace element testing is preliminary, some identifying features have emerged. These identifying factors, as well as information collected from the visual analysis, will now be compared to data collected from a lithic tool assemblage from St. Paul's Bay-2 to determine if the lithic tool assemblage from St. Paul's Bay-2 is made largely from Cow Head chert.

**St. Paul's Bay-2 Lithic Assemblage**

As discussed in Chapter 3, St. Paul's Bay-2 served as a lithic workshop site. The site's close proximity to nearby outcrops of Cow Head chert provides an opportunity to examine the chemical structure and visual connection between artifacts and their potential source. By comparing elemental concentrations and visual characterizations of artifacts from the site to geological samples of Cow Head chert a connection, if any, will be made linking the artifacts to a known source.

A total of 7,294 flakes collected from St. Paul's Bay-2 was considered in this analysis[9]. Among these, a sample of 25 was chosen for comparative analysis. These samples represent a variety of chert material present in the site's lithic assemblage. The following sections describe and characterize these chert flakes in order to link them to the nearby source(s) of Cow Head chert.

[9] Only flakes associated with a dated Recent Indian Cow Head complex feature were considered for analysis.

*Visual Characterization of St. Paul's Bay-2 lithics*

Similar to the previous section, all 25 chert flakes from St. Paul's Bay-2 were first separated by colour. Flakes sampled fell into three colour categories: *bluish gray to bluish black* (17); *yellowish red/browns to dusky red* (6) and; *white* (2) (Table 5.4). Within the first two colour categories - *bluish gray to bluish black* and *yellowish red/browns to dusky red* - all flakes have a *fine* texture and *waxy* luster. Colour patterns consist of *solid, banded with speckling* and *solid with speckling.* All samples are homogenous with no internal flaws. In addition, the categories Gley 2 bluish gray 5/1 10B, Gley 2 bluish black 2.5/1 5PB and 2.5 YR dark reddish gray 4/1 make up the majority (approximately 80-90%) of the site's lithic assemblage.

On the other hand, the third colour category of *white* accounts for less than 1% of the site's total lithic assemblage. This colour category also has very different visual characteristics when compared to the previous two categories. The colour pattern for this category is s*olid*, with a *dull* to *waxy* luster and *medium* texture. Both samples are homogenous with no internal flaws.

| **Sample** | **Colour Description** | **Colour Pattern** | **Texture** | **Luster** |
|---|---|---|---|---|
| **DlBk-6:128-1** | 2.5 YR dark reddish brown 3/3 | Solid | Fine | Waxy |
| **DlBk-6:128-2** | Gley 2 dark bluish gray 4/1 | SS | Fine | Waxy |
| **DlBk-6:128-3** | Gley 2 bluish gray 5/1 10B | BS | Fine | Waxy |
| **DlBk-6:128-4** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-6:128-5** | 2.5 YR dark reddish gray 4/1 | SS | Fine | Waxy |

| | | | | |
|---|---|---|---|---|
| **DlBk-6:128-6** | Gley 2 bluish gray 5/1 10B | Solid | Fine | Waxy |
| **DlBk-6:128-7** | Gley 2 bluish gray 5/1 10B | SS | Fine | Waxy |
| **DlBk-6:128-8** | 2.5 YR weak red 4/2 | Solid | Fine | Waxy |
| **DlBk-6:474-1** | 5Y white 8/1 | Solid | Medium | Waxy |
| **DlBk-6:474-2** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-6:474-3** | Gley 2 bluish gray 5/1 10B | Solid | Fine | Waxy |
| **DlBk-6:474-4** | Gley 2 bluish gray 5/1 10B | BS | Fine | Waxy |
| **DlBk-6:474-5** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-6:474-6** | Gley 2 bluish gray 5/1 5B | Solid | Fine | Waxy |
| **DlBk-6:474-7** | Gley 2 very dark bluish gray | BS | Fine | Waxy |
| **DlBk-6:617-1** | Gley 2 bluish gray 5/1 10B | BS | Fine | Waxy |
| **DlBk-6:617-2** | Gley 2 bluish gray 6/1 10B | Solid | Fine | Waxy |
| **DlBk-6:617-3** | Gley 2 bluish gray 5/1 10B | SS | Fine | Waxy |
| **DlBk-6:617-4** | Gley 2 bluish gray 5/1 10B | SS | Fine | Waxy |
| **DlBk-6:617-5** | 2.5Y white 8/1 | Solid | Medium | Dull |
| **DlBk-6: 617-6** | 2.5 YR dark reddish gray 4/1 | Solid | Fine | Waxy |
| **DlBk-6: 617-7** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-6: 617-8** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-6: 617-9** | 10R dusky red 3/3 | Solid | Fine | Waxy |
| **DlBk-6: 617-10** | 5YR reddish brown 4/3 | Solid | Fine | Waxy |

Table 5.4: Visual attributes of flakes from St. Paul's Bay-2 (colour pattern BS is banded and speckled and SS is solid and speckled).

Overall, the flakes sampled from St. Paul's Bay-2 all appear to have similar visual characteristics (Table 5.4), with the exception of *white* flakes. Flakes of the *bluish gray to bluish black* and *yellowish red/browns to dusky red* colour categories are relatively uniform in terms of colour pattern, luster and texture. On the other hand, *white* flakes have very different visual characteristics. Although the two flakes within the white colour category are homogenous in relation to each other, they differ in terms of luster: one has a dull luster and the other has a waxy luster. Therefore, based on the visual analysis of the flakes from St. Paul's Bay-2, it appears that the first two colour groupings - *bluish gray to bluish black* and *yellowish red/browns to dusky red* - have more in common with each other than the flakes from the white colour category.

In the following section, trace elements are used for a comparison of samples. This will determine if the three colour categories are of a similar or different material and geological source.

| | **Bluish gray to bluish black** | **Yellowish red/browns to dusky red** | **White** |
|---|---|---|---|
| **Colour Pattern** | Solid<br>Solid and Speckled<br>Banded and Speckled | Solid<br>Solid and Speckled | Solid |
| **Texture** | Fine | Fine | Medium |
| **Luster** | Waxy | Waxy | Dull to Waxy |

Table 5.5: Summary of visual characteristics of flakes from St. Paul's Bay-2.

*Chemical Characterization of St. Paul's Bay-2 lithics*

Similar to the section above on the chemical characterization of Cow Head chert, trace element concentrations of CaO and $Al_2O_3$ are used to identify compositional groups for samples tested from St. Paul's Bay-2 (Figure 5.6). As in the section above, this will indicate if flakes from this site have a similar chemical structure, therefore indicating that they are of the same material and geological source. Information gathered from the analysis of flakes from St. Paul's Bay-2 is compared to the data gathered from the above analysis of Cow Head chert. This comparison will determine whether the lithic assemblage from St. Paul's Bay-2 is made primarily from Cow Head chert.

Results from the elemental analysis of artifacts from St. Paul's Bay-2 indicates that the bulk of flakes tested have a similar elemental compositions; the majority of flakes (96%) fall into a similar cluster, Group 1. Elemental concentrations for Group 1 are as follows: 0.02 to 0.60% CaO and 0.2 to 2.2% $Al_2O_3$. This similarity suggests that these samples are from the same geological source and material.

However, in Figure 5.6 there is one outlier that has a very different trace element composition than those identified in Group 1. The outlier, sample 617-5, has a much higher $Al_2O_3$ content than those in Group 1, 1.0 to 2.7% more. Unlike the outlier discussed in the previous section, this outlier cannot be explained by an inclusion being hit during the ablation process. All three data acquisition runs indicate that the outlier has a high amount $Al_2O_3$, at 3.01 to 3.04%, whereas the rest of the flakes from St. Paul's Bay-2 have 0.2 to 2.2% $Al_2O_3$. This suggests that flake 617-5 is not of the same geological source or material as the rest of the samples.

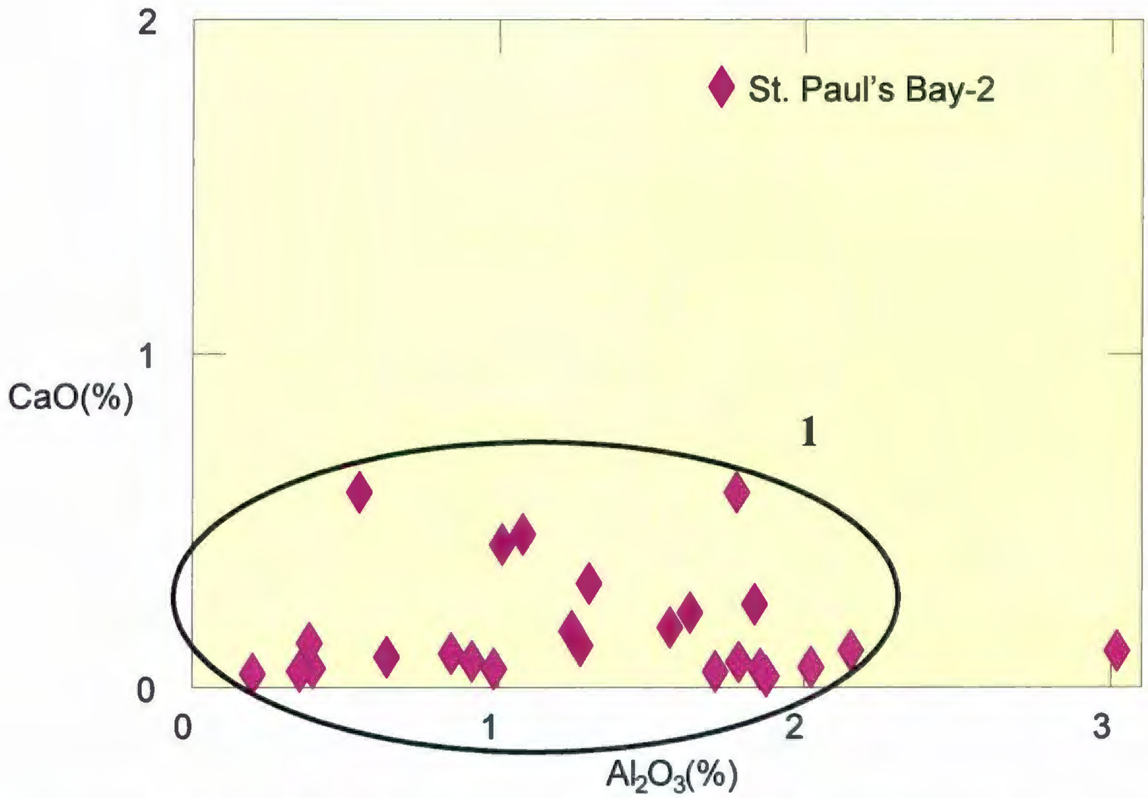


Figure 5.6: CaO vs. $Al_2O_3$ data plot for St. Paul's Bay-2 flakes. The black ellipse is drawn to map the area representing the compositional group.

Overall, the chemical compositions of flakes tested from St. Paul's Bay-2 are similar, with the exception of one outlier. The majority of samples tested from this site are relatively homogenous in term of elemental concentrations. Later, results from this section will be compared to results gathered from the chemical analysis of Cow Head chert to determine if these flakes are made from Cow Head chert.

*Summary of St. Paul's Bay-2 Flake Analysis*

Overall, similar visual characteristics and trace element compositions of flakes from St. Paul's Bay-2 suggest that these flakes are of the same material and geological source, with the exception of the outlier, flake 617-5. This flake has very different visual characterizations, in terms of colour (*white*), texture (*medium*) and luster (*dull*), and chemical content than the majority of flakes in Table 5.4. Additionally, colour and colour pattern should not be exclusively used as a sourcing technique. The grouping of artifacts in Figure 5.6 further reiterates this point as flakes from all three colour categories and colour pattern are present within the cluster.

Information gathered from the analysis of flakes from St. Paul's Bay-2 is compared to the data gathered from the previous analysis of Cow Head chert outcrop samples. This will determine if the lithic assemblage from St. Paul's Bay-2 lithic assemblage is made from the nearby sources of Cow Head chert.

**Comparison of St. Paul's Bay-2 Flakes to Cow Head Chert outcrop samples**

In Chapter 3 it was hypothesized that the lithic assemblage found at St. Paul's Bay-2 was predominately made from Cow Head chert due to the site's close proximity to an outcrop of Cow Head chert. In order to test this hypothesis, samples of Cow Head chert from the source were first characterized, visually and chemically. Once completed, these data were then compared to data collected from the visual and chemical analysis of chert flakes from St. Paul's Bay-2. Results are as follows.

*Visual Comparison*

Overall, the visual comparison of flakes from St. Paul's Bay-2 to raw material samples of Cow Head chert from two source outcrops demonstrates that these samples are visually similar to one another in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities, it can be suggested that the majority of flakes from St. Paul's

Bay-2 are Cow Head chert, particularly those that fall under the colour categories of *bluish gray to bluish black* and *yellowish red/browns to dusky red.*

However, one colour category identified at St. Paul's Bay-2 was not recognized in the Cow Head chert raw material samples, the *white* colour category. One *white* flake, sample 474-1, has a similar texture and luster as the Cow Head chert samples, whereas the other flake, sample 617-5 does not. Based primarily on texture and luster, it can be assumed that sample 474-1 is Cow Head chert whereas the other flake, sample 617-5, is not. A flake, such as sample 617-5, is visually different than the rest of the flakes from St. Paul's Bay-2 and the Cow Head chert samples, therefore suggesting that it is not Cow Head chert. Chemical comparison in the following section will conclusively determine this.

Overall, based on the visual characteristics of Cow Head chert, primary identifying factors for Cow Head chert are: fine grained texture, waxy luster, colours consisting of *bluish gray to bluish black* and *yellowish red/browns to dusky red* and colour patterning consisting of either, solid, banded, or speckled. Nevertheless, these visual characteristics should not be the only provenance technique used when identifying Cow Head chert because other examples of chert, found throughout Newfoundland and Labrador have similar characteristics (LeBlanc 2008; Nagle 1985, 1986).

*Chemical Comparison*

Since compositional groups were identified in previous sections, these same groupings are applied to flakes from St. Paul's Bay-2 and the samples of Cow Head chert (Figure 5.7). Flakes and chert samples that fall into the same compositional groupings will have a similar chemical makeup and therefore may be identified as similar material, in this case Cow Head chert. Artifacts that fall outside of these groupings are classified as outliers and may or may not be Cow Head chert (described above).

From the elemental analysis of Cow Head chert source samples and chert flakes from St. Paul's Bay-2 it appears that all flakes tested - with the exception of one outlier, the white chert sample 617-5 - are Cow Head chert. This can be primarily identified by overlapping clustered groups. For example, 76% of the flakes from St. Paul's Bay-2 fall within the two compositional groups of Cow Head chert, identified in Figure 5.5. Even more so, all samples of Cow Head chert, with the exception of 617-5, fall within the compositional grouping of flakes from St. Paul's Bay-2, identified in Figure 5.6. Overall this suggests that all samples of Cow Head chert and all flakes from St. Paul's Bay-2, with the exception of the 617-5, have similar element concentrations, which therefore suggests that they are the same material, Cow Head chert. From the chemical analysis it is evident that Cow Head chert is composed of 0.2 to 2.2% $Al_2O_3$ and 0.02 to 0.70% CaO.

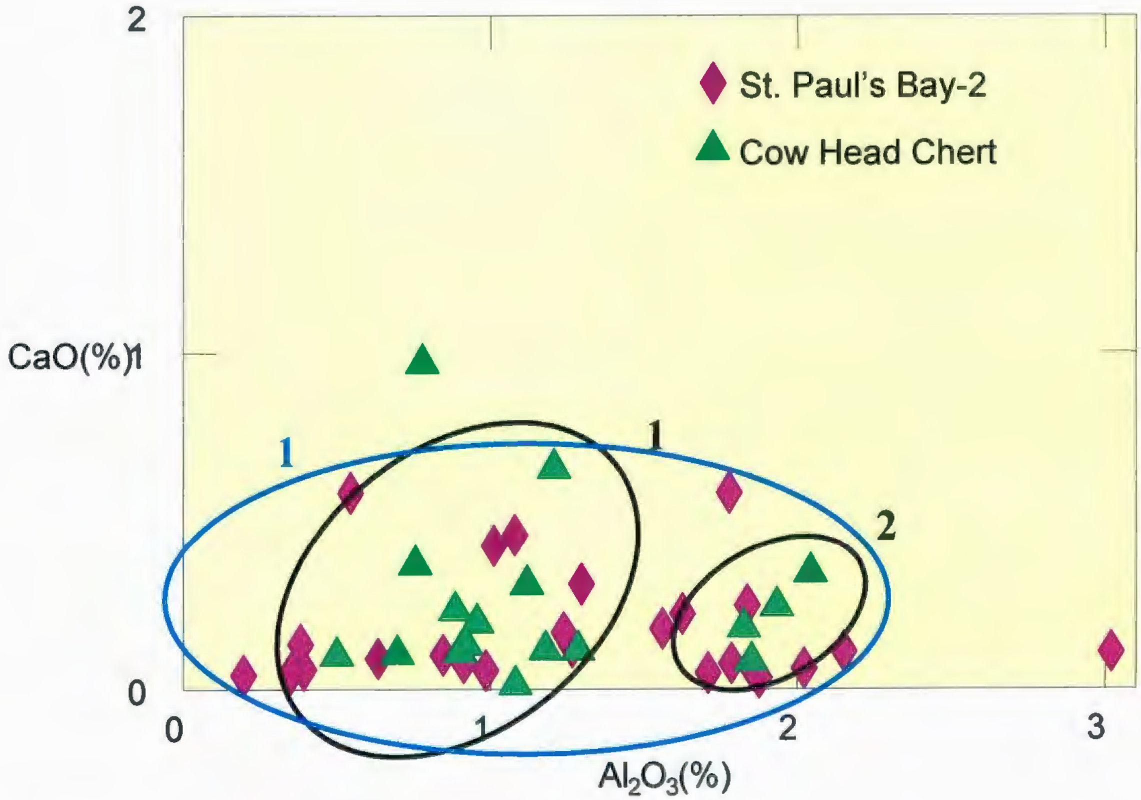


Figure 5.7: CaO vs. $Al_2O_3$ data plot for St. Paul's Bay-2 flakes and Cow Head chert source samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipse is drawn to map the area representing the compositional group for the St. Paul's Bay-2 flakes (as in Figure 5.6).

**Summary**

The visual and geochemical correlation of outcrops and artifacts was used in this chapter to test for an association between artifacts from St. Paul's Bay-2 and nearby outcrops of Cow Head chert. Results from these analyses indicated that the majority of flakes from St. Paul's Bay-2 can be classified as Cow Head chert. Similar visual characteristics such as colour, texture and luster, and element concentrations such as CaO and $Al_2O_3$, support this conclusion.

Additionally, results from these analyses have revealed new, and confirmed previous, facts about Cow Head chert. Confirmed facts about Cow Head chert include: its wide array of colours, its many different colour patterns and high $SiO_2$ content[10]. New details gathered about Cow Head chert include: its chemical structure and elemental concentration, and the fact that colour and colour pattern have no elemental concentration effect on the chemical structure of Cow Head chert.

Overall, this chapter provided a detailed description of both the visual and chemical characteristics of Cow Head chert and artifacts from St. Paul's Bay-2 to connect the artifacts to a known source. From the evidence presented above, it appears that the majority of the lithic assemblage found at St. Paul's Bay-2 is made from nearby sources of Cow Head chert. The significance of these results are discussed in Chapter 8. The next chapter serves as a complement to this one, where the visual characteristics and chemical structure of Cow Head chert are compared to artifacts from Recent Indian Cow Head complex sites throughout the Northern Peninsula.

[10] The mean of $SiO_2$ for samples of Cow Head chert discussed above is 97.95 and its standard deviation is 1.84.

