Protecting the Cambrien and Nachicapau Lakes Areas

Naskapi Archaeological Project

Archaeological and Paleo-environmental Research, Summer 2024

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and the *Ministère de la Culture et des Communications du Québec*

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Naskapi Nation of Kawawachikamach

Contents

List of figures

List of tables

Executive summary

Background

In June 2020, the Naskapi Nation of Kawawachikamach initiated an archaeological project to support its efforts to protect an important portion of Naskapi traditional territory: the lands and waters surrounding Waskaikinis (Fort McKenzie), including Mistisiipuw Nipiiy (Cambrien Lake) and Nachacapau Nipiiy (Nachicapau Lake). The project began with an archaeological potential study in 2020–2021 and continued with two seasons of fieldwork (each lasting three weeks) during the summers of 2021 and 2022. Prior to beginning each survey, archaeologists Moira McCaffrey and David Denton spent from several days to a week in the community consulting with the NNK Chief and Council, presenting results in community meetings, and interviewing Elders. Naskapi technicians have been a part of the archaeology team from the outset and have contributed to the success of the project in many ways.

At the close of the 2022 field season, a large and important site was discovered at Kaa Upiyaakaaw, the sandy narrows at the northern end of Cambrien Lake. An additional, short season of fieldwork was approved for 2024 in order to explore this enigmatic site more thoroughly, as well as to carry out archaeological survey work in a select number of locations.

Field season 2024

Fieldwork was carried out over a period of 19 days between July 28 and August 15, 2024. The team, including archaeologists Moira McCaffrey and David Denton, and Naskapi technicians Tshiueten Vachon and Jaylen Andre, was based at Norpaq Adventure's Little Châteauguay Camp, situated west of the proposed protected area. The team travelled daily by helicopter to predetermined locations to undertake archaeological work and scientific sampling. Four members of a "science team", including three researchers from the Université du Québec à Montréal (UQAM) and one from the Geological Survey of Canada, participated for one week.

Community outreach

Historical circumstances have led the Naskapi to settle in Kawawachikamach, far from their ancestral homeland and the places that define their history. For the first time, the archaeology project included a component of site visits for Kawawachikamach community members. Seven residents, including two Elders, took part in one-day tours of a large Precontact period site and a fur trade period portage site. They were able to see these places firsthand, share their impressions and ideas, and lead discussions on the significance and importance of archaeological sites to Naskapi identity and resilience.

Archaeology highlights

The archaeology team carried out additional work on four previously identified sites discovered in 2021 or 2022, found six new sites, and recorded three artifact find areas. Here are some highlights of the research results:

- Discoveries at Kaa Upiyaakaaw 1 (HdEh-1)
  - Tests excavated in features f1, f4-f5, and f7 indicate that the site is contained within a thin, surface layer of somewhat mobile sand: there is no sign of intact, subsurface deposits in the areas tested.[1]
  - A new feature (feature f9) was identified, containing flakes and tools of Ramah chert, a distinctive stone type from the Torngat Mountains in northern Labrador.
  - Calcined animal bone was collected on feature f9, including a probable fragment of a barbed fish spear. Two radiocarbon dates were obtained from the bone, indicating that the occupation of feature f9 likely took place between 4900 and 4500 years ago.
  - The Ramah chert at feature f9 and the radiocarbon dates suggest that the group who camped here were related to First Nation's ancestors that archaeologists call the Maritime Archaic and Innu refer to as Tshiash Innu. These people lived along the Labrador coast from about 8000 to 3500 years ago. Archaeological discoveries also situate them in inland areas like Mushuau Nipi and Kamestastin Lake, and on sites close to Kuujjuaq and Aupaluk, near Ungava Bay.
  - Many new stone artifacts were mapped and collected from features f2, f4-f5, f7, and f8. When added to those from the 2022 field season, and analyzed, these findings will help us better interpret the ancient occupations.

[1] On the other hand, we cannot exclude the possibility of pits or other *in situ* buried features of limited dimensions. However, it would be impossible to find these without completely removing the surface layer of the site. A drone based ground penetrating radar (GPR) survey of the site could offer a nondestructive means of identifying any such features.

  - Small fragments of calcined bone were also found in features f4-f5 and f7. A single radiocarbon date of between 3350 and 3200 years ago was obtained. If confirmed by other dates or sources of information, this would suggest that the occupation(s) associated with these similar features could be over a thousand years more recent than that of feature f9.
  - The possibility that features f2, f4-f5, f7, and f8 result from a very late occupation of the Maritime Archaic people, at a time when this group had abandoned the Labrador coast, needs to be further explored.
- Survey work to identify early occupation areas on eroded high terraces resulted in additional finds on the Kaa Upiyaakaaw 2 (HdEh-2) site and the discovery of two significant new sites, including one located on an ancient—and long abandoned—channel of the Caniapiscau River.
- Helicopter exploration in the central Nachicapau Lake region resulted in a small number of landings and the discovery of an intact Precontact site near the narrows between the two arms of this vast lake.
- An important new site was found on Mistisipu Nipiy (Cambrien Lake) thanks to information provided by Naskapi Elder Jacob Mameanskum following the site visit by his grandson, Gordon Dominique. There are many signs that confirm Naskapi use of the site in the first half of the 20th century. Subsurface testing revealed that this place was also used hundreds, or perhaps thousands of years earlier.
- A reexamination of site Piyaaskwaastikw (HaEf-2) in the southern part of the study area, which was affected by the large forest fire in 2023, resulted in useful observations concerning an important Naskapi portage site. Many new artifacts and some new habitation features were exposed due to burning of the surface vegetation. These findings suggest that many other sites have likely been exposed by this fire throughout the broad burnt zone.
- A short reconnaissance was carried out directly north of the protected area, a region that historical sources and Naskapi land-use data suggest was important to Naskapi ancestors. Apart from providing an overview of this sector, a scatter of chert tools and flakes (HiEh-1) was found on an eroded terrace, suggesting a campsite or activity area that may date back several thousand years.

Science team results

Members of the science team collected a large amount of information and samples for analysis and dating. These include samples from lake sediments and peat bogs that will, when fully analyzed, tell the story of how the environment changed over the thousands of years of human life in the protected area. Likewise, when fully analyzed in the coming months, samples from sites Kaa Upiyaakaaw 1 and 2 (HdEh-1 and 2) and from site HeEg-8 will contribute to dating these occupations and better understanding environmental conditions when people lived there.

Recommendations

Chapter 6 contains two sets of recommendations. The first is a series of next steps for the preparation of an accessible synthesis of the overall results of the archaeology project, bringing together archaeological data from the three seasons of fieldwork with historical documentation and information from interviews with Naskapi Elders. The recommendations are listed under the following headings:

1. Understanding and dating the Precontact period;
2. Learning more about the Fur Trade period; and
3. Working together to create a synthesis.

The second set of recommendations relates to the management of archaeological resources and possible community-based research that could be initiated in the protected area in future. It is noted that the archaeological sites could play a role in Naskapi reconnection with their heritage in this important area of their traditional territory. A final recommendation is to consider an archaeological survey on the Caniapiscau River to the north of the present boundaries of the protected area.

Participants and acknowledgments

Roles and responsibilities

Project director for Council of Naskapi Nation of Kawawachikamach	Former Councillor David Swappie Jr.
Project managers (Atmacinta inc.)	Robert Prévost and Lindsay Richardson
Archaeological technicians	Tshiueten Vachon and Jaylen Andre
Consulting archaeologists: field research and report writing	David Denton and Moira McCaffrey
GIS / cartography	David Denton

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- Hydro-Québec
- Kativik Regional Government
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- Dr. Anne de Vernal, Professor, Geotop and Département des sciences de la Terre et de l'atmosphère, Université du Québec à Montréal (UQAM)

- Dr. Magali Rizza, Professor, Département des sciences de la Terre et de l'atmosphère, Université du Québec à Montréal (UQAM)
- Dr. Natasha Roy, Research and Communication Officer, Geotop and Département des sciences de la Terre et de l'atmosphère, Université du Québec à Montréal (UQAM)
- Dr. Stephen Wolfe, Research Scientist, Natural Resources Canada, Geological Survey of Canada
- Ariane Lefebvre, Masters student, Département des sciences de la Terre et de l'atmosphère, Université du Québec à Montréal (UQAM)

The following individuals played critical roles in making the fieldwork project both successful and enjoyable.

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Finally, we wish to thank our partners, David Dorken (Moira McCaffrey) and Susan Marshall (David Denton) for their help and support throughout this project.

The authors are solely responsible for any errors in fact or interpretation in this report.

Permits

This fieldwork was undertaken with the following permits issued to Moira McCaffrey.

- Permis de recherche archéologique, Numéro de permis 24-MCCM-01, Ministère de la Culture et des Communications, Québec
- Certificate of Conformity, for acquisition of knowledge (archaeology component) in the Cambrien and Nachicapau Lakes area, on Category III land (2024-016), Kativik Regional Government, Kuujjuaq, Québec
- Permis d'occupation provisoire, Numéro de dossier 002050-21-910, Énergie et Ressources naturelles, Québec

1 | Introduction

1.1 Background

In June 2020, the Naskapi Nation of Kawawachikamach initiated an archaeological project to support its efforts to protect an important portion of Naskapi traditional territory: the lands and waters surrounding Waskaikinis (Fort McKenzie), including Mistisiipuw Nipiiy (Cambrien Lake) and Nachacapau Nipiiy (Nachicapau Lake) (figure 1.1). Archaeological research adds an essential human dimension to the protected area project, highlighting that these lands are a Naskapi "lived environment" with deep cultural and historical roots.

Figure 1.1: Location of protected area project showing Cambrien Lake and Nachicapau Lake sectors.

The project began with the preparation of an archaeological potential study in the winter of 2020–2021. This involved a detailed review of oral history accounts, as well as research on archaeological, historical, geographic, and other information related to the project area. A preliminary mapping of places considered of archaeological interest was carried out. The resulting report (Denton and McCaffrey 2021) provided the basis for planning archaeological surveys. Three-week-long field surveys were conducted in August and early September of both 2021 and 2022. In each case, the archaeologists spent several days in Kawawachikamach consulting with community members and interviewing Elders prior to going into the field.

In all, 45 archaeological sites were identified during the two field seasons, revealing 60 occupations dating to the Precontact, Historic, Modern, and Recent periods. There are sites dating from as recently as the mid-20th century to as old as 4000 or 5000 years ago. Furthermore, the first seven radiocarbon dates for the region were obtained, all situated within the past 1000 years (Denton and McCaffrey 2023; McCaffrey and Denton 2022).

What is thought to be the oldest site from the two expeditions is also the largest Precontact period site discovered to date. We found it on the second last day of the 2022 field season. Lying on the surface of an eroded terrace at Kaa Upiyaakaaw—the 'sandy narrows' at the northern end of Mistisipu Nipiy (Cambrien Lake)—we noted eight features, mostly composed of fire-cracked rocks with artifacts in and around them. These included a large number of ground stone tools that archaeologists call "celts", thought to have been used as axes or adzes for woodworking. Also found were chipped tools made from a high quality, local chert—a stone well suited for making tools such as dart and spear points, knives, and scrapers.

Aspects of the site, especially the presence of the stone celts, suggest it may date back to between about 5500 and 3500 years ago. If confirmed, this would make it one of the oldest occupations known from the interior of northern Quebec. The site is very unusual—in fact unique for the Quebec-Labrador peninsula—with respect to the number of celts found. The terrace on which the features lie is eroding, and a part of the site has already fallen down the slope toward the river. With its unusual features and remarkable collection of artifacts, much about this important site, which we now refer to as Kaa Upiyaaukaau 1 (and by its Borden code HdEh-1), especially its dating and who lived here, has remained a mystery.

While we did not carry out archaeological field research in 2023, thanks to a collaboration with Kativik Regional Government, a drone survey of Kaa Upiyaakaau 1 (HdEh-1) and several

COVER IMAGE: View of archaeological site HeEg-9 (NAP24-06) with Aapiihtaamischuun (Shale Falls) in background. Orange flags mark location of stone artifacts found on surface of high terrace overlooking the falls.

more recent Naskapi sites was carried out. At Kaa Upiyaakaau 1 (HdEh-1), this resulted in a very detailed orthomosaic map and a digital elevation model (DEM) of the site.

1.2 Field season 2024

This report provides an account of the third season of fieldwork, carried out during the summer of 2024. The fieldwork phase of the project took place over a period of 19 days between July 28 and August 15, 2024. The project team consisted of archaeologists Moira McCaffrey and David Denton, and Kawawachikamach residents Tshiueten Vachon and Jaylen Andre, assisting as archaeological technicians. Four researchers forming our “science team”, including three from the Université du Québec à Montréal and one from the Geological Survey of Canada, participated in the fieldwork from August 3 until August 10. The team was based at Norpaq Adventure’s Little Châteauguay Camp located on a small lake on the Châteauguay River, just to the west of the proposed protected area.[2] Project researchers travelled each day by helicopter.

The 2024 fieldwork project was focused on achieving three main objectives:

- Our first objective, which figured prominently in the initiative to undertake a third field season, was to collect more information and samples in order to better understand the ancient site mentioned above—Kaa Upiyaakaaw 1 (HdEh-1). To this end, we planned to collect new archaeological data and, in collaboration with members of the “science team”, carry out a program of paleo-environmental sampling that would help to date the occupation(s) and to indicate what the environment was like at the time.
- Equally important, our second objective was bring interested community members, including Elders, out to see some of the most important archaeological sites in the proposed protected area. Since the first fieldwork season in 2021 we have been sadly aware that—with the important exception of the Naskapi archaeological technicians—Kawawachikamach community members have had been unable to visit these places that are an important part of their heritage. The 2024 field season offered the opportunity to begin redressing this situation.
- Finally, the third major objective was to carry out additional survey work in several locales, to help answer specific questions. Included were short surveys in the Nachicapau Lake area, on the Caniapiscau River near Aapiihtaamischuun (Shale Falls), at the southern end of Mistisipu Nipiy (Cambrien Lake), and on the Caniapiscau River to the north of the proposed protected area.

[2]The broader team included two camp support staff.

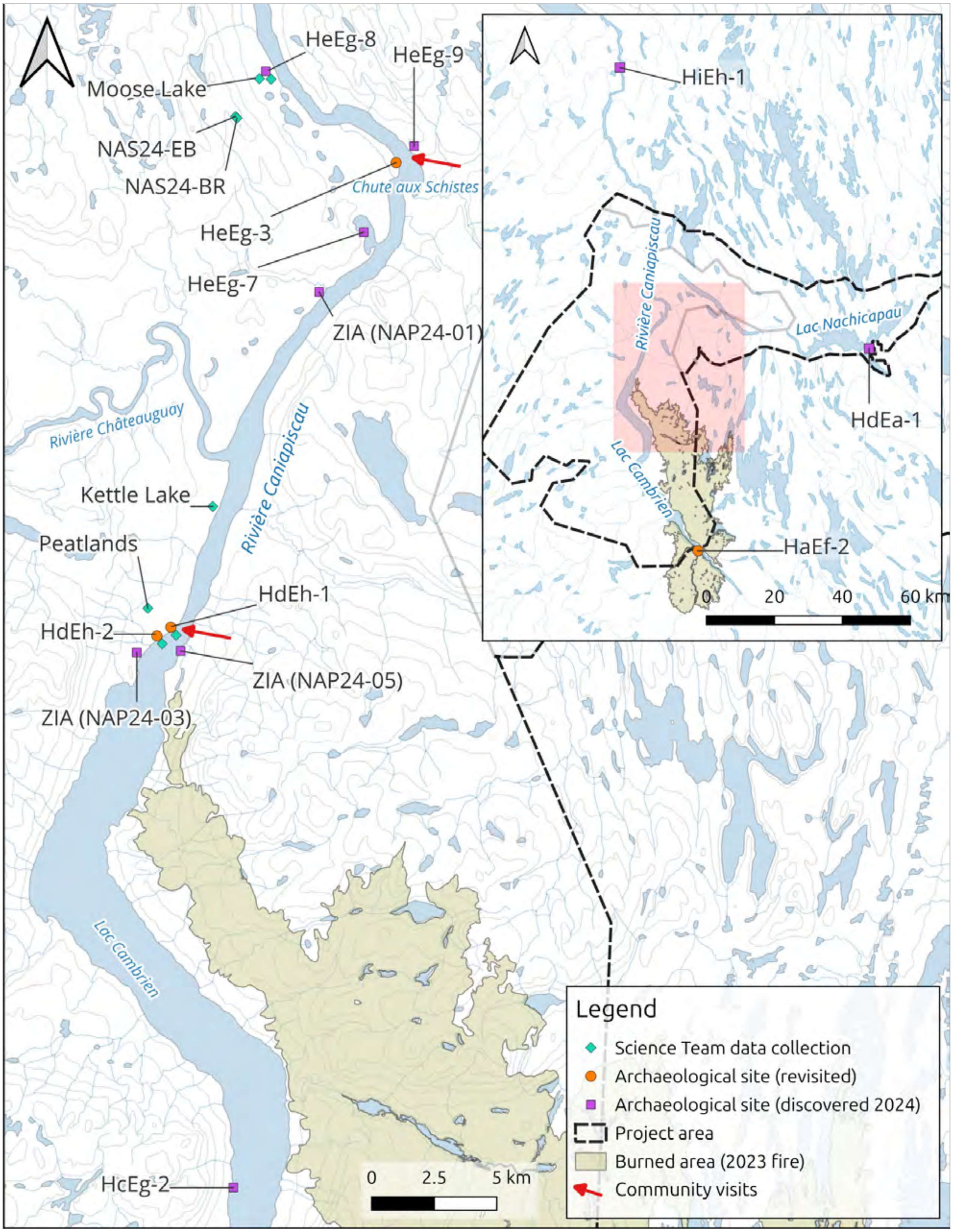

Figure 1.2: Overview map showing location of new (discovered in 2024) and revisited archaeological sites, science team data collection sites, and sites visited by Naskapi participating in community visits. Also shows area burned in 2023 fire.

Figure 1.3: Archaeology team. From left to right: Moira McCaffrey, David Denton, Tshiueten Vachon, and Jaylen Andre.

1.3 Organization of the report

The report is organized as follows:

- Following this introduction, chapter 2 on community outreach describes our discussions in Kawawachikamach prior to the start of fieldwork, and the visits of Elders and other community members to two important archaeological sites in the region.
- Chapter 3 presents the archaeological objectives in more detail, the methods used to attain those objectives, and a narrative of how the fieldwork proceeded.
- By far the longest in the report, chapter 4 presents the results of the 2024 archaeological field investigations. It begins with an overview of the fieldwork findings and continues with detailed results from each of the six study locales where we conducted archaeological survey work and, in two cases, paleo-environmental sampling.
- Chapter 5 summarizes the work carried out by members of the science team to better understand the dating and paleo-environmental context of ancient occupations in the region.
- Finally, chapter 6 offers a brief conclusions and a series of recommendations.

2 | Community outreach

2.1 Community discussions

The archaeological consultants arrived in Kawawachikamach on July 23—-four and a half days before the start of fieldwork-—in order to discuss the project with available Naskapi Nation Councillors and community members interested in learning more about archaeology. Coordination work was also needed to ensure the success of the planned visits of Kawawachikamach residents to archaeological sites in the proposed protected area. Finally, we needed to spend time with Tshiueten Vachon and Jaylen Andre, the archaeological technicians, to ensure that they were briefed in advance of fieldwork.

The timing for meetings with councillors and community members was challenging. Many people, including most Elders, were out of town that week visiting the Sainte-Anne-de-Beaupré basilica. Nevertheless, on July 24 we had a productive discussion with Derek Jeremy Einish (in person) and David Swappie Jr. (on Zoom), which included an overview of the archaeology project and planned activities for the coming field season. Both Jeremy and David were enthusiastic about the discoveries and strongly supportive of ongoing work. On the mornings of July 25 and 26, we were available in the conference room at the Naskapi Nation of Kawawachikamach (NNK) office to chat about archaeology with community members. Of note, Jimmy Shecanapish and Marianne Mameanskum Chescappio spent time with us, viewing the presentation we had prepared and discussing heritage matters. Tshiueten Vachon and Jaylen Andre took part in these meetings.

With Melissa Marie Peastitute's assistance, a Facebook Live event was held to choose participants for the community visits to archaeological sites from among the names of those who had expressed interest. Ultimately, the participants changed prior to the visits (due to availability). Nevertheless, the following week, seven community members travelled to visit sites, including two Elders (see below for more details).

2.2 Community visits to archaeological sites

Historical circumstances have led the Naskapi to settle in Kawawachikamach far from their ancestral homeland and the places that define their history. An important goal of the 2024 field season was to incorporate visits by Naskapi individuals to see and explore archaeological sites in the proposed protected area. Two visits took place—on July 30 and August 1. In each instance, community members travelled by floatplane from Schefferville to Little Châteauguay Camp. Once they were settled in, we presented an overview of the archaeological project to date, with a focus on the two sites they would be visiting—a large, early Precontact period site at the outlet of Cambrien Lake (Kaa Upiyaakaaw 1, HdEh-1) and a Historic period portage site at Aapiihtaamischuun (Shale Falls), with impressive earthen tent rings dating to the Fur Trade period (HeEg-3) (for map locations, see figures 4.1, 4.2, and 4.41).

The visits followed a similar scenario. After a safety briefing, groups travelled by helicopter in two convoys with members of the archaeology team, meeting up first at the Precontact site and afterwards at the Historic portage site (where the archaeological team had previously cleared a helicopter landing pad on the terrace adjacent to the site). Although the schedule was tight, there was plenty of time to tour the sites in detail, ask and answer questions, share knowledge and discuss the rich history of the region, and admire the beauty of the landscape—especially the sights and sounds of Aapiihtaamischuun (Shale Falls). Lunch and snacks took place near the archaeological sites.

The July 30 party consisted of Sampson Chescappio (Elder), Jesse Guanish (Elder), Alexandria Sandy-Uniam, and Willie Moses Sandy (figure 2.1). Elders Sampson Chescappio and Jesse Guanish were generous in sharing valuable knowledge and ideas about what they were seeing (figure 2.3). They offered theories on how stone tools were used and why archaeological sites were discovered in these specific locations. Sampson suggested that there may old camps in the woods at the edge of the dune and also confirmed the Naskapi place name, Kaa Upiyaakaaw ('sandy narrows') for the outlet of Cambrien Lake. Both Sampson and Jesse covered a lot of terrain—walking almost constantly to explore each site and its surroundings. With Alexandria and Jess, the two younger participants, we discussed how best to share archaeological information in ways that would be accessible to community members. In particular, both described how smartphones and easy access to large amounts of information present challenges to sharing history and archaeology with younger generations of Naskapi.

Community visitors on August 1 were Jimmy Shecanapish, Gordon Dominique, and Robert Mameamskum Sr (figure 2.2). In this instance, in addition to discussions on archaeology, the participants were keen to explore questions surrounding accessibility—both to the sites and

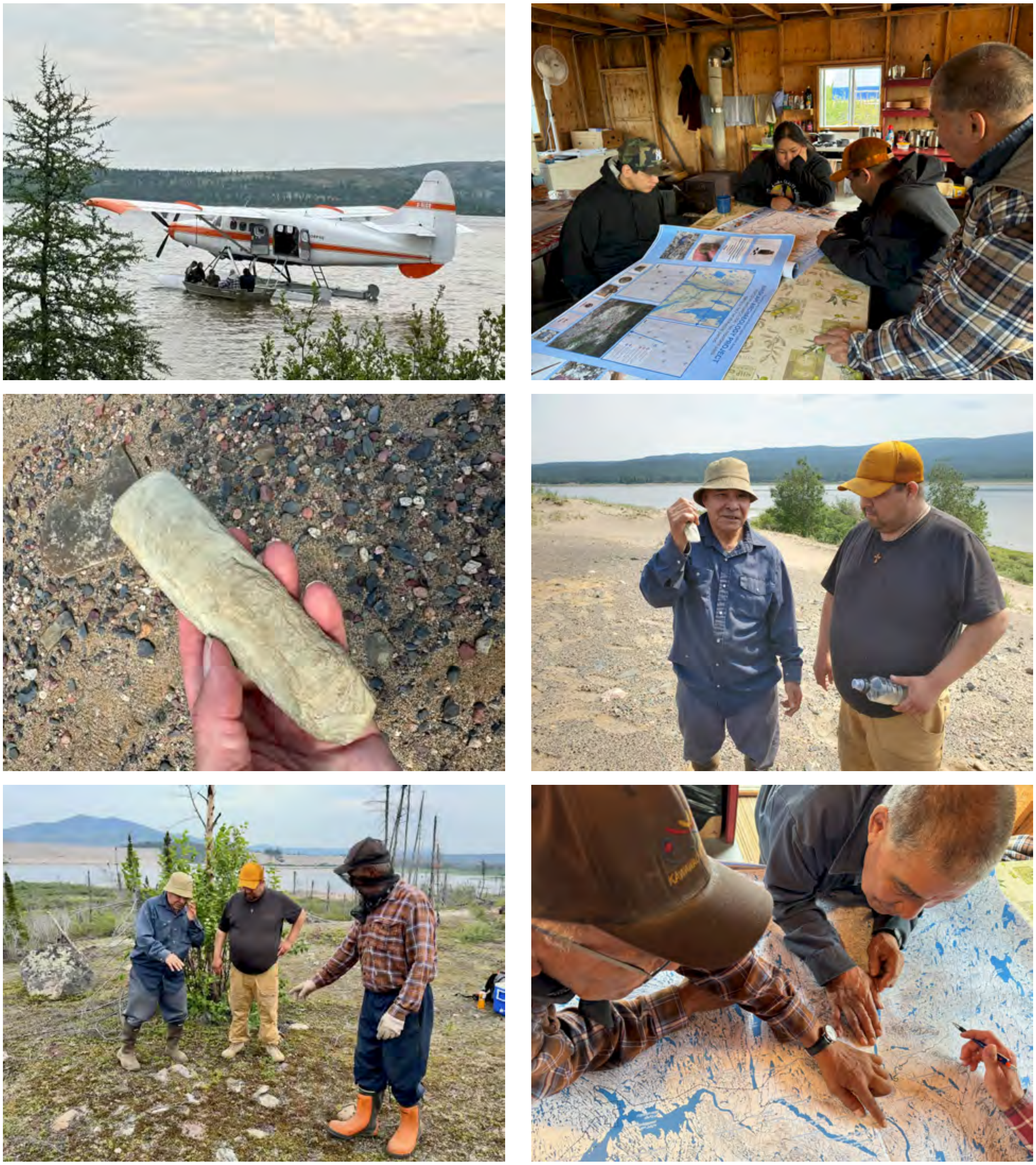

Figure 2.1: First community visit on July 30 with Sampson Chescappio (Elder), Jesse Guanish (Elder), Alexandria Sandy-Uniam, and Willie Moses Sandy.

Figure 2.2: Second community visit on August 1 with Jimmy Shecanapish, Gordon Dominique, and Robert Mameamskum Sr.

Figure 2.3: Naskapi Elders Sampson Chescappio and Jesse Guanish at historic portage site HeEg-3, near Aapiihtaamischuun (Shale Falls).

the region in general. In the future, could school programs regularly incorporate visits to archaeological sites? How would cultural tourism operate and what sort of training would the Naskapi need to guide such activities? What type of archaeological projects should take place in future? The exchanges reflect the role that archaeology can play in the protection and development of heritage resources by the Naskapi Nation of Kawawachikamach.

Beautiful weather on both days scheduled for the visits helped to ensure success for this important part of the 2024 fieldwork program, despite the daunting logistics. In sum, we hope these visits are an important step in reconnecting Naskapi community members with places in their traditional territory that are a core part of their heritage.

3 | Archaeological fieldwork: What we aimed for, what we did

The archaeology team carried out survey work resulting in a wide range of new information concerning ancient occupations within the proposed protected area. Much of the 2024 survey work was focused on places we considered to be of higher potential for the oldest sites. This is in contrast with fieldwork carried out in 2021 and 2022, where there was a greater balance between attention given to modern and historic Naskapi sites, and older ancestral occupations. The focus for 2024 was largely inspired by the exciting finds at Kaa Upiyaakaaw 1 (HdEh-1), discovered at the end of the 2022 field season. There was a need to collect additional information from that remarkable site and to find other sites that would shed light on the people who lived there and the earliest occupations in the region.

3.1 Objectives

The general project objectives were presented in chapter 1. Below, are our more specific objectives related to the archaeological aspects of the project:

1. Research at Kaa Upiyaakaaw 1 (HdEh-1)
    - Excavate test pits within a sample of fire-cracked rock features to determine if *in situ* deposits exist below the surface. We hoped this work would result in the recovery of charcoal or calcined bone to permit direct dating of the occupation using the radiocarbon method.
    - carry out test excavations in feature f1, which is partially covered by eolian sands, to see if there are archaeological materials in place below the sand.
    - Surface collect and map artifacts exposed by wind erosion since 2022.
    - Support the science team's work involving paleo-environmental and chronological data collection and sampling at the site.
2. Targeted archaeological survey work

Figure 3.1: Surveying high terrace near Aapiihtaamischuun (Shale Falls) at site HeEg-9 with (left to right) Tshiueten Vachon, Jaylen Andre, and Moira McCaffrey.

Figure 3.2: David Denton (l.) and Jaylen Andre (r.) recording finds using DGPS at site Kaa Upiyaakaaw 2 (HdEh-2).

- Survey a number of eroded terraces located at approximately the same elevation as the Kaa Upiyaakaaw 1 (HdEh-1) site to look for new sites that might contain diagnostic artifacts or dateable charcoal, to provide a context for or assist in the interpretation of the Kaa Upiyaakaaw 1 (HdEh-1) site;
- Visit the Kaa Upiyaakaaw 2 (HdEh-2) site to collect any artifacts recently exposed by wind erosion;
- As requested by the Nachicapau sub-committee, carry out additional survey work at Nachicapau Lake;
- Conduct an initial flyover and survey in the zone north of the protected area along the Caniapiscau River. As suggested by Denton and McCaffrey (2024), several stretches of the river to the north should be rich in archaeological sites directly related to Naskapi historical use of this area.
- Offer support for the science team's work at other locations, including in the Aapiihtaamischuun (Shale Falls) region.

3.2 Fieldwork narrative

As mentioned in the Introduction, the work of the 2024 field season took place over a period of 19 days between July 28 and August 15. A brief narrative of the field season follows. For a map of the study locales, see figure 4.1.

July 28 – August 2 The first week was dominated by the community visits (2 days) and preparation for these visits (a half day clearing a helicopter landing area). We began marking finds at Kaa Upiyaakaaw 1 (HdEh-1), including in the area of the newly-identified feature f9. We also began survey work on eroded terraces in the Aapiihtaamischuun (Shale Falls) and the Kaa Upiyaakaaw study locales.

August 3 – 9 Members of the science team arrived and began work at the Kaa Upiyaakaaw 1 (HdEh-1) site. While Stephen Wolfe and Magali Rizza dug trenches, examined stratigraphy, and took samples, the archaeological team mapped and collected surface finds and excavated a series of test pits in the principal features. Site Kaa Upiyaakaaw 2 (HdEh-2) was re-examined while Stephen Wolfe dug trenches and took samples for dating. We carried out additional survey work in the Aapiihtaamischuun (Shale Falls) study locale focused on new site HeEg-8, located on a former channel of the Caniapiscau River. We also examined terraces associated with the large dunes near the falls, leading to the discovery of site HeEg-9. Archaeology team members assisted Natasha Roy and Ariane

Lefebvre with their paleo-environmental sampling at Peatlands, Kettle Lake, and Moose Lake.

August 10 – 15 Following the departure of the science team members, six days remained in the field season. We were obliged to remain in camp on one of these days due to helicopter safety regulations related to the number of hours flown by the pilot. Of the remaining five fieldwork days, one was devoted to survey work at Nachicapau Lake, and another to a trip to examine the effects of the 2023 forest fire at the southern end of the proposed protected area, resulting in work in the Piyaaskwaastikw study locale. On the same day, we stopped in the Central Mistisipu Nipiy study locale and found, mapped, and recorded an important site indicated to us by a Naskapi Elder. We then finished mapping and recording sites in the Aapiihtaamischuun (Shale Falls) area, completed the excavation of tests at Kaa Upiyaakaaw 1 (HdEh-1), and carried out additional survey work on the opposite, or eastern eastern side of the river. Our final day, cut short because of helicopter mechanical problems, was devoted to examining terraces to the north of the proposed protected area (Northern Caniapiscau River study locale).

While we lost very little time due to weather, we did lose time due to the required rest day for the helicopter pilot and, in all, lost close to an additional day due to helicopter mechanical problems. Therefore, of the 19 total days, if we subtract the two days of forced down time and two and a half days for the community visits (including preparation), this left a total of 14.5 days for research activities.