# CHAPTER 6

# COW HEAD COMPLEX: LITHIC SOURCE IDENTIFICATION

Using similar visual and geochemical characteristics of lithic artifacts as described in Chapter 5, the first half of this chapter discusses the analysis of flakes from seven Cow Head complex Recent Indian sites. In the second half of the chapter, this information is compared to data collected from the previous chapter in order to identify Cow Head chert in the lithic assemblages from these sites. Like the preceding chapter, this chapter is primarily descriptive; it describes the visual and geochemical characteristics of lithic artifacts and how it relates to that of Cow Head chert.

## Visual and Chemical Characterization of Cow Head Complex Lithics

In the following sections, samples of artifacts from seven Recent Indian Cow Head complex sites are visually and chemically characterized. Using the same standards of measure as in Chapter 5, these artifacts are firstly characterized and second, compared to data collected from the previous chapter on Cow Head chert. This will help determine if Cow Head chert is present in the lithic assemblages of the sites in question.

### *Spearbank Site*

The Spearbank site is a multi-component Maritime Archaic, Palaeoeskimo and Recent Indian site. Only artifacts associated with the Recent Indian Cow Head complex are examined. Approximately 100 Cow Head complex artifacts collected from Spearbank

(DlBk-1) were considered for this analysis; however, due to the size restrictions of the LA-ICP-MS technique, only five could be chemically analyzed.

Visual Characterization of Lithics

Past visual characterization of the lithic assemblage from the Spearbank site suggested that approximately 98% of the utilized raw material consists of the local Cow Head chert (Hartery 2001, 2007). Chert colours dominating the collection consist of various shades of brown, green, red, bluish black, and black, with brown chert the most commonly used (Hartery 2001, 2007). Raw materials matching the visual characteristics of artifacts from the site were found on the nearby beach areas (Hartery 2007; Nagle 1984). For example, Hartery (2007) discovered a variety of chert that matches several bifaces and cores in the Cow Head complex lithic assemblage from that site.

Visual analysis of the five artifacts in the sample from the Spearbank site further supports Hartery's (2001, 2007) conclusions. All five artifacts fall into one colour category: *bluish gray to bluish black* (Table 6.1). All samples have a *fine* texture with a *waxy* luster and either a *banded* or *solid* colour pattern. In addition, all samples are homogenous with no internal flaws.

| **Sample** | **Colour Description** | **Colour Pattern** | **Texture** | **Luster** |
|---|---|---|---|---|
| **DlBk-1: 1813** | Gley 2 Dark bluish gray 4/1 10B | Banded | Fine | Waxy |
| **DlBk-1: 1710** | Gley 2 Bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **DlBk-1:1616** | 7.5YR Very dark brown 2.5/2 | Solid | Fine | Waxy |
| **DlBk-1:908** | 2.5 Y Black 2.5/1 | Solid | Fine | Waxy |

| | | | | |
|---|---|---|---|---|
| **DlBk-1:1736** | Gley 2 Very dark bluish gray 3/1 5PB | Banded | Fine | Waxy |

Table 6.1: Visual characteristics of Spearbank lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000).

Chemical Characterization of Lithics

The chemical characterizations of artifacts from the Spearbank site indicate that the tested artifacts have similar trace element composition; all artifacts fall within the same compositional grouping, Group 1 (Figure 6.1). Trace element concentrations for Group 1 are as follows: 0.25 to 0.38% CaO and 0.9 to 2.1% $Al_2O_3$. This similarity suggests that these samples are from the same geological source and material.

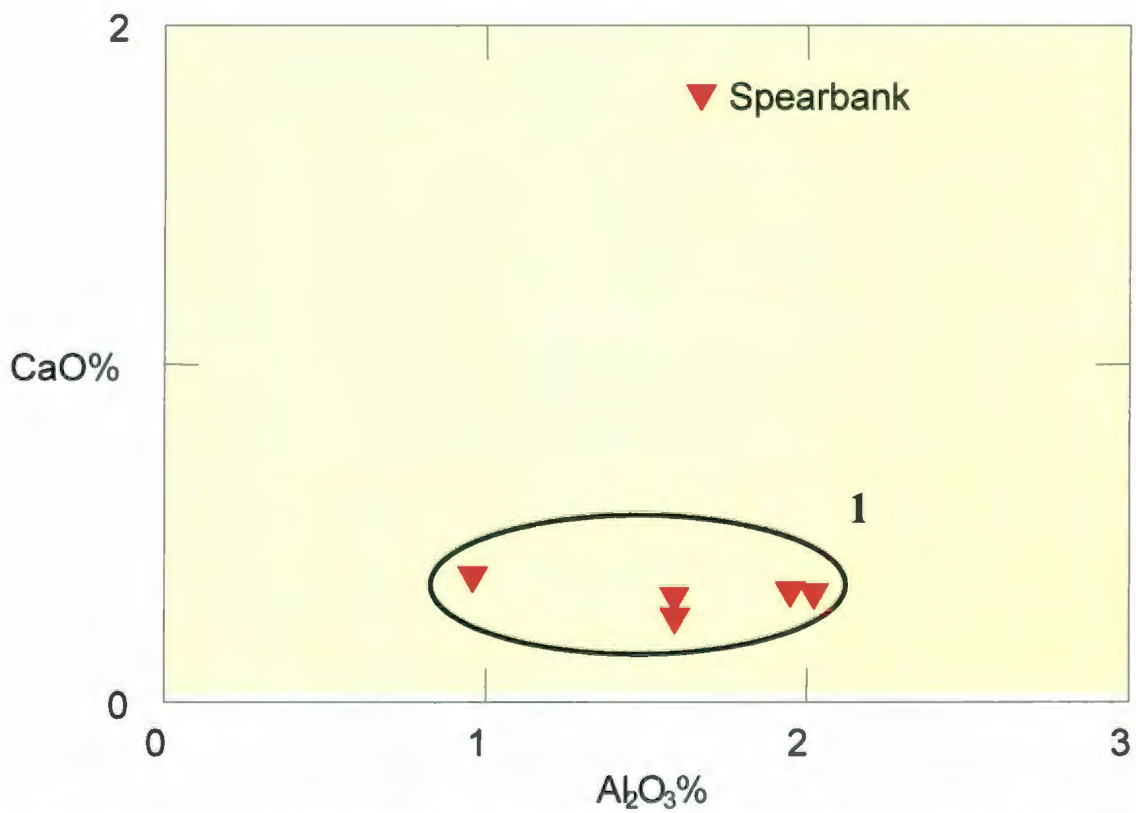


Figure 6.1: CaO vs. $Al_2O_3$ data plot for Spearbank lithics. The black ellipse is drawn to map the area representing the compositional group.

Summary of Spearbank Analyses

Overall, similar visual characteristics and trace element compositions of artifacts from the Spearbank site suggest that these flakes are of the same material and geological source; all artifacts are visually and chemically similar with each other.

*Portland Creek 4 and 5*

Portland Creek 4 and 5 are two single component Cow Head complex Recent Indian sites. Artifacts from Portland Creek 4 and 5 are discussed together as there are only two artifacts from each site analyzed. Twelve artifacts were available for analysis from these sites; however only four could be chemically analyzed due to size restrictions.

Visual Characteristics of Lithics

Past researchers who collected and analyzed the lithics from Portland Creek 4 and 5 described the colour and origin of the raw material. Thomson (1987) described the chert material from Portland Creek 4 as brown to black in colour. Biggin (1985) and Thomson (1987) described the lithic material from Portland Creek 5 as fine grained, black and originating from chert outcrops in Cow Head.

The four artifacts analyzed from Portland Creek 4 and 5 fall under the same colour category, *bluish gray to bluish black* (Table 6.2). All samples are homogenous with a *fine* texture and *waxy* luster and exhibit no internal flaws. The colour pattern ranges from *speckled* to *solid.*

| Sample | Colour Description | Colour Pattern | Texture | Luster |
|---|---|---|---|---|
| **EbBj-4:2** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **EbBj-4:2a** | Gley 2 bluish gray 5/1 10B | SS | Fine | Waxy |
| **EbBj-5:11** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **EbBj-5:12** | Gley 2 bluish black 2.5/1 5PB | Solid | Fine | Waxy |

Table 6.2: Visual characteristics of Portland Creek 4 and 5 lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000) (SS stands for solid and speckled).

Chemical Characterization of Lithics

The chemical characterization of artifacts from Portland Creek 4 and 5 indicate that the artifacts tested have similar trace element content; all artifacts fall within the same compositional grouping, Group 1 (Figure 6.2). Trace element concentrations for Group 1 are as follows: 0.06 to 0.30 % CaO and 1.03 to 1.88% $Al_2O_3$. This similarity suggests that these samples are of the same material and geological source.

Summary of Portland Creek 4 and 5 Analyses

Overall, similar visual characteristics and trace element compositions of flakes from Portland Creek 4 and 5 suggest that these flakes are of the same material and geological source; all artifacts are visual and chemically similar with each other.

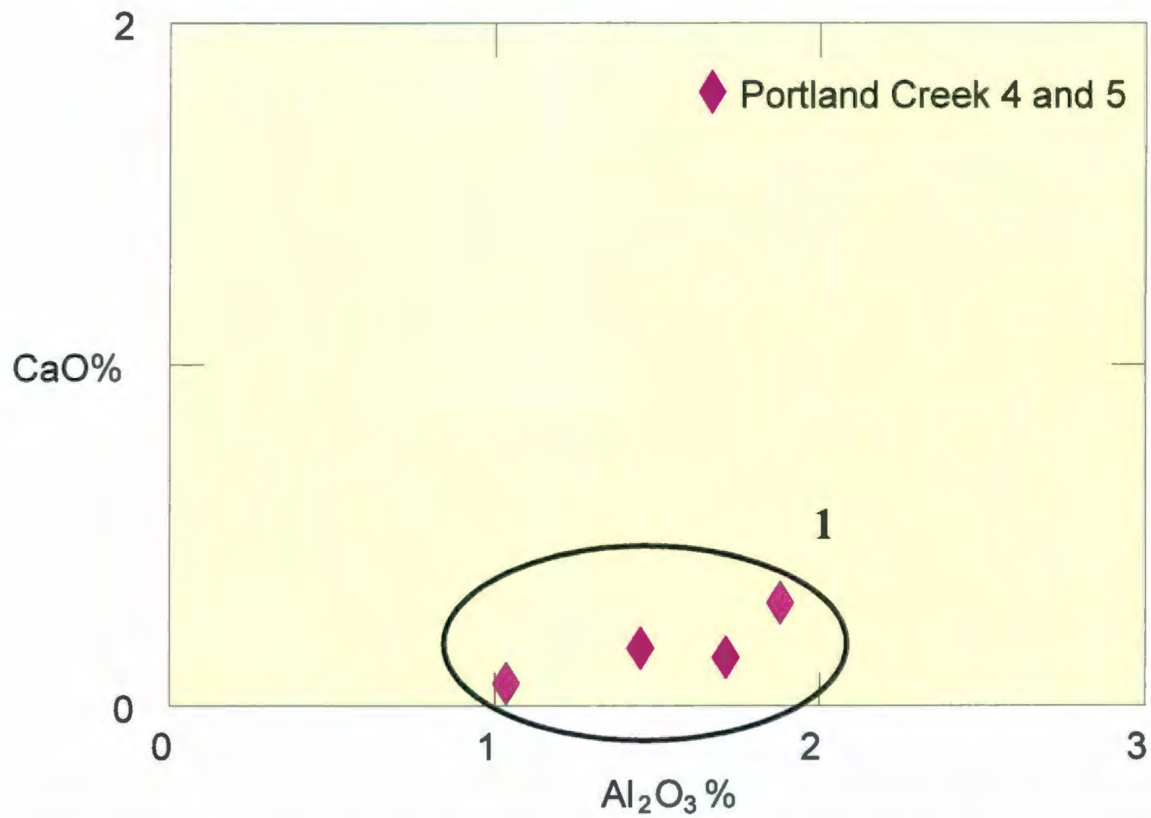


Figure 6.2 CaO vs. $Al_2O_3$ data plot for Portland Creek 4 and 5 lithics. The black ellipse is drawn to map the area representing the compositional group.

*Gould Site*

The Gould site is a Maritime Archaic and Cow Head complex Recent Indian site with some Dorset Palaeoeskimo material present. Only lithic material recovered from Cow Head complex Recent Indian contexts is examined.

Visual Characterization of Lithics

Past researchers who analyzed the Cow Head complex Recent Indian material from the Gould site described the raw material in terms of its colour, inclusions and its origin. Teal (2001) described the material primarily consisting of a white to dark gray rhyolite with some specimens exhibiting dark banding and/or small square inclusions, and black chert.

Other materials present – in small quantities - consist of a greenish-gray chert, brown chert, Ramah chert and a material of undetermined origin (Teal 2001:43, 45-46). Additionally, Teal discussed the possible source of these lithic materials, suggesting that the gray and white rhyolite materials found at the site were available locally, whereas the black chert was from Cow Head (Teal 2001:98-99). Teal (2001:99) also suggested that, with the exception of the Ramah chert, sources for the other lithic materials can be found within close proximity to the Gould site.

Flakes examined in this analysis fall into two colour categories (Table 6.3): *bluish gray to bluish black* and *light greenish gray to very dark gray*. Flakes falling under the *bluish gray to bluish black* colour category are homogenous with no inclusions or flaws. All of these flakes have a *solid* colour pattern with a *fine* texture and *waxy* luster. Flakes falling under the *light greenish gray to very dark gray* colour category have similar *medium* to *fine* texture and *dull* luster (Teal 2001:99).

| **Sample** | **Colour Description** | **Colour Pattern** | **Texture** | **Luster** |
|---|---|---|---|---|
| **EeBi-42:1650-1** | 5YR Dark gray 6/1 | Solid | Fine | Dull |
| **EeBi-42:1650-2** | 2.5 Y Black 2.5/1 | Solid | Fine | Waxy |
| **EeBi-42:1650-3** | 10YR Gray 6/1 | Solid | Fine | Dull |
| **EeBi-42:1745-1** | 2.5 Y Black 2.5/1 | Solid | Fine | Waxy |
| **EeBi-42:1745-2** | 10YR Light gray 7/1 | Solid | Medium | Dull |
| **EeBi-42:1829-2** | 7.5YR Gray 5/1 | Solid | Fine | Dull |
| **EeBi-42:1829-3** | 5YR Dark gray 6/1 | Solid | Medium | Dull |

| | | | | |
|---|---|---|---|---|
| **EeBi-42:1937** | 5 YR Dark gray 6/1 | Solid | Fine | Dull |
| **EeBi-42:1503-1** | 10YR Light gray 6/1 | Solid | Medium | Dull |
| **EeBi-42:1503-2** | Gley 2 Dark bluish gray 4/1 10B | Solid | Fine | Waxy |
| **EeBi-42:1503-3** | 10YR Very dark gray 3/1 | Solid | Fine | Dull |
| **EeBi-42:1727** | 7.5 YR Black 2.5/1 | Solid | Fine | Waxy |
| **EeBi-42:1658** | 7.5 YR Black 2.5/1 | Solid | Fine | Waxy |

Table 6.3: Visual characteristics of the Gould site lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000).

Chemical Characterization of Lithics

Plotting of the LA-ICP-MS results for the Gould site samples defines two distinct clusters: Group 1 and 2 (Figure 6.3). Group 1 has the least number of samples present within its ellipse. From the samples tested, 46% fall into this cluster. The clustering of artifacts within Group 1 indicates that these artifacts are of similar material and geological source. Element concentrations for Group 1 are as follows: 0.09 to 0.35% CaO and 0.90 to 1.30% $Al_2O_3$.

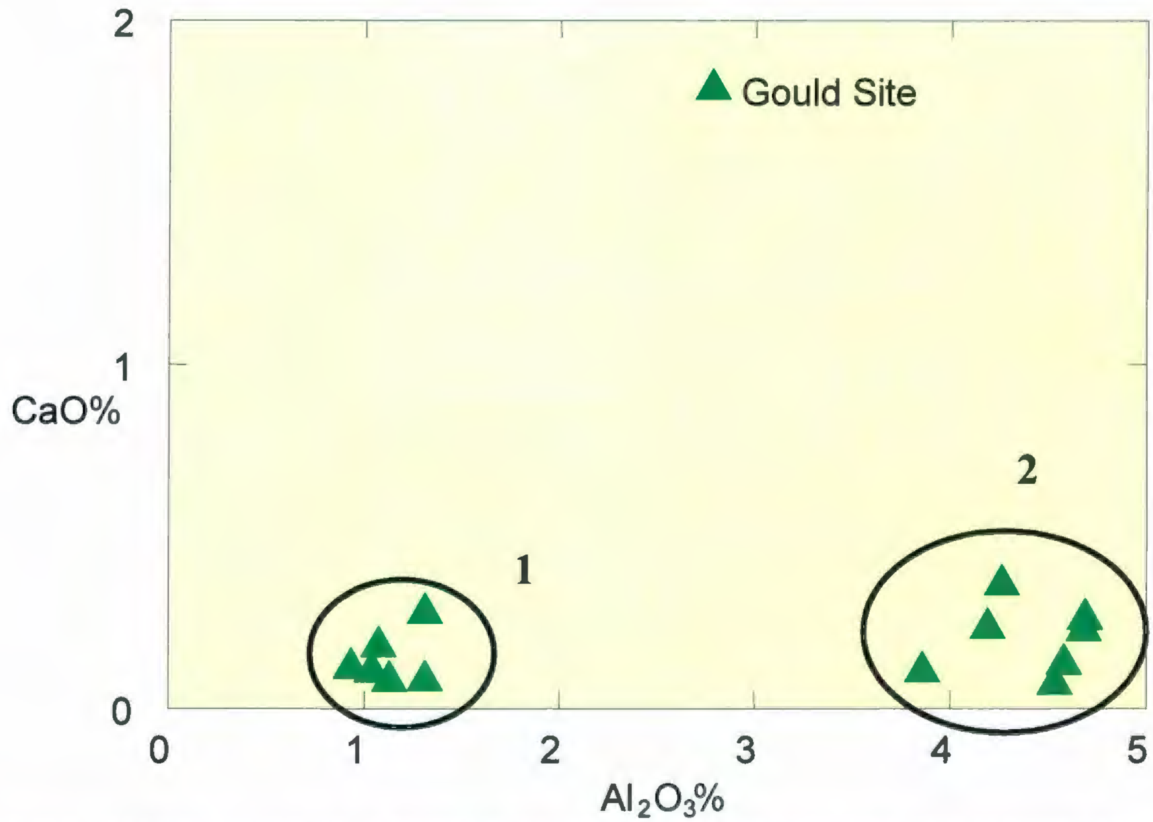


Figure 6.3 CaO vs. $Al_2O_3$ data plot for the Gould site lithics. The black ellipses are drawn to map the area representing each compositional group.

Group 2 on the other hand, has the greatest number of artifacts present within its cluster - approximately 54%. Group 2 has relatively similar levels of CaO (0.10 to 0.40%) as Group 1; however it has between 2.3 to 4.0% more $Al_2O_3$ than Group 1. This higher percentage of $Al_2O_3$ suggests that artifacts that fall within Group 2 are not of the same material and geological source as artifacts within Group 1. However, it does suggest that artifacts within Group 2 are of the same material and geological source.

Summary of the Gould Site Analyses

Overall, based on visual and chemical characterization of sampled artifacts from the Gould site it appears that two different material types from different sources were used at the site. Visual characterizations divide the samples into two groups: *bluish gray to bluish black* and *light greenish gray to very dark gray*. Within each colour grouping artifacts are relatively homogenous: they exhibit similar colour, luster and texture. Furthermore, trace element content also divides the artifacts into two groupings: Group 1 and 2. The main difference amongst these groupings is that artifacts within Group 2 have a much higher proportion of $Al_2O_3$ than those artifacts in Group 1.

Also, when data from both the visual and chemical characterizations are combined a distinctive pattern emerges. Artifacts within Group 1 are all those within the *bluish gray to bluish black* colour category, and artifacts within Group 2 are all those within the *light greenish gray to very dark gray* colour category. This, therefore, further indicates that lithic material collected from the Gould sites consists of at least two different material types that originate from two different sources, Group 1 from Cow Head and Group 2 from elsewhere.

*Spence Site*

The Spence site is a multi-component Dorset Palaeoeskimo and Recent Indian site. This site is characterized as Beaches and Little Passage complex and it also includes a small number, fewer than six, Cow Head complex artifacts (M.A.P. Renouf, personal communication 2009). Cultural material that has been associated with a dated Recent Indian feature is examined. Flakes were sampled from Features 9, 25 and 27, which date to approximately 1300-1500 BP (Renouf 1992, 1993). These features are likely belonging to the Beaches complex Recent Indian; however due to the occurrence of Cow Head complex artifacts in the lithic assemblage the site has been included in this analysis.

Visual Characterization of Lithics

The lithic assemblage from the Spence site was mainly described in terms of its comparison to Cow Head chert and its possible origins. Renouf (1992:93, 1993:73) described the Recent Indian lithic assemblage from the Spence site as consisting primarily of a chert that is coarser than the typical fine-grained Cow Head chert. Additionally, stemming from her characterization of this site as a lithic workshop, Renouf (1992, 1993) suggests that the source of the coarse chert is within close proximity to the site.

Contrary to Renouf's (1992, 1993) observations of the Spence site lithic assemblage, all samples analyzed in this research consisted of a *fine* grained chert with a *waxy* luster (Table 6.4). All samples fell into the colour category of *bluish gray to bluish black* with a colour pattern that varies from *speckled*, *solid* and *banded.*

| **Sample** | **Colour Description** | **Colour Pattern** | **Texture** | **Luster** |
|---|---|---|---|---|
| **EeBi-36:1937** | Gley 2 Dark bluish gray 4/1 5B | SS | Fine | Waxy |
| **EeBi-36:2025-1** | Gley 2 Bluish gray 5/1 10B | SS | Fine | Waxy |
| **EeBi-36:2025-2** | Gley 2 Bluish gray 5/1 10B | SS | Fine | Waxy |
| **EeBi-36:2025-3** | Gley 2 Bluish gray 5/1 10B | SS | Fine | Waxy |
| **EeBi-36:2612** | Gley 2 Bluish gray 5/1 10B | SS | Fine | Waxy |
| **EeBi-36:2341-1** | Gley 2 Dark bluish gray 4/1 5B | Solid | Fine | Waxy |
| **EeBi-36:2341-2** | Gley 2 Bluish black 2.5/1 5B | SS | Fine | Waxy |
| **EeBi-36:184-5** | Gley 2 Dark bluish gray 4/1 5B | Banded | Fine | Waxy |
| **EeBi-36:184-4** | Gley 2 Dark greenish gray 4/1 5GB | Solid | Fine | Waxy |
| **EeBi-36:184-1** | Gley 2 Bluish gray 5/1 10B | SS | Fine | Waxy |

| | | | | |
|---|---|---|---|---|
| **EeBi-36:184-2** | Gley 2 Bluish gray 5/1 10B | Solid | Fine | Waxy |
| **EeBi-36:184-3** | Gley 2 Bluish black 2.5/1 5PB | SS | Fine | Waxy |

Table 6.4: Visual characteristics of the Spence site lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000) (SS stands for solid and speckled).

Chemical Characterization of Lithics

The chemical characterization of artifacts from the Spence site indicates that the artifacts tested have similar trace element content; all artifacts fall within the same compositional grouping, Group 1 (Figure 6.4). Element concentrations for Group 1 are as follows: 0.04 to 0.22 % CaO and 0.38 to 1.63% $Al_2O_3$. This similarity suggests that these samples are from the same geological source and material.

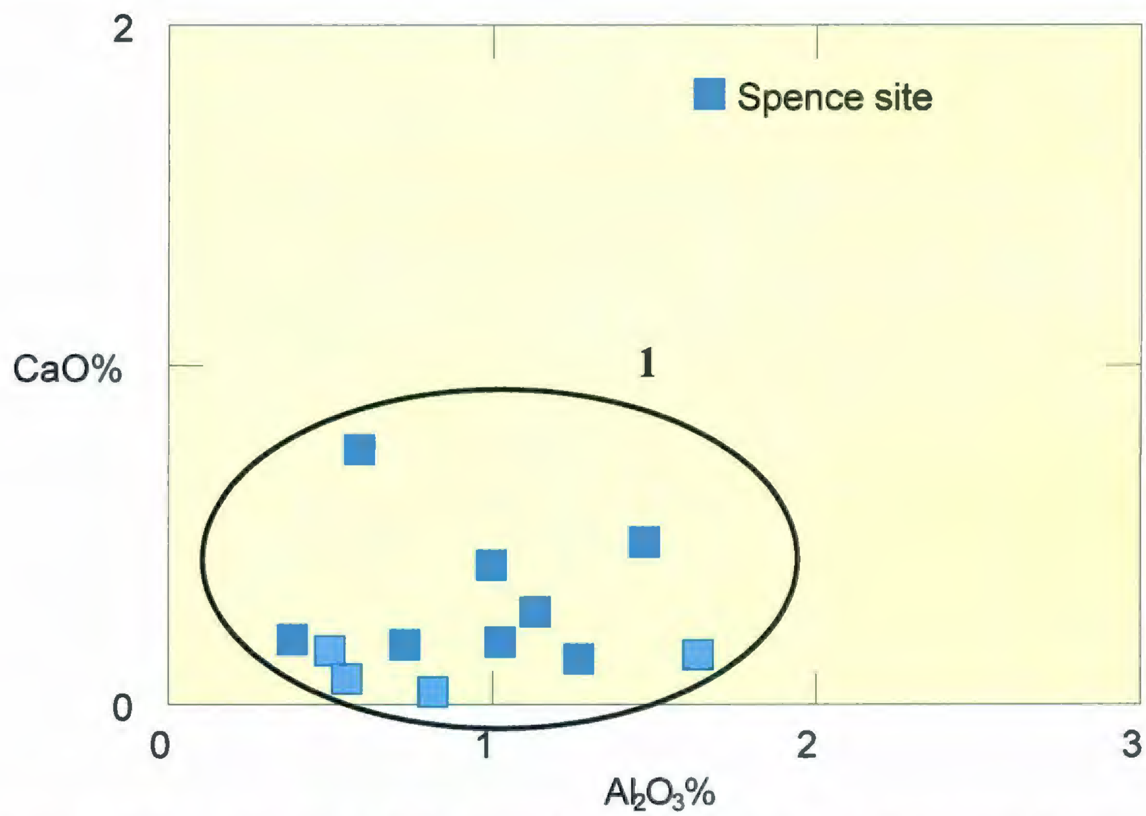


Figure 6.4 CaO vs. $Al_2O_3$ data plot for the Spence site lithics. The black ellipse is drawn to map the area representing the compositional group.

Summary of the Spence Site Analyses

Overall, similar visual characteristics and trace element compositions of flakes from the Spence site suggest that these flakes are of the same material and geological source; all artifacts are visual and chemically homogenous with each other and fall within the range of Cow Head for CaO and $Al_2O_3$.

*Peat Garden*

Similar to St. Paul's Bay-2, Peat Garden is a dual component Cow Head Recent Indian and Groswater Palaeoeskimo site (Hartery 2001, 2007; Reader 1998). Lithic materials associated with dated Cow Head complex features are examined.

Visual Characteristics of Lithics

As mentioned in Chapter 2, the dominant raw material type that was used by the Cow Head occupation of Peat Garden is a white-light gray chert termed Bird Cove chert (Hartery 2001, 2007; Reader 1998). However, Hartery (2001, 2007:25) notes that there are 75 Ramah chert and 79 Cow Head chert flakes. As Ramah chert is very distinguishable from Cow Head chert, only the flakes that were classified as Cow Head chert, as well as a sample of Bird Cove chert were examined in this research.

The samples analyzed from Peat Garden displayed a larger variety of characteristics when compared to artifacts analyzed from the other sites. Flakes examined from this site can be divided into two colour categories (Table 6.5): *bluish gray to bluish black* and *light greenish gray to very dark gray*. Flakes falling under the latter colour category make up the majority of flakes examined and were categorized as Bird Cove chert by Hartery (2001, 2007) and Reader (1997). These flakes can be described as having a *fine* to *medium* texture with a *dull* luster. The majority of these flakes displayed a high degree of diversity and exhibited high numbers of inclusions. On the other hand, flakes falling under the *bluish gray to bluish black* colour category have a *fine* texture and *waxy* luster. Colour pattern varies from *solid*, *specked* and *banded*. Flakes are homogenous with no internal flaws or fractures. Flakes falling under this category have been visually categorized as Cow Head chert by Hartery (2001, 2007).

| Sample | Colour Description | Colour Pattern | Texture | Luster |
|---|---|---|---|---|
| **EgBf-6:944-1** | Gley 1 Greenish gray 6/1 5GY | SS | Fine | Dull |
| **EgBf-6:944-2** | 2.5 Y Black 2.5/1 | Solid | Fine | Waxy |
| **EgBf-6:944-4** | 5 YR Very dark gray 3/1 | SS | Medium | Dull |
| **EgBf-6:315-1** | 7.5 YR Gray 6/1 | Solid | Medium | Dull |
| **EgBf-6:315-5** | 7.5 YR Gray 6/1 | Solid | Medium | Dull |
| **EgBf-6:138-1** | Gley 1 Dark greenish gray 4/1 10Y | Solid | Fine | Dull |
| **EgBf-6:188-1** | Gley 1 Light greenish gray 7/1 5GY | SS | Fine | Dull |
| **EgBf-6:188-3** | Gley 2 Bluish black 2.5/1 5B | SS | Fine | Waxy |
| **EgBf-6:188-4** | Gley 2 Dark bluish gray 4/1 5B | Banded | Fine | Waxy |
| **EgBf-6:1614-2** | Gley 2 Bluish gray 5/1 5B | SS | Fine | Waxy |

Table 6.5: Visual characteristics of Peat Garden lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000) (SS stands for solid and speckled).

Chemical Characterization of Lithics

Plotting of the LA-ICP-MS results for the Peat Garden samples defines two distinct clusters: Group 1 and 2 (Figure 6.5). Group 1 has the least number of samples present within its ellipse. From the samples tested, 40% of the samples from Peat Garden fell into this cluster. The clustering of artifacts within Group 1 indicates that these artifacts are of similar material and geological source. Element concentrations for Group 1 are as follows: 0.10 to 0.27 % CaO and 1.11 to 1.87% $Al_2O_3$.

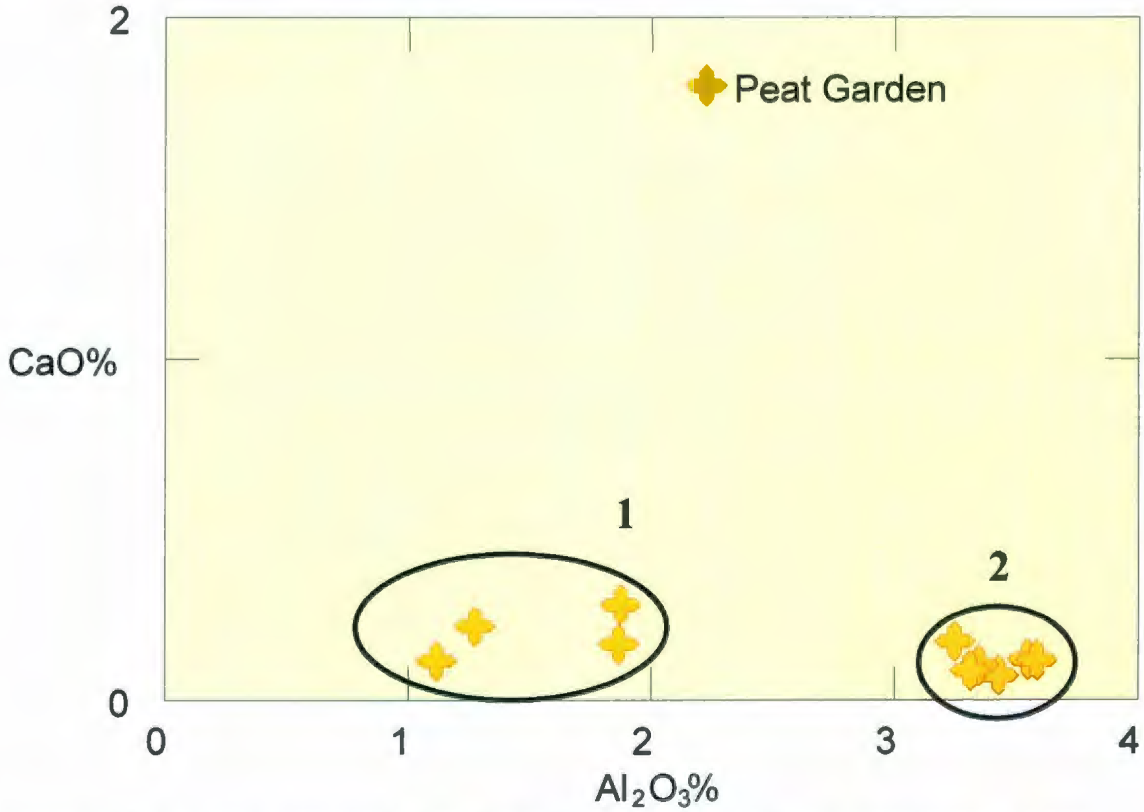


Figure 6.5 CaO vs. $Al_2O_3$ data plot for Peat Garden lithics. The black ellipse is drawn to map the area representing each compositional group.

Group 2 on the other hand, has the greatest number of artifacts present within its cluster - approximately 60%. Group 2 has relatively similar levels of CaO (0.10 to

0.21%) as Group 1; however it has between 2.21 to 2.71% more $Al_2O_3$ than Group 1. This higher percentage of $Al_2O_3$ suggests that artifacts that fall within Group 2 are not of the same material and geological source as artifacts within Group 1. However, it does suggest that artifacts within Group 2 are of the same material and geological source given that trace element levels are within a similar range.

### Summary of Peat Garden Analyses

Overall, based on visual and chemical characterization of sampled artifacts from Peat Garden it appears that two different material types were used at the site. Visual characterizations divide the samples into two groups: *bluish gray to bluish black* and *light greenish gray to very dark gray*. Within each colour grouping artifacts are relatively homogenous, displaying similar colour, luster and texture. Additionally, major trace element content also divides the artifacts into two groupings: Group 1 and Group 2. The main difference amongst these groupings is that artifacts within Group 2 have a much higher $Al_2O_3$ percentage than those artifacts in Group 1.

Additionally, when data from both the visual and chemical characterizations are combined a very distinctive pattern emerges. Artifacts within Group 1 are those within the *bluish gray to bluish black* colour category and artifacts within Group 2 are those within the *light greenish gray to very dark gray* colour category. This, therefore, further indicates that lithic material collected from Peat Garden consists of at least two different material types that originate from two different sources.

*L'Anse aux Meadows*

L'Anse aux Meadows is a multi-component Maritime Archaic Indian, Groswater and Dorset Palaeoeskimo, Cow Head complex Recent Indian and Norse site. Approximately 200 artifacts have been attributed to "Late Prehistoric Indian A," better known as the Cow Head complex. However, due to size restrictions of the LA-ICP-MS, only six artifacts could be chemically analyzed. Artifacts chosen are associated with a Recent Indian feature, Cooking Pit A (Ingstad 1977; Wallace 1989).

<u>Visual Characterization of Lithics</u>

Past researchers who examined the Cow Head complex artifacts from L'Anse aux Meadows described the lithic assemblage in terms of the colour and origin or the raw material. Ingstad (1977) indicated that the assemblages consisted primarily of a gray-green and white chert. In addition, she also identified small amounts of what she recognized as a purplish rhyolite (Ingstad 1977). Hartery (2001, 2007) who later examined this lithic assemblage describes it in terms of the origin of raw material. Hartery (2001, 2007) discusses that some of the material present in this lithic assemblage is visually similar to that of Cow Head chert; however she suggests that this material originated in Pistolet Bay. According to Hartery (2001, 2007:39), the chert from Pistolet Bay formed during the same time period as Cow Head chert, but differs in chemical structure.

Artifacts examined from L'Anse aux Meadows fall into three colour categories (Table 6.6): *bluish gray to bluish black*, *reddish gray*, and *light greenish gray to very dark gray*. Only one artifact fell under the *bluish gray to bluish black* colour category. This artifact has a *fine* texture, *waxy* luster and a *banded* colour pattern. It is homogenous with no inclusions or flaws. Additionally, only one artifact fell under the *reddish gray* colour category. This artifact has a *fine* texture, *waxy* luster and *banded* colour pattern. It is homogenous with no inclusions or flaws. Artifacts falling under the *light greenish gray to very dark gray* colour category are homogenous as well, with no inclusions or flaws. Flakes in this category have a *medium* to *fine* texture and a *dull* to *waxy* luster. Colour patterns include *solid*, *speckled* and *banded.*

| **Sample** | **Colour Description** | **Colour Pattern** | **Texture** | **Luster** |
|---|---|---|---|---|
| **4A600A1205-1** | Gley 1 Dark greenish gray 4/1 10Y | Banded | Medium | Dull |
| **4A600A1205-2** | Gley 1 Light greenish gray 7/1 10Y | Solid | Medium | Dull |
| **4A600A1205-3** | Gley 2 Bluish black 2.5/1 5PB | Solid | Fine | Waxy |
| **4A600A190(b)-1** | 7.5 YR Very dark gray 3/1 | SS | Medium | Dull |
| **4A600A191-1** | 10R Dark reddish gray 4/1 and 5YR Reddish gray 5/2 | Banded | Fine | Waxy |
| **A600A191-2** | Gley1 Dark greenish gray 4/1 10Y | Solid | Medium | Dull |

Table 6.6: Visual characteristics of L'Anse aux Meadows lithics. Colour descriptions are based on the Munsell Colour Chart (Munsell Colour Chart 2000) (SS stands for solid and speckled).

Chemical Characterization of Lithics

Plotting of the LA-ICP-MS results for the L'Anse aux Meadows samples defines two distinct clusters: Group 1 and 2 (Figure 6.5). Group 1 has the least number of samples present within its ellipse. From the samples tested, 33% of the samples from L'Anse aux Meadows fell into this cluster. The clustering of artifacts within Group 1 indicates that these artifacts are of similar material and geological source. Element concentrations for Group 1 are as follows: 0.21 to 0.31% CaO and 1.06 to 1.69% $Al_2O_3$.

Group 2, on the other hand, has the greatest number of artifacts present within its cluster, approximately 67%. Group 2 has relatively similar levels of CaO (0.07 to 0.18%) as Group 1; however it has between 1.76 to 8.11% more $Al_2O_3$ than Group 1. This higher percentage of $Al_2O_3$ suggests that artifacts that fall within Group 2 are not of the same material and geological source as artifacts within Group 1.