3.3 Survey zones and methods

A total of 31 zones was examined in the course of the survey work, as shown in table 3.1, Of these, all but seven were on eroded terraces, for a total area of approximately 61 ha or an average per zone of 2.3 ha. These are areas that were defined in advance through examination of satellite imagery and then examined on foot. Usually, the survey zones were linear features such as raised beach lines or terrace edges and, in all cases, there was significant exposure of the sand and gravel surface, possibly due to the erosion of former surface vegetation and soil layers. In some cases, especially in the Aapiihtaamschiuun (Shale Falls) study locale, south of the falls on the west side of the river, the degree of exposure had been increased by a relatively recent (2014) forest fire.

In defining survey zones, we prioritized elevations between about 90 and 110 m above sea level. The zones were walked systematically with an emphasis on the terrace edges and the flattest areas. The principal objective in surveying these denuded zones was to find sites that

Figure 3.3: Excavating test pits in survey zone on Nachicapau Lake.

Figure 3.4: Surveying shoreline of former channel of Caniapiscau River in Aapiihtaamischuun (Shale Falls) study locale.

Survey activity	No. of zones	Total no. of test pits	Mean no. of test pits	Total area of zones (ha)	Mean area of zones (ha)
Visual inspection (eroded terraces)	26			61	2.3
Visual inspection and partial testing (forested areas)	7	40	5.7	2	0.3
Total	**31**				**63**

Table 3.1: Archaeological survey zones for 2024 showing zones inspected visually and those inspected visually and partially tested.

might help to put the Kaa Upiyaakaaw 1 (HdEh-1) site into a broader context, and, ideally, to find diagnostic artifacts that would clear up the issue of the site's chronology and cultural ties.

When artifacts were spotted, they were marked with stake flags and these locations mapped using an EOS Arrow DGPS—a high accuracy, handheld GNSS (Global Navigation Satellite System) receiver.

As also noted in table 3.1, a much smaller number of survey zones (N=7) was subject to visual examination and the excavation of test pits. These zones were located in forested areas where there was soil development and ground cover; for example, around the dune near Kaa Upiyaakaaw 1 (HdEh-1), at the Naskapi earthen tent ring near Aapiihtaamischuun (Shale Falls), in the Central Nachicapau Lake locale, and in the Central Mistisipu Nipiy locale. Our procedure for excavating test pits and recording finds is described in detail in Denton and McCaffrey (2023: 17-18).

The small number of test pits excavated in 2024 compared with the 2021 and 2022 field seasons, reflects our very different objectives for 2024. Again, the hope was that the visual inspection of exposed terraces would result in the discovery of sites that might help us answer questions about Kaa Upiyaakaaw 1 (HdEh-1), or at least provide broader context to assist in the interpretation of the region's earliest period of occupation.

4 | Archaeological findings

This chapter of the report presents our findings at the different sites we worked on in 2024. As presented in table 4.1, we carried out work at a total of 13 sites, of which four were found in 2022 or 2021, and six were “new” sites discovered in 2024. Three “miscellaneous find” sites are also included.[3] The overview map (figure 1.2 shows the location of sites investigated in 2024.

The description of sites and presentation of finds in this chapter is organized according to six “study locales”. Although somewhat arbitrarily defined to group together sites and provide geographic context for the zones where we conducted research, the locales closely reflect the project objectives as described in section 3.1.

The six study locales are indicated on the map in figure 4.1. An overview of research activities and major results obtained in each study locale is presented in table 4.2. This table also includes a reference to the section of the report in which detailed information is presented.

	No. of sites	**Site names / codes**
Revisited sites	4	Kaa Upiyaakaw 1 and 2 (HdEh-1 and 2), HeEg-3, HaEf-2
New sites	6	HeEg-7, 8 and 9; HcEg-2, HdEa-1, HiEh-1
Miscellaneous finds	3	Kaa Upiyaakaaw 3 and 4 (ZIA NAP24-05 and 03), ZIA (NAP24-01)
Total	**13**	

Table 4.1: Sites worked on during 2024 field season.

[3]These discoveries were deemed by the Ministère de la Culture et des Communications, which manages archaeological sites in Québec, to be “Zones of archaeological interest” (ZIA) rather than archaeological sites and were not assigned Borden Codes.

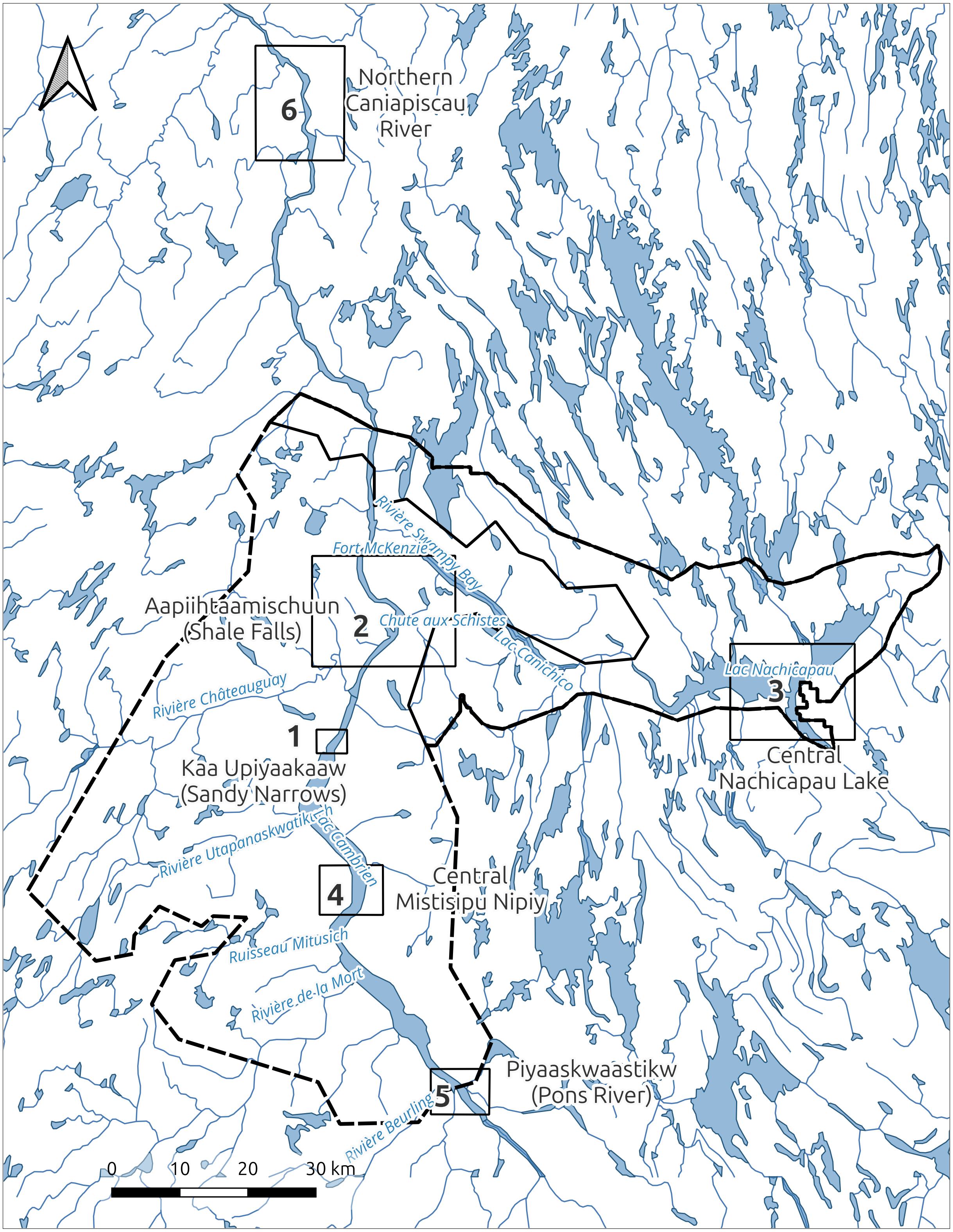

Figure 4.1: Index map showing 2024 study locales corresponding to detail maps at beginning of each section of this chapter.

Study locale	Name	Report section	Research activities	Major results
1	Kaa Upiyaakaaw (Sandy Narrows)	4.1	Testing, surface collection, and paleo-environmental sampling at the Kaa Upiyaakaaw 1 and 2 sites. Some survey work was carried out at other eroded terraces in the locale.	At Kaa Upiyaakaaw 1 (HdEh-1), we found a new feature with artifacts and calcined bone fragments and recovered many more artifacts from in and around features discovered in 2022. We were surprised to find calcined bone fragments associated with some of these features. At Kaa Upiyaakaaw 2 (HdEh-2), we discovered a new occupation area.
2	Aapiihtaamis-chuun (Shale Falls)	4.2	Survey work on numerous eroded terraces and paleo-environmental sampling at several locations.	Three new sites were found in this locale including a Naskapi earthen tent ring, a surface site on a high terrace facing the falls that produced flakes of a distinctive opaque red chert, and a large surface site located on a former channel of the Caniapiscau River that produced tools and flakes of translucent grey and red chert.
3	Central Nachicapau Lake	4.3	Brief survey in the central portion of Nachicapau Lake.	Discovery of *in situ* a Precontact period site on the southern shore of Lake Nachicapau, near the narrows between the two arms of the lake.
4	Central Mistisipu Nipiy (Cambrien Lake)	4.4	Survey of a point indicated by Elder Jacob Mameanskum following community visit.	An important site (HcEg-2) was found with Precontact, Modern, and Recent period occupations in a previously unsurveyed part of Cambrien Lake—thanks to information from a Naskapi Elder.
5	Piyaaskwaastikw (Pons River)	4.5	Brief survey to assess impact of 2023 forest fire on previously-identified archaeological site.	Significant exposure of new features and artifacts was documented at Piyaaskwaastikw (HaEf-2) site.
6	Northern Caniapiscau River	4.6	Short survey of eroded terraces to assess potential of areas along the river to the north of protected area.	A Precontact period site was found with a lithic raw material that suggests links with archaeological sites in the Kuujjuaq area.

Table 4.2: Overview of survey activities and results in the six study locales.

4.1 Study locale 1: Kaa Upiyaakaaw

Kaa Upiyaakaaw has turned out to be a key study locale within the protected area. As the Naskapi name, 'sandy narrows' clearly indicates, this is a narrows at the place where Mistisipu Nipiy (Cambrien Lake) narrows at its northern end to become once again the Caniapiscau River. The area is extremely sandy as well: there are vast exposed surfaces associated with wind erosion and major sets of active dunes on both sides of the river.

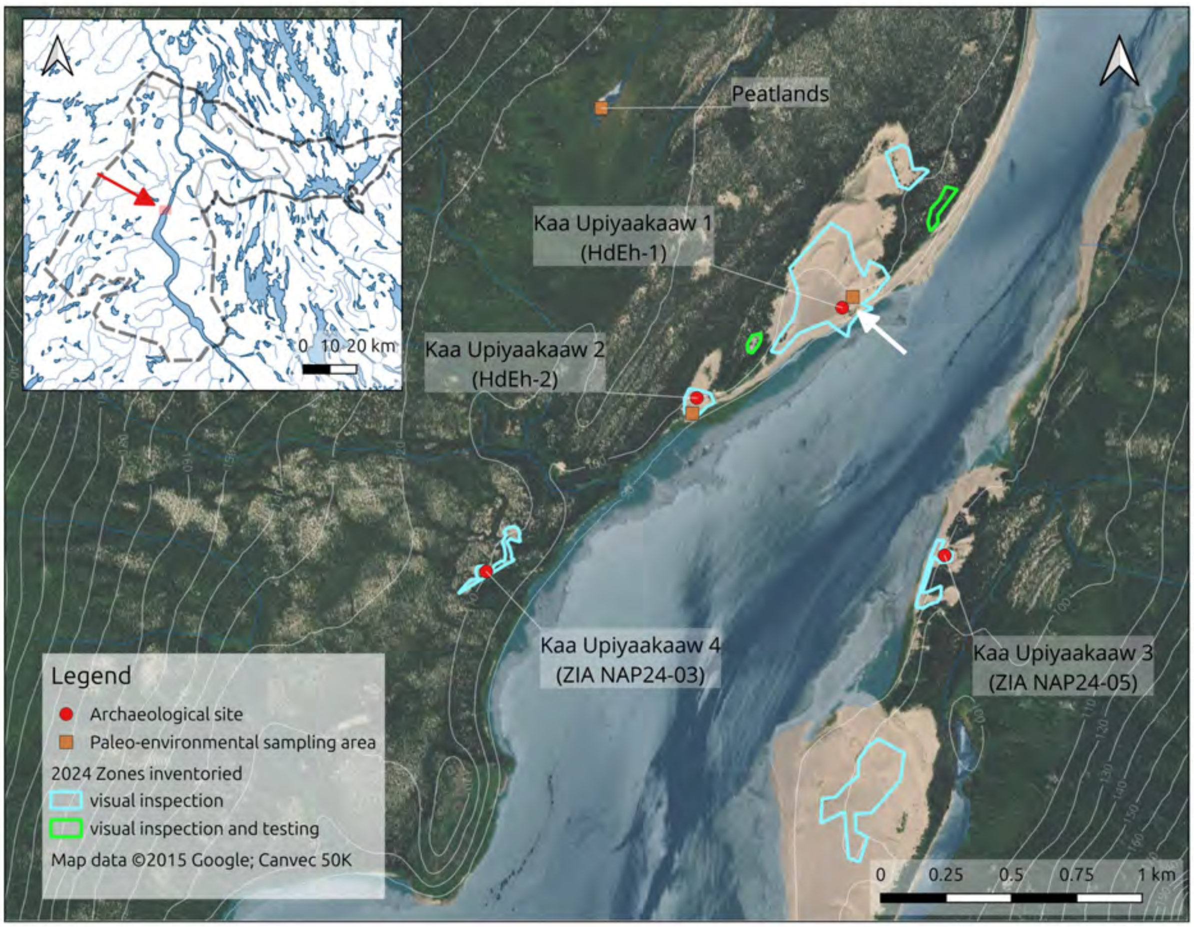

Figure 4.2: Study locale 1: Map showing location of Kaa Upiyaakaaw archaeological sites, zones inventoried, and paleo-environmental sampling areas. White arrow indicates site of community visit.

There are four archaeological sites known from this area so far (figure 4.2), including two sites discovered at the end of the 2022 field season, Kaa Upiyaakaaw 1 and 2 (HdEh-1 and 2) and two miscellaneous find areas, Kaa Upiyaakaaw 3 and 4 (ZIA NAP24-03 and 05), discovered in the summer of 2024.

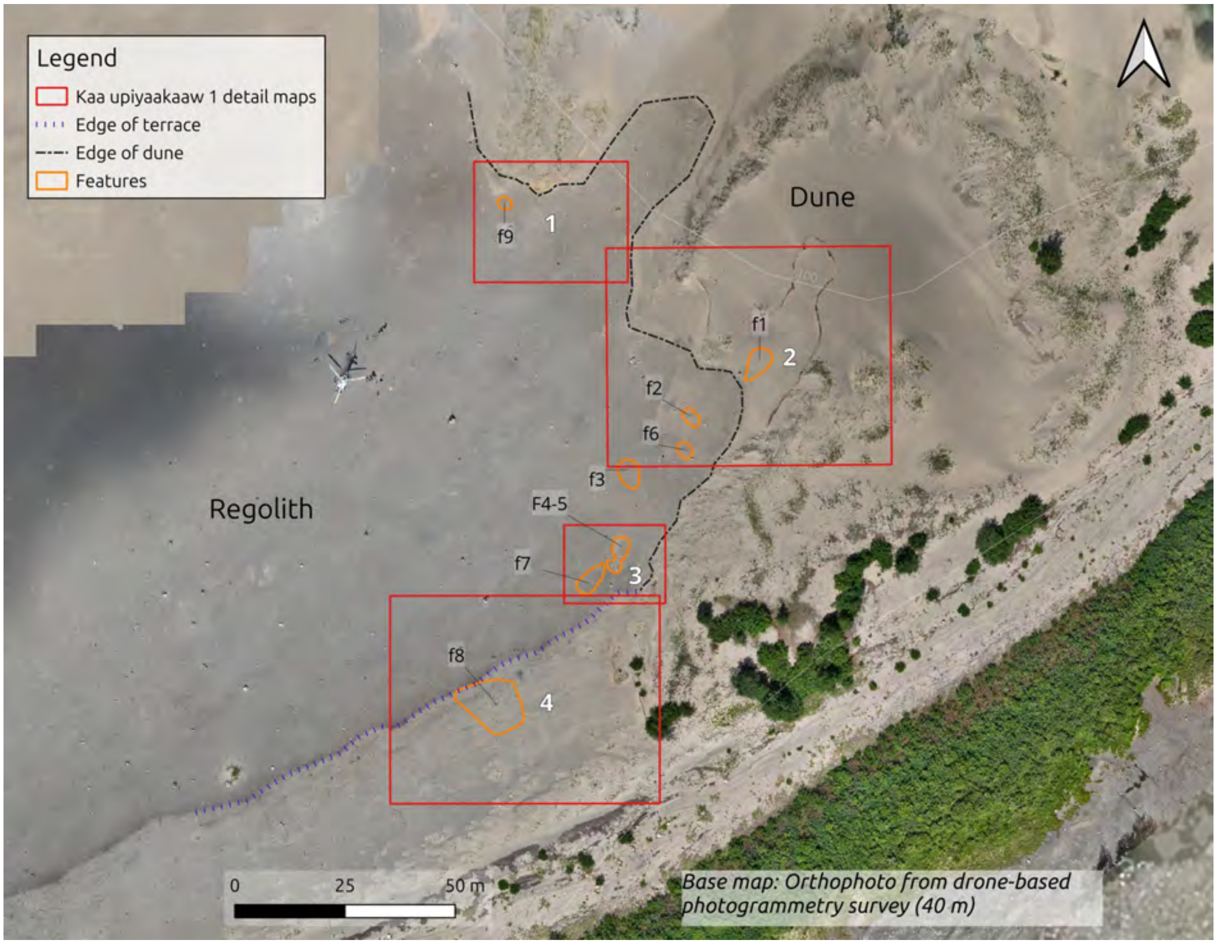

Figure 4.3: Index map showing four find areas at site Kaa Upiyaakaaw 1.

Naskapi Elder Jacob Mameanskum mentioned the area as having been used in the fall and early winter when people left to go hunting. During one of the community visits, Elder Sampson Chescappio suggested that Naskapi might have lived in the woods directly to the west of the eroded terrace at Kaa Upiyaakaaw 1. As indicated on figure 4.2, we tested two wooded areas near the site—a flat protected zone to the west and also flat zones found amid undulating terrain of now stabilized dunes located northeast of the site. In both cases, the tests were negative. This being said, we have barely scratched the surface at this locale: there are many other places that could be examined. In general, Kaa Upiyaakaaw must have always been an important landmark for travellers on Mistisipu, whether decades, centuries, or millennia ago.

4.1.1 Kaa Upiyaakaaw 1 (HdEh-1)

A main focus of the 2024 fieldwork was to carry out additional research on the important site Kaa Upiyaakaaw 1 where in 2022 eight features were identified—most of them covered with fire-cracked rock—and about 1000 stone artifacts were mapped and collected including over 40 celts (ground stone axes) (Denton and McCaffrey 2023: 159–171).

The archaeology team recorded hundreds of additional stone tools and flakes on the site, collected calcined bone that was newly visible on the surface of three features, and dug test excavations into three features to search (unsuccessfully) for intact deposits. A new Precontact period zone was discovered (feature f9) containing a stone hearth and surface distribution of mainly Ramah chert flakes, as well as a number of tools. The science team collected samples to assist in dating the site and understanding the geomorphological processes at work. Lake and bog core samples were collected nearby in order to reconstruct the site environment through time (Appendix C).

To facilitate reporting the results of the 2024 survey, we have divided the site into four "find areas" as shown in figure 4.3.

Find area 1 (feature f9)

Introduction This new occupation area was added on July 28 during our first visit to Kaa Upiyaakaaw 1 (HdEh-1) at the start of the 2024 field season. While walking towards the terrace edge where the 2022 discoveries were made, we found a small number of fire-cracked rocks and began to notice flakes and tools of Ramah chert, as well as small pieces of calcined bone. These finds are approximately 90 m inland from the edge of the terrace where features f4-f5 and f7 are situated. They are nestled about 5 m from the southern margin of the dune in this zone.

Description Feature f9 consists of a scattering of three fire-cracked rocks and a fourth cobble that appears heat reddened (figure 4.5) within a circular area of approximately 1.5 m in diameter. These modest remains are associated with a concentration of small calcined bone fragments (figure 4.6) and with tools and flakes, primarily of Ramah chert (see plan, figure 4.7). The overall context of the discovery suggests that these rocks are what remains of a dispersed hearth. In this view (figure 4.4), the outline of the feature includes these few rocks, as well as the main bone concentration.

While the main concentration of bone overlapped with the group of rocks, a wider distribution of small bone fragments was seen to continue approximately 5 m further, southeast of the feature (figure 4.7). The scatter of lithic tools and flakes also generally extended to the southeast of feature f9. Although most flakes were within 10 m of the rock feature, a broader scattering of small flakes extended almost 20 m. It seems clear that this distribution reflects a southeast movement of flakes and some calcined bone fragments, carried by strong northwest winds.

Figure 4.4: View to south-southwest of find area associated with feature f9 at Kaa Upiyaakaaw 1 (HdEh-1), located at foot of dune (white dashed ellipse) with area of features f4-f5 and f7 in background.

Figure 4.5: View of rocks in feature f9 at Kaa Upiyaakaaw 1 (HdEh-1).

Figure 4.6: Small pieces of calcined bone on ground surface at Kaa Upiyaakaaw 1 (HdEh-1), feature f9.

Artifacts recovered A small but significant collection of artifacts was found on the surface of feature f9. In all, five tools and 47 flakes were recovered, the vast majority made of Ramah chert—a widely traded toolstone that originates in the Torngat Mountains of northern Labrador (figure 4.8). There are two projectile point fragments: both are finished objects of roughly the same size and shape that are missing their bases. In one instance, a slight curvature to the base on one side seems to suggest a stem, rather than a side-notch, though this is difficult to tell for sure. A thin biface mesial fragment, comprised of three refit pieces, was also found. Although the fragment is small, the angle of the sides tends to suggest that the tool had a contracting shape to the base.

A particularly intriguing artifact is a bi-pointed slate or siltstone biface, refit from two pieces. The tool gives the appearance of being unfinished, though weathering caused by wind and sand may have obliterated detail on the artifact's edges. This style of tool, often ground to strengthen the edges, has been seen in collections from Maritime Archaic sites on the Labrador coast, from a time period that aligns well with the early date obtained on calcined bone described below. A large chunk of banded grey-green siltstone was also found that may be an early stage celt preform. The flakes are almost all of Ramah chert, with the exception of a small number of quartz flakes. Combined they suggest tool resharpening and repair was tak-

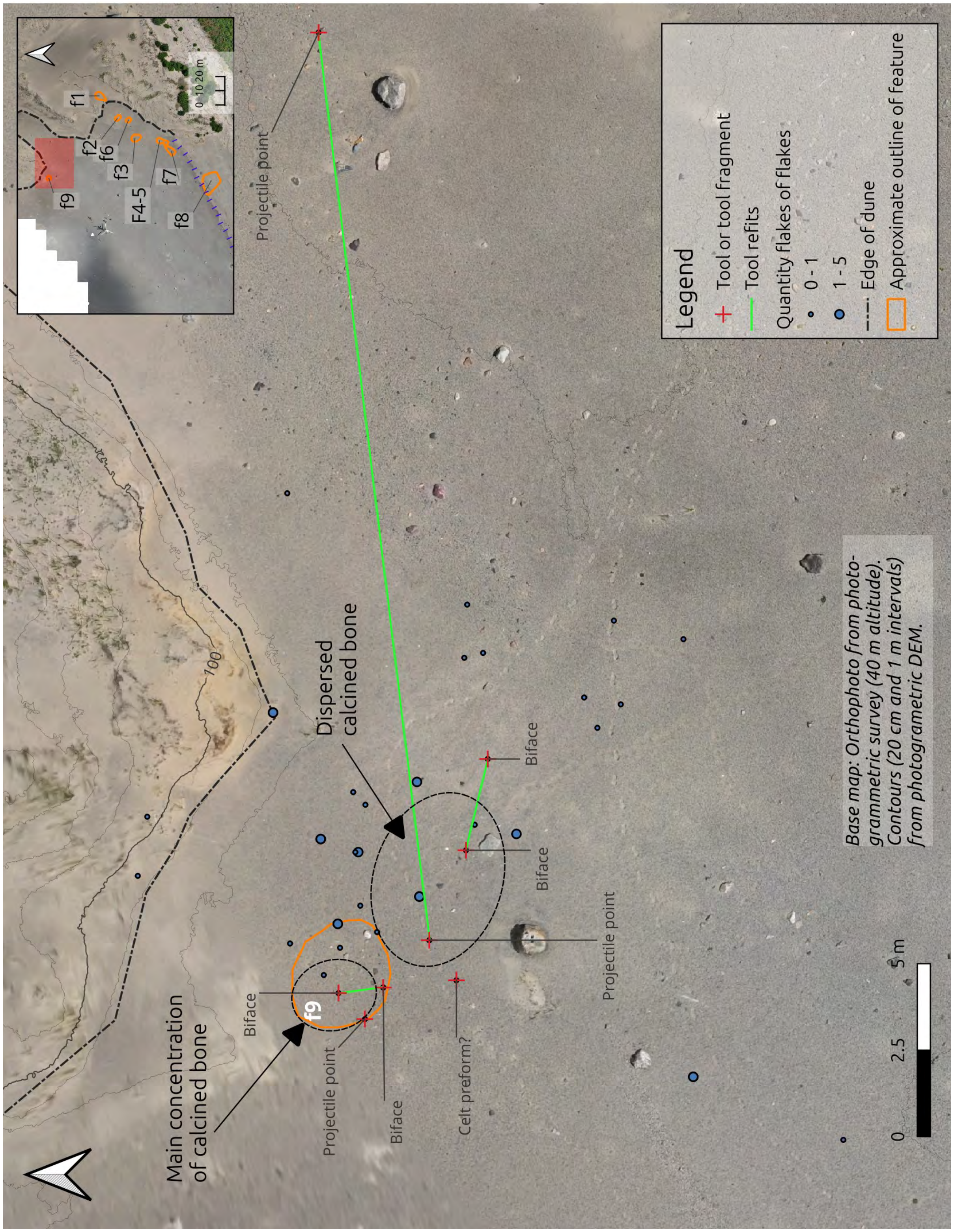

Figure 4.7: Plan of surface finds at Kaa Upiyaakaaw 1 (HdEh-1), feature f9.

Figure 4.8: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f9, including two Ramah chert projectile points with missing bases (.240 and .207-.243, top left), Ramah chert refit biface mesial fragment (.205-.226-.244, bottom left), and bipointed slate or siltstone biface (.210-.213, right).

ing place in this location (figure 4.9). Finally, an unusual discovery found among the calcined bones is what may be a small fragment of a bone leister—a composite tool used to spear fish (figure 4.10). A leister is formed by three bone prongs with barbs, attached to a wooden shaft. Fragments of such tools have survived on a small number of archaeological sites in the eastern Subarctic. Further research on this artifact will be needed to confirm the identification.

Radiocarbon dates A sample of calcined bone fragments from the main concentration at feature f9 was submitted to the André E. Lalonde Accelerator Mass Spectrometry Laboratory at the University of Ottawa. The sample returned a conventional radiocarbon age of 4140 ± 20 BP or, after calibration, 4820–4575 cal BP (UOC-27426).

A second sample of bone from the “dispersed calcined bone” near f9 was submitted to Beta Analytic for dating. This sample returned a conventional radiocarbon age of 4300 ± 30 BP or, after calibration, 4830–4926 cal BP (Beta-740440).

Figure 4.9: Sample of flakes from site Kaa Upiyaakaaw 1 (HdEh-1), feature f9, including Ramah chert flakes (top and bottom left) and quartz flakes (bottom right).

Figure 4.10: Possible bone leister or fishing spear fragment (.484) from site Kaa Upiyaakaaw 1 (HdEh-1), feature f9.

Find area 2 (features f1 and f2)

Introduction We carried out additional surface inspections to complete work begun in 2022 in the area of features f1 and f2. In addition, we excavated three one metre square test excavations (TE 1 through TE 3). Members of the science team also excavated two research trenches (figure 4.11).

Find area 2 includes two features described as follows in the 2022 field report ((Denton and McCaffrey 2023: 163–163):

Feature f1 is a teardrop-shaped scatter of fire-cracked rocks that is 8.5 m long by 5.0 m wide, with the long axis lying southwest–northeast. The feature is located at the northeast margin of the site, closest to the edge of the dune, and is partially covered with sand. While only a single flake of red chert was found in this area, we suspect that there is more cultural material in place below the sand.

Feature f2 is a scatter of fire-cracked rocks that is 4.5 by 2.6 m, with the long axis oriented northwest–southeast. A similarly oriented linear scatter of lithic artifacts is roughly centred on this feature. It extends from 2 to 3 m beyond the edges of the feature, except to the southeast, where it extends 6 m from the feature.

Surface finds As shown on figure 4.11, most surface finds were in the area in and around feature f2, generally corresponding with the zone where artifacts were found in 2022. Additional flakes and a small number of tool fragments were collected from the raised bank of windblown sand that rises approximately half a metre near the edge of the terrace, to the east of feature f2. It would appear that these are objects that have been swept by the wind in an easterly direction from the concentration of flakes and tools surrounding feature f2.[4]

A small number of flakes were found on the slope of the dune. The highest of these were at an elevation of approximately 102 m above sea level and were located in the area of test excavation TE 2. These are assumed to have been blown up the dune by wind action.

Test excavations The following test excavation (TE) units were dug in this area of the site.

TE 1 is a one metre square excavation in the area of feature f1, which intersects with a line of buried stabilized soil on the dune at an elevation of approximately 102 m above sea level, or 1.5 m above the level of the regolith—the area of consolidated pebbles and sand. This test was excavated to a depth of about 50 cm. Although no cultural material was found, the test allowed us to document the stabilized soil layer in this area.

TE 2 is a one metre square excavation located four metres to the west-northwest of TE 1 in a location where three flakes were found on the surface of the sand. An additional flake was recovered as work began, for a total of four. The excavation of this test revealed layers of windblown sand. It seems clear that the flakes found here were blown by the wind, up the slope.

TE 3 is a one metre square excavation located close to the centre of feature f1. The test included five fire-cracked rocks that were observed on the surface. Disappointingly, no cultural materials were found: this test revealed the complete absence of a buried cultural layer in feature f1.

Artifacts recovered The artifacts mapped and surface collected on and near feature f2 consist of six tools and 180 flakes, almost all of grey or red translucent chert (figure 4.14). An endscraper fragment and a flake core of grey chert were recovered. The collection also includes a biface base fragment, one of the rare objects made of translucent black chert. This tool may have broken as it was being knapped into a projectile point or perhaps while being used as a knife. The base and remaining edge are heavily ground—a process that prepares the

[4] A few objects on this bank of sand are somewhat larger than would be expected for windblown lithics (eg., .342, the semi-lunar knife or sidescraper base). The question of artifact movement needs to be investigated further.