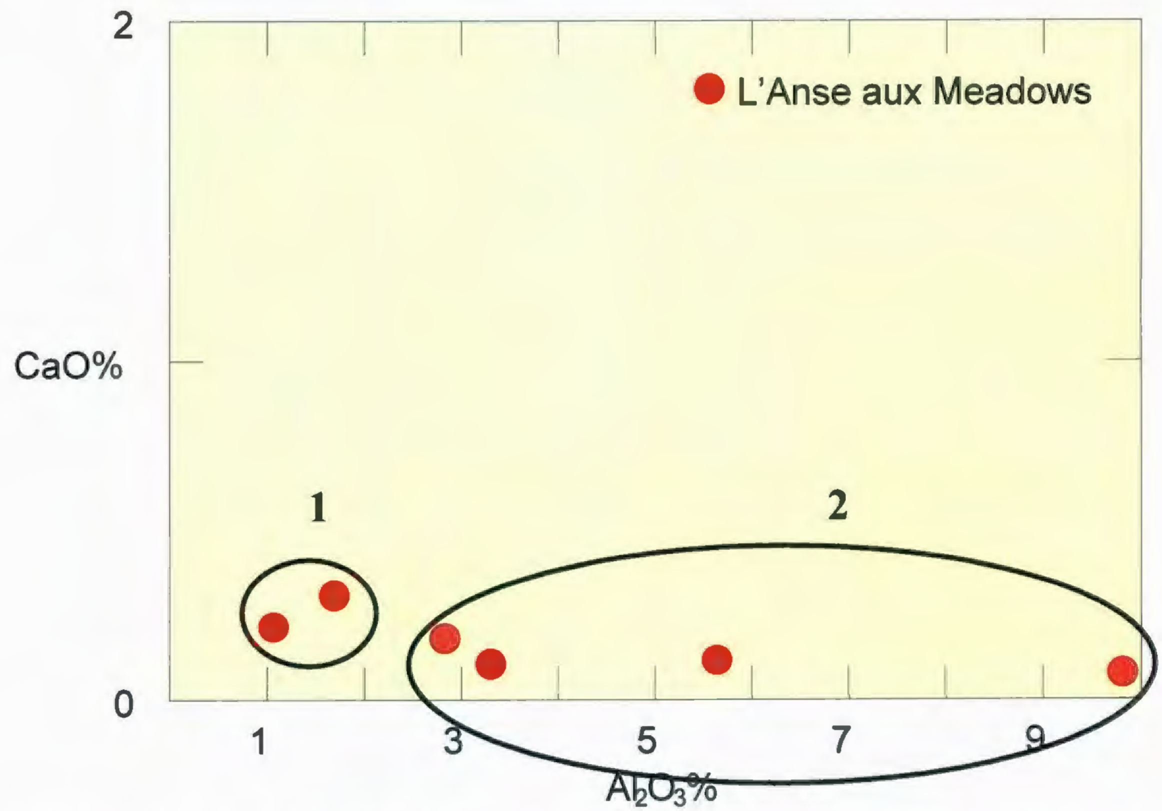


Figure 6.6 CaO vs. $Al_2O_3$ data plot for L'Anse aux Meadows lithics. The black ellipse is drawn to map the area representing each compositional group.

Summary of L'Anse aux Meadows Analyses

Overall, based on visual and chemical characterization of sampled artifacts from L'Anse aux Meadows it appears that at least two different material types were used at the site. Visual characterizations divide the samples into three groups: *bluish gray to bluish black*, *reddish gray* and *light greenish gray to very dark gray*. Within each colour grouping artifacts are relatively homogenous, displaying similar colour, luster and texture. Additionally, trace element content also divides the artifacts into two groupings: Group 1 and 2. The main difference amongst these groupings is that artifacts within Group 2 have a much higher $Al_2O_3$ percentage than those artifacts in Group 1.

Additionally, when data from both the visual and chemical characterizations are combined a very distinctive pattern emerges. Artifacts within Group 1 are those within the *bluish gray to bluish black* and *reddish gray* colour category and artifacts within Group 2 those within the *light greenish gray to very dark gray* colour category. This, therefore, further indicates that lithic material collected from L'Anse aux Meadows consists of at least two different material types that originate from two different sources.

**Comparison of Cow Head Complex Lithic Artifacts to Cow Head Chert**

Artifacts characterized in this chapter are compared to data gathered from the visual and chemical characterization of Cow Head chert (Chapter 5) in order to connect the artifacts to a known source. This comparison is done on a site by site basis.

*Spearbank*

Visual Comparison to Cow Head Chert outcrop samples

Overall, the visual comparison of lithics from the Spearbank site to raw material samples of Cow Head chert demonstrates that these samples are visually identical to one another in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities, it is suggested that all sampled artifacts from the Spearbank site are Cow Head chert.

Chemical Comparison to Cow Head Chert outcrop samples

Since compositional groupings for Cow Head chert were identified in Chapter 5, these same groupings are applied to flakes from the Spearbank site, as well as the others listed below, and the samples of Cow Head chert (Figure 6.7). Flakes and chert samples that fall into the same compositional groupings will have a similar chemical structure and therefore may be identified as the same material, in this case Cow Head chert. Artifacts that fall outside of these groupings are classified as outliers and may or may not be Cow Head chert (described in Chapter 5).

From the element analysis of Cow Head chert and chert flakes from the Spearbank site it appears that all samples tested are Cow Head chert. This can be primarily identified by overlapping clustered groups. For example, 60% of the flakes from the Spearbank site fall within the two compositional groups of Cow Head chert, identified in Figure 5.5 and reproduced in Figure 6.7. Even more so, some of the samples of Cow Head chert (25%) fall within the compositional grouping of flakes from the Spearbank site, identified in Figure 6.1 and reproduced in figure 6.7. Overall, this suggests that the element concentrations of the artifacts analyzed from the Spearbank site are similar to those of the raw material samples of Cow Head chert; this therefore suggests that they are the same material (Cow Head chert) and are from the same source (Cow Head Group).

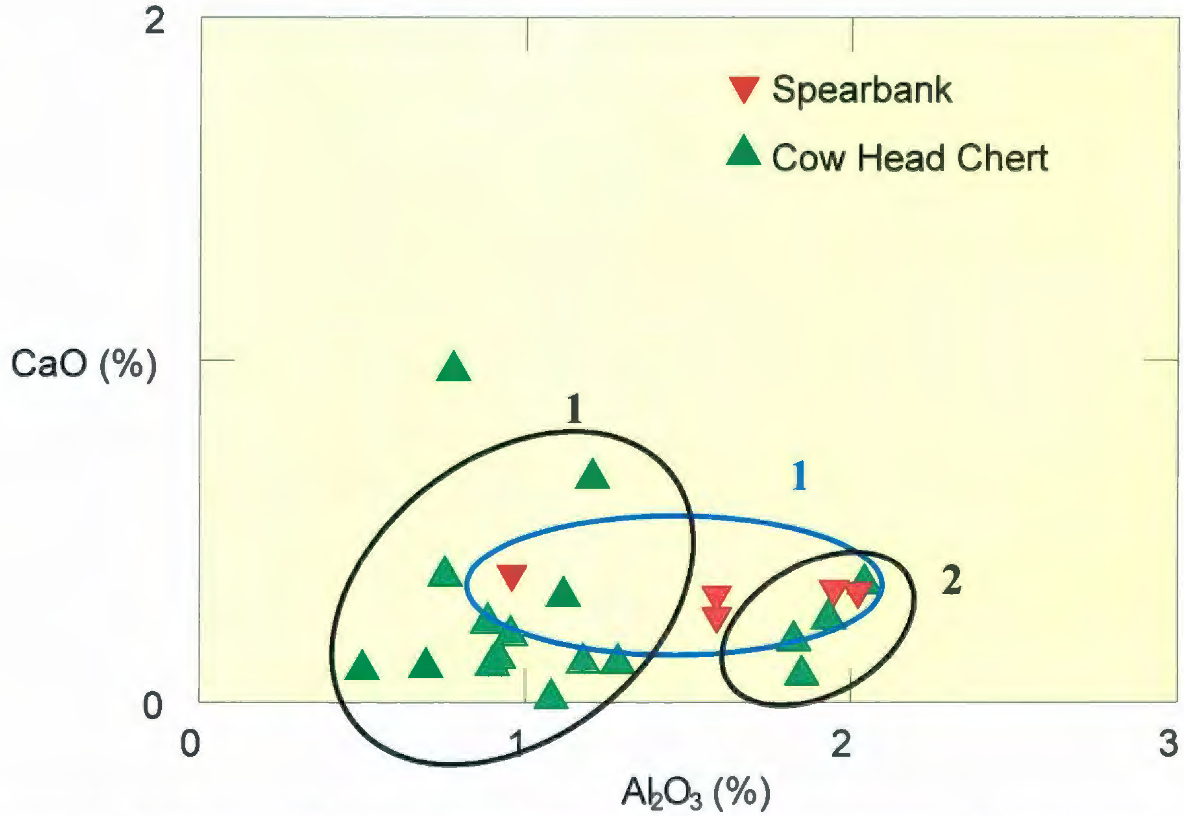


Figure 6.7: CaO vs. $Al_2O_3$ data plot for Spearbank and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipse is drawn to map the area representing the compositional group for the Spearbank site (as in Figure 6.1).

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from the Spearbank site, it appears that all samples tested are Cow Head chert, originating from the Cow Head Group. This analysis confirms statements of previous researchers (Auger 1986; Hartery 2001, 2007; Tuck 1978) regarding the sites' association to and use of nearby chert outcrops.

*Portland Creek 4 and 5*

Visual Comparison to Cow Head Chert outcrop samples

Overall, the visual comparison of lithics from Portland Creek 4 and 5 to raw material samples of Cow Head chert demonstrates that these samples are visually identical to one another in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities, it is suggested that the sampled artifacts from Portland Creek 4 and 5 are Cow Head chert.

Chemical Comparison to Cow Head Chert outcrop samples

From the element analysis of Cow Head chert and chert flakes from Portland Creek 4 and 5 it appears that all flakes tested are Cow Head chert. This can be primarily identified by overlapping clustered groups. For example, 75% of the flakes from Portland Creek 4 and 5 fall within the two compositional groups of Cow Head chert, identified in Figure 5.5 and reproduced in Figure 6.8. Even more so, some of the samples of Cow Head chert (65%) fall within the compositional grouping of flakes from Portland Creek 4 and 5, identified in Figure 6.2 and reproduced in Figure 6.8. Overall, this suggests that the artifacts analyzed from Portland Creek 4 and 5 and the raw material of Cow Head chert have similar element concentrations, which therefore suggests that they are the same material (Cow Head chert) and are from the same source.

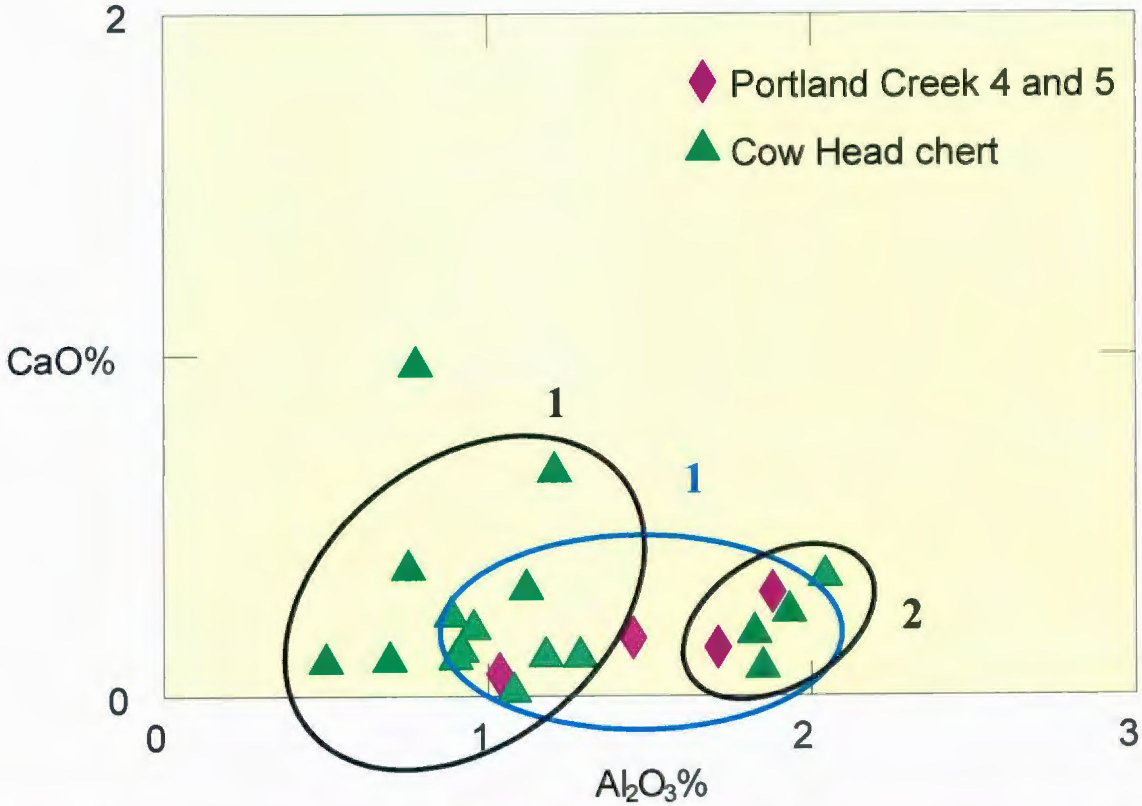


Figure 6.8: CaO vs. $Al_2O_3$ data plot for Portland Creek 4 and 5 and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipse is drawn to map the area representing the compositional group for Portland Creek 4 and 5 (as in Figure 6.2).

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from Portland Creek 4 and 5, it appears that all samples tested are Cow Head chert. This analysis confirms the statements/conclusions of previous researchers (Biggin 1985; Thomson 1987) regarding the origin of some of the lithic material found at the sites.

*Gould site*

Visual Comparison to Cow Head Chert outcrop samples

In general, the visual comparison of lithics from the Gould site to raw material samples of Cow Head chert demonstrates that approximately half of the samples - those falling under the *bluish gray to bluish black* colour category - are Cow Head chert. Flakes falling under the *bluish gray to bluish black* colour category are similar to the Cow Head chert raw material samples in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities it can be suggested that these flakes are Cow Head chert, and therefore come from the Cow Head Group.

However, one colour category identified at the Gould site was not recognized in the Cow Head chert raw material samples, the *light greenish gray to very dark gray* colour category. Approximately half of the flakes sampled from the Gould site fell into this colour category. Some of the flakes within this colour category have a similar *fine* texture as the Cow Head chert samples; however all of the samples have a *dull* luster, which is different from the *waxy* luster of the Cow Head chert samples. Based primarily on colour, texture and luster, it can be assumed that flakes falling under the *light greenish gray to very dark gray* colour category are not Cow Head chert, but a different chert originating from an unknown source. Furthermore, these flakes are visually different than the Cow Head chert samples therefore suggesting that they are not Cow Head chert.

Chemical Characterization to Cow Head Chert outcrop samples

From the element analysis of Cow Head chert and chert flakes from the Gould site it appears that at least half of the flakes tested from Gould site are Cow Head chert (Figure

6.9). This can be primarily identified by overlapping clustered groups, Group 1 from the Cow Head chert sample and Group 1 from the Gould site. Overall this suggests that at least half of the artifacts analyzed from the Gould site and the raw material of Cow Head chert have similar element concentrations, which therefore suggests that they are the same material (Cow Head chert) and are from the same source (Cow Head Group).

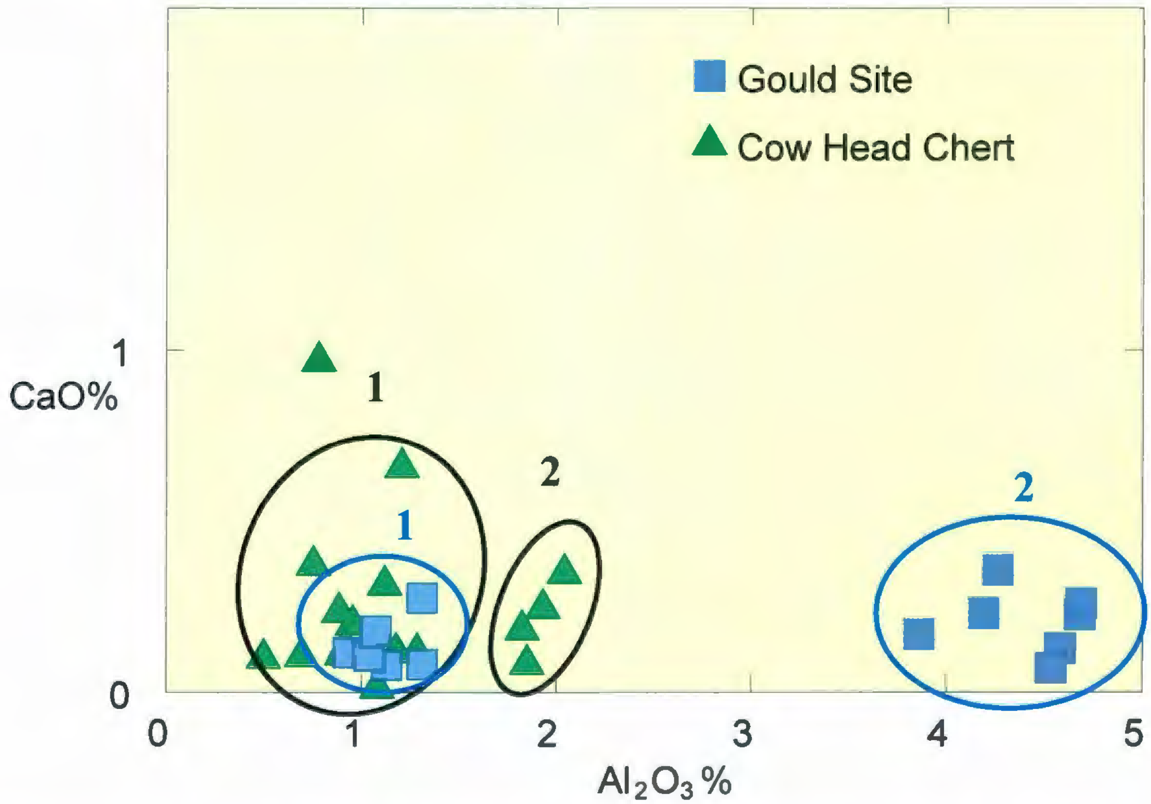


Figure 6.9: CaO vs. $Al_2O_3$ data plot for the Gould site and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipses are drawn to map the area representing each compositional group for the Gould site (as in Figure 6.3).

On the other hand, the remaining flakes from the Gould site - those that fall within Group 2 - do not appear to be Cow Head chert; no compositional groups overlap with it.

Therefore, this suggests that those flakes from the Gould site are not Cow Head chert but a chert that comes from another source altogether.

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from the Gould site, it appears that at least half of the samples tested - those falling under the *bluish gray to bluish black* colour category - are Cow Head chert. This analysis confirms Teal's (2001:99) suggestion that the black chert from the Gould site originates from the Cow Head region.

Furthermore, this comparison of visual and chemical characteristics reveals another material type in the Gould site lithic assemblage; that being, those flakes falling under the *light greenish gray to very dark gray* colour category. Flakes falling under this colour category differ from Cow Head chert in terms of visual and chemical characteristics, which therefore suggest that they are not Cow Head chert. Teal (2001:98-99) previously identified this material type in the Gould site lithic assemblage as a white to dark gray rhyolite; however chemical analysis has characterized it as a chert - its silica ($SiO_2$) content is between 94-98%. Additionally, Teal (2001:99) discussed a possible source for this material type, suggesting that it is locally available; however this source has not been found.

*Spence Site*

Visual Comparison to Cow Head Chert outcrop samples

Overall, the visual comparison of lithics from the Spence site to raw material samples of Cow Head chert demonstrates that these samples are visually identical to one another in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities, it can be suggested that the sampled artifacts from the Spence site are Cow Head chert.

Chemical Comparison to Cow Head Chert outcrop samples

From the element analysis of Cow Head chert and chert flakes from the Spence site it appears that all flakes tested are Cow Head chert (Figure 6.10). This can be primarily identified by overlapping clustered groups. For example, 92% of the flakes from the Spence site fall within the two compositional groups of Cow Head chert, identified in Figure 5.5 and reproduced in Figure 6.8. Even more so, some of the samples of Cow Head chert (94%) fall within the compositional grouping of flakes from the Spence site, identified in Figure 6.4 and reproduced in Figure 6.8. Overall, this suggests that the artifacts analyzed from the Spence site and the raw material from Cow Head have similar element concentrations, which therefore suggests that they are the same material (Cow Head chert) and are from the same source (Cow Head Group).

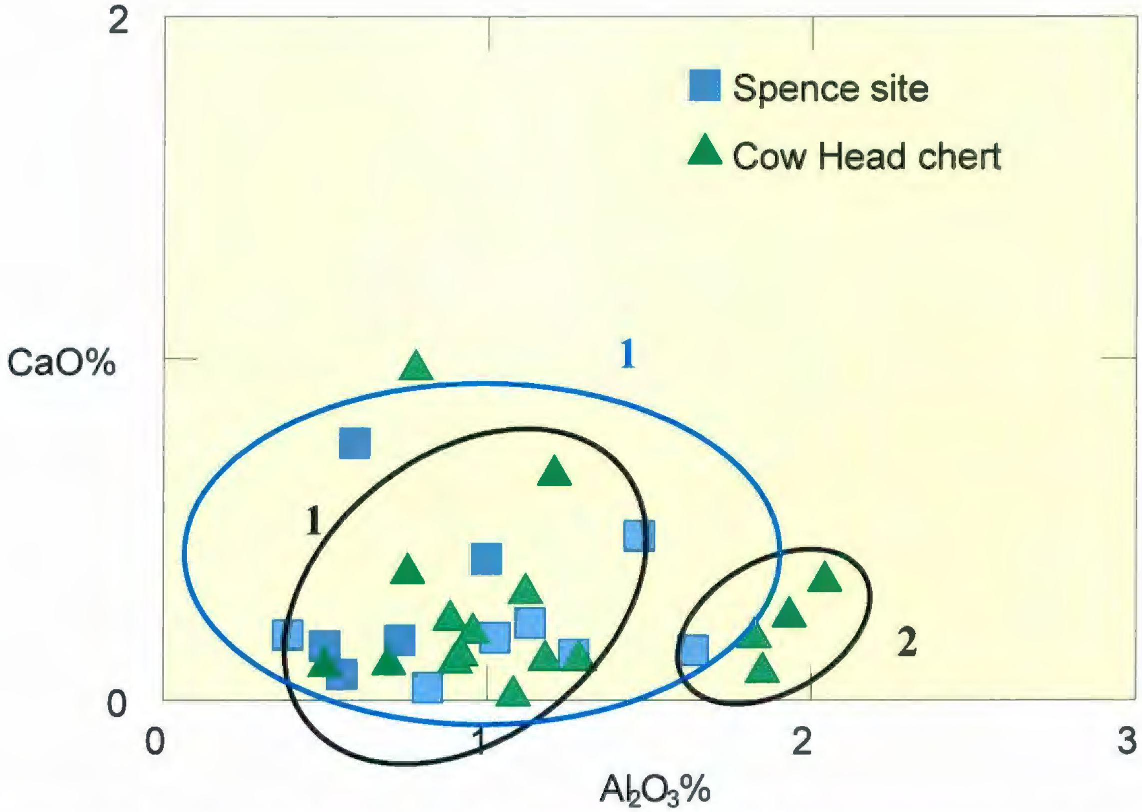


Figure 6.10: CaO vs. $Al_2O_3$ data plot for the Spence site and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipse is drawn to map the area representing the compositional group for the Spence site (as in Figure 6.4).

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from the Spence site, it appears that all samples tested are Cow Head chert, originating from the Cow Head Group. Contrary to Renouf's (1992, 1993) suggestion that the source of the site's lithic assemblage is nearby, results from the visual and chemical analysis has identified that the sampled flakes are in fact Cow Head chert.

*Peat Garden*

Visual Comparison to Cow Head Chert outcrop samples

In general, the visual comparison of lithics from Peat Garden to raw material samples of Cow Head chert demonstrates that 40% of the samples - those falling under the *bluish gray to bluish black* colour category - are Cow Head chert. Flakes falling under this colour category are similar to the Cow Head chert raw material samples in terms of colour, colour pattern, texture and luster. Therefore, based on these similarities, it is suggested that these flakes are Cow Head chert, and therefore originate from the Cow Head Group.

However, the *light greenish gray to very dark gray* colour category identified at Peat Garden was not recognized in the Cow Head chert raw material samples. These flakes have a *fine* texture and a *dull* luster. Based primarily on texture and luster, it can be assumed that flakes falling under the *light greenish gray to very dark gray* colour category are not Cow Head chert, but a different chert originating from an unknown source. These flakes are visually different than the Cow Head chert samples, therefore suggesting that they are not Cow Head chert.

Chemical Comparison to Cow Head Chert outcrop samples

From the element analysis of Cow Head chert and chert flakes from Peat Garden it appears that approximately 40% of the flakes tested from Peat Garden are Cow Head chert (Figure 6.11). This can be primarily identified by overlapping clustered groups, Group 1 from Cow Head chert and Group 1 from Peat Garden. Overall this suggests that approximately half of the artifacts analyzed from Peat Garden and the raw material from

Cow Head have similar element concentrations, which therefore suggests that they are the same material (Cow Head chert) and are from the same source (Cow Head Group).

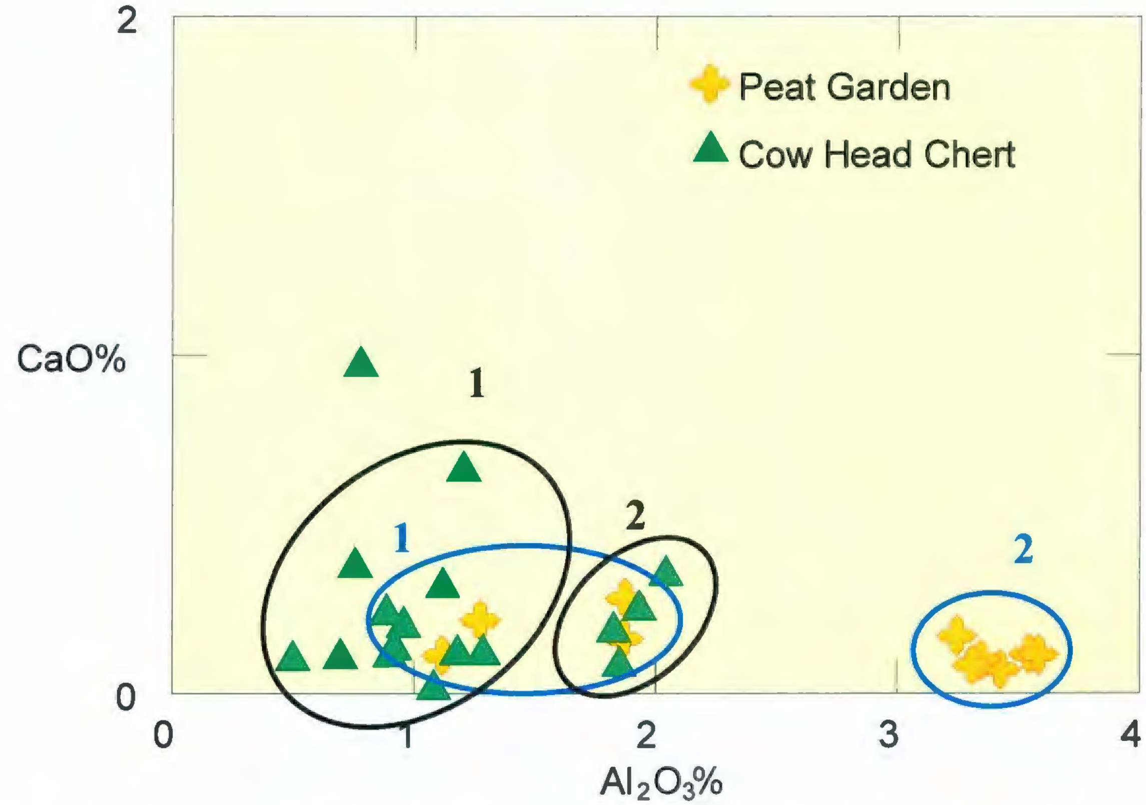


Figure 6.11: CaO vs. $Al_2O_3$ data plot for Peat Garden and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipses are drawn to map the area representing each compositional group for Peat Garden (as in Figure 6.5).

On the other hand, the remaining flakes from Peat Garden - those that fall within Group 2 - do not appear to be Cow Head chert. No trace element compositional overlapping occurs between the two compositional groupings of Cow Head chert and Group 2 from Peat Garden. This therefore suggests that flakes falling within Group 2 are not Cow Head chert, but a different type of chert altogether. The source of this chert is unknown.

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from Peat Garden it appears that flakes falling under the *bluish gray to bluish black* colour category are Cow Head chert, originating from the Cow Head Group. This analysis confirms Hartery's (2001, 2007) hypothesis that some of the lithic material from the site is Cow Head chert.

Furthermore, the comparison of visual and chemical characteristics reveals another material type in this lithic assemblage - those flakes falling under the *light greenish gray to very dark gray* colour category. Flakes falling under this colour category differ from Cow Head chert in terms of visual and chemical characteristics, which therefore suggest that they are not Cow Head chert. Reader (1998) and Hartery (2001, 2007) identified this material as Bird Cove chert. Additionally, Hartery (2001, 2007) discussed a possible source for this lithic material, suggesting that it may be locally available; however, a source has not to date been found.

*L'Anse aux Meadows*

Visual Comparison to Cow Head Chert outcrop samples

Overall, the visual comparison of lithics from L'Anse aux Meadows to raw material samples of Cow Head chert demonstrates that one flake, falling under the *bluish gray to bluish black* colour category, is Cow Head chert. The flake falling under the *bluish gray to bluish black* colour category is similar to the Cow Head chert raw material samples in terms of colour, colour pattern, texture and luster. Based on these similarities, it is suggested that this flake is made from Cow Head chert and therefore originates from the Cow Head Group.

Additionally, another flake falling under the *reddish gray* colour category has very similar visual characteristics as the Cow Head chert; however it is of a colour category not previously recognized in this research. Similar texture, luster, and colour pattern makes this flake homogenous to the Cow Head chert samples. Luster, texture and colour pattern identify it as Cow Head chert; however, its colour description does not.

Furthermore, another colour category identified at L'Anse aux Meadows that was not recognized in the Cow Head chert raw material samples is the *light greenish gray to very dark gray* colour category. Sixty-eight percent of the flakes sampled from L'Anse aux Meadows fell into this colour category. None of the flakes within this colour category have any visual characteristics similar to that of Cow Head chert. All samples have a *medium* texture and *dull* luster. Based on this, it can be assumed that flakes falling under the *light greenish gray to very dark gray* colour category are not Cow Head chert, but a different chert originating from an unknown source. These flakes are visually different from the Cow Head chert samples therefore suggesting that they are not Cow Head chert.

<u>Chemical Comparison to Cow Head Chert outcrop samples</u>

From the element analysis of Cow Head chert and chert flakes from Peat Garden it appears approximately 33% of the flakes tested from L'Anse aux Meadows are Cow Head chert (Figure 6.12). This can be primarily identified by overlapping clustered groups - Group 1 from Cow Head chert and Group 1 from L'Anse aux Meadows. Overall, this suggests that at least a third of the artifacts analyzed from L'Anse aux Meadows and the raw material of Cow Head chert have identical element concentrations, which therefore suggests that they are the same material (Cow Head chert) and are from the same source (Cow Head Group).

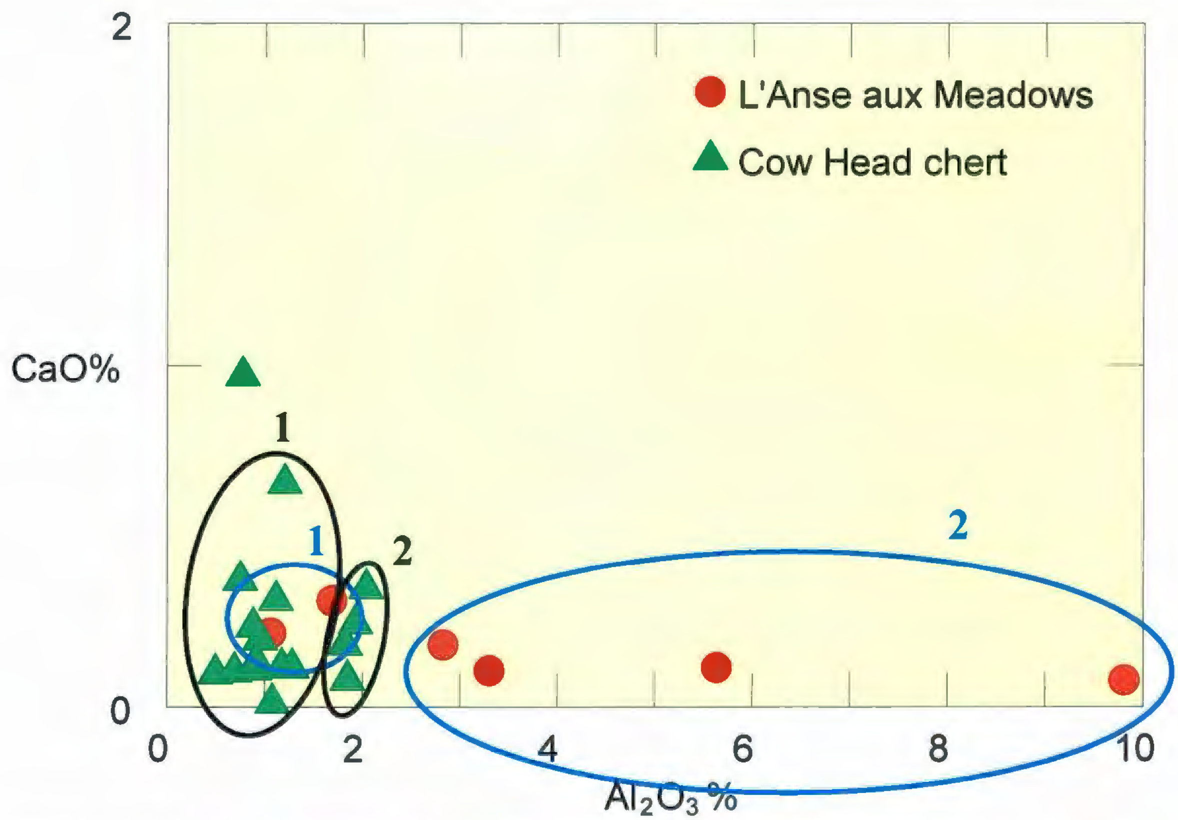


Figure 6.12: CaO vs. $Al_2O_3$ data plot for L'Anse aux Meadows and Cow Head chert outcrop samples. The black ellipses are drawn to map the area representing each compositional group for the Cow Head chert outcrop samples (as in Figure 5.5) and the blue ellipses are drawn to map the area representing each compositional group for L'Anse aux Meadows (as in Figure 6.6).

On the other hand, the remaining flakes from L'Anse aux Meadows - those that fall within Group 2 - do not appear to be Cow Head chert. No trace element compositional overlapping occurs between the two compositional groupings of Cow Head chert and Group 2 from L'Anse aux Meadows. This therefore suggests that flakes falling within Group 2 are not Cow Head chert but a different type of chert altogether. The source of this chert is unknown.

Summary

Overall, based on the visual and chemical comparison of Cow Head chert to sampled artifacts from L'Anse aux Meadows it appears that a third of the samples tested - those falling under the *bluish gray to bluish black* and *reddish gray* colour categories - are Cow Head chert, originating from the Cow Head Group. This therefore suggests that there is a small quantity of Cow Head chert in the Cow Head complex lithic assemblage from L'Anse aux Meadows.

Furthermore, the comparison of visual and chemical characteristics has revealed another material type in the L'Anse aux Meadows lithic assemblage - those flakes falling under the *light greenish gray to very dark gray* colour category. Flakes falling under this colour category differ from Cow Head chert in terms of visual and chemical characteristics, which therefore suggest that they are not Cow Head chert. This supports previous statements by Hartery (2001, 2007) which she suggests came from Pistolet Bay. Although the chemical analysis does not reveal the origin of this material, it does confirm that the source is not the Cow Head Group.

**Unidentified lithics**

All lithic artifacts tested in this research have been visual and chemically identified as Cow Head chert, except for those falling under Group 2 compositions at the Gould site, Peat Garden, L'Anse aux Meadows, and flake 617-5 from St. Paul's Bay-2. These artifacts are visually and chemically compared to each other to determine if they are from the same source.

Visual Comparison

Overall, the visual comparison of Group 2 lithics demonstrates that they are visually identical to each other in terms of colour, colour pattern, texture and luster. Furthermore, all samples, except flake 617-5, falls under the colour category of *light greenish gray to very dark gray.* Flake 617-5 falls under the *white* colour category. Therefore, based on colour, colour pattern, texture, and luster it appears that these flakes are similar, suggesting that they may be from the same outcrop.

| Sample | Colour Description | Colour Pattern | Texture | Luster |
|---|---|---|---|---|
| **EgBf-6:944-1** | Gley 1 Greenish gray 6/1 5GY | SS | Fine | Dull |
| **EgBf-6:944-4** | 5 YR Very dark gray 3/1 | SS | Medium | Dull |
| **EgBf-6:315-1** | 7.5 YR Gray 6/1 | Solid | Medium | Dull |
| **EgBf-6:315-5** | 7.5 YR Gray 6/1 | Solid | Medium | Dull |
| **EgBf-6:138-1** | Gley 1 Dark greenish gray 4/1 10Y | Solid | Fine | Dull |
| **EgBf-6:188-1** | Gley 1 Light greenish gray 7/1 5GY | SS | Fine | Dull |
| **DlBk-6:617-5** | 2.5Y White 8/1 | Solid | Medium | Dull |
| **EeBi-42:1650-1** | 5YR Dark gray 6/1 | Solid | Fine | Dull |
| **EeBi-42:1650-3** | 10YR Gray 6/1 | Solid | Fine | Dull |
| **EeBi-42: 1745-2** | 10YR Light gray 7/1 | Solid | Medium | Dull |
| **EeBi-42:1829-2** | 7.5YR Gray 5/1 | Solid | Fine | Dull |

| | | | | |
|---|---|---|---|---|
| **EeBi-42:1829-3** | 5YR Dark gray 6/1 | Solid | Medium | Dull |
| **EeBi-42:1937** | 5YR Dark gray 6/1 | Solid | Fine | Dull |
| **EeBi-42:1503-1** | 10YR Light gray 6/1 | Solid | Medium | Dull |
| **4A600A120-1** | Gley 1 Dark greenish gray 4/1 10Y | Banded | Medium | Dull |
| **4A600A1205-2** | Gley 1 Light greenish gray 7/1 10Y | Solid | Medium | Dull |
| **4A600A190(b)-1** | 7.5YR Very dark gray 3/1 | SS | Medium | Dull |
| **4A600A191-2** | Gley 1 Dark greenish gray 4/1 10Y | Solid | Medium | Dull |

Table 6.7: Visual comparison of lithic from Group 2 element compositions and flake 617-5 from St. Paul's Bay-2 (SS stands for solid and speckled).

## Chemical Comparison

From the element comparison of Group 2 lithics it appears that these artifacts came from at least two different sources (Figure 6.13); no compositional groups overlapped, which suggest that they originated from different sources.