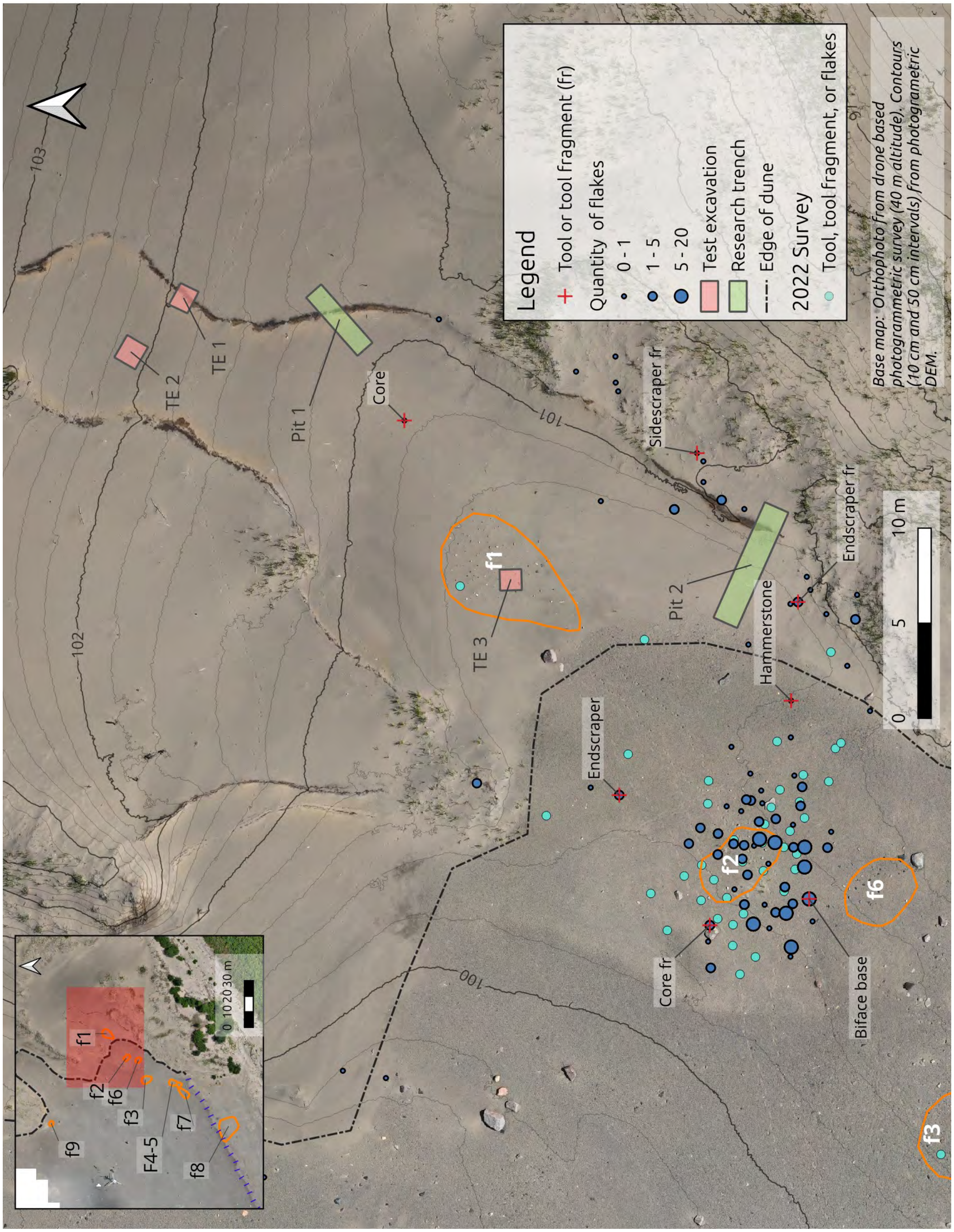

Figure 4.11: Plan of surface finds, test excavations, and research trenches at Kaa Upiyaakaaw 1 (HdEh-1), features f1 and f2.

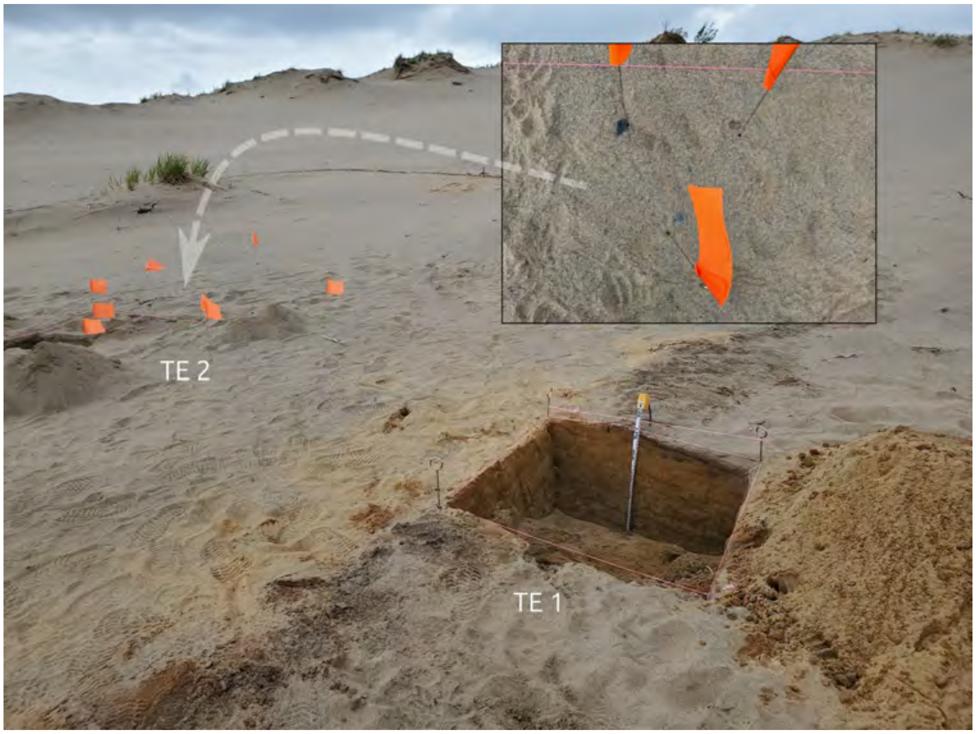

Figure 4.12: Main photo: view towards north showing test excavations TE 1 and TE 2. Inset photo shows flakes marked by orange flags found on surface of TE 2.

Figure 4.13: Left: Feature f1 facing northeast; right: Stephen Wolfe (l.) and Tsiueten Vachon (r.) excavating TE 3 in feature f1.

tool edge for further flaking or for use. Of particular interest was the recovery of a large, semi-lunar knife or sidescraper fragment made of an opaque maroon chert rarely found on sites to date. The fragment refits with a smaller one recovered in the same locale in 2022, resulting in an almost complete tool.

Conclusions on the nature of feature f2 and the activities that took place there—based on the artifact collection—will have to await further analysis of the entire 2022 and 2024 collection. Nevertheless, it is clear that this feature stands out from others on the site in that it is dominated by the use of chert (figure 4.15). This was definitely not a location where ground stone celts were being made and used, but rather a place where chert tools were made, used, and resharpened.

Find area 3 (features f4-f5 and f7)

Introduction This find area includes three features described as follows in the 2022 field report ((Denton and McCaffrey 2023: 163–163):

Features f4 and f5 are conjoined sections of a larger feature, roughly bilobate in shape, which stretches 8.0 m in a northeast–southwest orientation and is approximately 3.5 m wide as defined by the carpet of fire-cracked and reddened rocks (figure 4.16). These two features are unique in being associated with a series of larger rocks, the majority of which vary from 20 cm to a maximum of about 30 cm in length. Many of the rocks are grouped along the western edge of the fire-cracked rock carpet, especially between the two lobes of f4 and f5. On the ground, this concentration of larger rocks stands out and gives the impression of having played some structural role within a single habitation. Another series of rocks traverses the f4 lobe of the feature. The distribution of lithic flakes and tools closely follows the outline of the larger feature (f4), and extends into the concentration of larger rocks to the west.

Feature f7 is an 8 m by 4 m concentration of fire-cracked rocks that is generally in alignment with features f4–f5. As with these features, it corresponds with concentrations of lithic flakes and tools.

Surface finds The distribution of lithic materials found in 2024 conforms very closely to the 2022 distribution (figure 4.16). As in 2022, the largest quantity of banded grey-green siltstone flakes is associated with the area of rocks straddling the zone between features f4 and f5. Tools and flakes appear to be associated with the outer margins of the features, seemingly even more so than in 2022.

Figure 4.14: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f2, including biface base (.262, top left), hammerstone (.296, top right), semi-lunar knife or sidescraper (.342 base refit with .34 found in 2022, bottom left), and endscraper fragment (.350, bottom right).

Figure 4.15: Sample of grey and red translucent chert flakes from site Kaa Upiyaakaaw 1 (HdEh-1), feature f2.

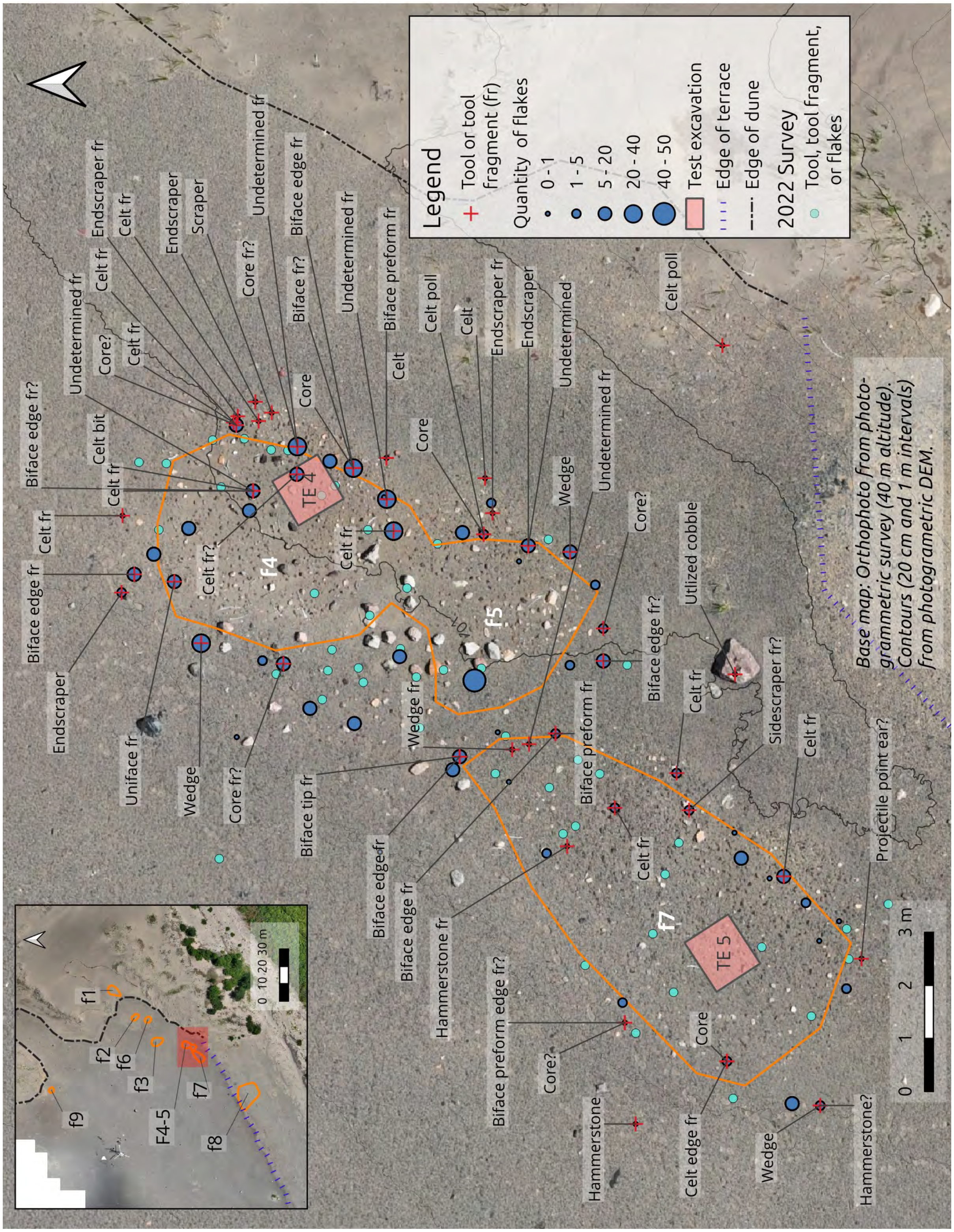

Figure 4.16: Plan of surface finds and test excavations at Kaa Upiyaakaaw 1 (HdEh-1), features f4-f5 and f7.

Figure 4.17: View to south-southwest of features f4-f5 and f7 at Kaa Upiyaakaaw 1 (HdEh-1) showing find locations, with Jaylen Andre and David Denton mapping finds.

Figure 4.18: Vertical view of TE 4 in feature f4 at beginning of excavation. Drone image courtesy Stephen Wolfe.

Figure 4.19: View to southeast of team members searching for calcined bone fragments in feature f4 at Kaa Upiyaakaaw 1 (HdEh-1). From l. to r.: Magali Rizza, David Denton, Ariane Lefebvre, and Natasha Roy.

Feature	Weight (g)	No. fragments
f4	1.13	7
f5	0.28	2
f7	4.73	23
f9	79.75	290

Table 4.3: Weight and number of calcined bone fragments associated with features f4, f5, f7, and f9.

An important discovery in 2024—not observed in 2022—was the presence of tiny fragments of calcined bone on the surface of features f4–f5 and f7.[5] The bone is very dispersed, with small areas that appear to have slightly higher concentrations. Table 4.3 shows the number of fragments and overall weights of the calcined bone by feature. We have also included feature f9 with the others from find area 3 for the purpose of comparison.

This table clearly shows that very little bone was found in association with features f4 and f5. Slightly more bone fragments were recovered in feature f7, while feature f9 had a substantial number of calcined bones forming both a main concentration and a secondary scatter.

Test excavations The following test excavation units were dug in this area of the site:

TE 4 is a one metre square excavation located near the eastern edge of feature f4. As shown in figure 4.20 (top), the surface of the test was covered with a relatively even scatter of fire-cracked rocks. The excavation proceeded as follows:

1. Five flakes were collected from the surface and then the top layer of fire-cracked rocks was removed along with approximately three centimetres of sand.
2. An additional layer of mainly fire-cracked rocks was removed, along with several centimetres of orange sand. In all, 29 flakes were found in this orange sand.
3. A mottled sand was found below the orange sand, as shown in figure 4.20 (bottom). Three flakes were recovered from the top three centimetres of this sand.
4. Encountering no further cultural remains, TE 4 was dug out to a depth of approximately 30 cm to record stratigraphic observations and collect OSL samples. OSL samples NAS24-09A and NAS24-09B were collected at a depth of 6 cm and sam-

[5] We have the sharp eyes of Magali Rizza to credit for this discovery.

ple NAS24-10 was collected at a depth of 28 cm (see reports by Magali Rizza and Stephen Wolfe in Appendices C.1 and C.3).

TE 5 is a one metre square excavation located approximately 2 m from the southern end of feature f7. As was the case for TE 4, there were many fire-cracked rocks on the surface, and more of these directly below the surface rocks. While two flakes were found on the pebbly surface, in contrast to TE 4, the sand on which the rocks were lying and the layer just below were devoid of flakes or any other cultural materials. This unit was excavated to a depth of just over 5 cm.

Artifacts recovered A large number of artifacts were mapped and surface collected on and near the features in find area 3. These finds are briefly described below according to features f4–f5, treated as one unit as the occupation areas appear to be connected, followed by feature f7.

As was the case in 2022, features f4–f5 contained a dense concentration of artifacts. A surface collection of 24 tools and 322 flakes was made in and around feature f4, while 12 tools and 134 flakes were recovered from feature f5 (figures 4.21, 4.22 and 4.23). A diversity of tool types and lithic raw materials characterizes these two features, though ground stone axes (and siltstone flakes resulting from their manufacture and reworking) stand out in the collection.

Highlights of the collection made in features f4–f5 include three complete celts, as well as numerous celt fragments. One of these is a red siltstone celt, possibly a preform, that was refit from four fragments found in close proximity. An interesting biface made of siltstone or slate may have originally been bi-pointed—one half is snapped off. The 2024 assemblage includes quite a few endscrapers, found primarily in feature f4, suggesting that an activity requiring their use took place in this locale. Across both features f4–f5, there is also evidence of chert bifacial tool manufacture in the form of tool edges and biface reduction flakes. Another prominent artifact type is small chert cores. Some of these appear to be expended, taking on the form of small cubes.

The flake collection presents a range of lithic materials, dominated by a mix of mainly fine-grained, translucent grey chert and banded grey-green siltstone. A number of other toolstone materials—red siltstone, quartz, black chert (translucent and opaque varieties), and Ramah chert—are present in minute quantities (figure 4.24).

Future analysis of the lithic collections from features f4–f5, made in both 2022 and 2024, will attempt to determine how these two features relate to each other and, of course, how they relate to the other features on the site. In particular, we hope to confirm that features f4–f5

Figure 4.20: Near vertical photos showing sequence of excavation of TE 4 at Kaa Upiyaakaaw 1 (HdEh-1), feature f4.

Figure 4.21: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f4, including refit celt (.300-.301-.305-.410, top left), celt .307, top right), biface fragment (.308, middle left), and celt fragments (.418, middle right; .405, bottom left; .408, bottom right).

Figure 4.22: Additional tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f4, including endscrapers (.303, top left; .302, top right; .306, middle left), flake core (.258, middle right), and biface edge fragments (.358, bottom left; .396, bottom right).

Figure 4.23: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f5, including celt (.309, top left), endscraper (.384, top right), biface edge fragment (.366, middle left), biface fragment (.365, middle right), flake core (.388, bottom left), and wedge (.382, bottom right).

Figure 4.24: Sample of chert and siltstone flakes from site Kaa Upiyaakaaw 1 (HdEh-1), features f4–f5.

were occupied at the same time, and establish the relationship of this elongated feature with nearby feature f7.

In and near feature f7, 20 tools and 65 flakes were mapped and surface collected in 2024. With a few exceptions, tools recovered were fragmentary, having broken is use or in fabrication. One complete celt and a celt edge of grey-green banded siltstone were found, as well as three celt fragments of red siltstone. A small grey chert hammerstone and a large shattered quartz one were recovered, pointing to tool production taking place in this location. There were a number of chert biface and biface preform edge fragments, as well as chert flake cores, an endscraper fragment, and a possible “ear” (extremity on one side of the base) of a side-notched projectile point. Two quartz wedges were also found—a tool type often pointing to wood-working activities (figure 4.25). The flake collection is dominated by a mix of mainly grey chert and banded grey-green siltstone, with a few flakes each of red siltstone, quartz, black translucent chert, and Ramah chert.

The collection from feature f7 parallels closely the materials found in 2022, when 12 complete or fragmentary celts were collected, along with numerous chert flake cores. Further analysis of the combined 2022 and 2024 collections will allow us to refine observations about feature f7; however, at this point in time, it appears that a range of activities took place here involving ground stone celt production, chert tool manufacture and use, as well as possibly woodworking involving the use of celts and quartz wedges. The presence of numerous Ramah chert flakes is interesting and highlights extensive trade networks or possibly even the presence of individuals arriving from distant eastern regions.

Radiocarbon date A sample of calcined bone fragments from feature f7 was submitted to the André E. Lalonde Accelerator Mass Spectrometry Laboratory at the University of Ottawa. The sample returned a ^{14}C date of 3070 ± 20 BP, or, after calibration, 3350–3213 cal BP (UOC-27426).

Find area 4 (feature f8)

Introduction This find area includes one feature described as follows in the 2022 field report (Denton and McCaffrey 2023: 163–163):

> **Feature f8** is located 30 m to the southwest of feature f7. As already mentioned, most of the fire-cracked rocks associated with this feature have fallen over the edge of the terrace and down the slope. Flakes and tools are also associated with this feature, including many that have rolled well down the slope.

Figure 4.25: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f7, including celt (.463, top left), hammerstone (.428, top right), retouched core, (426, bottom left), core (.429, bottom right).

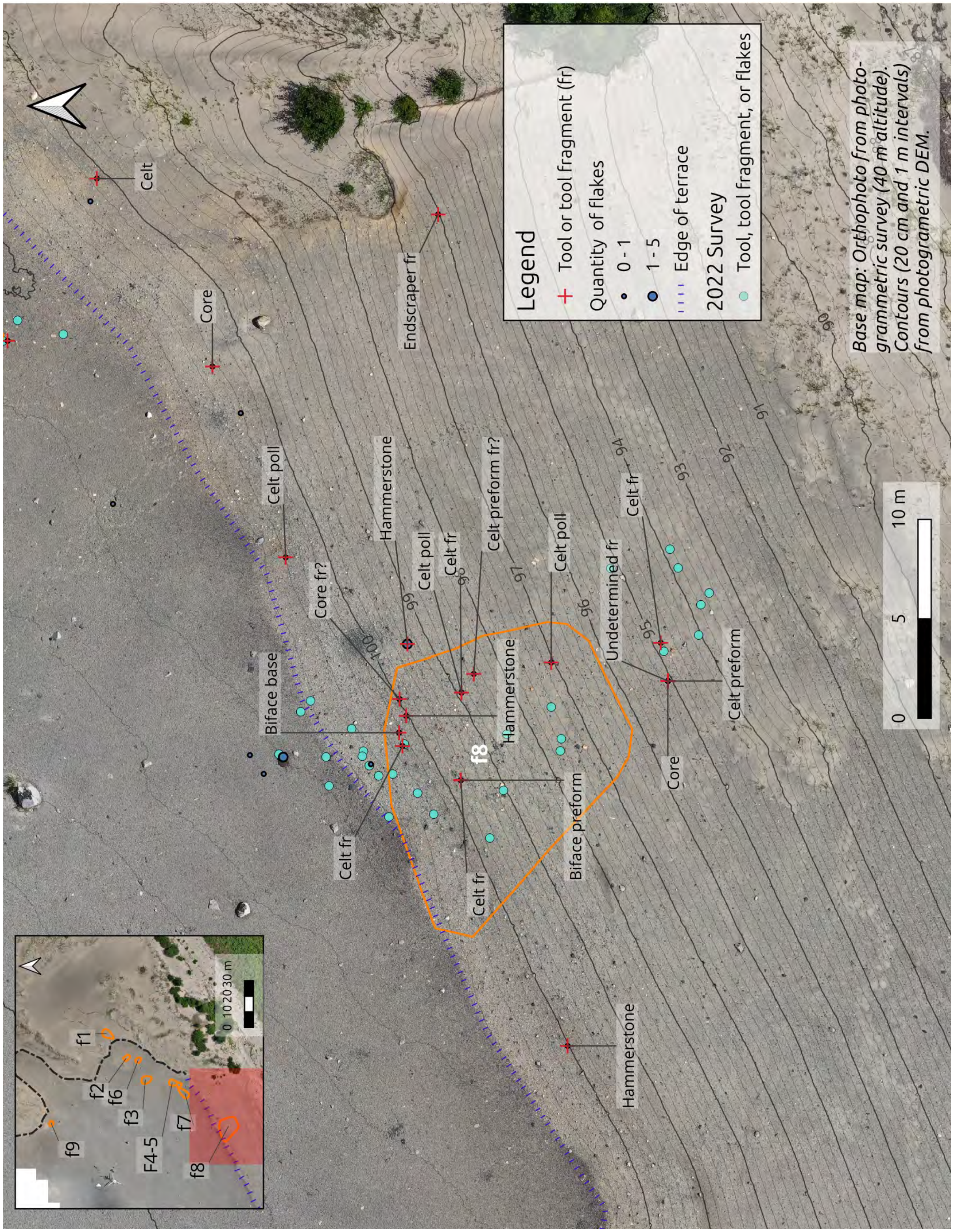

Figure 4.26: Plan of surface finds at Kaa Upiyaakaaw 1 (HdEh-1), feature f8.

Surface finds Figure 4.26 shows the location of surface finds associated with feature f8. With the exception of a few flakes located on the terrace, almost all of the finds were on the slope where they fell when the terrace edge eroded. Interestingly, most are tools or tool fragments. It is possible that smaller objects like flakes were harder to see or may have become buried in the sand. Some smaller flakes may have blown away. There is also the possibility that there was less stone chipping taking place in the area of feature f8, and that could explain the relative absence of flakes in the 2024 sample.

Artifacts recovered The artifacts mapped and surface collected on and near feature f8 consist of 17 tools and 16 flakes (figure 4.30). As mentioned above, many more tool fragments than flakes were found in the erosion zone of this feature. Of particular note was the recovery of a Ramah chert biface with a square base and slightly rounded corners (figure 4.29). The edges on this tool fragment appear to have been ground. The general shape of the biface along with ground edges may serve as diagnostic features when looking for comparisons with sites in nearby regions.

Also recovered was the mesial section of a grey-green siltstone celt, which when refit with three fragments found in 2022 formed a complete axe. A second grey-green siltstone celt fragment was recorded—a smooth and finally-shaped poll. The presence of a red siltstone celt preform, as well as two hammerstones and a possible hammerstone fragment, point to celt production at feature f8. Finally, a bifacial preform was collected made of grey siltstone with a roughly bi-pointed shape. This artifact evokes comparisons with two similar tools recovered in 2024 on features f4 and f9. Bifaces of this type may have been intended for grinding, to turn them into smooth sharp points.

Future research on the complete (2022 and 2024) artifact collection from feature f8 will need to focus on the presence of numerous finally-made and aesthetically pleasing tools. For example, the refit celt mentioned above is characterized by striking swirls of banded grey-green colouring, and the poll of a second celt is finely finished. In 2022, a unique discoidal hammerstone was recovered, as well as a complete red chert endscraper and over eight complete and fragmentary celts. Hopefully, the close examination of these artifacts will help in deciphering the activities that took place in this locale.

Preliminary interpretations of Kaa Upiyaakaaw 1 (HdEh-1)

As presented above, the 2024 field season at site Kaa Upiyaakaaw 1 (HdEh-1) resulted in the discovery of a new feature (f9), the mapping and collection of many more artifacts from in and around features f2, f4-f5, f7, and f8, and the unexpected discovery of small calcined bone fragments associated with features f9, f4-f5, and f7. Three calcined bone samples have been

Figure 4.27: View to southwest showing edge of terrace and slope with find locations near feature f8, Kaa Upiyaakaaw 1 (HdEh-1).

Figure 4.28: View to southeast of rocks associated with feature f8 and surface find locations on edge of terrace and down the slope.

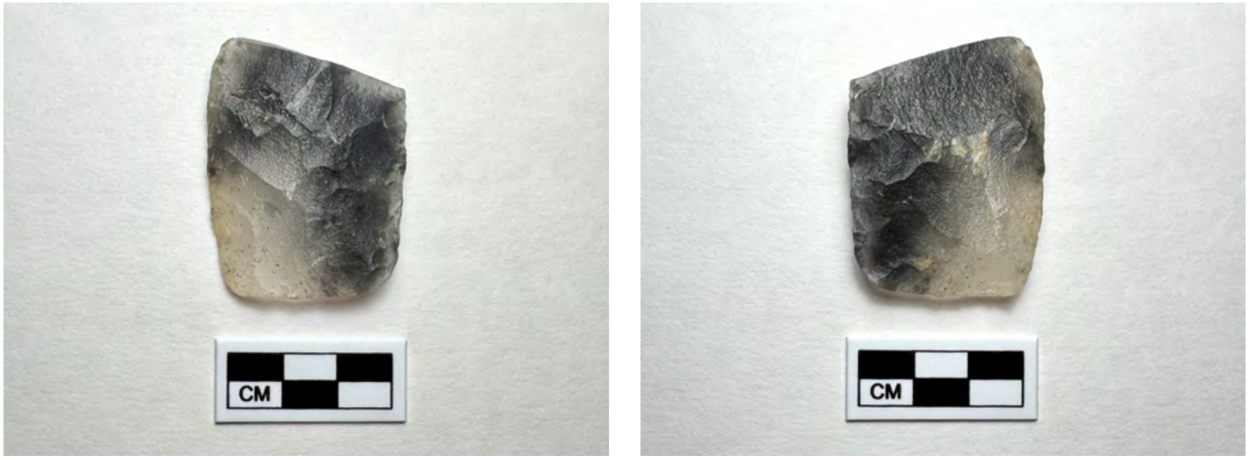

Figure 4.29: Ramah chert biface base (.453, front and back) from site Kaa Upiyaakaaw 1 (HdEh-1), feature f8.

dated, resulting in the first three radiocarbon dates for Kaa Upiyaakaw 1 (HdEh-1). The following paragraphs offer very preliminary interpretations that explore different aspects of this remarkable ancient site.

What survives in place? An important objective of the 2024 fieldwork at site Kaa Upiyaakaw 1 (HdEh-1) was to determine whether *in situ* deposits (cultural layers undisturbed by erosion) could be found associated with the main features. In particular, it was hoped that additional testing would reveal evidence of underlying, stratigraphically-intact deposits containing organic material such as charcoal that would allow the direct dating of features. The excavation of one metre square tests in features f1, f4, f5, and f7 confirmed that all these features are in fact severely eroded, with almost all archaeological material found on the surface within the top few centimetres of relatively loose sand. We are still unable to say when the erosion of the terrace began. Hopefully, dates from samples collected by the science team members at different levels related to the adjacent sand dune formation will eventually assist with this.

We are also struggling to understand the original form of the fire-cracked rock features, with their associated artifact distributions, and to determine whether these distinctive "spaces" reflect exact areas where the ancients camped and carried out activities. On the other hand, it is possible that the fire-cracked rocks and associated artifacts migrated, or spread out, over time due to wind erosion across the terrace surface. On other eroding terraces in the region, we observed large shale or siltstone rocks that had disintegrated, resulting in fragments spreading out over time in a wide oval shape around the rock, apparently due to the movement of the sand. This raises the possibility that the "carpets" of fire-cracked rocks that make up the var-

Figure 4.30: Tools from site Kaa Upiyaakaaw 1 (HdEh-1), feature f8, including celt (.324 refit with .102-.103 found in 2022,top left), celt poll fragment (.461, top right), biface preform (.315, middle left), celt preform (.326, middle right), hammerstone (.455, bottom left), and possible hammerstone or core fragment (.456, bottom right).

ious features on the site were once hearths comprised of tight clusters of rock that gradually spread out over time. If true, this would suggest that artifacts, both large and small, have also migrated outwards to some degree. Analysis of the fire-cracked rock distributions that make up the features, and of the artifacts—including studying the location of artifact fragments that refit together—may eventually help us understand post-occupation movements. This work would, in turn, allow for a clearer view of the actual areas where people lived, made and used their tools, and carried out a range of activities.

The conclusion that the entire site surface is quite eroded does not mean that there are no intact cultural deposits at lower levels. The ancients living at Kaa Upiyaakaw 1 may well have dug pits to store food or to bury their dead; however, it is unlikely that such features would be found without full-scale excavations. Eventually, a ground-penetrating radar (GPR) survey of the terrace could determine whether sub-surface features exist. Also, while the one metre square test excavations do indicate that the site lies almost entirely on the surface of the eroded terrace, the fact that in 2024 we mapped and collected as many artifacts as in 2022, suggests that artifacts still lie beneath the surface and will be exposed in future years. We also expect that more fragments of calcined bone may appear. Finally, it is critical to emphasize that despite surface erosion and possible migration or movement of materials, the various features on the site do make up coherent units that can be studied and compared. In other words, we are confident that the features characterized by fire-cracked rock and artifacts mark the former presence of habitations and activity areas.

When did people live here? As emphasized several times in this report, an important objective of the 2024 field season was to collect data that would assist with dating the occupation(s) at the site. The dating of three calcined bone samples from two of the features (table 4.4) is an important step forward, but also one that has raised new questions.

The two oldest dates suggest that the occupation related to feature f9 took place between 4900 and 4500 years ago (years cal BP). The younger of these two dates is from the main concentration of calcined bone, while the older is from the more dispersed bone cluster. Though the calibrated date ranges do not quite overlap, it seems clear that these two spatial groupings relate to the same occupation event, with the dispersed bone being blown from the main hearth area by strong northwest winds. The two dates suggest that the 100 m above sea level terrace upon which the site sits emerged from the sea at least 4500 years ago or, quite likely, 4900 years ago.[6]

[6]This is slightly earlier than the cosmogenic (^{10}Be) date of 4400 BP for a terrace at 95 m above sea level located in the southern Cambrien Lake area (Vallée 2025: 56).

Lab no.	Feature	^{14}C date	Calibrated date (95.4% probability)
UOC-27426	f9	4140 ± 20 BP	4820–4575 cal BP
Beta-740440	f9	4300 ± 30 BP	4830–4926 cal BP
UOC-27426	f7	3070 ± 20 BP	3350–3213 cal BP

Table 4.4: Radiocarbon dates on calcined bone samples from site Kaa Upiyaakaaw 1 (HdEh-1).

The third and most recent date is from a calcined bone sample collected in feature f7. While this date is younger than expected, we cannot reject it out of hand. It does raise the possibility that feature f7—and by extension, the other similar features along the terrace edge (f2, f4-f5)—were created during an occupation or series of occupations between 3350 and 3200 years ago.

All three dates require further confirmation by means of additional radiocarbon dates and comparison with luminescence and cosmogenic dates from sampling by members of the science team. Preliminary dates from optically stimulated luminescence (OSL) of feldspar from the sand samples taken at the level of human occupation are significantly more recent than the calcined bone dates (Appendix C.1). We recognize that the dates from the calcined bone could be somewhat older than the actual occupation dates for reasons including the marine reservoir effect (Alves et al. 2018) and the exchange of carbon from the burning of "old wood" at the time of combustion (Snoeck et al. 2014). Given the character of the archaeological assemblages, however, we are convinced that the occupations on the site are significantly older than the preliminary OSL dates. Possible reasons for the discrepancies need to be further explored.

Then and there: The environment of the site An important question relates to the nature of the environment when the terrace was first occupied, particularly in the vicinity of feature f9, as early as 4800 years ago. It seems likely that the surface of the terrace would have recently emerged from the waters of the long arm of the Iberville Sea, which extended south from present-day Ungava Bay along the depression that would become the Caniapiscau River valley. If this is correct, the site location when occupied would have been situated not far above sea level. For now, we are unable to say whether the terrace was forested or tundra-like: perhaps at this early date, vegetation had not yet developed.

The remains of the occupation associated with feature f9 are located 90 m inland from the terrace edge and nestled near the southwestern edge of the dune. We can only guess that people chose to live so far from the water's edge to seek protection from the prevailing winds.

Overall, much remains to be understood about the local environment of the site and how it evolved from the earliest occupation to those that may be somewhat more recent, spread out along the terrace edge. In particular, we need better documentation of the relative level of the Iberville Sea's retreating shoreline at the time of the occupations. Similarly, a chronology of dune formation and detailed history of erosion of the terrace would greatly assist interpretation. Finally, we need to situate the occupations in relation to the evolution of local and regional ecological communities. We hope that the ongoing work of the science team members will provide at least partial answers in all of these areas.

Axes, adzes, and chisels: Detailed study of the celts The large number of groundstone celts found lying on and near the fire-cracked rock features are the hallmark of site Kaa Upiyaakaw 1 (HdEh-1) and what makes it so unique in the archaeological record of northern Quebec-Labrador. To date in our research, we have not found a similar archaeological site—in terms of location, type of features, and artifact composition—with which comparisons can be drawn. The celts, which were likely used or intended to be used as axes, adzes, and chisels, are primarily made out of grey-green banded siltstone thought to come from a nearby, but as yet unidentified geological source. The 2024 surface collection adds complete celts and celt preforms, as well as numerous fragments of these that may refit with elements found in 2022.

A detailed analysis of the celts recovered in 2022 was carried out by archaeologist Tiziana Gallo (see her report in Appendix D). Given the large number of celts and celt fragments at various stages of manufacture, the study focused on the processes involved in making these tools—a combination of flaking, pecking, grinding, and polishing. For some of the finished celts and fragments, it was possible to identify all or some of these production stages, despite a fair bit of weathering on the tools caused by wind and sand action. In a small number of instances, Gallo was also able to observe (under magnification) use-wear on the working end of these tools, and suggest possible functions for these somewhat enigmatic objects.

In future, it will be important to expand this research to include the newly discovered celts and celt fragments collected in 2024. In addition, a study that involves mapping celt types and locations will need to be integrated with the analysis of chert tools. The resulting distribution maps, within and across features, should provide insights into the activities that took place at the site.

Ancient residents of Kaa Upiyaakaw 1 In our report on the 2022 survey, we reviewed the findings from the site and looked to adjacent areas for comparisons, especially with respect to the fire-cracked rock features and the large number of celts (Denton and McCaffrey 2023: 45–50). This exercise revealed the seeming uniqueness of Kaa Upiyaakaaw 1. Despite the lack of close matches, the presence of Ramah chert, albeit in tiny quantities, and the large number of ground stone celts, seemed to suggest general connections to late Maritime Archaic groups best known from sites on the Labrador coast dating to 5000 to 3500 cal BP (Fitzhugh 1975, 1978; Betts and Hrynick 2021: 105–143).

We further noted that Maritime Archaic sites relatively close to the study area have been identified on high terraces inland from Ungava Bay, near Kuujjuaq and Aupaluk (Avataq Cultural Institute 2011, 2013, 2018, 2019). To underline the plausibility of connections with Maritime Archaic groups to the north, we noted that travel from the Kuujjuaq region to the study area would have been relatively easy before about 4500 cal BP, in summer or winter, following the long arm of the Iberville Sea.

In the Kamestastin region of interior Labrador, archaeologists and Innu working together have also been finding traces of Tshiash Innu, as they refer to Maritime Archaic groups, going back close to 7000 years. Their work confirms that Tshiash Innu were also using the interior, where their traces are found in prime caribou hunting areas (Arbour et al. 2018; Jenkinson 2019, 2020; Jenkinson et al. 2021).

As mentioned above, one of the most significant results of the 2024 fieldwork at Kaa Upiyaakaaw 1 (HdEh-1) was the surface collection of a large number of artifacts from in and near features f2, f4-f5, f7, and f8, not to mention from the new feature f9. While the artifacts from the 2024 field season do not offer more conclusive links to the Maritime Archaic in the form of diagnostic tools like complete projectile points, they do strengthen the connection hypothesized following the 2022 field season in several ways:

1. Feature f9, with its concentration of Ramah chert flakes and artifacts, and two radiocarbon dates between 4500 and 4900 cal BP, strongly suggests links with the coast of Labrador. During this time period, Ramah chert from the quarries at Ramah Bay on the northern Labrador coast was becoming the dominant toolstone of the Maritime Archaic people.
2. While lacking complete examples of the stemmed points that are strongly diagnostic of the Maritime Archaic, the two small projectile points found near feature f9, both unfortunately missing their base, may have originally been stemmed (figure 4.8). In addition, the bipointed slate or siltstone biface and the possible bone leister would fit in well with a Maritime Archaic tool kit (figures 4.8 and 4.10).
3. While artifacts collected in 2024 near features f2, f4-f5, f7, and f8 located along the terrace edge do not include diagnostic projectile points, many would also fit in well with Maritime Archaic assemblages (figures 4.14, 4.21, 4.23, 4.25, and 4.30). Some examples

> would be the two slate or siltstone preforms for bipointed bifaces, a number of large semi-lunar chert knives, numerous small flake cores, and chert hammerstones including a chert pecking stone with a distinctive discoidal shape (found in 2022). Finally, the consistent though small presence of Ramah chert flakes and the occasional tool of this material (mainly biface fragments) are, of course, indicative of ties to the Labrador coast. (figure 4.29)

It should be mentioned that the radiocarbon date on calcined bone from feature f7 is younger than expected. It reflects a period when Maritime Archaic groups appear to have already abandoned the Labrador coast for over two hundred years and were disappearing from the island of Newfoundland (Holly Jr et al. 2021). If this younger dating holds, an interesting hypothesis is that feature f7—and the other quite similar features located along the terrace edge—were created by Maritime Archaic people who moved inland after 3500 cal BP. For now, such an interpretation remains speculative.

We are on more solid ground in stating that the 2024 finds support the very intensive use of local stone resources by the inhabitants of Kaa Upiyaakaaw 1. People living at the site were using a distinctive grey-green banded siltstone, which likely came from the Menihek Formation in the nearby Labrador Trough, for the manufacture of almost all of the several dozen celts found on the site. While very similar banded siltstone was observed at two locations in the Aapiihtaamischuun (Shale Falls) area, we have yet to find a quarry. In fact, there is so much of this stone available in the area, including the occasional slab observed on the terrace at site Kaa Upiyaakaw 1, that there may have been no need to visit a specific quarry. The ancient site occupants also exploited a variety of high quality Labrador Trough cherts, probably from nearby outcrops of the Ruth and Sokoman Formations, for the manufacture of chipped stone tools.

Further analysis of the integrated collections from the 2022 and 2024 field seasons will hopefully result in interesting distribution patterns for different tool types and lithic raw materials. It is also likely that numerous tool fragments will refit, providing a clearer picture of the types of tools present on the site, how they were made and used, and the activities that led to their breakage. Hopefully, the patterns that emerge from these and other research avenues will ultimately point to cultural connections that will clarify when these ancients camped at site Kaa Upiyaakaaw 1, from where they originated, and perhaps even subsequent locations where they carried stone celts and chert tools on their seasonal rounds and travels.

Period(s) of occupation Precontact, probably related to Maritime Archaic

Recommendations Despite ongoing wind erosion, two seasons of surface collection, and the excavation of tests in a few features, site Kaa Upiyaakaaw 1 (HdEh-1) continues to hold interest for future archaeological research and educational activities related to Naskapi and broader First Nation's heritage of the area. Further monitoring of the state of erosion on the terrace should take place at intervals of two to three years. This monitoring should include limited surface collection and, especially, a search for calcined bone fragments on features f4-f5 and f7, supervised by an archaeologist, in order to confirm the dating of the occupation(s).

This is currently the oldest and most complex Precontact period archaeological site discovered during surveys in the Cambrien and Nachicapau lakes region. In addition, Kaa Upiyaakaaw 1 is at present a unique site with no obvious contemporaries situated nearby or beyond in northern Quebec-Labrador. Consequently, we strongly recommend that the site be protected, particularly in the event that future cultural tourism programs lead to visitors entering the region. On the other hand, the success of the community visits that took place at the site in 2024 leads us to recommend that additional, guided educational visits be organized for Naskapi leadership and community members. Beyond the obvious cultural benefits of seeing this important heritage site firsthand, the terrace location offers stunning views of the Caniapiscau River—a major travel route used by Naskapi families and hunters throughout their history.

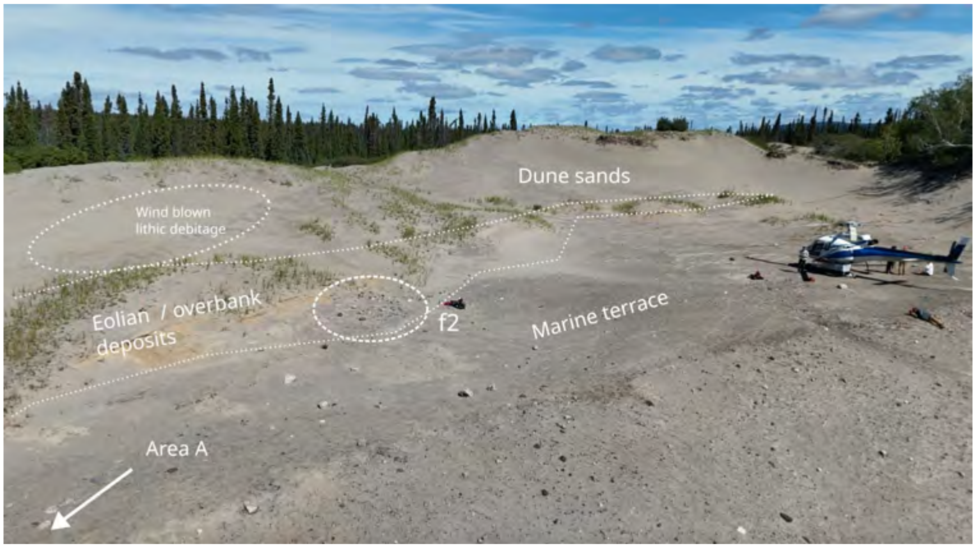

Figure 4.31: View to north of terrace where Kaa Upiyaakaaw 2 (HdEh-2) is located.

4.1.2 Kaa Upiyaakaaw 2 (HdEh-2)

Introduction

Site Kaa Upiyaakaaw 2 (HdEh-2) is located approximately 650 m southwest of—and lies on a continuation of the same marine terrace as—Kaa Upiyaakaaw 1 (HdEh-1) (figure 4.2). This site was discovered in 2022 on the same day that site Kaa Upiyaakaaw 1 (HdEh-1) was found, and due to time constraints at the end of the 2022 field season, it was examined somewhat superficially at that time (McCaffrey and Denton 2022: 172–175). In 2024, we returned on August 9 to see if additional artifacts or features might be discovered and to conduct paleo-environmental sampling in order to assess the site's context in relation to the much larger, adjacent site of Kaa Upiyaakaaw 1 (HdEh-1).

Site description

The site consists of two main areas (A and B) and two features (f1 and f2) (figure 4.33).

Area A First recorded in 2022, area A is located on the surface of the marine terrace on the southwestern side, and on the steep sand slope below the edge of the terrace, where stone artifacts have slid and tumbled due to erosion of the terrace edge. While most of the lithic tools and debitage recovered from area A were found during the 2022 survey, a small number of flakes and tools, described below, were discovered in 2024. These objects were likely exposed due to the effects of wind erosion.

Figure 4.32: View to south-southwest with area B of Kaa Upiyaakaaw 2 (HdEh-2) in foreground.

Also in 2024, a dispersed scattering of flakes was found on the eolian sand and on the edge of the dune between 35 and 50 m to the north of the main concentration of artifacts at area A. These are small flakes that were likely carried up the slope from area A by strong southerly or southwesterly winds.

Feature 1 A concentration of rocks (f1), many appearing fire-cracked, was recorded within area A in 2022. Many of the rocks associated with this feature (perhaps a dispersed hearth) have fallen down the slope from the eroding edge of the terrace.

Area B Area B, a new discovery made in 2024, is located on the northeastern side of the terrace—a zone that abuts dune sands and was not closely examined in 2022. It consists of a small scatter of lithic artifacts, mainly tools made of grey chert. No fire-cracked rock was observed nor other evidence of features beyond the stone artifacts. As is the case with area A, the finds associated with area B were primarily located on the regolith—the exposed, somewhat stabilized, stony surface of the marine terrace.

Feature 2 A second concentration of stones (f2) recorded in 2022 was reexamined in 2024. It consists of a combination of shale-like rocks of various sizes and granitic rocks. The rocks are located on eolian sand, not far from the edge of the regolith. While the shale rocks

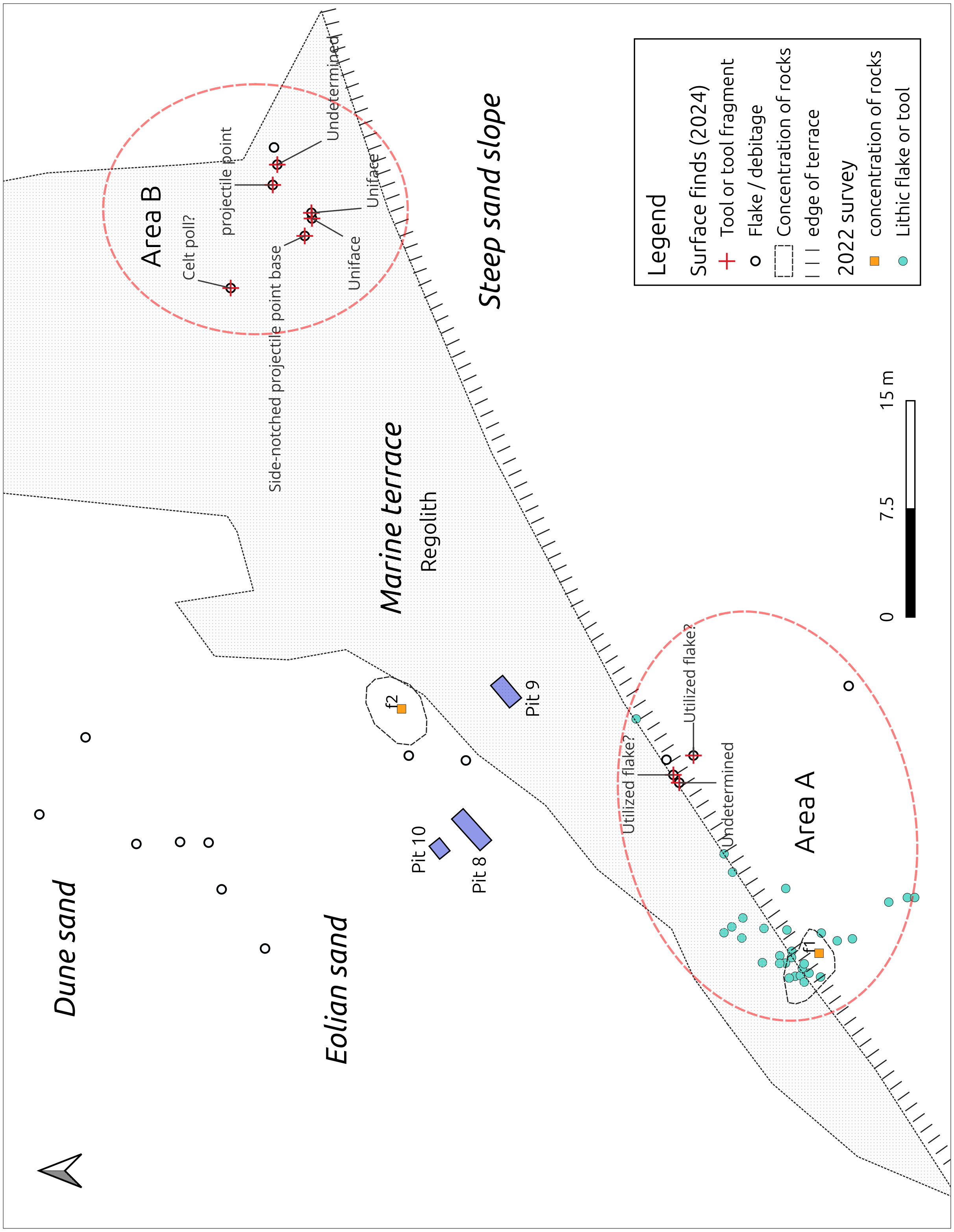

Figure 4.33: Kaa Upiyaakaaw 2 (HdEh-2) site plan showing areas A and B, archaeological finds (2024 and 2022), geological sampling locations (Pit 8, 9, and 10), and geographic context.

are angular and have broken into many small pieces—a natural erosional process observed on several of the exposed terraces—the granitic rocks are large cobbles, some of which are reddened, suggesting that they have been heated. This feature is quite different from the small, highly fractured fire-cracked rocks seen on features at Kaa Kaa Upiyaakaaw 1 (HdEh-1) and is not associated with any artifacts. We consider this mix of rocks, especially the granitic ones, as "suspect" and suggest that the feature is probably associated with the human occupation of the terrace.

Artifacts recovered

The artifacts recovered in 2024 from site Kaa Upiyaakaaw 2 (HdEh-2) paint a more complex picture of occupations and activities than was assumed after work in 2022. In area A, we recovered a utilized flake fragment of Ramah chert, as well as numerous flakes of both Ramah chert and clear chert These findings concord well with the lithic materials observed on the site in 2022. A new development, however, was the discovery of siltstone fragments in both red and grey-green banded varieties. In particular, one object may be the poll, or back end, of a stone axe made from red siltstone (figure 4.34).

Area B produced a small but important collection as it includes potentially diagnostic artifacts, meaning that we may eventually be able to compare tool styles with similar ones from other parts of northern Quebec-Labrador. Almost all of the tools in area B are made of a very fine-grained, translucent and lustrous grey to black chert that almost certainly originates in a Labrador Trough formation. Two of the tools are projectile point fragments. The larger fragment is mesial—missing the tip and base. Although difficult to say with certainty, the part missing from the base may be a stem (ie., a long v-shaped form) (figure 4.35). The second point fragment is the distinctive "ear" of a side-notched projectile point. Also recovered was a large flake with unifacial retouch on alternating sides and a possible ground stone tool fragment made of grey-green banded siltstone (figure 4.36).

Preliminary interpretation

At least two Precontact period occupations have now been documented on site Kaa Upiyaakaaw 2 (HdEh-2). The first took place within area A and appears to have encompassed a campsite with a hearth (f1). The tools recovered in this zone in 2022 and 2024 are made of Ramah chert, originating in the Torngat mountains of northern Labrador. Flakes and cores of a clear chert that is local in origin and mimics Ramah chert's striking translucency were also present. The discovery of possible tools made of siltstone adds a new dimension to our understanding of the site, and suggests potential links to nearby site Kaa Upiyaakaaw 1 (HdEh-1).

Figure 4.34: Artifacts from site Kaa Upiyaakaaw 2 (HdEh-2), area A, including utilized flake (.34, top left), possible celt poll (.32, top right), and flakes of Ramah chert (bottom left) and clear chert (bottom right),

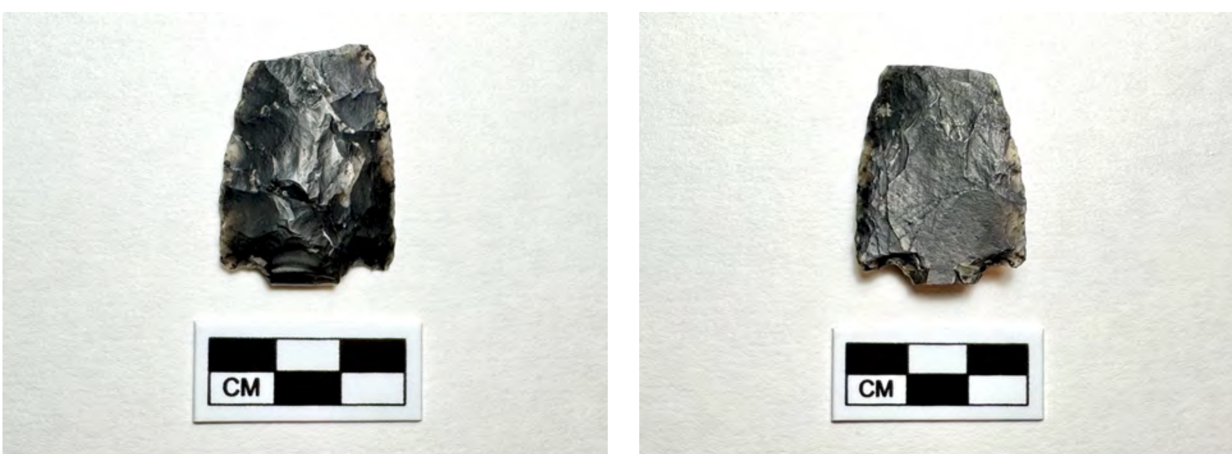

Figure 4.35: Projectile point fragment (.46, front and back) from site Kaa Upiyaakaaw 2 (HdEh-2), area B.

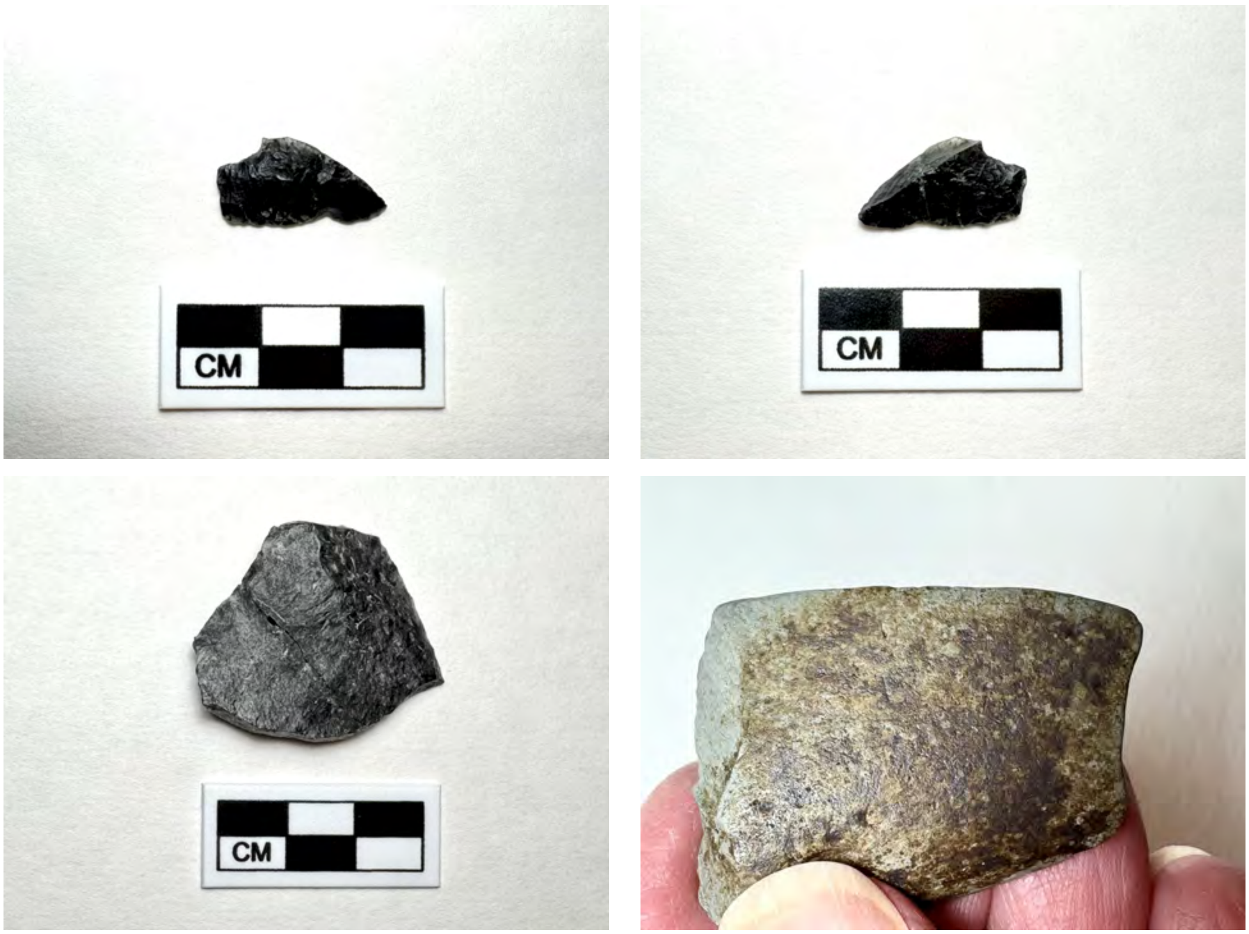

Figure 4.36: Artifacts from site Kaa Upiyaakaaw 2 (HdEh-2), area B, including side-notched projectile point base fragment (.43, front and back, top), unifacially retouched flake tool (.44-.45, bottom left), and possible ground stone tool fragment (.47, bottom right),

Newly discovered area B may be an activity area that was briefly occupied by a hunter or small hunting party. The limited number of grey chert tools found on the site, the fact that two are projectile point fragments, and the lack of flakes or fire-cracked rocks, all suggest that this is the location of a brief halt rather than a campsite. Moreover, as there is no overlap in the varieties of toolstone used in areas A and B, we think the two occupations took place at different times.

Feature f2 appears to be the result of human activity rather than of natural processes. A lack of artifacts in or close to the feature implies that it served a function unrelated to camp life or hunting preparedness. One possibility, especially considering the presence of granitic cobbles, is that this cluster of rocks is what remains of a sweat lodge.

The time period associated with both areas of site Kaa Upiyaakaaw 2 (HdEh-2), as well as with feature f2, is difficult to determine beyond Precontact period. Nevertheless, the high elevation of this terrace suggests an older date. Future research on the tool styles found in both areas may eventually offer more precision in dating.

Period(s) of occupation Precontact

Recommendations We did not recommend additional work on Kaa Upiyaakaaw 2 (HdEh-2) following the 2022 field season. Despite this, the site held surprises when we returned in 2024, including a new occupation zone. Consequently, we suggest that this locale be revisited in the event of future archaeological projects in the Cambrien Lake region.

4.1.3 Kaa Upiyaakaaw 3 (NAP24-05 ZIA)

Introduction

On August 9, following research work on sites Kaa Upiyaakaaw 1 (HdEh-1) and Kaa Upiyaakaaw 2 (HdEh-2), we crossed the Caniapiscau River by helicopter to examine the dune formations situated along the eastern shoreline facing these two important sites. We soon found evidence of a Precontact period presence both on the beach and further inland, and named this new site Kaa Upiyaakaaw 3 (NAP24-05 ZIA) (figure 4.37).

Site description

While surveying the beach fronting the northernmost zone of clearings, we discovered a large chert flake lying on the surface of the sand. Nearby, we noted a scatter of red siltstone chunks and large flakes. Moving inland to a sand blowout at an elevation of 95 m above sea level, we

Figure 4.37: General location of site Kaa Upiyaakaaw 3 (NAP24-05 ZIA) with Jaylen Andre seated on right. Sites Kaa Upiyaakaaw 1 (HdEh-1, centre) and Kaa Upiyaakaaw 2 (HdEh-2, left) are visible in background across river.

Figure 4.38: Artifacts from site Kaa Upiyaakaaw 3 (NAP24-05 ZIA), including grey and green banded siltstone flakes (.4, left) and red siltstone flakes (.1, right).

found numerous large grey siltstone flakes and chunks on the surface. Despite a search of the area, no intact site features were located. As a result, we opted to record the location as and collect only a small sample of the lithic material.

Artifacts recovered

The artifacts collected at site Kaa Upiyaakaaw 3 (NAP24-05 ZIA) consist of one large flake of a mottled black and grey translucent chert. The flake shows signs of having been burnt. The rest of the collection comprises a sample of flakes in two varieties of siltstone—grey-green banded (12) and red (3) (figure 4.38). These same stone types are all found in abundance on site Kaa Upiyaakaaw 1 (HdEh-1) across the river, suggesting a possible connection between the sites.

Preliminary interpretations

This site is difficult to interpret and impossible to date accurately due to the lack of identifiable features such as hearths or diagnostic artifacts. The flake scatters no doubt resulted from an individual, or small group, working stone at this location in precontact times. The presence of banded grey-green and red siltstone, generally used to make ground stone tools such as axes, suggests that the site might date to a few thousand years ago and be related to site Kaa Upiyaakaaw 1 (HdEh-1) across the river. These suggestions, however, remain conjectural.

Period(s) of occupation Precontact

Recommendations While the discovery of artifacts in this location is of interest, the site itself has little further research potential.

4.1.4 Kaa Upiyaakaaw 4 (NAP24-03 ZIA)

Introduction

Archaeological survey work was carried out on August 2 along the western shore of the Caniapiscau River. We began by exploring the area adjacent to and northeast of site Kaa Upiyaakaaw 1 (HdEh-1). After a few hours of crossing difficult terrain that was unsuccessful as far as finding sites was concerned, we moved to terraces at an elevation of 110 m above sea level situated about one km southwest of site Kaa Upiyaakaaw 2 (HdEh-2). Here we made an unusual discovery—a complete celt, or ground stone axe, lying on the ground. The new site was named Kaa Upiyaakaaw 4 (NAP24-03 ZIA).

Figure 4.39: View of site Kaa Upiyaakaaw 4 (NAP24-03 ZIA) showing stone axe lying on surface.

Site description

We carried out a visual inspection of two open, eroded zones at high elevation, nestled between forested landscape. As we were returning to the helicopter, we found a complete celt, or ground stone axe, lying on the surface of the terrace (figure 4.39). No additional artifacts were seen nearby, with the exception of some large chunks of siltstone several metres away. A thorough search of the broader area failed to uncover additional signs of an archaeological site.

Artifacts recovered

The ground stone celt or axe resembles many of those found on the nearby site of Kaa Upiyaakaaw 1 (HdEh-1). It is made out of a banded grey-green siltstone that likely comes from the Mehihek geological formation in the nearby Labrador Trough (figure 4.40). Axes like this were made by chipping a block of siltstone into a rough lozenge shape. It was then pecked with a hammerstone to refine the form. The final step in celt manufacture is grinding to smooth parts of the tool's surface and create a sharp bevelled bit. It is unclear if this axe was ever finished as the bit shows numerous flake removals rather than grinding. Three large chunks of banded grey-green siltstone, which show some evidence of flaking, were also collected on the site.

Figure 4.40: Stone axe (.1) found on site Kaa Upiyaakaaw 4 (NAP24-03).

Preliminary interpretations

The presence of a stone axe lying on this high elevation terrace is interesting for a number of reasons. It confirms that these landforms were used by people, likely thousands of years ago. Furthermore, this is the only location in the region, outside of site Kaa Upiyaakaaw 1 (HdEh-1), where a stone celt or axe has been found. It is tempting to think that a person from site Kaa Upiyaakaaw 1 (HdEh-1) dropped the axe at this location. Where were they going? How did they plan to use the axe? Did they accidentally lose it here or decide it was no longer useful to them? At present, we can only speculate as to the answers.

Period(s) of occupation Precontact

Recommendations While the discovery of an artifact in this location is of interest, the site itself has little further research potential.

4.2 Study locale 2: Aapiihtaamischuun (Shale Falls)

We first realized this locale was archaeologically significant during the 2021 field season, in the course of which we found four sites, three of which had been exposed by a 2014 forest fire (McCaffrey and Denton 2022: 100–124). We were thrilled to observe 11 Naskapi earthen tent rings in the three burned sites. The earthen tent rings were occupied by Naskapi between between 100 and 150 years ago, and several were so well preserved and clearly defined that we considered them to be of educational interest: places where Naskapi could visit and view these elements of their heritage. For this reason, one of these sites (figure 4.41) was included in the site visit by Kawawachikamach community members.