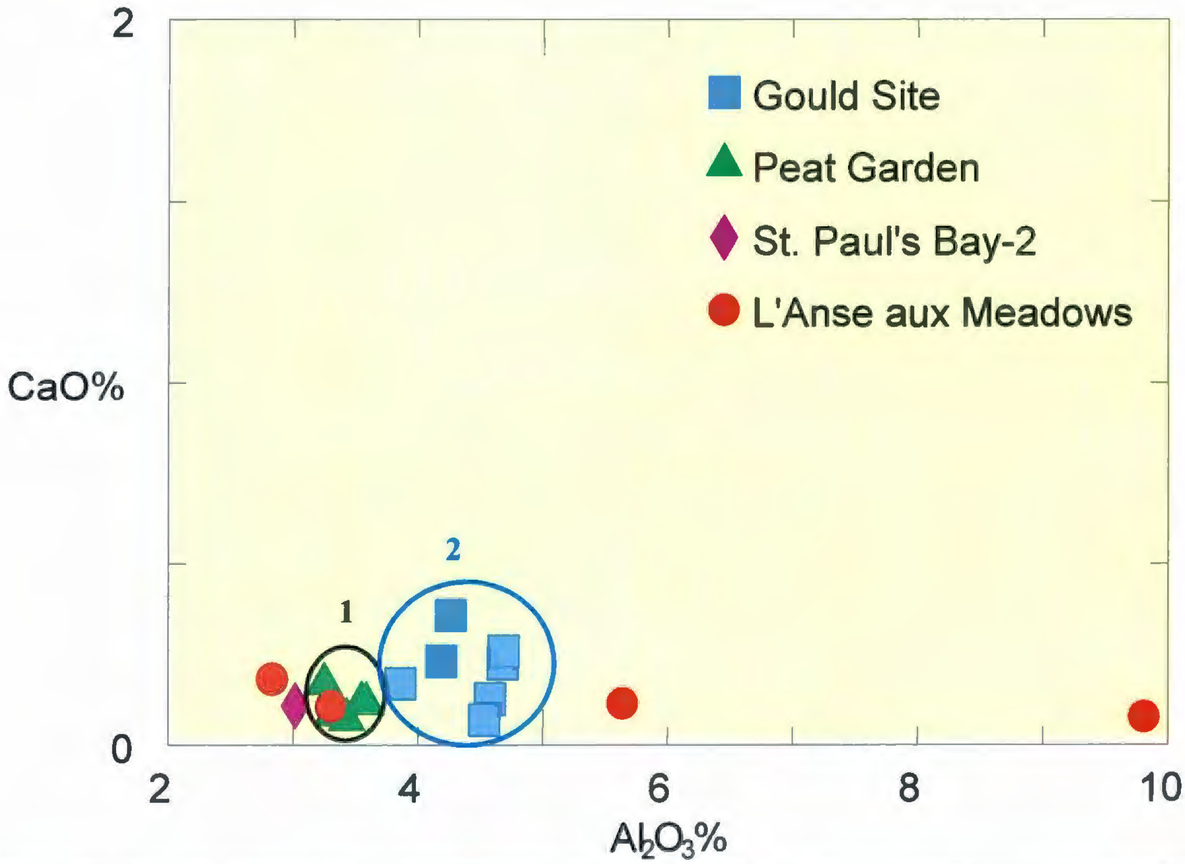


Figure 6.13: CaO vs. $Al_2O_3$ data plot for Group 2 compositional groups from Peat Garden, the Gould site and the unidentified lithic from St. Paul's Bay-2. The ellipses are drawn to map the area representing each compositional group (as in Figures 6.9, and 6.11). Black=Peat Garden and Blue=Gould site.

Overall, based on their distinct element compositions, it appears that lithics falling under the Group 2 categories originated from at least two different sources. Therefore, this suggests that there are at least two other raw material outcrops that were utilized by the Recent Indian Cow Head complex. Furthermore, this comparison also demonstrates that visually alike lithic materials are not necessarily from the same source or outcrop.

**Summary of Cow Head Complex Recent Indian Artifacts**

The visual and geochemical correlation of outcrops and artifacts was used in this chapter to try and test for an association between artifacts from various Cow Head complex Recent Indian sites throughout the Northern Peninsula and nearby outcrops of Cow Head chert. Results from these analyses indicated that all sites under study have a presence of Cow Head chert in their lithic assemblages, as well as other types of lithic material from unknown origins, such as those at the Gould site, Peat Garden and L'Anse aux Meadows. Similar and dissimilar visual characteristics such as colour, texture and luster, and element concentrations such as CaO and $Al_2O_3$, demonstrate this. The significance of these results is discussed in Chapter 7.

# CHAPTER 7

# ANALYSIS AND INTERPRETATION OF RESULTS

This chapter interprets and discusses the information presented in the previous chapters and places it in its broader context. The first half of the chapter establishes the theoretical context of this research, describing concepts relating to mobility and lithic procurement and how researchers, so far, have applied such concepts to the Recent Indian and, more importantly, to the Cow Head complex. The second half of this chapter examines the distribution of Cow Head chert on the Northern Peninsula to infer patterns of lithic raw material procurement and territorial range.

## Hunter-Gatherer Mobility

Mobility, as defined by Kelly (1983:277), describes the way in which hunter-gatherers move across the landscape. Hunter-gatherer groups maintain a degree of mobility to manage various spatial and temporal dissimilarities in resource distribution and availability to ensure that resources, such as food, water and fuel, are readily available and accessible (Binford 1980; Kelly 1983, 1995). Binford's (1980) forager-collector model, which takes into account these spatial and temporal differences amongst resource distribution and availability, has been adapted and successfully used amongst various researchers to describe and interpret mobility strategies for various hunter-gatherer groups (Amick 1996; Bamforth 1990, 1991; Chatters 1987; Féblot-Augustins 1997; cf. Fitzhugh and Habu 2002; Jones *et al.* 2003; Kelly 1983; Kelly and Todd 1988; Kuhn 2004;

MacDonald 1995; Nagle 1984; Reader 1993; Shott 1986). Based on work by these and other researchers it is evident that mobility studies are "universal, variable, and multi-dimensional" (Kelly 1992:43). It is necessary therefore "to recognize the various forms of mobility archaeologically" (Kelly 1992:43). Here I consider the concepts of residential and logistical mobility as well as what Binford (1982, 1983) terms "long term mobility," also known as "territorial mobility" (Kelly 1992). Additionally, these concepts are examined concomitantly with concepts of lithic raw material economies - primarily procurement strategies – to infer a territorial range for the Recent Indian Cow Head complex.

*Residential and Logistical Mobility*

Hunter-gatherer mobility can be described in terms of two variants of mobility: residential and logistical (Binford 1980, 1982; Kelly 1983). Residential mobility refers to the movement of an entire, or most, of a hunter-gatherer group (referred to as foragers) between base camps within an annual round (Binford 1980, 1982; Kelly 1983). Since residential sites, or base camps, are often located near sources of food, fuel and water, the depletion or near-depletion of these resources and their availability in another area often influences the decision to relocate the entire group to another area (Binford 1982:10). Logistical mobility, on the other hand, is the movement of individuals or task groups to and from a residential site on daily forays or extensive trips (Kelly 1983:298); hunter-gatherer groups practicing this type of mobility are called collectors. These trips may last for more than a day and may cover vast distances. Remnants of logistical forays may include hunting blinds, kill sites, and caches as the individual or task group exploits, processes, and consumes a particular resource (Binford 1980:10-12, 1982:8). Overall, the distribution and availability of resources across a group's landscape will be a major determinant of that group's mobility strategy (Binford 1980:14; Kelly 1983:277).

The mobility strategies described above form a continuum with residential (foragers) mobility at one end and logistical (collectors) mobility at the other. Most hunter-gatherer groups would probably employ both residential and logistical mobility as the need arose (Binford 1980; Kelly 1983). Indeed, many hunter-gatherer populations in northern regions would employ both mobility strategies when variability in food resources was seasonal more than spatial (Binford 1980; Renouf 1988). This would be the case for Newfoundland where many prehistoric cultures probably were both residentially and logistically mobile in order to acquire various resources (Fitzhugh 1972; Hood 1995; Howley 1915; LeBlanc 1996, 2008; Pastore 1986; Renouf 1993, 1994; Robbins 1985; Rowley-Conwy 1990; Schwarz 1994).

*Recent Indian Residential/Logistical Mobility*

In Newfoundland, all interpretations of Recent Indian residential and logistical mobility are archaeologically and ecologically based, focusing on site location, faunal remains and migration patterns of animals (Rowley-Conwy 1990; Schwarz 1994). Additionally, these models provide a very general overview of Recent Indian mobility strategies; they focus on the cultural tradition as a whole rather than attempting to define these strategies on a cross-complex basis. Unlike these early studies, recent studies have examined site function and location to determine mobility patterns and also focus their analysis on the Cow Head complex (Hartery 2001, 2007; Renouf 2003; Renouf *et al.* 2000, n.d).

Focusing on later Recent Indian populations, the Beaches and Little Passage complexes and the Beothuk, Rowley-Conwy (1990) and Schwarz (1994) suggested that these groups had a low residential mobility and high logistical mobility. Schwarz (1994:67) argues that these Recent Indian groups spent spring on the outer coastal areas hunting harp seals; summer in the inner coastal areas exploiting a variety of resources, such as smelt and shellfish; and fall and winter in the interior hunting caribou and living on stored meat. Additionally, Rowley-Conwy (1990) interprets the storage techniques of the Beothuk as an adaptation to spend more energy and time creating and storing food surpluses rather than spending it to move to another camp, which suggests that the Beothuk were less mobile in fall and winter then in the spring and summer (cf. Holly 2002; Howley 1915).

Furthermore, recent studies (Renouf *et al.* 2000, n.d; Renouf 2003; Hartery 2001, 2007) that examine site location and function come to similar conclusions as Schwarz (1994) and Rowley-Conwy (1990), arguing that the earlier Recent Indian Cow Head complex populations on the Northern Peninsula had a low residential mobility and a high logistical mobility. For example, by examining site function, Renouf *et al.* (n.d) determined that the Cow Head complex component of the Gould site functioned as a residential base camp, which was evident from the wide variety of activities, such as hunting, cooking, food processing, tool maintenance, and storage, which took place there. Additionally, the presence of architectural remains, such as a dwelling and multiple hearths, further strengthened her argument. Additionally, by comparing site function of the Gould site to that of Spearbank, Peat Garden and St. Paul's Bay-2, Renouf *et al.* (n.d) suggested that these sites served as logistical field camps that were focused on lithic quarrying and/or tool manufacture. Hartery (2001, 2007), who also examined function of the Peat Garden site, based on location, artifacts, features and faunal assemblage, drew similar conclusions.

Overall, from previous work it is clear that many researchers have reached similar conclusions about the Recent Indian culture, in terms of their residential and logistical mobility. It has been convincingly argued that this culture, as a whole, as well as the separate complexes which comprise it, were highly mobile moving along the coast as well as between coastal and interior regions.

*Territorial Range*[11]

'Territorial range' refers to the total area used by a hunter-gatherer group over several years. As Binford (1982) points out, the total area used by a hunter-gatherer group in one year is referred to as their 'annual range'; however, the seasonal, annual, and multi-year use of a geographic area is referred to as territorial range (Kelly 1992). For the rest of this chapter the term range will be used to refer to the territory or geographic area covered by a group.

Determining the size of the range in which a hunter-gatherer group habitually occupied has, within the past two decades, become a growing area of interest within the study of mobility. There are many techniques that researchers have used to help determine the size of a group's range, such as examining site location and function;

[11] The term 'territory', as used here, refers to the geographic region exploited on a regular basis by a hunter-gatherer group. Unless stated, the use of this term does not imply notions that these territorial ranges were well defined, restrictive or defended.

however, the technique that has become most prevalent and relevant to this research is lithic sourcing (Amick 1996; Bamforth 1990; Beck and Jones 1990; Beck *et al.* 2002; Burke 2006a; Holen 1991; Jones *et al.* 2003; LeBlanc 2008; Nagle 1984; MacDonald 1995; Monet-White 1991; O'Driscoll 2003). Lithic sourcing is an excellent means of determining territorial range if the following conditions are met: all geological sources are known, its material type can explicitly be identified, and that exchange can be ruled out as a method of lithic raw material acquisition (Hess 1996; Jones *et al.* 2003; Meltzer 1989).

*Recent Indian Territorial Range*

Unlike the above section on Recent Indian mobility, study and interpretation into Recent Indian territorial range is virtually absent. Although some researchers, such as Schwarz (1984, 1994) and Rowley-Conwy (1990) have studied and interpreted Recent Indian settlement and subsistence patterns no one has formally addressed the topic of territorial range. This research represents the first investigation of this subject.

Nevertheless, minimal conclusions regarding range can be gathered from mobility studies mentioned above. Based on data and information provided by these researchers as well as others (Hartery 2001, 2007; Holly 1997, 2002; Pastore 1989; Renouf *et al.* n.d), regarding Recent Indian mobility, it is interpreted that the culture's territorial range was large, encompassing both coastal and interior regions. Furthermore, these studies suggest that Recent Indians moved freely along the coast as well as between interior and coastal regions.

The research presented in this chapter builds upon previous work to generate a territorial range for the Cow Head complex, one that is based on Cow Head chert lithic procurement strategies.

**Lithic Procurement Patterns**

Over the past three decades researchers have developed many theoretical models which have helped to explain the formation of lithic assemblages. Using basic economic principles and ethnographic analogies many models, some of which stemmed from Binford's (1980) forager-collector model of hunter-gatherer mobility patterns, examine the relationship between aspects of territorial range and lithic procurement (Andrefsky 1994; Bamforth 1986, 1990, 1991; Beck *et al.* 2002; Binford 1979, 1980, 1982; Burke 2006a, 2007; Cowan 1999; Gramly 1980; Kelly 1987, 1992, 1995; MacDonald 1995; Nagle 1984; Reader 1993; Shott 1986; Stevenson 1985). The basis for many of these models is the assumption that as hunter-gatherers perform daily activities, they deplete and replenish their supply of lithic raw material in either a structured or opportunistic manner, thus leading to the deposition of lithic assemblages that may contain artifacts of different sizes, raw material, and types. While lithic raw material is permanent or fixed to the landscape, acquisition strategies must take into consideration conditions such as ice and snow cover, which can influence its availability (Andrefsky 1994; Bamforth 1986; Beck and Jones 1990; Kelly 1987; Nelson 1971; Wenzel and Shelley 2001). Acquisition strategies may also take into consideration aspects of existing seasonal rounds.

There are three ways in which lithic raw materials or tools can be acquired: direct, indirect, or embedded procurement (Binford 1979; Meltzer 1989). Direct procurement involves the travel to a lithic outcrop simply to acquire stone. This usually involves logistical forays as individuals or task groups are sent to the quarry to gather material and return back to a residential base camp. Archaeological evidence supporting direct procurement involves the use of a lithic source in a direct fashion. Large numbers of cores, preforms and debris, as well as formal and informal tool classes[12] associated with the raw material in question, in a site assemblage, are all strong indicators that an outcrop was directly procured (Andrefsky 1994; Bamforth 1986, 1990, 1991; Beck and Jones 1990; Beck *et al.* 2002; Binford 1979; Bradley *et al.* 2001; Burke 2006a; Carr 1994; Gramly 1984; Jones *et al.* 2003; Nagle 1984; Meltzer 1989). However, this is not to be confused with embedded procurement. During embedded procurement lithic raw material is collected during the group's seasonal round or during some larger subsistence task (Binford 1979). Binford (1979:266) states that "raw materials are generally procured as elements of an embedded strategy, and are obtained in anticipation for future needs." Archaeological evidence supporting embedded procurement is very similar to that of direct procurement; however, when embedded procurement is the means of acquisition one would expect to find formal tool classes made from exotic raw materials that are worn out, complete and broken as groups discarded them in favour of new ones (Binford 1979: 260). Indirect procurement, on the other hand, involves the exchange of goods for raw

[12] Formal tool classes refer to tools that have a formal shape and design, such as bifaces and endscrapers. These are flexible and designed to be rejuvenated (Andrefsky 1994:22). Tools that fit these specifications are: bifaces, projectile points, and prepared cores. Informal tool classes refer to tools that are simpler and have a less formal shape and design. Informal tools are seen as a response to a condition rather than anticipation (Binford 1979) and therefore wasteful with regard to lithic material (Andrefsky 1994:22).

lithic materials, tools or preforms (Meltzer 1989). Archaeological evidence supporting indirect procurement involves a restricted tool kit and lithic assemblage associated with the raw material in question. One would expect to find formal tool classes, such as projectile points and bifaces, that are either broken or exhausted and small amounts of debitage, usually in the form of retouch flakes (Andrefsky 1994; Bamforth 1986, 1990, 1991; Beck and Jones 1990; Beck *et al.* 2002; Binford 1979; Bradley *et al.* 2001; Carr 1994; Jones *et al.* 2003; Nagle 1984; Meltzer 1989).

Like mobility studies, one of the ways in which lithic procurement strategies can be studied is through the geological sourcing of lithic artifacts (Amick 1996; Bamforth 1990; Burke 2006a; Jensen and Petersen 1998; LeBlanc 2008; Loring 2002; Nagle 1984; Reader 1993). The sourcing of artifacts provides the means of determining a group's procurement strategy, which in turn can help determine that group's annual round and territorial range. For example, Burke (2006a) examined sources of Munsungun chert from around Munsungun Lake, Maine, to determine the territorial range of Paleoindian populations in southern Quebec, Maine and New Hampshire. Using visual analysis to identify and source the chert, and concepts of raw material economies, such as procurement strategies and distance decay[13], Burke was able to determine, based on the dominating presence of Munsungun chert in some of the sites' lithic assemblages, that Paleoindian ranges were large and covered enormous distances.

[13] Distance decay refers to the phenomenon that the farther the location of a given site from the lithic source, the lower the flake:tool ratio. This is interpreted as reflecting increased costs in time and energy in procurement of lithic raw materials according to increasing distance from the lithic source area (Ricklis and Cox 1993:450).

Furthermore, another way in which hunter-gatherer territorial ranges have been studied is through the organization of tool technology. The analysis of formal and informal tools, raw material availability and quality, and the design of stone tools have been used as an indicator of territorial range (Andrefsky 1994; Bamforth 1991; Binford 1979, 1980; Burke 2007; Carr 1994; Cowan 1999; Gramly 1980; Kelly and Todd 1988; MacDonald 1994; Shott 1986); however, as this research is focused on the geochemical sourcing of Cow Head chert, this method is not addressed.

*Recent Indian Lithic Procurement Patterns*

Currently, very little is known about Recent Indian lithic procurement strategies. Most discussions of Recent Indian lithic procurement strategies are limited to statements or speculations regarding a lithic materials source location. For example, in his analysis of the lithic assemblage from Russell's Point, Trinity Bay, Newfoundland, Gilbert (2002) suggests that based on the high number of artifacts, all of which are made from the same gray chert, that the source for this material is nearby, within Trinity Bay.

To date, only one study has analyzed Recent Indian lithic acquisition strategies (Reader 1993). Reader (1993) analyzed the lithic assemblage of the Beaches complex from the Spence site as well as from Daniel Rattle sites in Labrador to suggest two spatial and temporal patterns based on lithic raw material selection. From his analysis, Reader (1993) determined that from 2000-1000 BP, the predominant lithic material found on Recent Indian sites in Labrador and Quebec was Ramah chert, while in Newfoundland it was Newfoundland cherts. Reader (1993) notes that after 1000 BP this changes. In Labrador there is a movement away from Ramah chert and Newfoundland chert and pink quartzite start to dominate the lithic assemblages. Reader (1993:50) accredits this change in raw material use to an increase of movement and interaction between Recent Indian groups living in Newfoundland and those living in Labrador and Quebec. Overall, from his study Reader (1993) determines that, based on a change in lithic acquisition patterns from direct to indirect procurement, the degree of mobility and interaction between Recent Indian groups increased after 1000 BP. Reader's (1993) study is very important as it documents the movement of lithic material and people across the Strait of Belle Isle.

In the following section, I examine lithic procurement strategies to explain the presence of Cow Head chert on eight Cow Head complex sites. I have already demonstrated the presence of Cow Head chert on Recent Indian Cow Head complex sites on the Northern Peninsula (Chapter 5 and 6) and now I explore the implications of these results for understanding the territorial range of these Cow Head complex people.

**Interpretation**

Combining the data collected from Chapters 3, 5 and 6 with archaeological interpretations from eight Cow Head complex sites, the following section discusses and explains the presence of Cow Head chert in these lithic assemblages. Explanations for the presence of Cow Head chert amongst these sites is addressed through concepts of lithic procurement strategies and site classification (residential base camp vs. logistical field camp). Using lithic procurement strategies as an indicator of movement, this information is used to infer a territorial range for the cultural group.