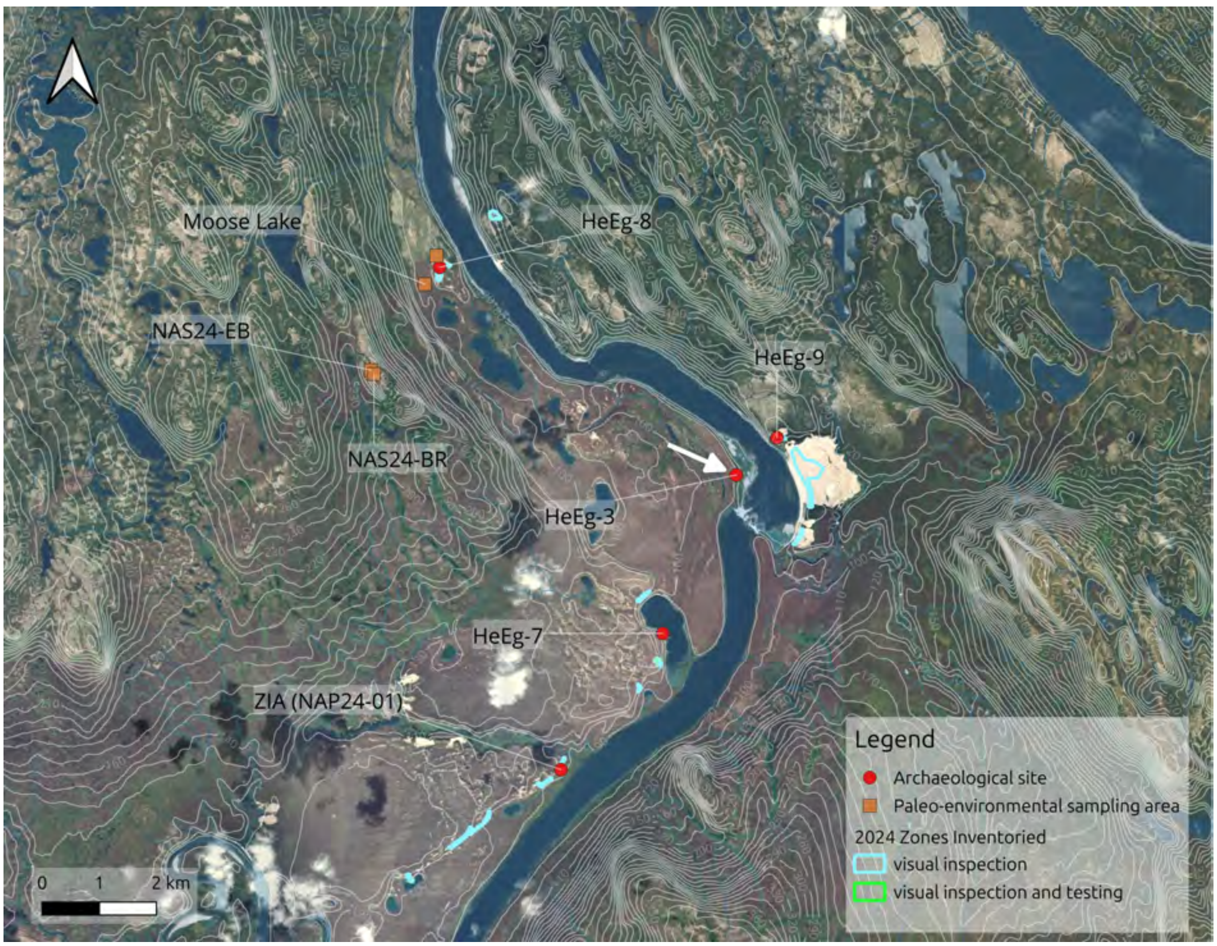

Figure 4.41: Study locale 2: Map showing location of sites in Aapiihtaamischuun (Shale Falls) area, zones inventoried, and paleo-environmental sampling areas. White arrow shows site of community visit.

In 2022, we surveyed a former beach ridge in this locale, located some 300 m inland from the present shoreline of the Caniapiscau River, and found a concentration of grey siltstone flakes and a few tools on the ground surface. We considered that this site could have been used at a time when the river channel was quite different from the present one (Denton and McCaffrey 2023: 155–158). We returned to the general location in 2024, believing that the region held further archaeological potential.

4.2.1 HeEg-7 (NAP24-02)

Introduction

We examined terraces along the western side of Waawaakus, the small lake situated southwest of Aapiihtaamischuun (Shale Falls). The discovery of sites HeEg-1 and HeEg-2 in 2021, which together produced evidence of Precontact, Historic, and Modern period occupations, suggested that the lake deserved additional attention. At the extremity of a ridge on flat land with excellent views of the lake, we noted a faint earthen tent ring with fire-cracked rocks in the centre demarcating a hearth. The site was discovered on July 31: we returned to test and map the tent ring on August 11.

Site description

Site HeEg-7 is located on the western shore of a lake known in Naskapi as Waawaakus, one of a chain of small, mostly enclosed lakes located just to the west of Aapiihtaamischuun (Shale Falls). These lakes were likely formed as scour holes in an ancient channel of the Caniapiscau River. The site is near the eastern end of a rounded, raised beach ridge, oriented west-northwest to east-southwest, which overlooks the lake to the north and east. It lies at an elevation of 96 m above sea level and approximately 7 m above the surface of the lake, and is 25 m distant from its shore (figure 4.42).

An earthen tent ring was discovered on a flat surface of the beach ridge. The earthen ring consists of a slightly raised, circular rim with a diameter of 4 m that can be traced for all but the northeastern one third of the dwelling footprint (figure 4.43). A central fireplace consists of a circle of rocks just under 1 m in diameter—each rock between 25 and 12 cm in diameter and some of which appear reddened or fire-cracked. Adjacent and to the northeast of this feature, we observed a concentration of smaller cobbles (figure 4.44).

Three test pits were excavated in and near the tent ring. The ground surface consists of a compact moss and there is an almost complete absence of a black humus layer. All three tests were negative while a fourth produced one fire-cracked rock. In our efforts to find artifacts

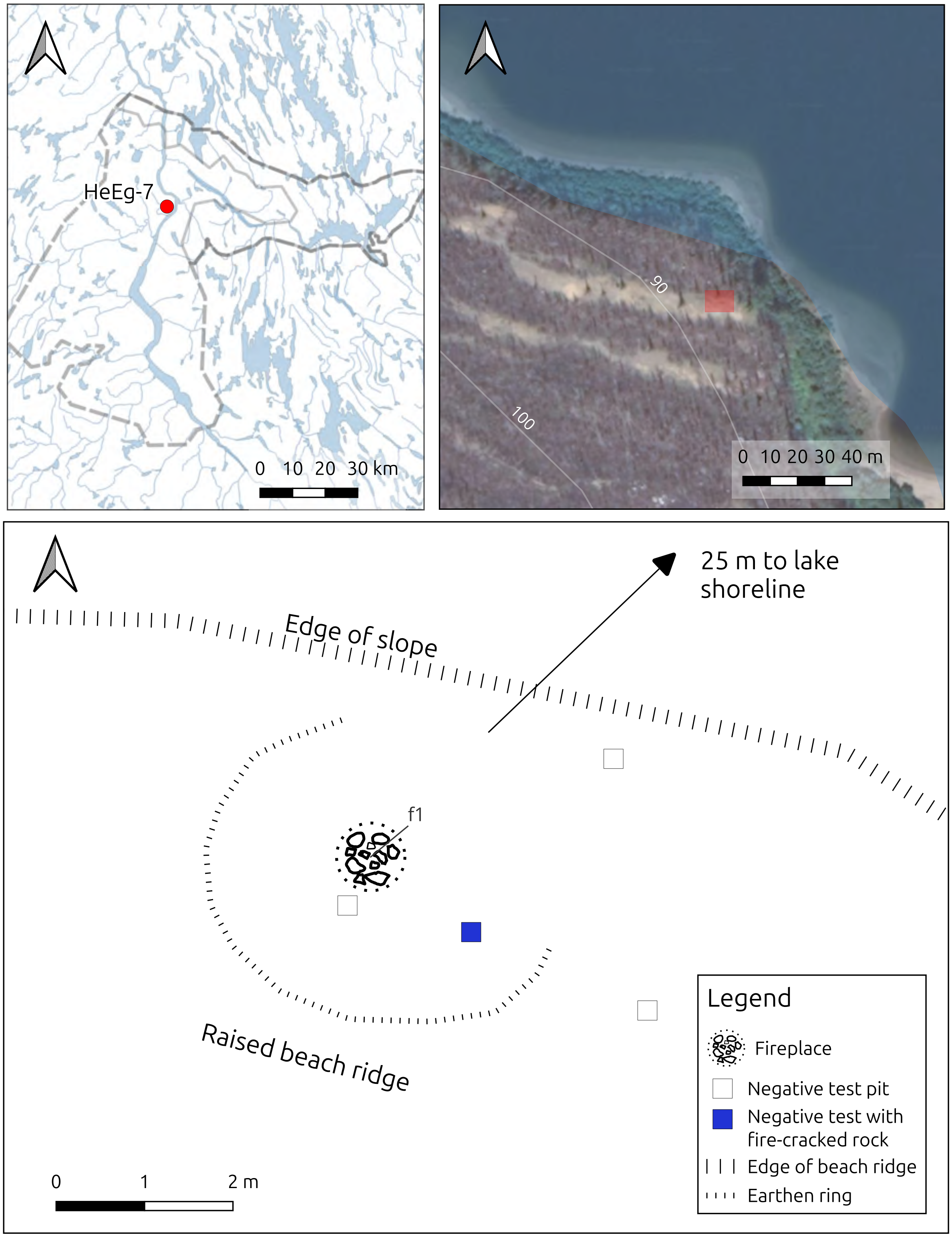

Figure 4.42: Site HeEg-7 showing location, geographical context, and site plan.

Figure 4.43: View toward east-southeast of earthen tent ring at site HeEg-7. Trowel points to magnetic north; orange flags indicate centre of hearth and high points where ring is visible.

Figure 4.44: View towards southwest of fireplace and concentration of small cobbles.

that might help us date this occupation we scanned the area with a metal detector, but found nothing.

Preliminary interpretations

At present, it is not clear whether this habitation feature dates to the Precontact period or is more recent in date. Despite the absence of metal, we think that it most likely dates to the Historic period.

Period(s) of occupation Historic

Recommendations Site HeEg-7 increases the number of earthen tent rings recorded in the project area. Furthermore, it is situated in an interesting location with a view of and oriented towards the small lake Waawaakus, while still not far from Caniapiscau River. The complete excavation of the site might reveal information to date the occupation. Nevertheless, we do not recommend future research here.

4.2.2 HeEg-8 (NAP24-04)

Introduction

A large and intriguing Precontact period site was found 7 km to the northwest of Aapiihtaamischuun (Shale Falls) in an area of interest related to a nearby former channel of the Caniapiscau River. On August 7, while walking this expansive eroded zone about 400 m inland from the western shoreline of the river, we discovered artifacts spread across the surface of two adjacent locales. We returned the next day, August 8, to test and map the site and collect the artifacts.

Site description

Site HeEg-8 is located inland from the western shore of the Caniapiscau River in a large eroded sand deposit, as shown in figure 4.45. Three areas are included in the site, which stretches over a distance of approximately 260 m. To the west of these three areas is a zone containing several small lakes identified as a former channel of the Caniapiscau River. One of these lakes, Moose Lake, was cored as part of the paleo-environmental study (figure 4.46).

Area A Area A, the most northerly of the three areas, comprises a surface scatter of stone artifacts. It is located at an elevation between 88 and 89 m above sea level, or between 21 and 22 m above the level of the Caniapiscau River. The main artifact scatter was 65 m long and 30 m wide, with the long axis oriented northwest–southeast and with the southeastern portion sloping gently upwards. As shown in figures 4.45 and 4.46, the northwestern portion of

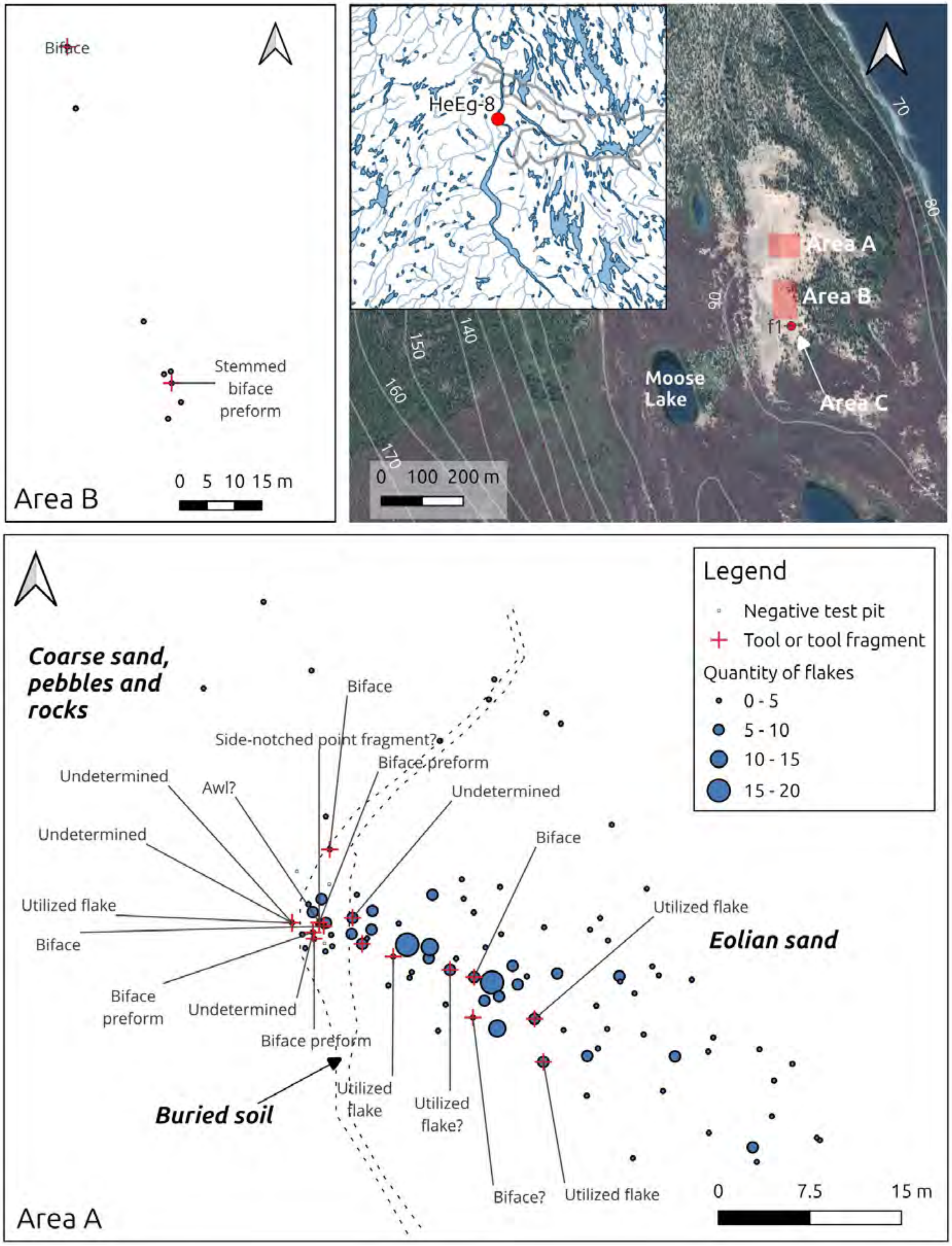

Figure 4.45: Site HeEg-8 showing location, geographical context, and site plan.

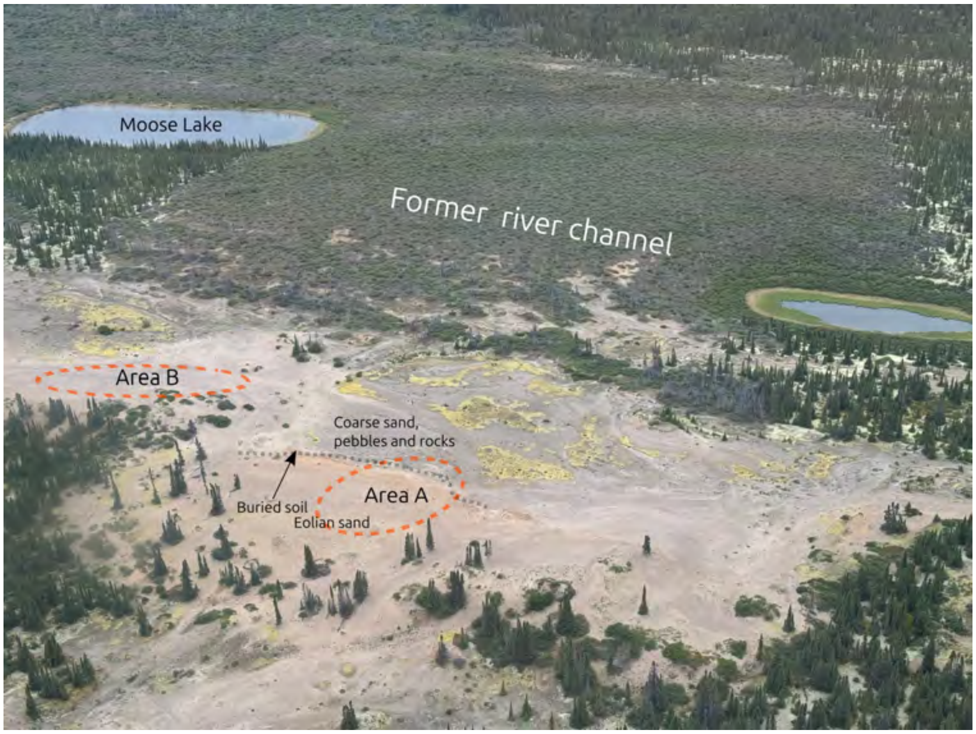

Figure 4.46: Oblique aerial view facing west showing areas A and B of site HeEg-8 in relation to geographic features.

the scatter was spatially associated with what appear to be lines of buried soil–an undulating line of finer, more consolidated, orangy coloured sediment, sometimes splitting into two or more lines, and all likely associated with a former shoreline.

To the west of the lines of buried soil, the eroded surface is more pebbly and stony and there are some patches of very fine lichen growth; to the east, there is only wind-blown sand. We presume that many of the artifacts in the southeastern portion of the scatter were blown there by northwesterly winds.

Four test pits were excavated at the northwestern end of the artifact scatter, as shown in figure 4.45, in an area where a very thin and fragile lichen growth had taken hold. The objective of the test pits was to determine if an intact soil layer containing artifacts could be located. Unfortunately, all of the tests were negative and none showed an intact soil horizon just below the surface. Note that no fire-cracked rock or other indication of a hearth or feature was found in area A.

Area B Area B consists of a spread-out, linear scatter of a small number of artifacts over a distance of almost 75 m. This area is located approximately 100 m south of area A and is at

Figure 4.47: View of area A on site HeEg-8 showing artifact scatter marked with orange flags. David Denton preparing to begin mapping.

Figure 4.48: Site HeEg-8 facing southwest showing buried soil (white dashed lines) and area A artifact scatter (red dashed line). The orange flags indicate artifact find locations.

Figure 4.49: Concentration of cobbles (f1) in area C of site HeEg-8; area B in background.

an elevation of approximately 92 m above sea level. Again, we did not observe fire-cracked rock or other features associated with this artifact scatter.

Area C A single feature was identified as area C—a concentration of cobbles some of which appear to be fire-cracked or heat reddened (figure 4.49). Area C is at an elevation of 93 m above sea level and is located about 45 m to the south-southeast of area B. The main group of cobbles is scattered over approximately two by two metres. No artifacts were found among the rocks or in the vicinity of this feature. We dug a test pit into the cobble concentration, just west of centre, in an attempt to better understand the nature of this feature. At a depth of 40 cm, the wall profiles of the test revealed sterile layers of eolian sand. In sum, although no artifacts, charcoal, bone, or additional fire-cracked rocks were encountered in this test pit, we continue to think that the surface cobbles are likely the remains of a dispersed and eroded hearth, possibly associated with the artifacts found in areas A and B.

Artifacts recovered

The artifacts found on site HeEg-8 are almost entirely made from a very fine-grained, lustrous, and translucent grey chert (figure 4.52). The colour of the chert, especially when back-lit, can vary from grey to black, sometimes with green or red aspects. The chert matrix often


Figure 4.50: Chert boulder encountered close to site HeEg-8, and detail showing grey and red chert blocks .

incorporates clouds, swirls, bands of darker colour, and inclusions that appear as dark dots or splotches. The stone almost certainly comes from a geological formation in the nearby Labrador Trough. Similar looking stone (possibly from the same geological source) has been found on a number of sites in the project area, most notably on site Kaa Upiyaakaaw 1 (HdEh-1). In fact, a chert boulder was encountered on the terrace close to area A (figure 4.50). The boulder is composed of massive chert blocks—grey, green, and red in colour. We found no clear evidence to suggest that knappers had been using chert from the boulder; however, it's presence does point to the ready availability of local toolstone matching that found in the collection.

Other lithic materials were noted on the site in minute quantities—in particular, a distinctive lustrous, opaque chert characterized by bands in different colours of red (figure 4.52, bottom right).

The scatter of artifacts designated as area A contained 19 stone tool fragments and 378 flakes. The tool fragments appear to be in the final stages of completion (figure 4.51). In other words, we recovered a range of biface bases (including two that appear to be stems), biface edges, and retouched fragments, many too small to be identified. Some of the broken artifacts look finished: these fragments may have been carried to the site from elsewhere, with the intention of reworking them into new forms. A number of utilized flakes were also found suggesting that everyday tasks were being carried out on the site. Some of the flakes appear burnt, perhaps in a small hearth that eroded so extensively it escaped our detection.

A much smaller number of artifacts—2 tool fragments and 8 flakes—were collected in area B (figure 4.53). The biface fragment appears to be a preform for a projectile point with a

Figure 4.51: Tool fragments from site HeEg-8, area A, showing biface preform bases (.1, top left and .9, top right), biface bases (or tips?) (.5, middle left and .14, middle right), side-notched projectile point base (.2, bottom left), and utilized flake (.48, bottom right).

Figure 4.52: Sample of flakes from site HeEg-8, area A.

Figure 4.53: Artifacts from site HeEg-8, area B, including biface preform base (.120, top left), biface edge (.17-.115, top right), biface reduction flake (.118, bottom left), and sample of flakes (.116, bottom right).

short stemmed base. The biface edge is from a finely-made tool of undetermined form. Two fragments refit to make up this edge, and they were found in widely separated parts of the site. This refit biface edge allows us to link areas A and B.

Preliminary interpretations

The surface nature of site HeEg-8 presents challenges in that no features, beyond the possible hearth in area C, were noted. Nevertheless, we can offer some preliminary interpretations about the site. For a start, the occupants were clearly focused on working stone into tools, rather than on hunting or food processing activities. The number of artifacts, and their spread, suggest a small group was present, arriving with chert preforms and tools that were well-advanced towards completion. The fact that the collections from both area A and B are made of the same chert, and the refit biface edge that spans both areas, lead us to conclude that this is one (likely brief) occupation event.

Dating the site is difficult without charcoal or calcined bones, though there are clues that suggest a date of several thousand years. Site HeEg-8 sits on the shore of an ancient channel of the Caniapiscau River, possibly at the location of a long disappeared lake. One factor to consider is site elevation—the lowest area of which (area A) is at 88-89 m above sea level or 11–12 m below the 100 m elevation of Kaa Upiyaakaaw 1. Given that the occupation must have taken place after the land surface emerged from the Iberville Sea, this would likely suggest a date no older than about 4000 years. In addition, some of the tool forms, particularly the biface bases with short stems, resemble stemmed point forms from sites on the Labrador coast and the Quebec Lower North Shore, which suggest a date of over 3500 years. Future research related to both the geomorphology of the location and comparisons with diagnostic tools from other regions, may help to refine dating. Furthermore, Stephen Wolfe, member of the science team, collected a series of OSL dating samples from site HeEg-8 in hopes of bracketing the time period when people were present on the site.

Period(s) of occupation Precontact

Recommendations Site HeEg-8 is an important discovery, confirming the strong archaeological potential of high elevation terraces associated with ancient landforms. We recommend that the site, and the broader terrace where it is located, receive additional archaeological surveys and testing. As seen by our return to site Kaa Upiyaakaaw 1 (HdEh-1) in 2024, older surface sites in the project area can be complex and hold elusive details that–due to wind and sand erosion–may be revealed over time. Future archaeological work would attempt to locate dateable charcoal and calcined bone, more diagnostic artifacts, and additional occupation areas.

4.2.3 HeEg-9 (NAP24-06)

Introduction

In 2022, we visited a high eroded terrace on the east side of the Caniapiscau River just below Aapiihtaamischuun (Shale Falls) and explored the active sand dune behind it. In 2024, based on our experience with site Kaa Upiyaakaaw 1 (HdEh-1)—also on an eroded terrace beside an active sand dune—we planned to examine the terrace edges near the falls more systematically. During our first visit on August 9, we stopped at the most northerly of the series of eroded terraces that stretch 2.2 km around the curving eastern shore of the river. This relatively small terrace is nestled between dunes now covered with vegetation. A visual examination of the flat area inland from the terrace edge led to the discovery of a surface scatter of lithic chipping debris, designated as site HeEg-9. On August 9, we returned to the site to map and collect the artifacts, and to explore the area further.

Site description

The terrace on which site HeEg-9 lies is at an elevation 121 m above sea level (figure 4.54). It overlooks the river, here flowing to the northwest some 53 m below, and provides a breathtaking view of the falls 1.5 km to the south. The surface of the terrace is a regolith. In this instance, it is a deposit of sand covered with many small pebbles and tiny fragments of rock that protect the surface from further erosion. A series of boulders is concentrated in the central area of the terrace.

The scatter of flakes begins approximately 20 m inland from the terrace edge and covers an area of about 30 m by 15 m, with the long axis oriented southwest-northeast (figure 4.55). The scatter begins just to the northeast of the boulders and continues onto the edge of the dune

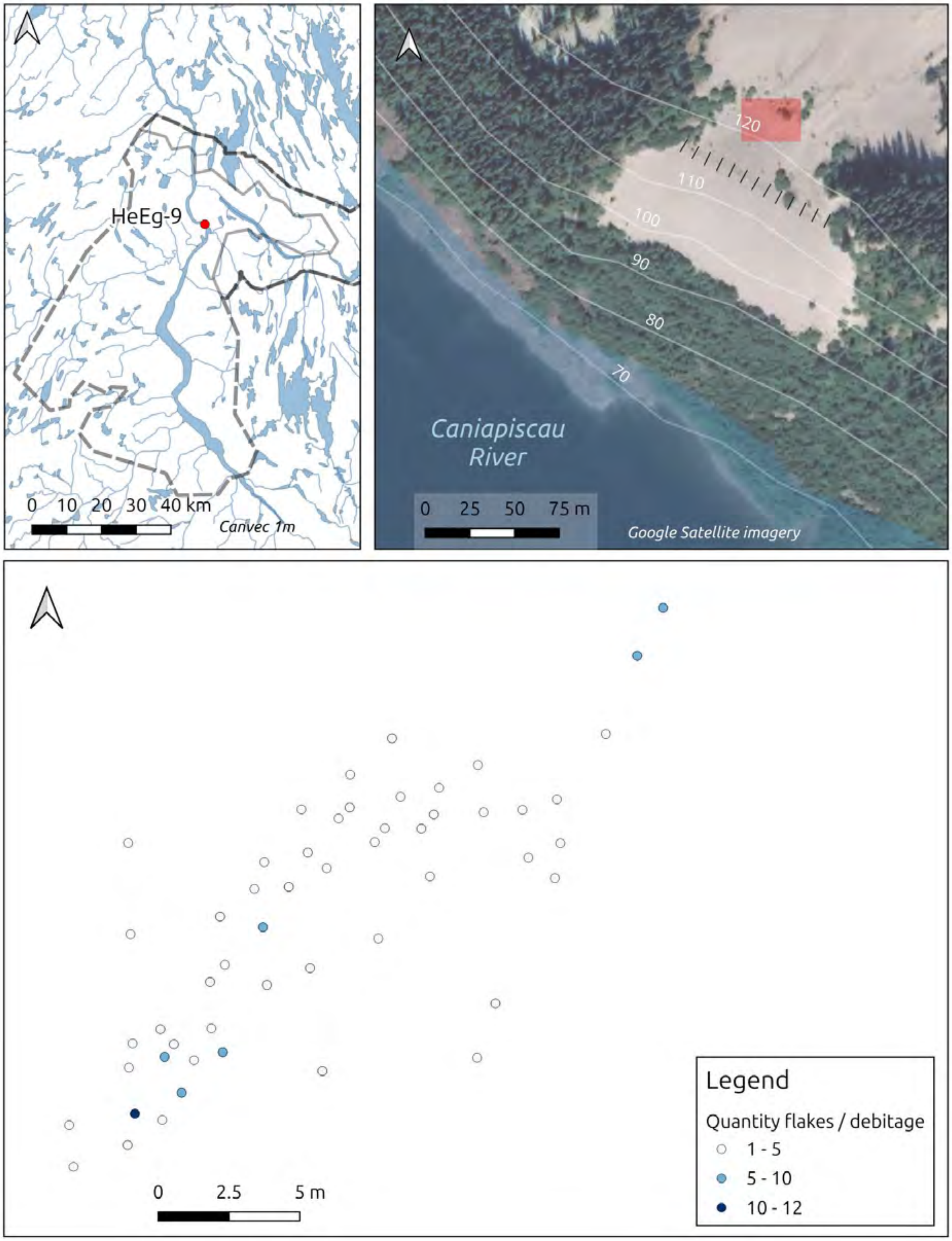

Figure 4.54: Location of site HeEg-9 and plan showing scatter of lithic flakes.

Figure 4.55: Oblique aerial view of site HeEg-9 facing northwest showing terrace edge, surface of reglolith, dune, and location of archaeological finds (white elipse). Drone image courtesy Stephen Wolfe.

sand, perpendicular to the terrace edge. The elongated shape of the artifact scatter aligns with the direction of the dune's movement, suggesting that at least some of the flakes have been blown by strong southwesterly winds. Although time constraints were a factor, no sign of a hearth in the form of fire-cracked rocks or any intact deposits were located, despite search efforts.

Artifacts recovered

The collection from site HeEg-9 comprises two possible tool fragments and 146 flakes. Without exception, all artifacts are made of a dark red chert that has been found on numerous other Precontact period sites in the project area. We have also encountered this material regularly in the form of cobbles and erratic blocks lying on beaches and terraces, confirming that the material originates in a Labrador Trough geological formation. The chert is medium-grained, opaque, and with a mat or dull lustre. The colour varies from medium to dark red: the texture can be smooth to rough with lines and swirls created by variations in colour and grain size.

The two possible tool elements are too small and fragmented to identify firmly but may come from preforms. The majority of the flakes are relatively large in size. Nevertheless, it is possible that smaller, lighter flakes blew off the site or became buried under sand over time. At least one flake was struck from a large biface as it retains a piece of the preform's edge (figure

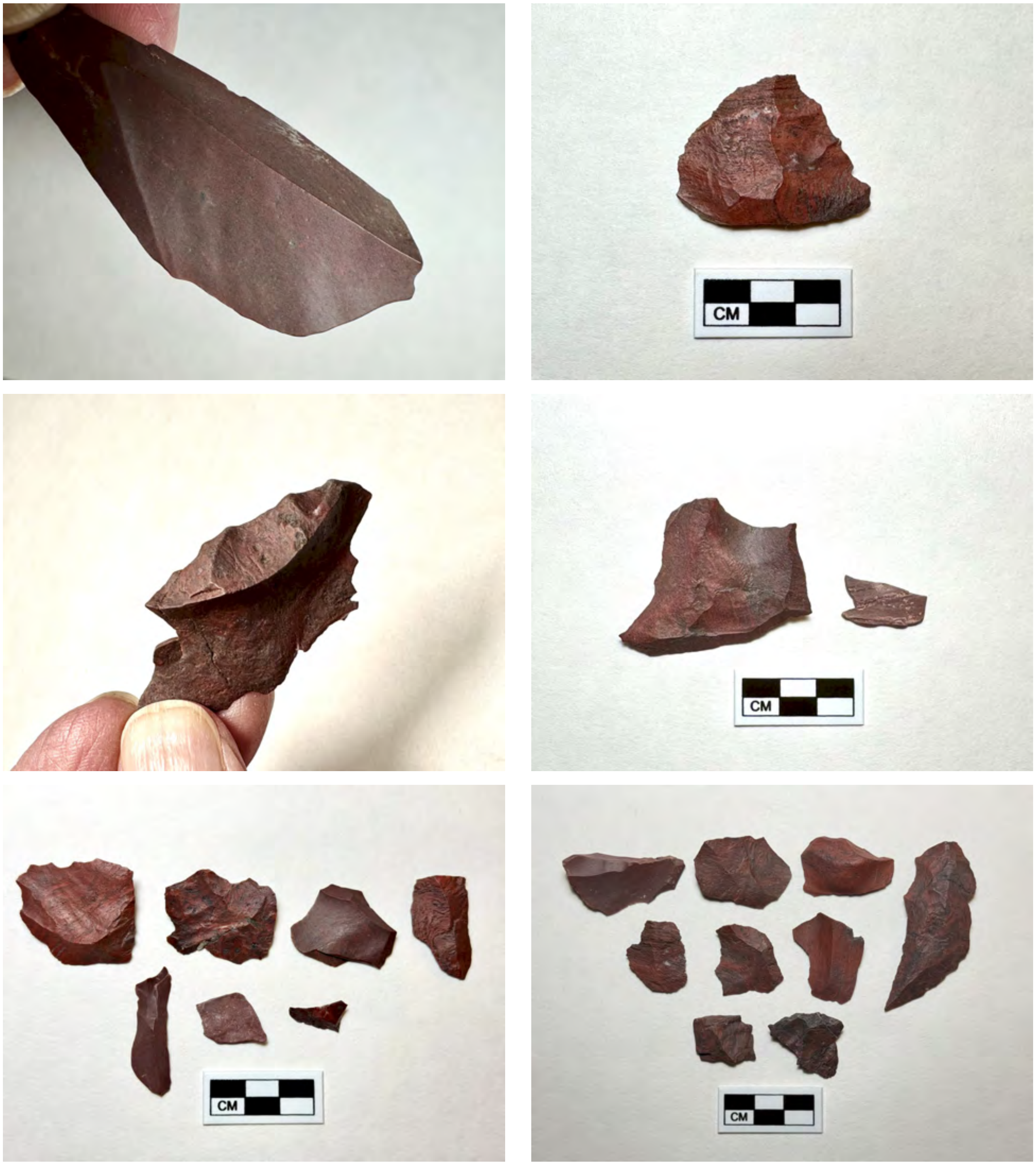

Figure 4.56: Artifacts from site HeEg-9, showing flakes that illustrate red chert colour and texture variation, including large biface edge flake (.31, middle left).