In the following sections each Cow Head complex site is discussed separately in order to determine the lithic procurement strategy used to acquire Cow Head chert (summarized in Table 7.1). This information is combined with current views relating to site classification. With the coupling of these data, all eight sites are then collectively examined in order to determine the territorial range of the Cow Head complex on the Northern Peninsula.

*St. Paul's Bay-2*

St. Paul's Bay-2 is a lithic quarry/workshop site with a secondary living component (Chapter 3). The majority of the lithic assemblage (approximately 99%) is identified as Cow Head chert (Chapter 5), with the remaining (less than 1%) consisting of exotic cherts such as Ramah, rhyolite and quartzite. St. Paul's Bay-2 has a restricted lithic assemblage, one that was narrowly focused on lithic quarrying and tool manufacture (Chapter 3). However, the presence of four hearths, a single dwelling, and calcified faunal remains (Renouf 2005) suggests the site had a secondary living component.

Geochemical and visual comparison reveals a high proportion of Cow Head chert in the St. Paul's Bay-2 lithic assemblage. This is expected as St. Paul's Bay-2 is interpreted as a logistical field camp (Renouf *et al.* n.d) where task groups procured Cow Head chert from the nearby source and manufactured it into tools. A field camp, as described by Binford (1980), is a site where a task group stays for a short period of time, such as a day or a week, in which they concentrate on a particular activity, such as hunting or lithic quarrying. The presence of four hearths and a dwelling at St. Paul's Bay-2 can be explained by the need to have comfort and survival while acquiring raw material (cf. Stevenson 1985:64).

Archaeological evidence, primarily the site's lithic assemblage, indicates that the presence of Cow Head chert at St. Paul's Bay-2 is a result of direct and/or embedded procurement. As the site was used over a long period of time - from about 1850-1050 BP - by Cow Head complex groups, it is possible that both these strategies were employed. Evidence supporting these strategies is based on the large number of cores, preforms and flakes made of Cow Head chert, as well as the formal and informal tool classes which are made of both Cow Head chert and non-local materials (Figures 3.18 and 3.20). Additionally, as four occupation periods are accounted for at the site (Table 3.5), it is possible that one of those occupation periods may represent a task group that directly procured Cow Head chert, while during a subsequent occupation period a task group could have collected the chert while on another, larger subsistence task.

*Spearbank*

Like St. Paul's Bay-2, the Spearbank site has been identified as a lithic quarry and tool manufacturing site associated with a nearby source of Cow Head chert (Tuck 1978). Visual and geochemical analysis has identified the presence of Cow Head chert (approximately 99%) in the Cow Head complex lithic assemblage (Hartery 2001, 2007; Chapter 6). Based on the above information, previous researchers (Hartery 2001, 2007; Renouf *et al.* n.d) have identified the Spearbank site as a logistical field camp focused on the quarrying of Cow Head chert and manufacturing tools.

Spearbank's lithic assemblage indicates that the presence of Cow Head chert at the site is a result of direct and/or embedded procurement. Because the site was used over a long period of time by the Cow Head complex groups (2000-1000 BP), it is possible that both these strategies were employed. Evidence supporting these strategies is based on the large number of cores, preforms and flakes made of Cow Head chert, as well as the formal and informal tool classes which are made of Cow Head chert and non-local materials (Hartery 2001, 2007). Similar to procurement strategies identified at St. Paul's Bay-2 it is possible that one task group directly procured Cow Head chert while another, earlier or later, task group collected the chert through embedded procurement. Overall, based on the lithic assemblage found at the Spearbank site it is hypothesized that the presence of Cow Head chert at the site is a result of either direct and/or embedded procurement.

*Portland Creek 4 and 5*

Currently little is known about these two sites as the only artifacts were surface collected; no further research has been conducted at these sites. However, from the information that is known about these sites it has been speculated that, based on the sites' locations, they may represent logistical field camps focused on fishing (Renouf *et al.* n.d). Both sites are located near a well-known salmon river, Portland Creek, which suggests that the two sites may have been used as logistical field camps focused on salmon fishing; salmon are predictable as they swim up rivers to spawn from June to early August (McCormick *et al.* 1998). This is a speculation as the artifact assemblages from these sites consist primarily of flakes.

The analysis of artifacts from Portland Creek 4 and 5 indicates a presence of Cow Head chert in the sites' lithic assemblages. As Portland Creek 4 and 5 are viewed as logistical field camps (Renouf *et al.* n.d), it is understood that they are directly linked to a residential base camp (Binford 1980). Residential base camps and field camps are linked as activities performed at the base camp directly supports the field camps and activities performed at the field camps directly supports the base camp (Binford 1980). A residential base camp for these sites has not been found. Without knowing where this potential residential base camp lies it can only be hypothesized as to how Cow Head chert ended up at these sites.

The procurement strategies that best account for this presence is direct and/or embedded procurement. Direct procurement may account for the presence of Cow Head chert at these sites since outcrops of Cow Head chert are located only 30 kilometres to the south. Additionally, embedded procurement may also account for this presence as it is possible that as groups of people travelled to Portland Creek 4 and 5 to fish they may have visited either St. Paul's Bay-2 or the Spearbank site to stock up on raw material and/or to manufacture stone tools needed to hunt and/or process salmon. Indirect procurement is not viewed here as a strategy of Cow Head chert acquisition because of the sites' proximity to Cow Head chert outcrops as well as the large primary Cow Head chert flakes found at the sites.

Overall the presence of Cow Head chert at both Portland Creek 4 and 5 could be a result of either direct and/or embedded procurement. However, due to the scarcity of archaeological data from these sites, these two procurement strategies represent hypotheses.

*Gould site*

Both Renouf *et al.* (n.d) and Hartery (2001, 2007) interpret the Gould site as a residential base camp based on the wide variety of activities, such as cooking, tool manufacture, food processing and storage, are represented in the heterogeneous tool assemblage. Binford (1980) describes a residential base camp as a central hub to which various short-term, task specific sites (or logistical sites), such as kill or lithic quarrying areas, are attached.

Analysis has revealed that approximately 80% of the lithic assemblage from the Gould site consists of a white to dark gray chert. Other lithic materials present include of Ramah and Cow Head chert, although in smaller quantities (Teal 2001: 52). Visual and geochemical artifact analysis identifies the presence of two types of chert at the site, one which has been identified as Cow Head chert, and the other of an unknown source (Chapter 6).

Based on the information provided by previous researchers (Hartery 2001, 2007; Renouf *et al.* n.d; Teal 2001) pertaining to the site's lithic assemblage, as well as information gathered throughout this research (Chapter 6), it is hypothesized that the presence of Cow Head chert on the Gould site is a result of indirect procurement. Artifacts made of Cow Head chert in the site's lithic assemblage are either complete tools (one projectile point - see Figure 2.5, far left), or tertiary and retouch flakes (Teal 2001:52). This suggests that the artifacts made from Cow Head chert were brought to the site in either a complete or near complete state.

Evidence for direct and embedded procurement is not supported based on the low percentage of Cow Head chert artifacts in the lithic assemblage and the fact that the nearest Cow Head chert outcrop is 100 kilometres away. If groups living at the Gould site were heading to the Cow Head region to acquire Cow Head chert or stop there on their way to another field camp site, then one would expect to find cores, preforms, flakes and formal and informal tools present in the site's lithic assemblage (cf. Bradley *et al.* 2001; Callahan 1979; Morrow and Jeffries 1989); however, there were no Cow Head chert preforms or cores found in association with the Cow Head complex lithic material assemblage (Teal 2001).

*Peat Garden*

Peat Garden has been identified as a lithic quarry and manufacturing site based on the large number of cores, preforms and debitage found at the site (Hartery 2001, 2007). Hartery (2001, 2007) identified the lithic material found at the site consists primarily (greater than 98%) of a white-light gray chert, which she calls Bird Cove chert. Less than 1% of the lithic assemblage is identified as Cow Head chert.

Hartery (2001, 2007) identified Peat Garden as a logistical field camp that was focused on the quarrying of Bird Cove chert and on tool manufacture. Additionally, the high concentration of lithic artifacts and debitage indicated easy access to a lithic outcrop. Furthermore, as the lithic assemblage consisted primarily of cores, preforms and flakes, made of Bird Cove chert, Hartery (2001, 2007) argued that this material was directly procured from an unknown source, likely nearby.

Hartery (2001, 2007) also identified 79 tertiary and retouch flakes as Cow Head chert, which accounts for less than 1% of the site's total lithic assemblage; no complete or broken tools made of Cow Head chert were found at the site. The geochemical and visual analysis of flakes confirmed the presence of Cow Head chert on this site (Chapter 6). However, like Portland Creek 4 and 5, it is difficult to pinpoint the lithic procurement strategy that explains how Cow Head chert ended up at Peat Garden. The following are therefore hypotheses.

The presence of Cow Head chert at Peat Garden may be the result of direct procurement. Task groups sent out on forays to collect Bird Cove chert may have also been previously sent to the Cow Head region to collect Cow Head chert. Similarly, the presence of Cow Head chert at Peat Garden could be a result of embedded procurement. Task groups who used Peat Garden might have been sent on hunting or fishing forays near sources of Cow Head chert and therefore Cow Head chert was collected and later brought to Peat Garden. Lastly, the presence of Cow Head chert may be explained by indirect procurement. Groups who occupied areas around Cow Head may have exchanged tools, made from Cow Head chert, with groups that occupied areas around Peat Garden.

Of these three hypotheses indirect procurement seems most likely. The small amount of Cow Head chert found at the site compared to the site's long occupation period (1800-1100 BP) indicates that the chert was acquired through exchange. If the chert was acquired by the other two forms of lithic procurement then one would expect to find more debitage and either complete or broken tools as they were discarded in favour of new ones made from Bird Cove chert (cf. Brumbach and Weinstien 1999; Gramly 1980, 1984; MacDonald 1995; Petraglia 1994).

*L'Anse aux Meadows*

At L'Anse aux Meadows approximately 200 artifacts, two cooking pits, a few hearths and a possible disturbed dwelling are associated with the site's Recent Indian Cow Head complex component (Kristensen 2010; Wallace 1989). The number of features as well as the narrowly focused lithic assemblage indicates that the site probably served as a residential base camp (Hartery 2001, 2007; Renouf *et al.* n.d).

Little work has been done on the lithics from this site. Hartery (2001, 2007) recently examined the artifacts and suggested that the raw material used to make the tools looked like Cow Head chert, but differed chemically. By comparing these artifacts to raw samples of Cow Head chert, this was confirmed (Chapter 6). Nevertheless, based on my analysis two of the seven artifacts tested were identified as Cow Head chert.

Based on artifactual evidence from L'Anse aux Meadows, only one procurement strategy seems to justify the presence of Cow Head chert at the site. Given that L'Anse aux Meadows is viewed as a residential base camp by Hartery (2001, 2007) and Renouf *et al.* (n.d), it is possible that the presence of Cow Head chert is the result of exchange with groups that occupied areas further south. Direct and embedded procurement are unlikely as L'Anse aux Meadows is over 250 kilometres away from the nearest outcrop of Cow Head chert. Additionally, as only two tertiary flakes were identified as Cow Head chert, direct and embedded procurement are eliminated as possible methods of acquisition as one would except to find more artifacts, such as preforms and complete tools and flakes, associated with the raw material (cf: Bradley *et al.* 2001; Callahan 1979; Morrow and Jeffries 1989). Therefore, based on the information that is currently known about L'Anse aux Meadows it appears that Cow Head chert made its way to L'Anse aux Meadows through indirect procurement.

*Spence Site*

The Spence site does not fit within the above comparison of data from Cow Head complex sites because it is primarily a Beaches complex rather than a Cow Head complex occupation. Although examined as a Cow Head complex site in this research, the Spence site has only a few artifacts that Renouf (personal communication 2009) has identified as Cow Head complex in origin; no Cow Head complex component has been formally identified at the site. Therefore, the artifacts examined in Chapter 6 are more than likely Beaches or Little Passage complex in origin. This geochemical artifact analysis has determined that there is a high presence of Cow Head chert in the site's lithic assemblage. All artifacts tested were visual and geochemically identified as Cow Head chert (Chapter 6).

The Spence site has been identified as a lithic quarry and tool manufacturing site, with a secondary living component (Renouf 1992, 1993). The large amount of lithic manufacturing and processing that took place there indicates that the site was a logistical field camp focused on lithic tool manufacturing. Faunal remains and hearths indicate a small living component (Renouf 1992, 1993).

The lithic assemblage from the Spence site consists primarily of a dark brown chert. Renouf (1992) suggested that this raw material originated from a nearby source that had been covered up in recent years; however, the geochemical comparison of this material to that of Cow Head chert indicates that the material originates from the Cow Head Group. As this material is present on the site in all forms, such as cores, preforms, flakes, formal and informal tools, this indicates that the material was acquired through direct and/or embedded procurement. This suggests the Beaches and Little Passage complexes, which later occupied the site, made specific trips to outcrops of Cow Head chert and/or stopped there during some larger foray.

Currently, not enough is known about the Cow Head complex occupation at this site. Fewer than four artifacts have been identified as Cow Head complex in origin (Renouf personal communication 2010). Visual comparison of these artifacts to flakes geochemically tested from the site reveals that they are made from Cow Head chert. However, trying to determine if these artifacts were brought to the site as preforms or as complete tools is difficult because one cannot distinguish between flakes produced by the Cow Head complex and those by the Beaches and Little Passage complexes. Therefore it can only be hypothesized as to which lithic procurement strategy was used.

Due to the Spence site's long distance to the closest Cow Head chert outcrop it is hypothesized that the presence of Cow Head chert at the Spence site is a result of indirect procurement. This is similar to the indirect procurement strategy hypothesized for the Gould site, which is located only one kilometre east of the Spence site. This is very interesting because it appears that the later Recent Indian complexes, the Beaches and Little Passage, that occupied the Spence site, did not procure Cow Head chert the same way as the earlier Cow Head complex people. This suggests that Cow Head chert procurement strategies may have changed over time.

| Site | Evidence | Interpretation |
|---|---|---|
| St. Paul's Bay-2 | -approximately 99% of the lithic assemblage is Cow Head chert<br>-large number of cores, preforms and flakes made of Cow Head chert<br>-formal and informal tool classes made of Cow Head chert<br>-multiple site occupations<br>-close proximity to Cow Head chert outcrop, within 1 kilometre<br>- logistical field camp focused on lithic procurement and manufacturing | Direct and/or embedded procurement |
| Spearbank | -approximately 99% of the lithic assemblage is Cow Head chert<br>-large number of cores, preforms and flakes made of Cow Head chert<br>-formal and informal tool classes made of Cow Head chert<br>-multiple site occupations<br>-close proximity to Cow Head chert outcrop, within 1 kilometre<br>-logistical field camp focused on lithic procurement and manufacturing | Direct and/or embedded procurement |
| Portland Creek 4 and 5 | -close proximity to outcrops of Cow Head chert, within 30 kilometres<br>-logistical field camp focused on fishing | Direct and/or embedded procurement |
| Gould | -residential base camp associated with many activities, including tool manufacture<br>-proximity to nearest Cow Head chert outcrop is greater than 100 kilometres<br>-Cow Head chert artifacts in lithic assemblage are complete tools (projectile points), tertiary and | Indirect procurement |

| | | |
|---|---|---|
| | retouch flakes | |
| Peat Garden | -Cow Head chert artifacts in lithic assemblage are tertiary and retouch flakes<br>-less than 1% of the tool assemblage is Cow Head chert<br>-proximity to nearest Cow Head chert outcrop is greater than 175 kilometres | Indirect procurement |
| L'Anse aux Meadows | -Cow Head chert artifacts in lithic assemblage are two tertiary flakes<br>-less than 1% of the tool assemblage is Cow Head chert<br>-proximity to nearest Cow Head chert outcrop is greater than 250 kilometres<br>-residential base camp | Indirect procurement |
| Spence | -lithic workshop site<br>-high presence of Cow Head chert in the lithic assemblage<br>-lithic assemblage mostly made up of cores, preforms and flakes | Direct and/or embedded procurement |

Table 7.1: Summary of lithic procurement strategies for each site.

*Summary*

From the above sections it is apparent that Cow Head chert was acquired by Cow Head complex Recent Indians through all three lithic procurement strategies: direct, embedded and indirect. Examining site classification as well as the quantity of Cow Head chert, a lithic procurement strategy was identified for each site that best described the presence of Cow Head chert in their lithic assemblages.

Results of this analysis indicate that sites close to outcrops of Cow Head chert used direct and/or embedded procurement strategies, whereas sites located over 100 kilometres away from the nearest outcrop of Cow Head chert likely obtained Cow Head chert through exchange. These observations are supported by the presence and/or absence of certain Cow Head chert artifacts, such as cores, preforms, projectile points, and bifaces, in the sites' lithic assemblages.

These results are the basis for discussing the territorial ranges of the Recent Indian Cow Head complex on the Northern Peninsula.

**Cow Head Complex Territories**

In the following section, the occurrence of Cow Head chert as well as its distance to the nearest source forms the basis for interpreting Cow Head complex territorial ranges on the Northern Peninsula. These data show that Cow Head chert was conveyed from sources within a zone measuring approximately 120 kilometres north-south and approximately 20 kilometres west-east. Direction west-east is defined by the coast on the west and on the east by the Long Range Mountains, which runs parallel to the coast and obstructs access to the interior and eastern coast (Figure 7.1). Although these territorial ranges may be modified once more Cow Head complexes are found, this reconstruction is based on current geochemical data and on similarity amongst artifact assemblages.

Coupling the above information with distances to the nearest source of Cow Head chert (Table 7.2), three territorial ranges are identified for the Cow Head complex (Figure 7.1). Sites where over 90% of the lithic assemblage is dominated by Cow Head chert are in close proximity to source, with the exception of the Spence site[14] which is an anomaly.

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[14] The majority of the lithic material from the Spence site is associated with the Beaches and Little Passage complexes (Renouf 1991, 1992). Fewer than four artifacts have been identified as Cow Head complex in origin (Renouf, personal communication 2009).

This indicates direct and/or embedded procurement of Cow Head chert rather than indirect procurement (Table 7.1). Sites that have less than 20% of Cow Head chert in their lithic assemblages, such as Peat Garden and the Gould site are over 100 kilometres from the nearest Cow Head chert outcrop. Indirect procurement of Cow Head chert emerges as a likely explanation for its presence on these sites (Table 7.1). Therefore, the amount of Cow Head chert in a site's lithic assemblage is related to its distance from the source; the further away a site is from an outcrop of Cow Head chert, the lesser amount of Cow Head chert will appear in its lithic assemblage. This is consistent with distance decay models (Ricklis and Cox 1993:450).

| **Site** | **Distance Km** | **Percent Cow Head chert** |
|---|---|---|
| St. Paul's Bay-2 | <0.5 | >99 |
| Spearbank Site | <0.1 | >99 |
| Portland Creek 4 and 5 | 30 | ≤100 |
| Spence Site | 120 | Unknown |
| Gould Site | 120 | <20 |
| Peat Garden | 150 | <1 |
| L'Anse aux Meadows | 250 | ≤1 |

Table 7.2: Recent Indian Cow Head complex sites and the percentage of Cow Head chert in the lithic assemblages versus distance from the nearest Cow Head chert outcrop. Distance from site to source has been calculated as linear distances, as the crow flies.

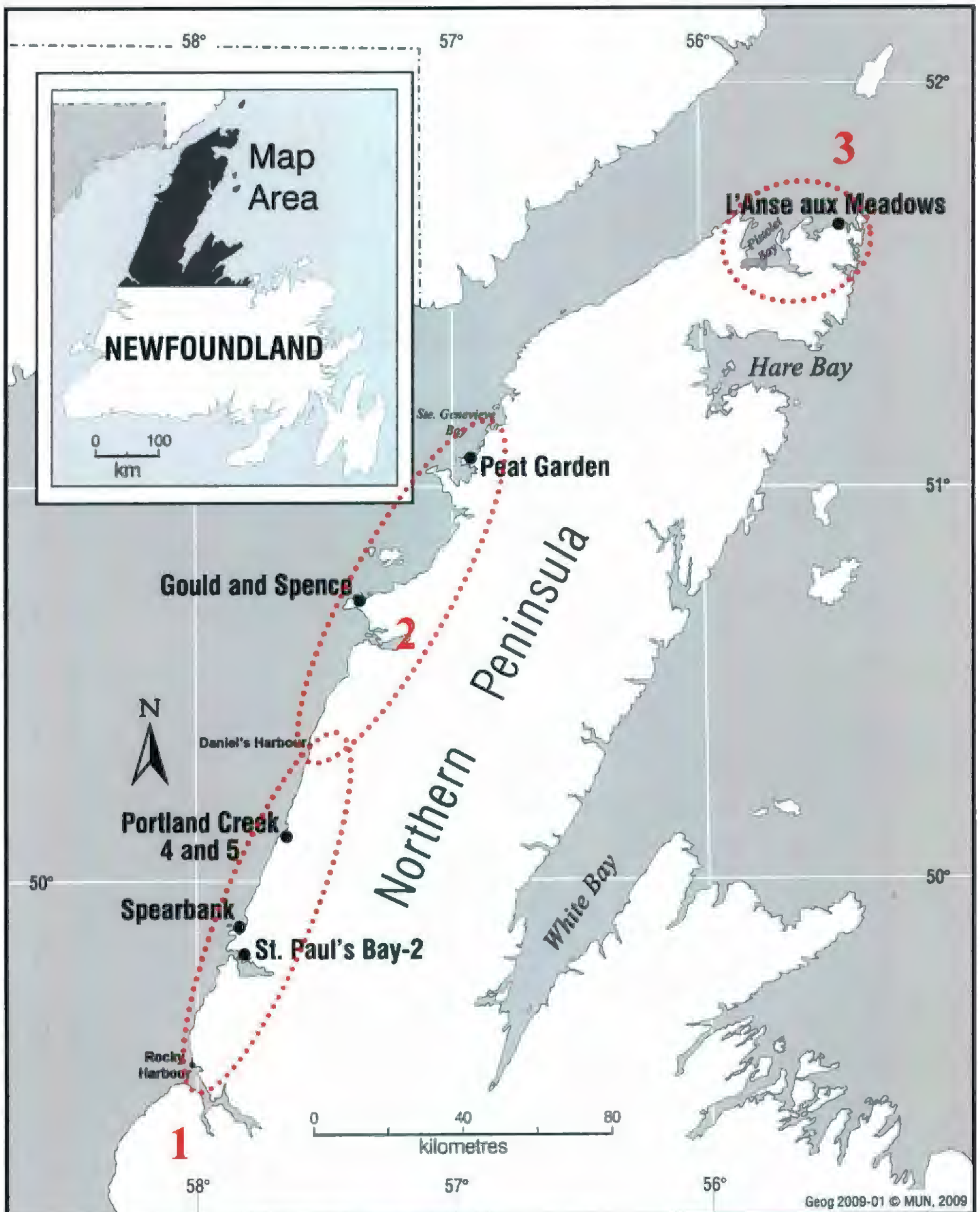

Figure 7.1: Cow Head complex range on the Northern Peninsula. Ellipses represent the different Cow Head complex territories inferred from this research (Map: PACAP).

As Cow Head complex sites are few and rare, the boundaries of the territorial ranges can only be estimated. Range 1 (Figure 7.1) is concentrated around the southern portion of the Northern Peninsula, ranging from what is presently known as Rocky

Harbour up to Daniel's Harbour. However, the northern and southern extent are estimated because no Cow Head complex sites have been found on the Northern Peninsula south of St. Paul's Bay-2 nor between Portland Creek 4 and 5 and the Gould site. I have estimated the northern extent of Range 1 to end at Daniel's Harbour because of the low relative proportion of Cow Head chert appearing on the sites to the north. It is possible that the territorial range may have been further north or south, but due to lack of archaeological sites associated with the Cow Head complex this cannot be presently determined.

Range 2 is estimated to extend as far south as Daniel's Harbour and north to the areas around Ste. Genevieve Bay. The southern extent is estimated to overlap slightly with that of Range 1. The procurement strategies suggested for the Gould site and Peat Garden suggests that the groups who inhabited Range 2 were going south and exchanging with groups that inhabited Range 1.

Range 3 is centered on L'Anse aux Meadows and encompasses Pistolet Bay, a large bay west of L'Anse aux Meadows. The full extent of this range is hard to determine as L'Anse aux Meadows is the only identified Cow Head complex site that far north. Even more so, as argued in the previous section of this chapter, since two Cow Head chert flakes were identified at the site, suggestion of trade with groups to the south emerges; however, the absence of Bird Cove chert suggests otherwise. If groups from L'Anse aux Meadows were exchanging with groups from the south then one would expect to find artifacts made of Bird Cove chert in the site's lithic assemblage. As the source for Bird Cove chert is believed to be closer to L'Anse aux Meadows than the Cow Head chert source more artifacts made from Bird Cove chert ought to be found at the site (cf. Ricklis and Cox 1993); however, that is not the case (Hartery 2001, 2007). Additionally, given that Hartery (2001, 2007) suggests that the Cow Head complex artifacts from L'Anse aux Meadows originate from Pistolet Bay, Range 3 encompasses this entire area.

**Discussion**

The information presented above adds new insight into the Recent Indian Cow Head complex culture. The Cow Head complex had been regarded as highly mobile (Hartery 2001, 2007; Renouf *et al.* n.d); therefore the three territorial ranges identified above were unexpected. Furthermore, these ranges demonstrate that movement along the Northern Peninsula was possibly restricted providing insight onto how territorial ranges changed amongst Recent Indian complexes.

As discussed in the mobility section above, the Recent Indian culture, as a whole, in Newfoundland is seen as highly mobile. Studies on the Cow Head (Hartery 2001, 2007; Renouf *et al.* n.d), Beaches (Holly 1997, 2001; Rowley-Conwy 1990; Schwarz 1984, 1994) and Little Passage (Holly 1997, 2001; Rowley-Conwy 1990; Schwarz 1984, 1994) complexes as well as the Beothuk (Holly 2002; Pastore 1989) have demonstrated this. Therefore, based on these studies, one would expect to find evidence suggesting that the Cow Head complex people's moved freely throughout the Northern Peninsula. However, the three territorial ranges identified in the above sections suggest that, even though the Cow Head complex peoples were highly mobile, their territorial range was limited. From these territorial ranges (Figure 7.1), it is evident that the Cow Head complex people did not move throughout the Northern Peninsula, as expected, but that they were limited to particular locations within the region.

Furthermore, by comparing lithic procurement strategies identified for each Recent Indian complex we see how territorial ranges have changed or remained the same. This is demonstrated by examining the lithic procurement strategies of Cow Head chert at the Spence site, which is a Beaches and Little Passage complex site. Using the information gathered in Chapter 6 and the above sections it is recognized that approximately 98% of the site's lithic assemblage is Cow Head chert. Additionally, the large amount of cores, preforms and primary and secondary flakes, all of which are made on Cow Head chert, demonstrated that the chert was brought to the site by direct and/or embedded procurement. This suggests that the later Recent Indian Beaches and Little Passage complex peoples were travelling down to the Cow Head region to acquire Cow Head chert and/or other resources. These lithic procurement strategies differ greatly from the indirect procurement strategy identified at the Gould site, which is located one kilometre from the Spence site and an earlier Cow Head complex site. Therefore, by comparing lithic procurement strategies it has been identified that territorial ranges vary amongst the Recent Indian complexes; in this case a change over time.

From this comparison it appears that the later Beaches and Little Passage complexes were more mobile and had a larger territorial range than the earlier Cow Head complex. This demonstrates that the Beaches and Little Passage complexes conform to the expected model.

**Summary**

The results of this research, as well as archaeological data collected from previous researchers, permitted the suggestion of three territorial ranges for the Recent Indian Cow Head complex. The research reported here indicates that territorial ranges were established early on during the Recent Indian Cow Head complex occupation of Newfoundland. Furthermore, these results indicate that movement by the Cow Head complex people on the Northern Peninsula was restricted, something which was not identified for later Recent Indian complexes.

From these results it is evident that the Cow Head complex occupation in Newfoundland is a unique phenomenon. Cow Head complex sites and assemblages only occur on the Northern Peninsula of Newfoundland. Additionally, the Cow Head complex does not seem to conform to the norm, unlike later Recent Indian complexes. Therefore, this research strengthens Hartery's (2007) statements suggesting that the Cow Head complex is different from other Recent Indian complexes.

# CHAPTER 8

# SUMMARY

This chapter summarizes the research objectives outlined at the beginning of this research, the methods used to meet them, and the results. The implications of this study for raw material sourcing studies are also discussed. Finally, future considerations are outlined.

## Summary of Research Objectives and Methodology

The overall objective of this research was to understand how the Recent Indian Cow Head complex populations on the Northern Peninsula of Newfoundland procured Cow Head chert. To fulfill these objectives I examined Cow Head complex sites at both a site-specific and regional scale. St. Paul's Bay-2 was examined site-specifically in order to (1) determine its function and occupation, and (2) to determine if it was associated with the nearby source of Cow Head chert. At a regional scale, seven Cow Head complex sites were examined and analyzed in order to determine if Cow Head chert was present in their lithic assemblages, and if so, to understand how it was procured. Lastly, a combination of all of this data was then used to interpret a range pattern for the Cow Head complex occupation of the Northern Peninsula.

To meet these objectives, I partially excavated a Cow Head complex site at St. Paul's Bay-2 and analyzed its lithic assemblage and architectural remains. Examining both the lithic assemblage and architectural remains I was able to identify St. Paul's Bay-2 as a lithic quarry/workshop site with a secondary living component (Chapter 3).

Additionally, using geochemical analysis and traditional observational methods (Chapter 4) I was able to determine that approximately 99% of the lithic material found at the site is Cow Head chert and that it was quarried from a nearby source (Chapter 5). Secondly, I was then able to compare these data to lithic assemblages collected from other Cow Head complex sites located throughout the Northern Peninsula. Analysis of chert artifacts from these sites indicated that Cow Head chert was present at each site (Chapter 6). Finally, by interpreting the above information I was then able to determine the possible lithic procurement strategies for Cow Head chert at each site, which in turn identified three territorial ranges for the Cow Head complex (Chapter 7).

**Implications for Raw Material Sourcing in Newfoundland Archaeology**

The research presented here is important to Newfoundland and Labrador archaeology as it represents the first comprehensive study to use laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) to source Cow Head chert in both a geological and archaeological context. The use of LA-ICP-MS is a valuable resource to archaeologists as it leaves minimal destruction on artifacts, which enables archaeologists to retrieve valuable quantitative data while maintaining the artifact's qualitative characteristics. In the case of Newfoundland archaeology, LA-ICP-MS offers a way to reinterpret and further enhance inferences about past cultures as the technique is applicable to both prehistoric and historic materials.

**Future Considerations**

As this research focused primarily on Cow Head chert and its presence on Cow Head complex sites found throughout the Northern Peninsula, future considerations could take into account the occurrence of other lithic raw material types. Additionally, the study region could be expanded to include Amerindian sites in both Labrador and Quebec. Some Amerindian sites, located in Labrador and Quebec, are known to have "Newfoundland" cherts in their lithic assemblages (Pintal 1998); therefore, an analysis of exotic raw materials found on Amerindian sites in Labrador and Quebec could help to further narrow down lithic procurement strategies and territorial dynamics for the Cow Head complex.

Overall, the data presented in this research provides an important foundation upon which future researchers can build upon to create a more extensive inventory of the lithic raw materials used by the Recent Indian Cow Head complex.

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## Appendix A

Lithic Source Analysis Form

Catalogue Number: ____________________________________

Site: ________________________________________________

Colour (Munsell):______________________________________

Chroma: ________________________

Hue: ___________________________

Value: __________________________

Inclusions: ____________________________

Colour Pattern: _________________________

Texture: _______________________________

Luster: ________________________________

Notes: _________________________________

_______________________________

_______________________________

_______________________________

_______________________________

**Appendix B**

LA-ICP-MS Procedure

Written by: Mike Tubrett

Each day - prior to data acquisition - the instrument is turned on and allowed to warm up for an hour. This is done to allow the internal components to reach maximum operating temperature. Once this is done, a glass standard (NIST-612) is placed in the laser cell and continuously ablated until a signal is produced that permits the instrument settings to be tuned. After tuning the instrument, data for NIST-612 (glass wafer doped with 61 elements) and BCR2G (glass wafer of melted basalt glass) are collected. This data is used as a standard or reference material. Following the collection of the standard data the unknown samples are placed into the laser cell and analyzed. Before and after each sample is analyzed an additional set of standards are collected.

Concentrations of 35 elements ($Al_2O_3$, $SiO_2$, CaO, $TiO_2$, V, MnO, FeO, Ga, Rb, Sr, Y, Zr, Nb, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Tl, Pb, Th, U) were determined at the MAF-IIC labs at Memorial University of Newfoundland (MUN) using laser ablation inductively coupled plasma-mass spectrometry (LA-ICP-MS).

The analytical system is a Finnigan ELEMENT XR, a high resolution double focusing magnetic sector inductively coupled plasma mass spectrometer (HR-ICPMS) coupled to a GEOLAS 193 nm excimer laser system. A helium flow rate of 0.9 to 1.0 l/min was used to carry ablated material to the ICP, with an additional 0.75 l/min argon make up argon gas added after the ablation cell. A laser spot size of 49 um was used for analyses. Laser energy was approximately 3 $J/cm^2$ and the laser repetition rate was 10 Hz. Time resolved intensity data were acquired by peak-jumping in a combination of pulse-counting and analog modes, depending on signal strength, with one point measured per peak for masses. Concentrations were calibrated with the NIST-612 glass. $SiO_2$ was the internal standard used to deal with differences in ablation yields and matrix effects between the unknown samples and the calibration materials (NIST-612 glass). The $SiO_2$ concentrations of the unknowns were assumed to be homogeneous at 100.0%.

Approximately 25 seconds of gas background data (with the laser beam off) were collected prior to each 50 second ablation of both standards and unknowns. NIST-612 glass and BCR2G glass was used as reference (calibration) material and analyzed in the first three and last three positions of each run. Basalt glass BCR2G was analyzed as an unknown twice in a run.

The data acquisition methodology employed an analytical sequence of two analyses of the NIST-612 standard and one of BCR2G reference material with analyses of up to 14 unknown artifacts, closing with a repetition of the same standards in reverse order. The BCR2G was treated as an unknown and data was acquired to allow the monitoring of accuracy and precision of the dataset and the technique in general (see attached table of BCR2G results (Table 9.1)). The error for the method is better than 3-7% relative standard deviation based on the reproducibility of results for various reference materials measured from day to day over several months in the MUN laboratory.

Data were reduced using MUN's in-house CONVERT and LAMTRACE spreadsheet programs, which employ procedures described by Longerich *et al.* (1996).

LAMTRACE allows selection of representative signal intervals, background subtraction, internal standard correction for ablation yield differences, instrument sensitivity drift during the analytical session, and the execution of calculations that convert count rates into concentrations by reference to the standards.

| **LA-ICP-MS BCR2G data: D. Lavers vs. Sylvester "MUN long term" value** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **D. Lavers Study N=93 Calibrated with 612** | | | | | | **MUN-PJS Long Term N=231** | | |
| | **Isotopic Mass** | | **Average** | **STD[15]** | **RSD%** | **Average** | **RSD%** | **D. Lavers AVG./MUN Long Term AVG** |
| $Al_2O_3$ | 27 | wt% | 12.5 | 0.3 | 2 | N/A | N/A | N/A |
| $SiO_2$ | 29 | wt% | 54.1 | 0.0 | 0 | N/A | N/A | N/A |
| CaO | 42 | wt% | 6.6 | 0.2 | 3 | 6.82 | 6 | 0.96 |
| CaO | 44 | wt% | 6.6 | 0.2 | 3 | 6.95 | N/A | N/A |
| $TiO_2$ | 49 | wt% | 2.6 | 0.1 | 5 | 2.68 | 14 | 0.95 |
| V | 51 | ppm | 424.8 | 13.0 | 3 | 400.0 | 8 | 1.06 |
| MnO | 55 | wt% | 0.2 | 0.0 | 4 | 0.19 | 7 | 1.02 |
| FeO | 57 | wt% | 13.1 | 3.1 | 24 | N/A | N/A | N/A |
| Ga | 69 | ppm | 46.6 | 8.3 | 18 | 43.0 | 8 | 1.08 |
| Rb | 85 | ppm | 47.1 | 1.3 | 3 | 44.5 | 12 | 1.06 |
| Sr | 88 | ppm | 306.6 | 9.4 | 3 | 329.0 | 8 | 0.93 |
| Y | 89 | ppm | 29.7 | 1.0 | 3 | 31.3 | 11 | 0.95 |
| Zr | 91 | ppm | 150.2 | 9.5 | 6 | 162.0 | 10 | 0.93 |
| Nb | 93 | ppm | 11.0 | 0.3 | 3 | 12.3 | 9 | 0.9 |
| Ba | 137 | ppm | 613.2 | 17.9 | 3 | 655.0 | 10 | 0.94 |
| La | 139 | ppm | 22.6 | 0.7 | 3 | 24.4 | 10 | 0.93 |
| Ce | 140 | ppm | 48.7 | 1.4 | 3 | 51.0 | 9 | 0.96 |
| Pr | 141 | ppm | 6.0 | 0.2 | 3 | 6.4 | 10 | 0.93 |
| Nd | 146 | ppm | 25.5 | 1.1 | 4 | 27.5 | 10 | 0.93 |
| Sm | 147 | ppm | 5.8 | 0.2 | 4 | 6.2 | 11 | 0.93 |
| Eu | 153 | ppm | 1.7 | 0.1 | 4 | 1.85 | 10 | 0.91 |
| Gd | 157 | ppm | 5.7 | 0.3 | 5 | 6.03 | 11 | 0.95 |
| Tb | 159 | ppm | 0.9 | 0.0 | 5 | 0.93 | 13 | 0.92 |
| Dy | 163 | ppm | 5.7 | 0.3 | 5 | 5.92 | 12 | 0.96 |

[15] STD=Standard Deviation
RSD=Relative Standard Deviation

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ho | 165 | ppm | 1.1 | 0.1 | 5 | 1.19 | 13 | 0.94 |
| Er | 166 | ppm | 3.2 | 0.1 | 5 | 3.3 | 13 | 0.96 |
| Tm | 169 | ppm | 0.5 | 0.0 | 6% | 0.48 | 14% | 0.94 |
| Yb | 172 | ppm | 3.1 | 0.2 | 5% | 3.23 | 13% | 0.95 |
| Lu | 175 | ppm | 0.5 | 0.0 | 6% | 0.48 | 14% | 0.93 |
| Hf | 178 | ppm | 4.1 | 0.2 | 5% | 4.57 | 14% | 0.9 |
| Ta | 181 | ppm | 0.7 | 0.0 | 6% | 0.78 | 12% | 0.89 |
| W | 182 | ppm | 0.5 | 0.1 | 20% | N/A | N/A | N/A |
| Tl | 205 | ppm | 0.2 | 0.0 | 15% | N/A | N/A | N/A |
| Pb | 208 | ppm | 10.2 | 0.7 | 7% | 10.2 | 14% | 1.0 |
| Th | 232 | ppm | 5.2 | 0.2 | 4% | 5.72 | 12% | 0.92 |
| U | 238 | ppm | 1.6 | 0.1 | 6% | 1.58 | 12% | 1.02 |

Table 9.1