Figure 4.57: Tshiueten Vachon and Moira McCaffrey enjoying view of Aapiihtaamischuun (Shale Falls) from edge of terrace at site HeEg-9.

4.56, middle left). A number of additional biface reduction flakes were noted in the collection; however, the striking platforms on most flakes suggest that the knappers were working with angular blocks or chunks of chert. Many of the flakes have a weathered appearance due to wind and sand exposure.

Preliminary interpretations

Site HeEg-9 appears to be a locale when an individual or a small group halted for a short period of time and worked stone that they were carrying with them. The absence of a hearth or fire-cracked rocks suggests that this event took place during relatively warm weather. It is also possible that this was was a specialized activity area associated with a campsite situated nearby, which we were not able to locate within the time available for surveying this and neighbouring terraces. The spectacular vista afforded by the location—with an unimpeded view up and down the Caniapiscau River—must also be considered when thinking about why people would have stopped in this location (figure 4.57). At present, there is no way to date the site more precisely than within the Precontact period, although site's high elevation tends to suggest an older date.

Period(s) of occupation Precontact

Recommendations Site HeEg-9 is significant for a number of reasons. The site expands our knowledge of the Aapiihtaamischuun (Shale Falls) region through time by making it possible to document human activity in these distinctive sand dune zones. Furthermore, the site is an example of an activity area focused on the use of one specific lithic material, encouraging us to think about how people carried and used stone resources originating in the Labrador Trough. Consequently, additional research is warranted in the vicinity of the site and the surrounding area, as there was insufficient time to thoroughly survey this and adjoining locations.

4.2.4 HeEg-3

The historic portage site HeEg-3[7], recorded in 2021, was chosen as an ideal location for community visits as the three large earthen tent rings with stone hearths are easy to see due to the 2014 fire. In addition, the location offers spectacular views of Aapiihtaamischuun (Shale Falls) and the Caniapiscau River in both directions (McCaffrey and Denton 2022: 145–151; Denton and McCaffrey 2023: 152–154).

During the second community visit, we dug a test pit in one of the earthen tent rings (feature 1) to demonstrate how archaeological testing is done. The positive test produced a nail fragment, some flakes of red mudstone, and a probable fragment of a grinding stone.

4.2.5 ZIA (NAP24-01)

Introduction

In keeping with our 2022 observation that we might find archaeological sites on landforms at high elevations, on the morning of July 21 we examined a series of eroded terraces situated south of Aapiihtaamischuun (Shale Falls) on the western side of the Caniapiscau River within the 2014 forest fire burn area.

Site description

In a sandy blowout at an elevation of 97 m above sea level, about 450 m northeast of site NAP22-22[8], we discovered a single large chert flake lying on the surface of the terrace (figure 4.58).

[7] Previously referred to by its temporary code, NAP21-15.

[8] This site was not given a permanent Borden Code due to its highly eroded state. Therefore, it continues to be referred to by its original temporary code.

Figure 4.58: View of site NAP24-01 with orange flag marking location of chert flake. Caniapiscau River in background.

Artifacts recovered

The large flake is made of a fine-grained, mottled black and grey translucent chert—a lithic type that has been recovered on other Precontact period sites in the region (figure 4.59). This stone variety almost certainly comes from a geological formation in the nearby Labrador Trough. The flake shows evidence of use along one of its edges.

Preliminary interpretations

Despite a concentrated search in the vicinity of this find, no additional evidence of a Precontact period presence was found in the area. It would appear that this lone tool was simply lost or discarded centuries or millennia ago.

Period(s) of occupation Precontact

Recommendations While the discovery of an artifact in this location is of interest, the site itself has little further research potential.

Figure 4.59: Utilized chert flake (.1) discovered at site NAP24-01.

4.3 Study locale 3: Central Nachicapau Lake

Nachicapau Lake is of cultural and historical importance for the Naskapi and its protection is a priority. Unfortunately, we have found fewer archaeological sites in this broad area than in the Caniapiscau River valley, mainly due to logistical difficulties that make survey work in the region extremely challenging (McCaffrey and Denton 2024). As a result, in 2024 time was reserved for additional survey work in the central Nachicapau Lake area.

4.3.1 HdEa-1 (NAP24-08)

Introduction

Site HdEa-1 was discovered when we travelled by helicopter to Nachicapau Lake on August 13 to survey zones in the south central part of the shoreline—a region that had received less attention during the 2021 and 2022 inventories. Finding places to land the helicopter remained a serious challenge. We finally succeeded in going ashore on a point of land jutting into the large bay in this sector (figure 4.60). We dug six test pits in dense vegetation on flat terrain inland from the shoreline. Two of the tests produced tiny quartz flakes, indicating the presence of a Precontact period occupation.

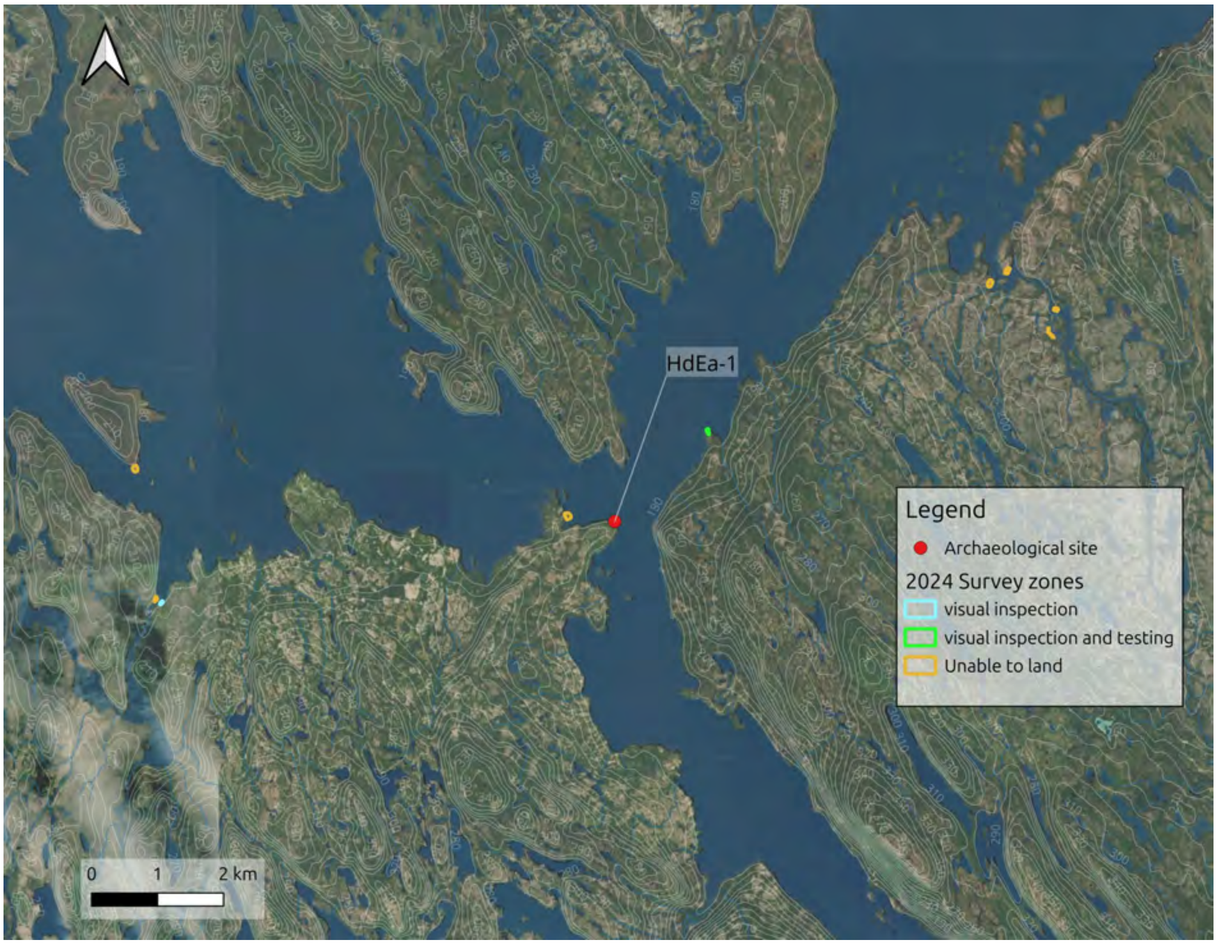

Figure 4.60: Study locale 3: Map showing survey zones and site in central Nachicapau Lake area.

Figure 4.61: Oblique aerial view of point facing southwest, showing general location of site HdEa-1 (dotted red ellipse).

Site description

Site HdEa-1 is located on the tip of a long point extending to the northeast from the southern shore of Nachicapau Lake into the narrows where the two arms of the lake meet. The point and the site face open water down the long reach of the eastern arm of the lake toward the northeast (figures 4.61 and 4.62).

The site sits on a small plateau at an elevation of approximately 181 m or 8 m above the level of the lake.[9] Vegetation in the site area is dominated by dwarf birch with clumps of Labrador tea and blueberry: sphagnum moss and occasional patches of Cladonia cover the ground. Scattered black spruce trees surround this small flat area, with the forest being denser closer to the lake at a slightly lower elevation (figure 4.63).

The two positive test pits have similar soil profiles. At the surface is the LF horizon (sphagnum moss and decaying vegetal material), which varies in thickness from 10 cm in test 2 to 4 cm in test 1. The cultural material is found in the underlying H (humus) horizon, which varies from 3 to 6 cm in thickness in test 1 to 2 cm in test 2. Below the H horizon is a very stony Ae (eluviated sand) horizon.

[9]Google Earth records the water level of Nachicapau Lake as 173 m.

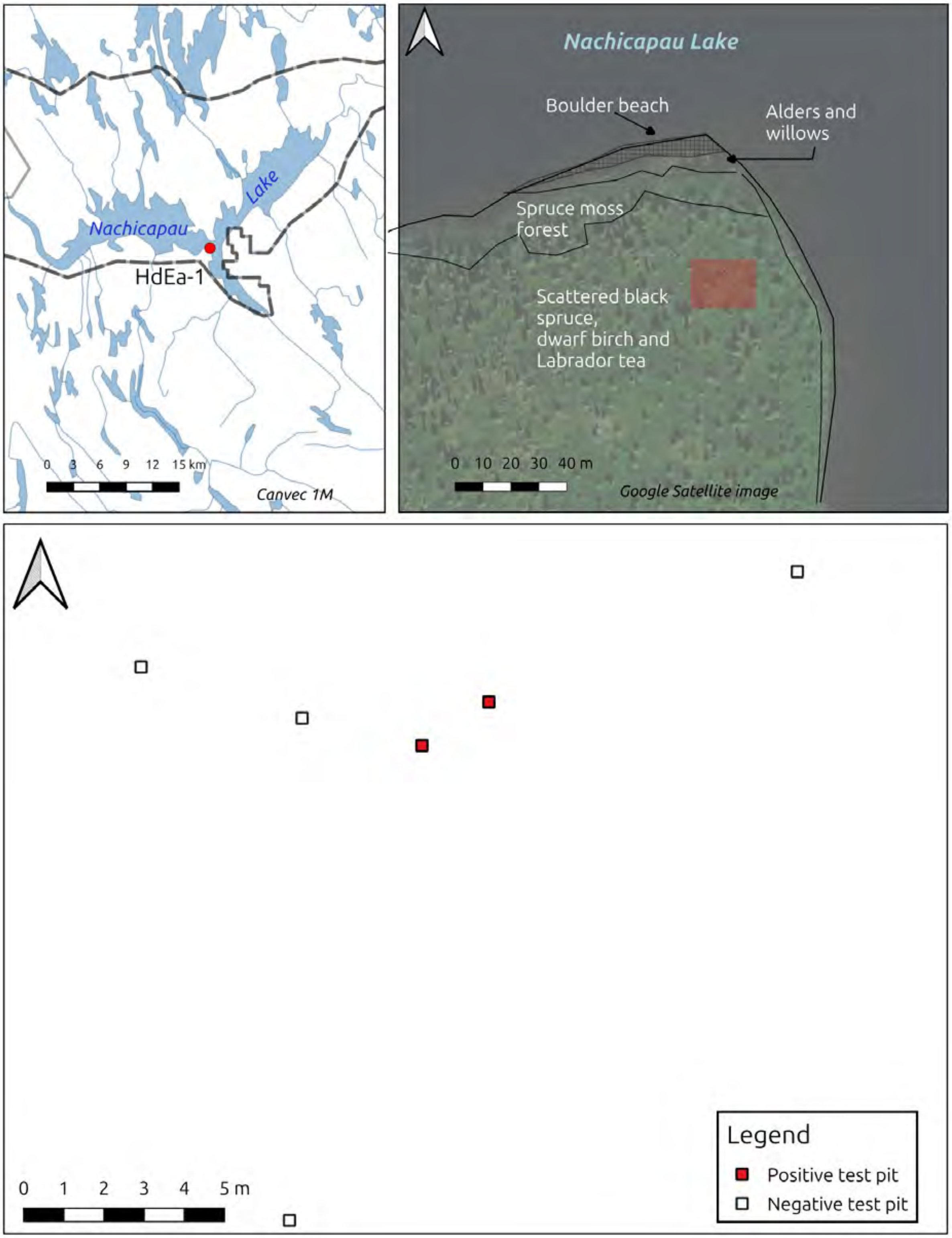

Figure 4.62: Plan of site HdEa-1 showing location, geographic context, and test pits.

Figure 4.63: Vegetation at site HdEa-1 is dominated by dwarf birch, Labrador tea, and sphagnum moss.

Test 1 contains several large rocks that are embedded in the Ae horizon or lower and that protrude upward through the H horizon. Test 2 produced a series of smaller rocks, some of which appear to be fire-cracked (figure 4.64).

Artifacts recovered

The artifacts discovered in the two positive test pits consist of small quartz flakes—23 were recovered in test 1 while 10 were found in test 2 (figure 4.65). Quartz used as a material to make stone tools has been found in small quantities on numerous archaeological sites from all time periods in the Cambrien and Nachicapau lakes region. The use of quartz as a toolstone is widespread on sites across the eastern Subarctic. The small size of most flakes suggests that tool sharpening or finishing was taking place on the site.

Preliminary interpretations

Interpretations of site HdEa-1 are difficult considering that there are only two positive test pits on which to base suggestions. The fact that rocks were found in both tests, including fire-cracked rocks in test 2, increases the likelihood that individuals camped at the site, perhaps on their way to or from hunting grounds situated to the northeast or southeast. There is no

Figure 4.64: View of test 2 at site HdEa-1 showing rocks in Ae horizon and reddened sand (red arrow).

Figure 4.65: Quartz flakes and shatter recovered in test 1 (.1, left) and test 2 (.2, right).

basis for proposing a date beyond Precontact period and, in fact, quartz continued to be used as a lithic material into the Contact and Historic periods.

Period(s) of occupation Precontact

Recommendations Site HdEa-1 deserves to be protected and further tested or excavated in future. Time constraints, as well as dense vegetation, prevented more test pits from being dug in the area. Additional work should be focused on locating a hearth(s) with dateable charcoal or calcined bone, as well as a larger sample of stone tools.

The discovery of this Precontact period site in the central part of Nachicapau Lake reinforces the impression left by surveys on the lake during the 2021 and 2022 field seasons. If archaeological work could be carried out by boat from a nearby basecamp, there would be a greater likelihood of finding archaeological sites in the Nachicapau Lake sector. The lack of suitable helicopter landing places is a major impediment to searching for sites.

4.4 Study locale 4: Central Mistisipu Nipiy (Central Cambrien Lake)

4.4.1 HcEg-2 (NAP24-07)

Introduction

Site HcEg-2 was found with the assistance of a Naskapi Elder following one of the community site visits. After travelling to base camp and then out to see the archaeological sites, Gordon Dominique went to visit his grandparents and spoke to his grandfather, Jacob Mameanskum, about what he had seen during the tour. In the course of that conversation, Jacob mentioned a place he remembered on Cambrien Lake where the women and children stayed when the men went hunting. Gordon sent a map showing the location of this point on the western shore of central Cambrien Lake, and suggested that we take a look (figure 4.66). We were very keen to survey this place and were able to do so on August 10.

The site is located on a small point on the western side of the lake, approximately 20 km south of the lake's outlet and 8 km north of the narrows in the middle of the lake (figure 4.67). The point consists of a long sloping beach that extends from the wooded shoreline approximately 80 m out into the lake. This sand deposit that forms the beach may be of deltaic

Figure 4.66: Study locale 4: Map of Central Mistisipu Nipiy showing location of site HcEg-2.

Figure 4.67: Oblique aerial view facing north of point where site HcEg-2 is located.

origin associated with a stream flowing into the lake approximately 150 m to the south of the central portion of the point. Along this section of the lake's western shore, the hills rise to 380 m above sea level, close to 300 m above the lake level.

The site consists of two main components (figure 4.68):

1. Modern / Recent period occupation(s) on the upper portion of the beach and within the adjacent birch stand. It is likely that these occupations extended into the spruce moss forest further inland.
2. Precontact period occupation(s) evidenced in several test pits excavated in a flat area in the spruce moss forest, just to the west of the birch stand.

Site description

Modern / Recent period occupation area The sand beach slopes upward relatively steeply from an elevation of 85 m at the water level on the eastern tip of the point to 88 m at the edge of the area of sand and gravel. The first indications of occupation on the point were the scattered rocks that appear to be out of their natural context, in the more gently sloping area of sand and gravel occupying the upper portion of the beach (figure 4.69). Although only one grouping of rocks was mapped (f1 in figure 4.68), more widely scattered rocks throughout

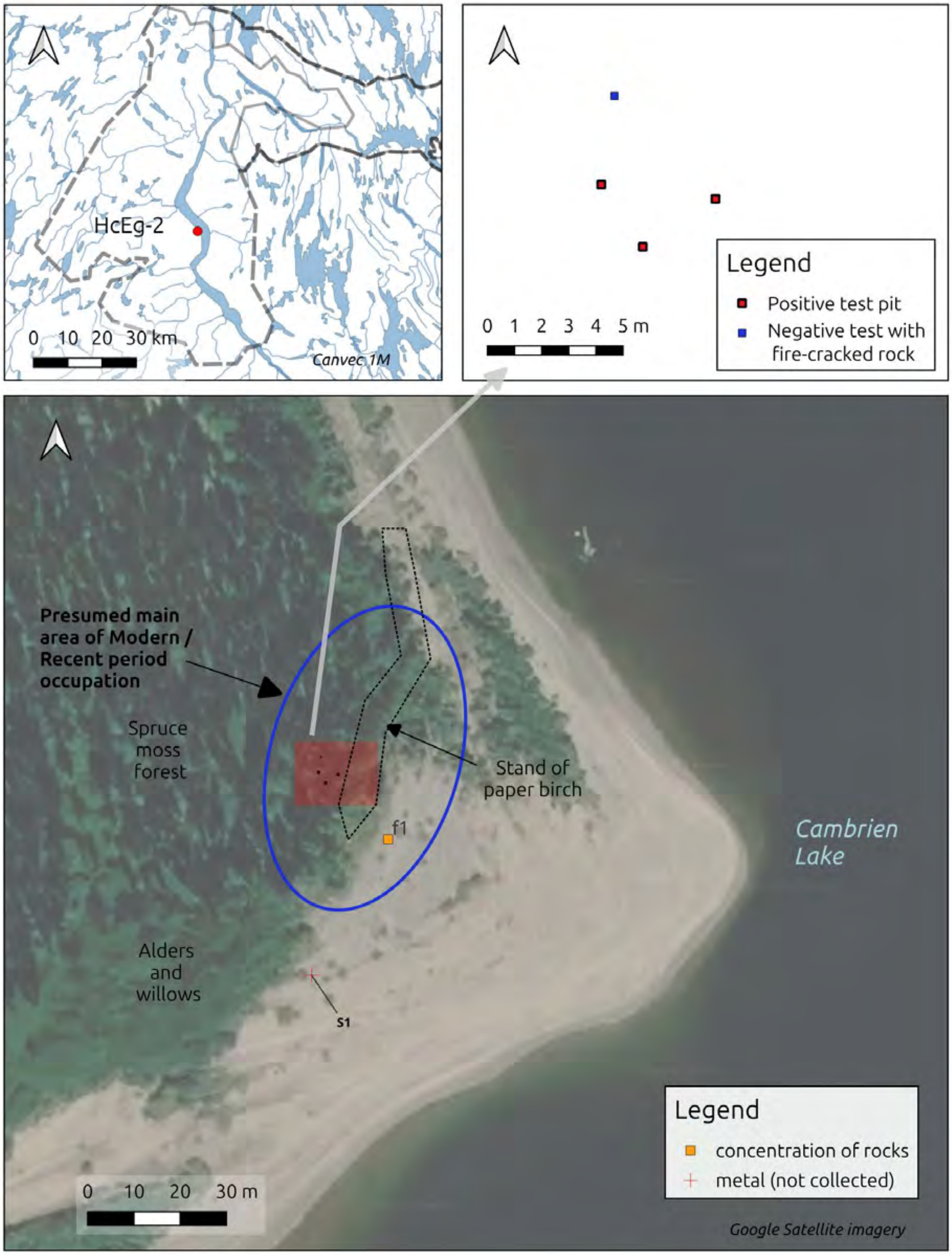

Figure 4.68: Plan of site HcEg-2 showing presumed main area of Modern / Recent period occupation and area of Precontact period occupation (inset).

the area seemed equally out of natural context. Many of these rocks were undoubtedly moved by the site occupants and used as weights to hold down the walls of canvas tents. Other indications of Modern / Recent period occupation were a small number of metal objects, including a tin lid and a cut scrap of tin (not collected) on the ground surface in the area of sand and gravel.

Other indications of Modern / Recent period occupation on the point were small clearings within the birch stand (figure 4.70) where the ground cover consists of low ericaceous plants and lichens, contrasting with the denser surrounding vegetation. Several large boulders mark the edge of the flat land surface leading down to the beach. It is likely that tents were pitched in these clearings that stand at an elevation of approximately 90–91 m or 5–6 m above the water level at the time of our visit. The presence of the birch stand is another clue indicating human occupation in recent times as this species is often found near commonly-used camping areas.

Although we were unable to see evidence on the ground surface, the camping area associated with the more recent occupations on the site very likely extends to the northwest into the spruce moss forest, as discussed further below.

Precontact period occupation area Four test pits were excavated in the forested portion of the site, approximately 10 m northwest of the clearings in the birch stand (figure 4.71). The area was selected for testing because it is relatively flat and the surface vegetation is dominated by sphagnum moss with some ericaceous plants including blueberry, but does not have the thick growth of Labrador tea that characterizes the slightly lower, surrounding zones. The area is at an elevation of 92–93 m or 7–8 m above the water level of Cambrien Lake at the time of our visit.

Three of these test pits produced evidence of stone tool use and manufacture in the form of one complete tool and flakes of various stone varieties (figures 4.74 and 4.73). The fourth test revealed evidence of occupation in the form of a couple of fire-cracked rocks.

The soil profile of test 1 (figure 4.72) shows the following sequence of layers from top to bottom:

- LF horizon (litter and fermented layer, including live and decaying sphagnum moss) of about 10 cm;
- Initial H horizon (humus) layer 1–2 cm thick. This layer contained a quartz flake;
- Layer of mixed brown sand containing a fire-cracked rock;
- Second H horizon 1–2 cm thick containing flakes of grey chert and Ramah chert in its lower portion;

Figure 4.69: View to southwest showing concentrations of rocks in lichen on edge of sand and gravel area, with birch stand in right background.

Figure 4.70: View to north showing clearings in birch stand where tents were likely pitched.

Figure 4.71: View to northeast showing area of positive test pits in spruce moss forest. Test 1 in right foreground; test 2 in right mid-ground; test 3 in left foreground.

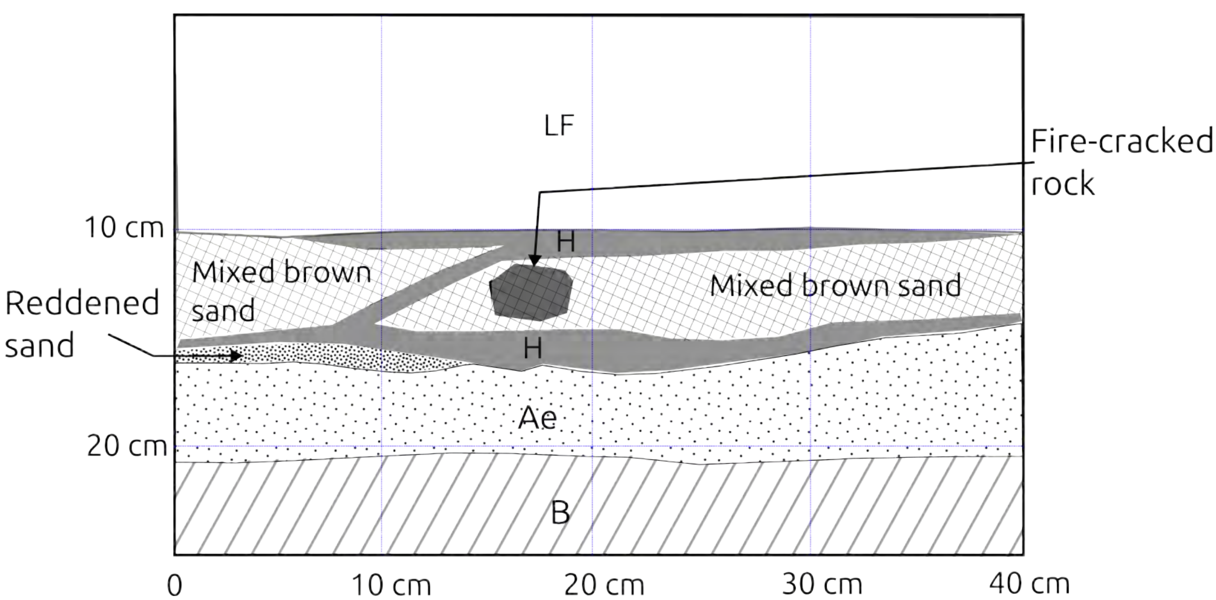

Figure 4.72: Profile of east wall of test 1. Note double H horizon (humus layers) separated by mixed brown sand with a fire-cracked rock, and reddened sand below lower humus.

Figure 4.73: View of northeast wall of test 3 showing chert flake in situ in wall at bottom of H horizon and in Ae horizon.

- Thin (1 cm) lens of reddened sand below the northern (left) side of the mixed brown sand and above the Ae horizon;
- Ae (eluviated sand) layer approximately 4 cm thick containing grey chert and Ramah chert flakes in its upper (1–2 cm) portion;
- Orangy-brown B horizon.

Artifacts recovered

Stone artifacts were recovered in three of the four test pits (figure 4.75). Test 1 produced a small number of flakes comprising Ramah chert (4), red siltstone (3), quartz (2), and grey chert (1). Test 2 included a tool of Ramah chert that is a blade-like flake with unifacial retouch on opposing lateral margins. Also recovered in test 2 were Ramah chert flakes (11) and a grey chert flake (1), as well as a Modern period can lid found in the moss as excavation of test 2 began. Test 3 held grey chert flakes (3), an elongated cobble that may have been used as a hammerstone, and a fragmented flat stone that shows possible signs of grinding.

The presence of Ramah chert, which originates in the Torngat Mountains of northern Labrador, is a particularly interesting aspect of this collection. The grey chert and red siltstone almost certainly come from geological formations in the Labrador Trough. Finally, quartz is

Figure 4.74: Tshiueten Vachon excavating test 2. Note tin lid found at base of LF (sphagnum and decaying vegetation) horizon.

a ubiquitous raw material that could have picked up nearby or in the course of the stone worker's travels.

Preliminary interpretations

Despite only a limited amount of archaeological work carried out on site HeEg-2, the evidence collected suggests that this is a complex site with multiple occupations spanning the Precontact period through to Modern and Recent times. The four test pits exposed stone artifacts and fire-cracked rocks, indicating a Precontact period site. Moreover, the double humus layer visible in the profile of test 1 suggests the possibility of two Precontact period occupations. The soil profile in test 1 also suggests the likely presence of a fireplace, although the absence of fire-cracked rock in the mixed brown sand is surprising. This may reflect disturbances in the soil profile caused by later occupations. The presence of Ramah chert along with stone from local sources is interesting but not unusual, as groups in the region exchanged toolstone over vast distances. A precise date for the Precontact period occupation(s) cannot be determined due to a lack of dateable charcoal or calcined bones.

Evidence for the presence of camps dating to the late Fort McKenzie period (1940s to 1950s) was visible in the form of clearings, discarded metal goods, and clusters of rocks that appeared

Figure 4.75: Artifacts found in tests 1, 2, and 3 on site HcEg-2, including a Ramah chert tool (.3, top left), flakes from test 2 (.4, top right), flakes from test 3 (.5, middle left), stone with possible grinding marks (.7, middle right), flakes from test 1 (.1, bottom left), and can lid (.2, bottom right).

to have been moved into place to hold down the edges of canvas tents. In all likelihood, Modern and Recent period occupations extend further into the forested area, though there was insufficient time to test this idea. The site's location on a point of land in the central part of Cambrien Lake affords an ideal place to view comings and goings on the river, to halt during long voyages and, as Jacob Mameanskum explained, to serve as a base camp for women and children while men were away hunting.

Period(s) of occupation Precontact, Modern, Recent

Recommendations Site HcEg-2 has high archaeological potential: further testing, possibly followed by excavation, is recommended. This location was remembered and brought to our attention by Naskapi Elder Jacob Mameanskum, making this a particularly important and meaningful site for the Naskapi Nation. Additional interview work with Elder Mameanskum should be part of any future research.

4.5 Study locale 5: Piyaaskwaastikw (Pons River)

An objective of survey work in 2024 was to verify the impact of the 2023 forest fire on previously discovered archaeological sites. This massive fire burned 800 square kilometres starting on the left bank of the Caniapiscau River, south of the proposed protected area, then hopped the river and moved north along a wide swath of the east side of Cambrien Lake, almost as far as the lake's outlet at Kaa Upiyaakaau (Sandy Narrows) (figures 4.76 and 4.77). We were unsure how intense the fire had been and how it might have impacted archaeological sites. We thought that an examination of the effects of the fire on known sites could indicate whether or not the burn may have exposed artifacts or features elsewhere, potentially facilitating the discovery of new sites.

Our archaeological interest in burnt areas developed during 2021 surveys near Aapiihtaamischuun (Shale Falls) where several Historic period sites had been exposed by a large fire in 2014 (McCaffrey and Denton 2022: 138-156). Some 11 Naskapi earthen tent rings were visible on the ground surface; it is likely that none of these would have been found were it not for the fire (ibid.: 44).

On August 10 we travelled south to investigate two sites within the burn: HaEf-1, a Precontact period site at the mouth of Pinuk Siipiy (Beurling River) and HaEf-2, a Precontact / Modern period site at the mouth of the Piyaaskwaastikw. Both these sites are located on the Caniapiscau River, upstream from the head of Cambrien Lake (figure 4.77).

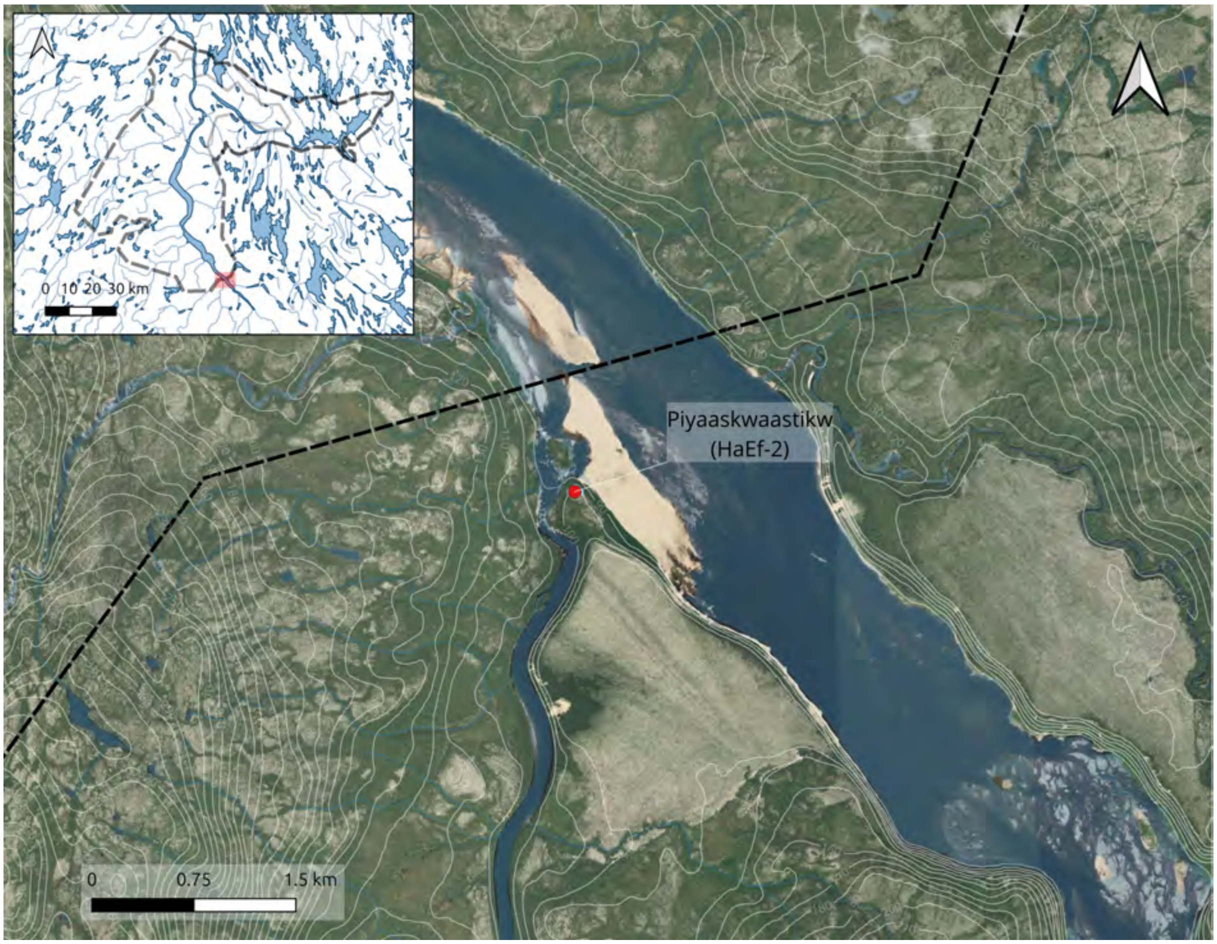

Figure 4.76: Study locale 5: map showing location of Piyaaskwaastikw site (HaEf-2) at outlet of Piyaaskwaastikw (Pons River).

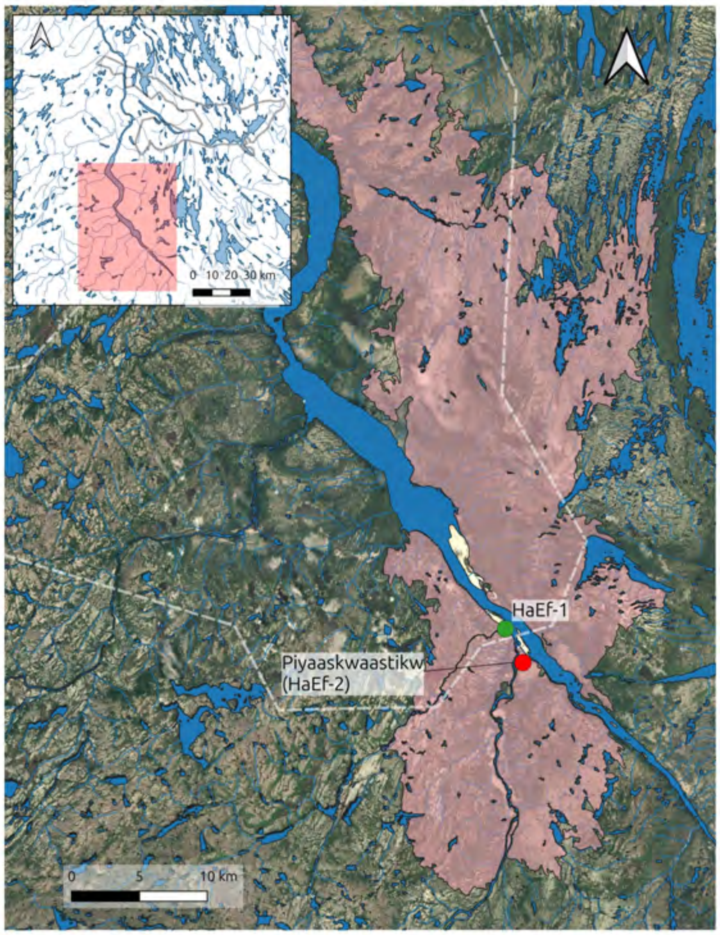

Figure 4.77: Location of sites HaEf-1 and Piyaaskwaastikw (HaEf-2) in relation to large burned area from 2023 fire and boundary of proposed protected area.

While it appears that the island in the mouth of Pinuk Siipiy (Beurling River) where site HaEf-1 is located had indeed been burnt, we were unable to land to investigate on the ground. We then travelled to the mouth of the Piyaaskwaastikw (Pons River).

4.5.1 Piyaaskwaastikw (HaEf-2)

Introduction

The Piyaaskwaastikw site (HaEf-2) is located on the left bank of the Caniapiscau River, less than a kilometre south of the southern boundary of the project area (figure 4.76). Here Piyaaskwaastikw (Pons River) sweeps into the Caniapiscau River from the southwest in two dramatic waterfalls, one on either side of a small island. The site is located on a hill in the triangle formed on the south side of the confluence of Piyaaskwaastikw (Pons River) and the Caniapiscau.

As the objective of our visit in 2024 was to document the effects of the 2023 fire, it is important to recall the results our initial investigation in 2022. At that time, we identified two areas of occupation, as shown in figure 4.80:

Area A Area A is located at the top of the hill at an elevation of 110 m or 28 m above the level of the river. Here we found a Modern period Naskapi camping area with two tent sites marked by rocks (f1 and f2). A Precontact period occupation was signalled by the presence of a feature with fire-cracked rocks, likely a hearth (f3), and two positive test pits containing small flakes and a tool fragment of quartz and Ramah chert.

Area B Area B is located on the southwestern flank of this hill between about 107 and 101 m above sea level or between 3 and 9 metres below the top of the hill. Several metal objects were noted and photographed in this area, and a tin kettle was collected. Several possible tenting areas were suggested by the presence of flattened surfaces (Denton and McCaffrey 2023: 192–7).

The location of an important portage route is a key element in the interpretation of this site. While the portage has yet to be mapped, a section of trail was noted in 2022. Clearly, the trail would have led down the slope to the southwest of the hill, to a stretch of calm water above the next set of rapids above the falls, approximately 280 m to the south-southwest of area B.

Site description

Our 2024 visit to the site took place late in the afternoon of August 10, unfortunately leaving insufficient time to map the findings or collect artifacts. Our principal observation was that the fire had a significant effect in removing living surface vegetation leaving the humus

Figure 4.78: View towards southwest in 2022 of grouping of rocks (tent site) at Piyaaskwaastikw (HaEf-2).

Figure 4.79: View towards northeast in 2024 of concentrations of rocks shown in figure 4.78.

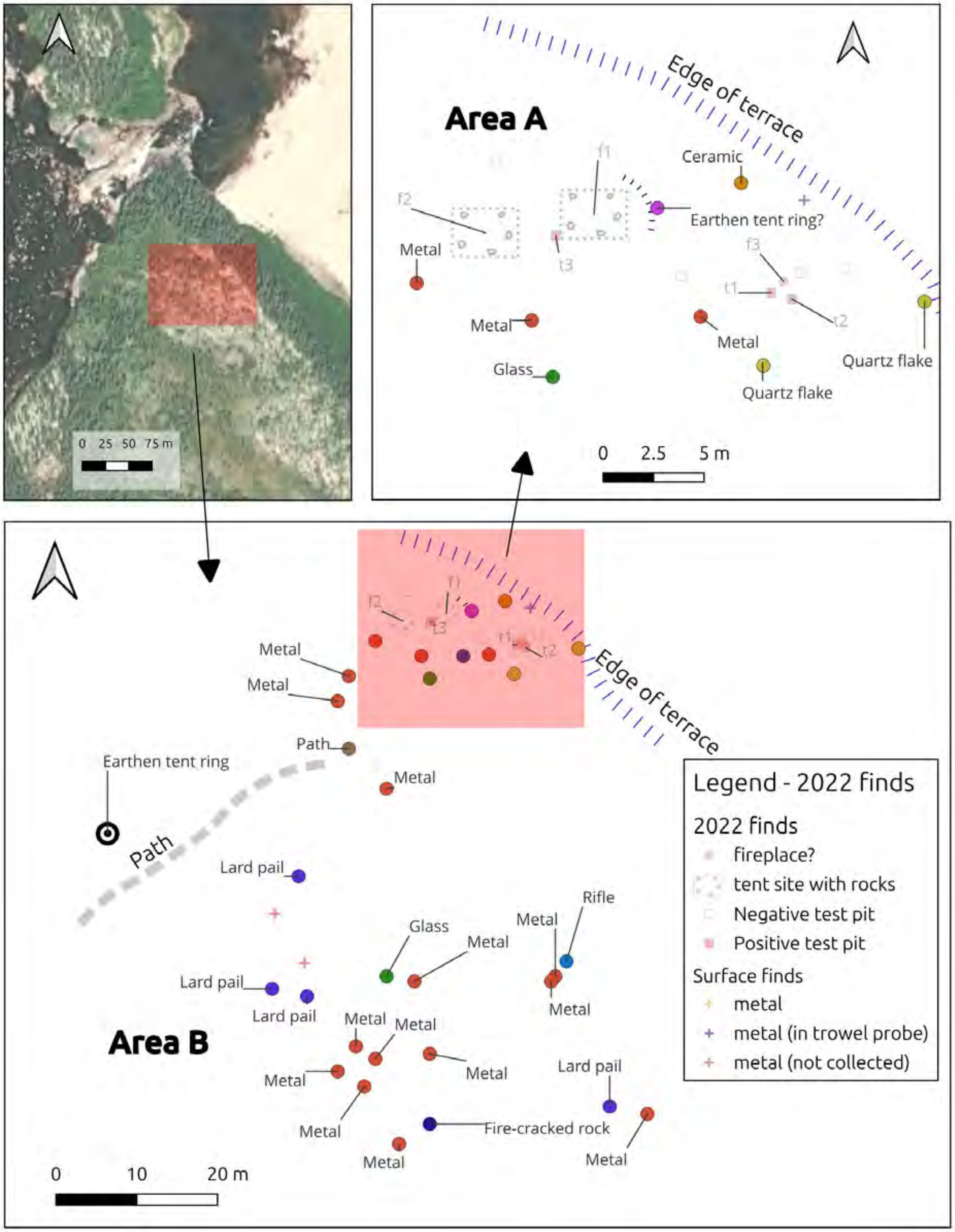

Figure 4.80: Site plan of Piyaaskwaastikw (HaEf-3) showing 2022 finds (in partial transparency) and location of sample of artifacts (coloured circles) and features from 2024, using coordinates from geotagged photos.

Figure 4.81: Earthen tent ring exposed by forest fire at Piyaaskwaastikw (HaEf-2), area B. White dashed line show outlines of earthen ring and central fireplace.

layer (H soil horizon) fully exposed, thus revealing dozens of artifacts and several features on the ground surface. Lacking time to map the findings with the DGPS, we took photographs of many objects visible on the surface and left all of them in place. The coordinates in the geotagged images were used to create the rough map shown in figure 4.80.[10]

The fire exposed several habitation areas—including an earthen tent ring located near the portage trail in area B (figure 4.81)—and others indicated by probable fireplaces. As well, many artifacts were visible, especially metal objects including rusted metal scraps and, most prominently, lard pails (figure 4.83). Smaller objects brought to light by the fire included ceramics, glass, and two quartz flakes associated with the Precontact period occupation in area A (figure 4.82). An especially interesting find was the metal component of a lever action carbine with a six digit serial number stamped on the left side of the upper tang (figure 4.84), and which is identified as a Marlin Model 1893 repeating carbine (Brophy 1989; Traister 1994: 131; Carpenteri 2005: 124).[11]

Preliminary interpretations

This site is especially interesting as it is "multi-component". In other words, there is evidence of occupation from at least two different time periods: the Precontact period signalled by the hearth and quartz flakes in area A, and the Modern period represented by all other features and surface artifacts, including those exposed by the 2023 fire. Clearly, the most significant occupation is the more recent one: Naskapi gathered and camped here after climbing the hill on the trail beginning near the foot of the falls, and before taking the second part of the portage that would start them on the journey inland, to the myriad of lakes and rivers on the plateau west of the Caniapiscau River, for their fall / winter trapping. People also likely stopped here in the spring on the return trip to Fort McKenzie. Perhaps the presence of so many lard tins is indicative of people finishing off their supplies and abandoning empty tins in the spring.

Further interviews with Naskapi Elders are essential to see if people remember seeing or hearing of this place and how it was used. The exposed artifacts suggest that the predominant period of occupation is in the latter half of Fort McKenzie's operation (1930s and 1940s).

Our motivation for visiting the site in 2024 was to determine the effects of the fire in exposing artifacts and features. While it is clear that the vast 2023 fire was a rapidly moving one that affected mainly the treetops, it also scorched the ground—at least in this location—burning all surface vegetation including moss, lichens and ericaceous plants, leaving the black

[10]Note that locations based on geotagged images are precise, at best, to 3–4 m. They are presented here to give a general indication of the findings and not as a final map of the site.

[11]While somewhat difficult to discern from the photograph, we read the serial number as 378334, which would suggest that the gun was manufactured between about 1906 and 1913 (Regnier (gunrunner) 2018).

Figure 4.82: Artifacts exposed at Piyaaskwaastikw (HaEf-2), area A and B, including metal strip (top left), ceramic sherd (top right), glass fragments (middle), and quartz flakes (bottom).

Figure 4.83: Sample of lard pails observed at Piyaaskwaastikw (HaEf-2), area B.

Figure 4.84: Lever action Marlin Model 1893 carbine exposed by 2023 fire at Piyaaskwaastikw (HaEf-2), area B.

humus exposed (figures 4.78 and 4.79). We expect that well-drained locations, such as those often selected by people for camping, would have been most impacted.

As demonstrated by our short visit, we think that this fire presents an opportunity to explore Naskapi sites across the large burned territory within the proposed protected area (figure 4.77), targeting locations near shorelines of rivers and lakes. While Naskapi earthen tent rings would be the most likely features to be exposed, the removal of surface vegetation could also bring to light older Historic and Precontact period fireplaces and dwelling features. As suggested by Sghinolfi et al. (n.d.), drone technology using photogrammetry could be a useful way to explore high potential locations.

4.6 Study locale 6: Northern Caniapiscau River

A preliminary analysis of historical documents and Naskapi land-use information suggests that the portion of the Caniapiscau River to the north of the protected area was of great importance to the Naskapi in the 19th century and the first half of the 20th century (Denton and McCaffrey 2024). We expect that there should be significant archaeological sites relating to the major activities identified by this exercise: intensive Naskapi hunting at the broadly defined caribou crossing places (figure 4.85, nos. 1, 2 and 7), and portages and associated camping places at the three major portages along the river transport route between Fort Chimo and Fort McKenzie (figure 4.85, nos. 2, 4 and 5).

Our plan for the 2024 field season included carrying out a one day exploratory survey to the north of the protected area to have a first look at these broad zones of archaeological potential. While the day of survey work was unfortunately cut short due to helicopter mechanical problems, we succeeded in gaining an overview of the area and evaluating its prospects for future survey work. We also discovered an archaeological site, described below.

4.6.1 HiEh-1 (NAP24-09)

Introduction

On August 14, the last day of the 2024 fieldwork season, we travelled north of the project area to conduct a rapid, mainly visual survey along a section of the fur trade route from Fort Chimo to Fort McKenzie. On the western side of the Caniapiscau River, about 8 km south of Kischaakus (Pyrite Falls), we landed on a ridge that gave the appearance of being an ancient shoreline. While visually inspecting this ridge, we found a scatter of black chert artifacts (figure 4.86).

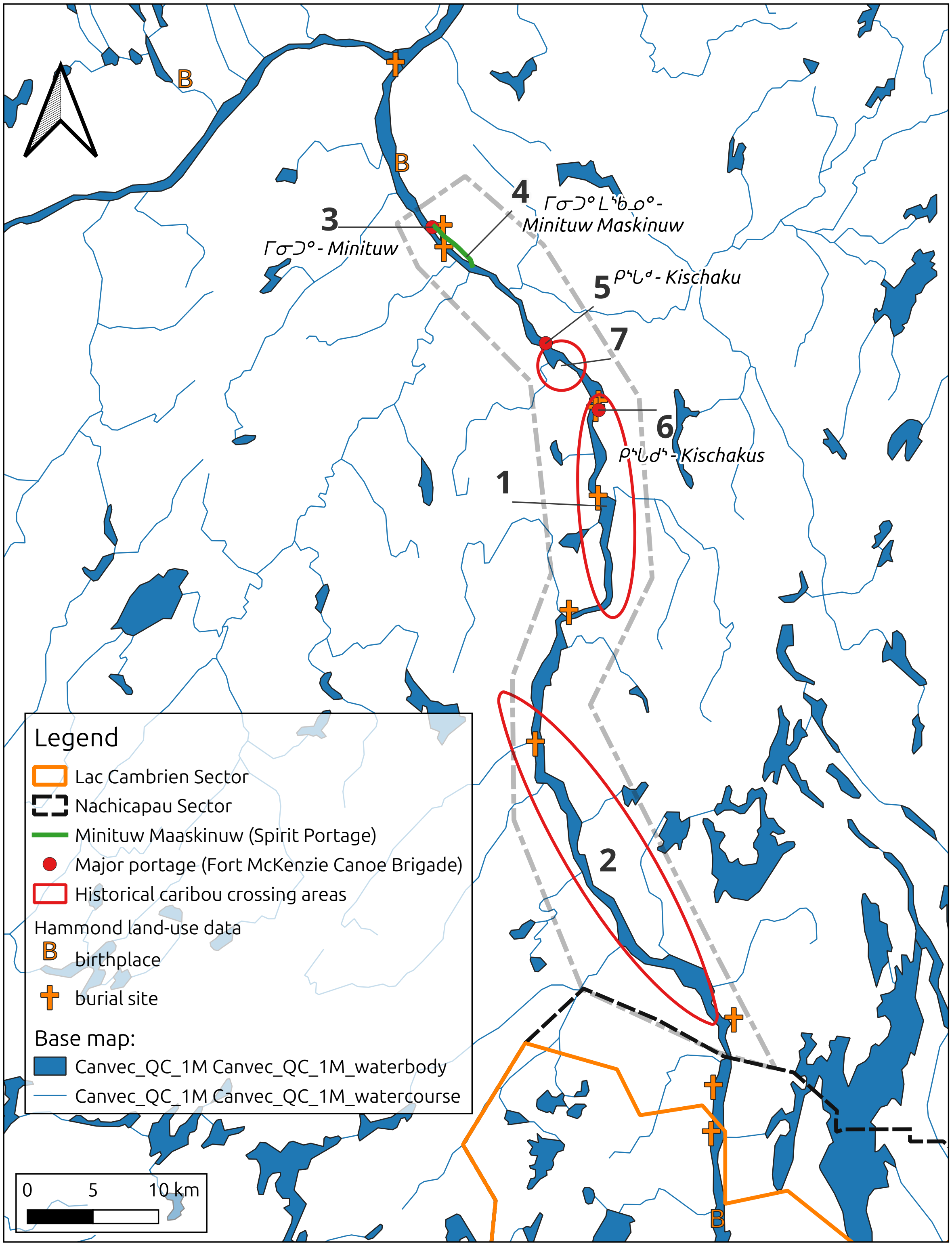

Figure 4.85: Historical / cultural information supporting northern extension of protected area. From Denton and McCaffrey (2024).

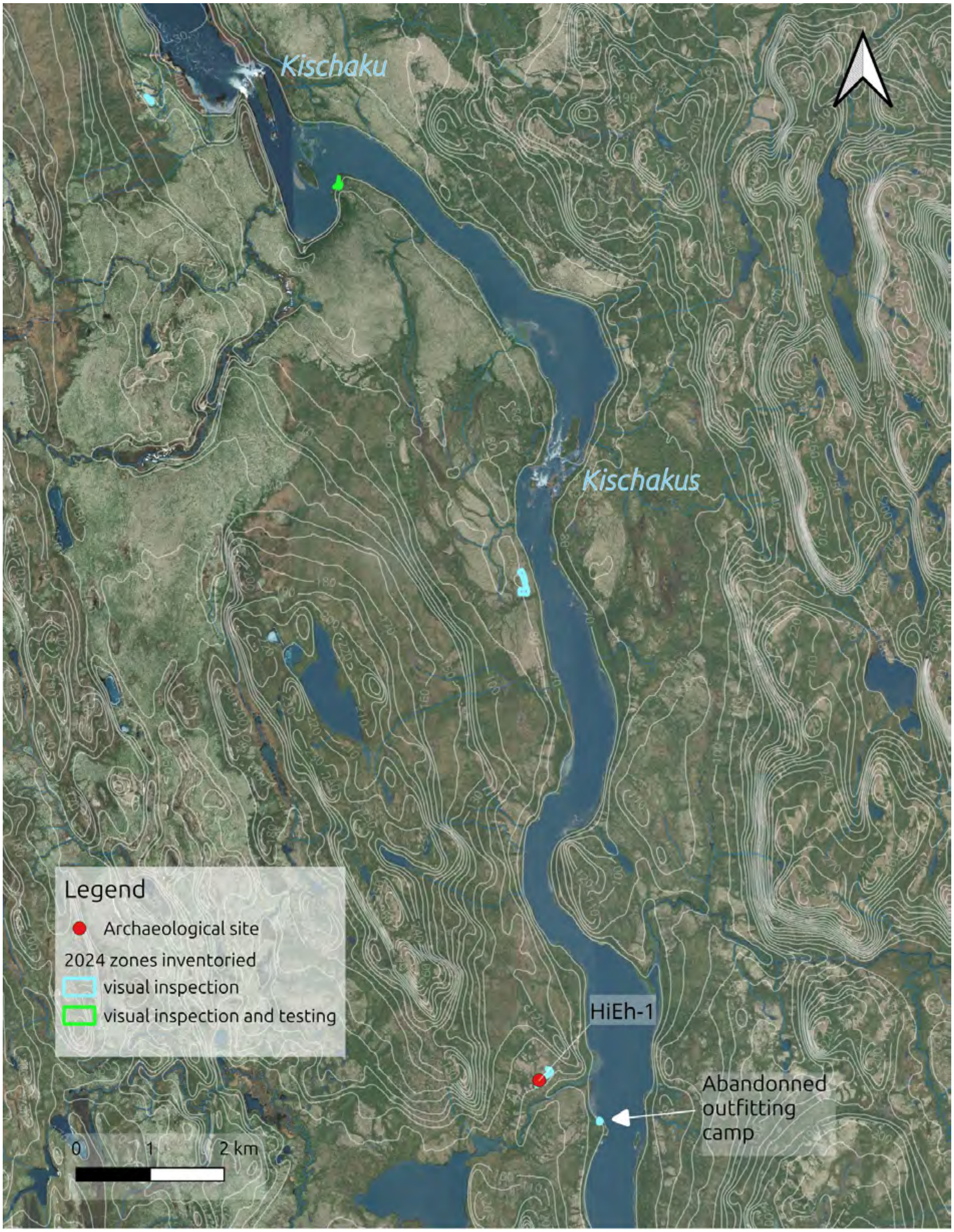

Figure 4.86: Study locale 6: Map showing location of site HiEh-1 and zones inventoried on northern portion of Caniapiscau River.

Figure 4.87: View to southwest of site HiEh-1 showing the rounded ridge and artifact scatter (orange flags).

Site description

Site HiEh-1 is located on a gently rounded, southwest–northeast oriented ridge. The site is about 700 m west of the western shore of the Caniapiscau River and at an elevation of 94 m above sea level or 20 m above the level of the river (figure 4.87). The ridge—most likely an ancient marine shoreline—runs parallel to a stream 250 m to the south, which drains a small lake known as Saamaaniipin Ukuskaawa Nipiiy (Jean-Marie's fishing lake). The artifact scatter consists of an approximately 10 m by 5 m grouping of lithic flakes, along with a small number of tools. No features, such as stone hearths or fire-cracked rocks, were observed on the site or nearby (figure 4.88).

Artifacts recovered

The artifacts surface-collected on site HiEh-1 consist of four tools and 89 flakes (figure 4.89). With the exception of a hammerstone, all artifacts are made from a medium-grained, opaque black chert. This stone has a low to dull lustre, and often includes white (possibly quartz) inclusions in the form of speckles and thin bands. The stone surfaces that were exposed to the elements have altered to shades of tan and orange. This factor made the artifacts very difficult to spot as they blended into the naturally-occurring pebbles and sand on the ridge.

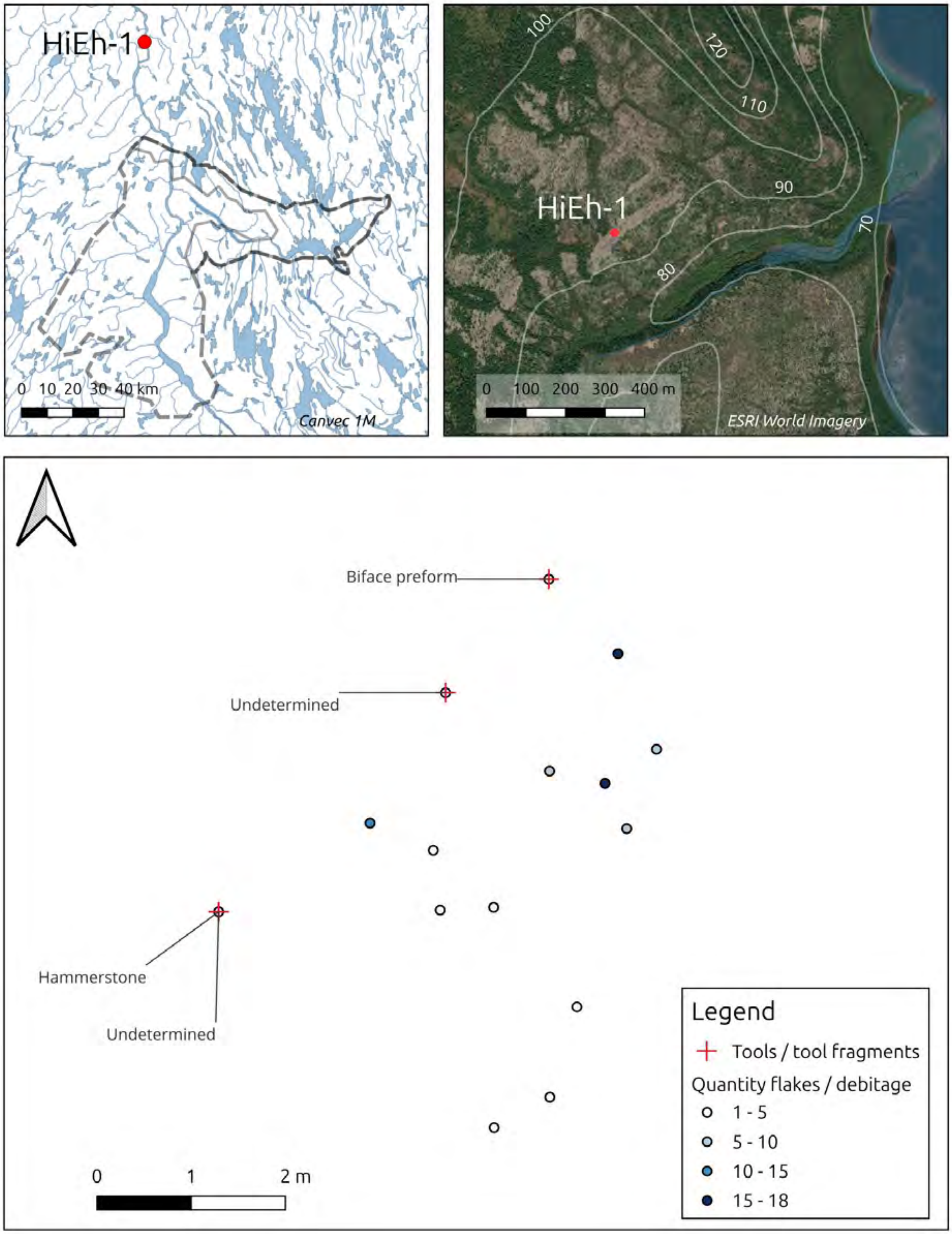

Figure 4.88: Plan of site HiEh-1 showing location, geographic context, and distribution of surface finds.

The most readily identifiable tool is a biface preform base with rounded corners, which appears to have broken in manufacture. A large notch was noted on another fragment, while the hammerstone shows subtle signs of battering. In general, the flakes have flat but prepared striking platforms and there are very few biface reduction flakes. This suggests that the knappers were working with blocks of chert rather than with bifacial preforms. Finally, many of the flakes are complete indicating little to no trampling on the site. The people who knapped this stone moved elsewhere once this activity was complete.

Preliminary interpretations

Site HiEh-1 is best interpreted as a place where an individual or a small group stopped for a relatively short time and flaked blocks of black chert that they had carried to the site, possibly from a nearby stone source situated in the Labrador Trough. The nature of the assemblage—comprising mainly flakes (including numerous large ones), along with a hammerstone and a biface preform base—suggests that the site occupants were engaged in the early stages of tool manufacture.

Perhaps the chert knappers were moving through the territory, carrying toolstone with them, when they paused and did some stone working. On the other hand, they may have been camped nearby and walked out to this ridge to sit and work in a breeze. The date of the site is impossible to estimate beyond Precontact period. Nevertheless, the ridge's high elevation and the site's location well inland from the current channel of the Caniapiscau River, both suggest that an older date is likely.

The artifacts discovered on site HiEh-1 are particularly interesting in that the black chert toolstone appears identical to tools and flakes recorded by archaeologists working for the Avataq Cultural Institute in locations directly north of the site. These finds, discussed in Denton and McCaffrey (2023: 46), were made over the past 12 years during surveys of high terraces along Ungava Bay near Kuujjuaq, Kuujjuarusiq (north of Kuujjuaq at the mouth of the Koksoak River, on the western shore), and Aupaluk. The recovery of diagnostic projectile points and point bases, as well as the presence of Ramah chert on these sites, point to connections with the Labrador coast and late Maritime Archaic groups (dating to 5500 to 3500 cal BP)[12] Further research is needed to determine if possible connections exist between these sites and site HiEh-1, as well as with early occupations in the project area such as those at Kaa Upiyaakaaw 1 (HdEh-1), near the outlet of Cambrien Lake.

[12]The term Archaic is used by archaeologists to imply sites that are from an "old" time period. Rejecting such words as pejorative, some Indigenous communities have developed their own terms to refer to this period. For example, the Labrador Innu refer to the Maritime Archaic people and period as Tshiash Innu (meaning ancient or from very long ago).

Figure 4.89: Artifacts from site HiEh-1, including biface preform base (.15, front and back, top), hammerstone (.11, middle left), notched fragment (.10, middle), and sample of flakes (bottom).

Period(s) of occupation Precontact

Recommendations This is a significant find. Once again, there is confirmation of a Precontact period archaeological site present on a high elevation terrace. The site was spotted just as we concluded a survey of the ridge and there was little time to explore the region further. For this reason, we recommend that more research be carried out in the area surrounding the site to look for additional evidence of a Precontact period presence.

5 | Science team data collection and preliminary analyses

Previous work at site Kaa Upiyaakaaw 1 (HdEh-1) in 2022 did not reveal any features with charcoal or calcined bone that could be radiocarbon dated. Therefore, an important objective of the 2024 field season was to collect different kinds of contextual information and samples that would hopefully allow us to date the occupation(s) at the site and to understand what the environment was like back when people camped on this terrace. In addition, reconstructing the environmental context of site Kaa Upiyaakaaw 1 would allow for a better understanding of other ancient sites in the protected area.

To undertake this research, we brought together a "science team" to compliment the archaeological work. In particular, we hoped they would assist in answering questions like: when did people live at site Kaa Upiyaakaaw 1 (HdEh-1), what was the environment like at the time, and how did people interact with that environment? Finally, we hoped to explore the possibility that the site (which was likely occupied thousands of years ago) was located on an arm of the Iberville Sea, an ancient extension of Ungava Bay that reached far inland.

The science team is comprised of the following researchers:

- *Dr Magali Rizza, Professor, Department of Earth and Atmospheric Science, Geotop, Université du Québec à Montréal (UQAM).* Magali has an expertise in geological dating techniques and is in charge of the LUX luminescence dating laboratory at UQAM. Apart from collecting the field samples that she will date in her lab, she is helping to reconstruct environmental conditions through time at site Kaa Upiyaakaaw 1 (HdEh-1) and at other ancient sites in the region. In collaboration with Stephen Wolfe, she is developing a better understanding of the sediment layers deposited on sites at various times.
- *Dr Natasha Roy, Research and Communication Officer, Geotop, Université du Québec à Montréal (UQAM).* Natasha is a specialist in the study of paleoecology, or past landscapes. In the case of the Cambrien Lake work this means the study of plant remains, including microscopic pollen and spores, contained in cores taken from the bottom of small lakes

Figure 5.1: Magali on site Kaa Upiyaakaaw 1 (HdEh-1) documenting stratigraphy (in all weather conditions), determining sampling locations, and collecting calcined bone for radiocarbon dating.

and peat bogs. The analysis of these samples will provide important information on how the vegetation and local ecology evolved in the region and how this relates to changes in climatic conditions.

- *Dr Stephen (Steve) Wolfe, Research Scientist, National Resources Canada, Geological Survey of Canada.* Steve's expertise in the study of climate change geoscience in Arctic and cold-climate environments, experience in analyzing the formation and evolution of eolian landforms and optical dating of sand dunes, and deep knowledge of geomorphology (the study of how landforms evolved over time) are helping us to better understand the context of site Kaa Upiyaakaaw 1 (HdEh-1) and other ancient occupations in the region.
- *Ariane Lefebvre, Masters Student, Department of Earth and Atmospheric Science, Université du Québec à Montréal (UQAM).* Ariane assisted Natasha in taking core samples from a peat bog and from lake sediments. She entered the Masters program in the Department of Earth and Atmospheric Science at UQAM in January 2025, and will be analyzing the paleoecological core samples for her Masters thesis.

The science team members arrived in the field on August 3 and returned to Schefferville on August 10. Depending on the research and sampling tasks involved, they worked independently or together, especially in the case of Magali and Steve. They also assisted with archaeological research when time permitted. The science team members were aided by Tshiueten and Jaylen, who had an opportunity to experience research firsthand in a range of scientific fields.

The work carried out by the science team during that week in the field, as well as preliminary analyses of a portion of collected data, are outlined in the three reports included in Appendix C. By necessity, these reports are highly technical in nature. The requirements of sampling and reporting related to numerous facets of this research—dating using different techniques, documenting eolian evolution, lake core sediment extraction and analysis, etc.—necessitate detailed recording and description of many variables. All of these studies are ongoing; however, once more results become available, it will be easier to provide accessible reporting that explains the significance of the analyses for archaeological interpretations.

A major focus of the work carried out by Magali and Steve involved collecting samples for dating using different techniques:

- OSL (optical stimulation luminescence) dating, a technique for dating quartz and feldspar in sand based on the length of time since they were last exposed to light;
- TCN (terrestrial cosmogenic nuclide) dating, a technique based on measuring the length of time that rocks have been exposed to cosmic radiation;

- and conventional radiocarbon dating of charcoal.

Much of their efforts took place at site Kaa Upiyaakaaw 1 (HdEh-1), where Steve and Magali excavated pits in which they could study sequences of sand layers and other sediments, some of which are likely quite recent while others may be thousands of years old. In general, their strategy was to document and collect samples from layers thought to be above (more recent than) and below (older than) those associated with the site occupation. If these layers above and below can be dated, it will allow us to better estimate when people lived at the site.

Steve and Magali also collected samples at several other locations, including site Kaa Upiyaakaaw 2 (HdEh-2) and site HeEh-8 (see figures 4.2 and 4.41 for locations). Sediment samples collected by Steve were analyzed by the Geological Survey of Canada sedimentology and mineralogy laboratories in order to better understand what the environment was like when these layers of sediment were deposited. Five samples for OSL dating were submitted to the Luminescence Dating Laboratory of the University of the Fraser Valley (Appendix C.3). Five of the 10 samples Magali collected were dated using the OSL technique in the Luminescence dating laboratory (LUX) at UQAM. The preliminary results are reported in Appendix C.1 and also discussed in section 4.1.1. In addition, Magali and Steve collected samples of charcoal from organic layers in order to date (using the radiocarbon method) periods of stable vegetation that showed signs of having subsequently burned due to forest fires.

In addition, samples of rock were taken from boulders at the Kaa Upiyaakaaw 1 (HdEh-1) site, and from boulders and bedrock on a hilltop at the margin of the Caniapiscau River valley, situated southwest of site HeEg-8. The plan is to date these samples using TCN dating. Once these dates have been processed, the samples from Kaa Upiyaakaaw 1 will help confirm when the terrace on which the site is located would have first been exposed and available for human occupation. The samples from the hilltop should provide dates when the valley was deglaciated.

The research work carried out by Natasha, assisted by Ariane, involved the use of coring devices to sample lake sediments and peat bog deposits located near sites Kaa Upiyaakaaw 1 (HdEh-1) and HeEg-8. A 135 cm core sampled from a peat bog (Peatlands, in figure 4.2), was sliced into 1 cm samples that were bagged and labelled for later analysis. Cores of 50 cm and 30 cm were taken from the bottom sediments of two small lakes, Moose Lake and Kettle Lake[13], respectively. Two cores were also collected from paleosols at the HeEg-8 site.

The resulting peat and sediment cores will be analyzed by Ariane for plant remains, including microscopic remains such as pollen, spores, and charcoal particles. Radiocarbon dating

[13] These are unofficial names given to these small lakes by the science team in order to facilitate the identification of samples.

Figure 5.2: Steve digging trenches to expose sediment stratigraphy, collecting sand samples within chosen levels, breaking off sample of large boulder, and using GoPro to record Tshiueten's impressions.


Figure 5.3: Steve and Magali devising light-blocking cover using available materials (left). Magali under cover collecting sand samples for OSL dating from beneath boulders in feature f5 on site Kaa Upiyaakaaw 1 (HdEh-1) (right).

of plant remains and charcoal associated with layers within cores can be used to establish a chronology of environmental and climatic changes, including the dynamics of forest fire activity. As reported in Appendix C.2, this work is already well underway. To-date, six samples of wood charcoal or burned spruce needles and plant leaves were submitted to the André E. Lalonde Accelerator Mass Spectrometry (AMS) Laboratory at the University of Ottawa. The results are laying the groundwork for a chronology of forest fire dynamics in the region. Natasha will soon be submitting 11 additional samples extracted from the cores for radiocarbon dating.

Finally, three sediment cores have been analyzed for density using a CT-scan and for density and chemical composition using an Itrax core scanner. The data collected from these non-destructive analyses will allow for a better understanding of the environment at the time the sediments were created and set the stage for the Ariane's analysis of plant remains.

Figure 5.4: Natasha and Ariane at Moose Lake sampling site, going through process of extracting sediment core (with help from helicopter pilot Cynthia Nubien).

6 | Conclusions and recommendations

6.1 Conclusions

Like fieldwork in 2021 and 2022, the 2024 field season was a whirlwind of activity, a somewhat frantic quest to obtain as much information—or find as many sites—as possible in a short period of time.

Near the beginning of this report (section 1.2) we set out our three main objectives for the 2024 season:

1. To collect additional information and samples to allow us to date and better understand the ancient site Kaa Upiyaakaaw 1 (HdEh-1) through archaeological testing and surface collection, and by a program of paleo-environmental sampling by members of the science team.
2. To bring interested community members, including Elders, out to see some of the most important archaeological sites in the proposed protected area. With the exception of the Naskapi archaeological technicians, Kawawachikamach community members have been unable to visit these places that are an important part of their heritage. The 2024 field season offered an opportunity to redress, at least partially, this situation.
3. To carry out additional survey work in several locales to help answer specific questions or to address flagrant holes in our overall survey data for the protected area.

It should be clear from this report that we have succeeded in producing a great deal of new information relating to the first objective concerning the Kaa Upiyaakaaw 1 site. More time is needed to digest this data. This factor contributes to the difficulty in drawing substantive conclusions based on the results of the 2024 fieldwork.

There is a pressing need to integrate information from the 2022 and 2024 seasons, to bring the collections together so that the fragments of broken artifacts can be refit, to compare systematically the finds from the various features, and to explore comparisons with sites further afield. For now, comparisons with sites in adjacent areas remain elusive due to the unique aspects of site Kaa Upiyaakaaw 1—in particular, the large number of celts and the pavements of fire-cracked rock that characterize the features.

The first radiocarbon dates from the site are big step forward: they confirm our preliminary interpretation that the site is at least several thousand years old, and indicate that First Nation's ancestors initially occupied the terrace between 4500 to 4900 years ago. At least in the case of this early occupation, an association with the Maritime Archaic seems highly likely. Further details on the dating and a better understanding of the environmental context will hopefully come with the ongoing analysis of samples collected by the science team, including samples for cosmogenic dating (TCN), optically stimulated luminescence (OSL) dating, and radiocarbon dating, as well as samples to be analyzed for pollen and macrofossils signalling changes in the vegetation over time (see reports in appendix C).

Concerning the second objective, the 2024 fieldwork added an important component focused on sharing archaeology finds directly with community members. Though this activity reduced survey time and added logistical complications, it was extremely rewarding to discuss the finds with Naskapi visitors, especially with the Elders who offered information, comments, and suggestions based on their knowledge of life *nuuhchimiihch*, in the bush. Our only regret was that budgets and logistic constraints limited the number of participants, and that several keen, potential participants, were unable to participate. As presented elsewhere in the report, the community visits paid off in another way, leading to the discovery of an important site in a part of Mistisipu Nipiy (Cambrien Lake) that had not been on our radar to survey.

The third objective included several activities designed to address specific questions and goals (presented in more detail in section 3.1) that required additional survey work. Of these, the most survey time was put into finding older sites on eroded terraces. This paid off with the identification of several interesting sites. While the lack of diagnostic artifacts is still an issue, these sites do provide a broader archaeological context for the interpretation of the older occupations in the area. In particular, the location of site HeEg-8 on a former, long abandoned channel of the Caniapiscau River may be instructive about the relationship between the site occupation and the evolution of the river following the retreat of the Iberville Sea due to post-glacial rebound.

The discovery of another intact site in the course of our survey on Nachicapau Lake is exciting, and points to the archaeological potential of the lake. The predominance of quartz flakes in this site highlights differences in lithic raw material use from sites in the Caniapiscau River valley, where Labrador Trough cherts predominate. As we have mentioned elsewhere (Mc-

Caffrey and Denton 2024), archaeological fieldwork in this area has been severely constrained by logistical issues: further survey work will require a major shift in logistical organization.

The results of another targeted survey confirm the methodological importance of surveying burnt areas, where artifacts and features may be exposed by the removal of living and decomposing surface vegetation. Finally, a brief foray along the Caniapiscau River to the north of the protected area highlights the archaeological potential of this region for ancient sites, as well as for sites related to the recent, historical period of intensive Naskapi occupation (Denton and McCaffrey 2024).

6.2 Recommendations

In the course of the three field seasons—representing a total of nine weeks—of archaeological survey in the protected area, we have found and recorded a large number of sites documenting many periods of Naskapi and related First Nation's ancestral occupation of the area. Also included are interviews with Naskapi Elders and historical documentation.

It is important to emphasize that these are survey results: at most the intact buried, or partially buried, archaeological sites found to date have been minimally tested. No broader site excavations have taken place. Nevertheless, there is a significant amount of archaeological data from the project that remains to be collated, analyzed, and synthesized. For example, in the case of surface sites on denuded terraces, especially Kaa Upiyaakaaw 1 (HdEh-1), the data produced from intensive surface collection approaches that from a full-scale excavation.

We divide our recommendations below into two sections: the first lists the major tasks that we think represent next steps, all focused on analyzing and synthesizing information from the project, and sharing these results in an accessible and meaningful way with the Naskapi Nation. The second section offers suggestions related to efforts that could be devoted to archaeology in the context of the protected area project, including management and protective measures, and additional research and public education programs. Included in the former are specific recommendations on monitoring the Kaa Upiyaakaaw 1 (HdEh-1) site.

6.2.1 Next steps: Analysis and synthesis

1. **Understanding and dating the Precontact period**
    - Analyze the stone tool collections from all features on site Kaa Upiyaakaaw 1 (HdEh-1), which involves refitting tool fragments to improve the sample of potentially diagnostic tools, and mapping tool types and lithic materials across individual features and the site as a whole. This work is needed to to arrive at a better

understanding of where these ancestral groups came from and went after they left, what they were doing at the site, etc.

- Integrate data from the science team studies to arrive at a clearer dating of Precontact period occupations on large sites in the region, as well as to reconstruct the landscape and environmental conditions in which these people lived.
- Study, identify, and prepare an illustrated description of the lithic materials used to make stone tools found on Precontact period sites in the region. This will help track the movements of groups in Quebec-Labrador. First Nations ancestors were the first miners to discover and explore geological formations in the Labrador Trough.
- Integrate the Fort McKenzie Precontact period collections excavated from a small number of sites in the 1980s.
- Determine if calcined bone exists from Precontact period sites excavated in the Fort McKenzie and Mushuau Nipi regions in the 1980s, and submit for radiocarbon dating.
- Compare tool types and lithic materials in the collections with those from other areas in northeastern Quebec, the Ungava region, and Labrador.
- Review the celt analysis prepared by T. Gallo; integrate the new celts and celt fragments discovered in 2024.

2. **Learning more about the Fur Trade period**
    - Review and synthesize information provided by Naskapi Elders in interviews carried out in relation to the archaeology project in 2021 and 2022, and determine how it can best be used in a synthesis of the archaeology project results.
    - Summarize findings related to earthen tent rings that are a prominent archaeological feature in the protected area and carry out a comparison with adjacent areas in northern Quebec and Labrador.
    - Closely read the Hudson's Bay Company journals and other historic sources in order to better understand the historical context of important Naskapi sites recorded.
3. **Working together to create an accessible synthesis**
    - As requested by the NNK Chief and Council, prepare a photo catalogue including all artifacts and other cultural materials recovered from sites in the protected area.
    - Carry out consultations with the NNK Chief and Council, and with community members, concerning the overall results of the archaeology project and the ideal form that a synthesis might take.

The most relevant format for the accessible synthesis will emerge from discussions with the NNK Chief and Council, and with community members. For now, we recommend a small, well-illustrated book designed for use by community members and by teachers in classrooms. The content of the book could serve as the basis for a web presentation that could be accessed through the NNK website. A series of more technical publications of the results in archaeological journals would be important. Published archaeological papers compliment and lend support to Naskapi presentation of their history. In addition, specialized publications become available to be shared broadly, and may be picked up and summarized by mainstream media, leading to a dissemination of news about Naskapi history and heritage.

6.2.2 Archaeology in the protected area: Recommendations for management and research

The following recommendations relate to the management, protection, and possible enhancement through research activities of archaeological resources in the protected area. The sites identified in the course of the archaeology project could play a significant role in Naskapi reconnection with their heritage in this important part of their traditional lands.

- Prepare a plan for training Naskapi in archaeological methods including site identification, surveillance, protection, and analysis, with the goal of encouraging Naskapi to train as archaeologists. Support Naskapi involvement in site monitoring and protection as part of a land guardian program.
- Consolidate the GIS data from the three fieldwork seasons to create a unified database to be used as a management tool by administrators of the protected area.
- Prepare a plan for the long-term monitoring of site Kaa Upiyaakaaw 1 (HdEh-1). The site should be reexamined every two to three years to monitor ongoing erosion. At the same time, controlled collection of any artifacts and calcined bone appearing on the surface could be carried out.
- Examine the possibility of a systematic, drone-based, GPR survey of site Kaa Upiyaakaaw 1 to identify possible subsurface features in an nondestructive way.
- The 2023 fire affected over 400 square kilometres within the protected area. The removal of surface vegetation by fire means that certain types of sites—especially those with earthen tent rings used by Naskapi in the late 19th century and early decades of the 20th century—should be easier to identify in these areas. Consideration should be given to carrying out archaeological inventories within the burned area, possibly using drone technology to visually survey high potential areas.

- Consider an archaeological survey program for the Nachicapau Lake area that would involve travel by boat and use of a base camp on, or much closer to, the lake (McCaffrey and Denton 2024).
- Plan and organize more community visits and engagement on-site, including the production of videos of Elders discussing the significance of sites, meaning and use of tools and features, etc.
- Consider a program of selective excavation of a sample of sites, engaging the community in an educational exploration of Naskapi heritage in the area. The program would ideally involve youth and Elders, and could focus on the excavation of:
  - a sample of buried Precontact period sites; and / or
  - a sample of more recent earthen tent rings that were the foundation for Naskapi *iiyuuchiwaahp*, or tepees, during the Fur Trade period.
- NNK should consider the involvement of a young archaeologist or graduate student to provide professional support and expertise for further archaeological research or training programs.[14]

Finally, the NNK should consider the possibility of continuing the archaeology project with surveys in zones identified as having a high potential for community-based research, but which lie *outside the presently defined protected area*. This could include zones along the Caniapiscau River to the north of the protected area where Naskapi intensively hunted caribou at crossing places, or sites associated with the portages where Naskapi community members—including men, women, and children—transported hundreds of tons of material to resupply Fort McKenzie (Denton and McCaffrey 2024). Or it could focus on other areas identified as being of special cultural / historical interest to the Naskapi. Surveys could be carried out by boat and involve participants camping on the land.[15]

[14] As recommended by former NNK councillor, David Swappie Jr., at a meeting in July 2024.

[15] The possibility of continuing the archaeology project in this manner was unofficially recommended at a meeting in July 2024 with two former Naskapi councillors—David Swappie Jr. and Jeremy Derek Einish.

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Appendices

A | Artifact catalogues

ARTIFACT CATALOGUES

Raw Material Codes

BBC	Brown (caramel) chert, fine grain, translucent, lustrous
BCM	Black chert, medium grain, opaque, dull
BCP	Black chert with pyrites, medium grain, opaque, dull
BCT	Black chert with oolites, fine grain, translucent, lustrous
BLC	Black and clear chert in bands, fine grain, translucent, lustrous
BON	Bone
BRS	Brass
CTC	Clear chert, fine grain, translucent, semi-lustrous
GCT	Grey chert with oolites and black bands, fine grain, translucent, lustrous
GGS	Grey-green banded siltstone
GMF	Grey chert, dark and light, very fine grain, opaque, dull
GSA	Grey shale or schist
GSS	Grey siltstone, sometimes with dark and light grey thin bands
IRN	Iron
MET	Metal
MIQ	Mistassini quartzite
MOC	Maroon chert, fine grain, opaque, dull
QZT	White quartzite, large grain
QZZ	Quartz
RAC	Ramah chert
RBC	Red chert, bands of ochre yellow and darker red, medium grain, opaque, lustrous
RCM	Red chert, darker inclusions and swirls, medium grain, opaque, dull
RCT	Red chert, fine grain, translucent, lustrous
RSS	Red siltstone
TBD	Material not yet identified

Abbreviations

BRF	Biface reduction flake
fr	Fragment

Study locale 1: Kaa Upiyaakaaw

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
HdEh-1	**NAP22-23**																
Catalogue numbers .1 to .203 were used in 2022.																	
			204	Tool	base missing	Projectile point tip fr		f9	S1	1		RAC	Snapped base, stemmed?, ground edges.	45	20	7	
			205	Tool	mesial	Biface mesial fr	226, 244	f9	S2	1		RAC		19	48	6	
			206	Flake(s)	proximal			f9	S2		1	RAC					
			207	Tool	tip	Projectile point tip fr	243	f9	S3			RAC	Burnt?	22	19	6	
			208	Flake(s)	shatter			f9	S3		1	RAC					
			209	Flake(s)	complete			f9	S4		4	RAC					
			209	Flake(s)	shatter			f9	S4		1	RAC					
			210	Tool	tip	Biface tip fr	213	f9	S5	1		GSA		125	33	5	
			211	Flake(s)	proximal			f9	S6		1	RAC					
			212	Flake(s)	complete			f9	S7		1	RAC					
			213	Tool	base	Biface base fr	210	f9	S8			GSA		79	31	5	
			214	Flake(s)	complete			f9	S9		1	RAC					
			215	Flake(s)	proximal			f9	S10		1	RAC					
			216	Flake(s)	proximal			f9	S11		1	RAC					
			217	Flake(s)	proximal			f9	S12		1	RAC					
			217	Flake(s)	shatter			f9	S12		1	RAC					
			218	Flake(s)	distal			f9	S13		2	RAC					
			219	Flake(s)	proximal			f9	S14		1	RAC					
			220	Flake(s)	complete			f9	S15		1	RAC					
			221	Flake(s)	complete			f9	S16		1	RAC					
			221	Flake(s)	distal			f9	S16		1	RAC					
			222	Flake(s)	proximal			f9	S17		1	RAC					
			223	Flake(s)	complete			f9	S18		1	RAC					
			224	Tool	complete	Celt preform?		f9	S19	1		GGS	Evidence of crushing and flaking around margins.	103	67	48	
			225	Flake(s)	proximal			f9	S20		1	RAC					
			226	Tool	edge fragment	Biface edge fr	205, 244	f9	S21			RAC		15	8	5	
			227	Flake(s)	complete			f9	S22		1	RAC					
			228	Flake(s)	complete			f9	S23		1	RAC					
			229	Flake(s)	proximal			f9	S24		1	RAC					
			230	Flake(s)	proximal			f9	S25		1	RAC					
			230	Flake(s)	complete			f9	S25		1	RAC					
			231	Flake(s)	complete			f9	S26		1	RAC					
			232	Flake(s)	shatter			f9	S27		1	RAC	Burnt.				
			233	Flake(s)	complete			f9	S28		1	RAC					
			234	Flake(s)	proximal			f9	S29		1	RAC	BRF.				
			235	Flake(s)	distal			f9	S30		1	RAC					
			236	Flake(s)	distal			f9	S31		1	RAC					
			237	Flake(s)	proximal			f9	S32		1	RAC					
			238	Flake(s)	shatter			f9	S33		1	RAC					
			239	Flake(s)	shatter			f9	S34		1	RAC					
			240	Flake(s)	complete			f9	S35		1	QZZ					
			240	Flake(s)	shatter			f9	S35		1	QZZ					
			241	Flake(s)	shatter			f9	S36		1	QZZ					
			242	Flake(s)	shatter			f9	S37		1	RAC					
			243	Tool	mesial	Projectile point mesial fr	207	f9	S213	1		RAC	Snapped base, stemmed?, ground edges.	43	21	8	
			244	Tool	edge fragment	Biface edge fr	205, 226	f9	SA11			RAC	Burnt, found in bone sample from main concentration.	20	6	4	
			245	Flake(s)	complete			f9	SA11		1	GGS	Found in bone sample from main concentration.				
			246	Flake(s)	complete			f9	SA12		3	RAC	Found in bone sample from secondary concentration; BRFs.				
			246	Flake(s)	shatter			f9	SA12		1	RAC	Found in bone sample from secondary concentration.				
			246	Flake(s)	shatter			f9	SA12		1	GSA	Found in bone sample from secondary concentration.				
			247	Historic	complete	Shell casing			S38			BRS	Head Stamp: F C 30 - 06 SPRG [Springfield Armory].	63			12
			248	Historic	complete	Shell casing			S39			BRS	Head Stamp: F C 30 - 06 SPRG [Springfield Armory].	63			12

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			249	Flake(s)	shatter			f2	S40		1	RCT					
			250	Flake(s)	shatter			f2	S41		1	GCT					
			250	Flake(s)	distal			f2	S41		1	GCT					
			251	Flake(s)	complete			f2	S42		1	GCT					
			251	Flake(s)	shatter			f2	S42		1	RCT					
			252	Flake(s)	proximal			f2	S43		1	GCT					
			253	Flake(s)	complete			f2	S44		1	RCT					
			253	Flake(s)	proximal			f2	S44		1	RCT					
			254	Flake(s)	complete			f2	S45		2	GCT					
			254	Flake(s)	proximal			f2	S45		1	GCT					
			255	Flake(s)	proximal			f2	S46		1	RCT					
			255	Flake(s)	shatter			f2	S46		1	RCT					
			256	Flake(s)	proximal			f2	S47		1	RCT					
			257	Flake(s)	complete			f2	S48		3	GCT					
			257	Flake(s)	complete			f2	S48		2	RCT					
			258	Flake(s)	complete			f2	S49		1	GCT					
			258	Flake(s)	shatter			f2	S49		1	GCT					
			259	Flake(s)	complete			f2	S50		3	RCT					
			259	Flake(s)	proximal			f2	S50		2	RCT					
			259	Flake(s)	shatter			f2	S50		1	RCT					
			259	Flake(s)	complete			f2	S50		1	GCT					
			259	Flake(s)	proximal			f2	S50		2	GCT					
			260	Flake(s)	complete			f2	S51		5	GCT					
			260	Flake(s)	complete			f2	S51		1	RCT					
			260	Flake(s)	proximal			f2	S51		1	RCT					
			260	Flake(s)	distal			f2	S51		1	RCT					
			260	Flake(s)	distal			f2	S51		1	GCT					
			260	Flake(s)	shatter			f2	S51		1	RCT					
			260	Flake(s)	shatter			f2	S51		3	GCT					
			261	Flake(s)	complete			f2	S52		2	BLC					
			261	Flake(s)	complete			f2	S52		1	RCT					
			261	Flake(s)	proximal			f2	S52		1	BLC					
			262	Tool	base	Biface base fr		f2	S53	1		BLC	Grinding visible on edge and base?	33	17	8	
			263	Flake(s)	complete			f2	S53		2	GCT					
			263	Flake(s)	complete			f2	S53		1	RCT					
			263	Flake(s)	proximal			f2	S53		4	RCT					
			263	Flake(s)	shatter			f2	S53		1	BCP					
			263	Flake(s)	shatter			f2	S53		1	GCT					
			263	Chunk(s)	fragment			f2	S53		1	RCT					
			264	Flake(s)	complete			f2	S54		1	BLC	Burnt.				
			264	Flake(s)	complete			f2	S54		1	RCT					
			265	Flake(s)	complete			f2	S55		1	GCT					
			266	Flake(s)	complete			f2	S56		1	RCT					
			266	Flake(s)	complete			f2	S56		2	GCT					
			266	Flake(s)	proximal			f2	S56		1	GCT					
			266	Flake(s)	proximal			f2	S56		1	RCT					
			266	Flake(s)	shatter			f2	S56		1	GCT					
			266	Flake(s)	shatter			f2	S56		1	RCT					
			267	Flake(s)	complete			f2	S57		1	RCT					
			267	Flake(s)	proximal			f2	S57		1	RCT					
			267	Flake(s)	shatter			f2	S57		1	RCT					
			268	Flake(s)	complete			f2	S58		1	GCT					
			268	Flake(s)	complete			f2	S58		1	RCT					
			268	Flake(s)	shatter			f2	S58		3	RCT					
			268	Flake(s)	shatter			f2	S58		1	GCT					
			269	Flake(s)	distal			f2	S59		1	BLC					
			270	Flake(s)	proximal			f2	S60		1	GCT					
			270	Flake(s)	shatter			f2	S60		1	RCT					
			271	Tool	fragment	Core fr		f2	S61	1		GCT		45	18	10	
			272	Flake(s)	complete			f2	S61		2	RCT					
			272	Flake(s)	proximal			f2	S61		1	GCT					
			272	Flake(s)	distal			f2	S61		1	GCT					
			272	Flake(s)	shatter			f2	S61		1	GSA					
			273	Flake(s)	distal			f2	S62		1	GCT	Cortex on dorsal surface?				
			274	Flake(s)	complete			f2	S63		1	RCT					
			274	Flake(s)	complete			f2	S63		1	GCT					
			275	Flake(s)	complete			f2	S64		2	GCT					
			275	Flake(s)	complete			f2	S64		5	RCT					
			275	Flake(s)	proximal			f2	S64		4	RCT					
			275	Flake(s)	shatter			f2	S64		1	BLC					
			275	Flake(s)	shatter			f2	S64		1	RCT					
			276	Flake(s)	complete			f2	S65		2	GCT	Largest is burnt flake.				
			276	Flake(s)	proximal			f2	S65		1	RCT					
			276	Flake(s)	shatter			f2	S65		1	GCT					
			277	Flake(s)	complete			f2	S66		1	GCT	Burnt.				
			278	Flake(s)	complete			f2	S67		1	GCT					
			278	Flake(s)	complete			f2	S67		2	RCT					
			278	Flake(s)	proximal			f2	S67		1	RCT					
			278	Flake(s)	shatter			f2	S67		1	GCT					
			278	Flake(s)	shatter			f2	S67		2	RCT					
			279	Flake(s)	complete			f2	S68		2	GCT	1 burnt?				
			279	Flake(s)	shatter			f2	S68		1	RCT					
			280	Flake(s)	complete			f2	S69		1	GCT					
			280	Flake(s)	distal			f2	S69		1	RCT					
			281	Flake(s)	shatter			f2	S70		1	RCT					
			282	Flake(s)	shatter			f2	S71		1	RCT					
			283	Flake(s)	complete			f2	S72		1	RCT					
			284	Flake(s)	complete			f2	S73		1	GCT					
			284	Flake(s)	shatter			f2	S73		1	GCT					
			285	Flake(s)	shatter			f2	S74		1	GCT					
			286	Flake(s)	distal			f2	S75		1	GCT					
			287	Flake(s)	complete			f2	S76		2	BCT					
			287	Flake(s)	complete			f2	S76		1	RCT					
			287	Flake(s)	proximal			f2	S76		3	BCT					
			287	Flake(s)	proximal			f2	S76		2	GCT					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			287	Flake(s)	distal			f2	S76		2	GCT					
			287	Flake(s)	shatter			f2	S76		1	GCT	Burnt; tool fragment?				
			288	Flake(s)	proximal			f2	S77		1	BCT					
			288	Flake(s)	shatter			f2	S77		1	RCT					
			289	Flake(s)	complete			f2	S78		2	RCT					
			290	Flake(s)	shatter			f2	S79		1	GCT					
			291	Flake(s)	shatter			f2	S80		1	GCT					
			292	Flake(s)	proximal			f2	S81		1	BCT					
			293	Flake(s)	complete			f2	S82		1	RCT					
			294	Flake(s)	complete			f2	S83		1	GCT					
			295	Flake(s)	distal			f2	S85		1	BLC					
			296	Tool	complete	Hammerstone		f2	S86	1		QZZ		40	46	30	
			297	Flake(s)	shatter			f2	S87		1	RCT					
			298	Tool	complete	Endcraper		f4	S88a	1		GCT	Check lithic material.	18	36	30	
			299	Flake(s)	shatter			f2	S88b		1	GCT					
			300	Tool	mesial	Celt mesial fr	301, 305, 410	f4	S89	1		RSS	4 pieces found in 2024 refit; refitted celt dimensions L165, W50, T27.	94	50	27	
			301	Tool	poll	Celt poll fr		f4	S91			RSS		30	40	19	
			302	Tool	distal	Endscraper fr		f4	S92	1		BCP		18	23	17	
			303	Tool	complete	Endscraper		f4	S93	1		GCT	2 nearby fragments refit.	47	30	9	
			304	Flake(s)	shatter			f4	S93		1	GCT	2 nearby fragments refit; same lithic material as 303.				
			305	Tool	fragment	Celt fr		f4	S94			RSS	Fits between mesial and poll.	28	44	22	
			306	Tool	complete	Scraper		f4	S95	1		GCT	Burnt; maybe snapped at base.	18	18	6	
			307	Tool	complete	Celt		f4	S96	1		GGS		86	29	11	
			308	Tool	fragment	Biface preform fr		f4	S96	1		GSA	Tip snapped off.	81	34	7	
			309	Tool	complete	Celt		f5	S98	1		GGS		145	39	20	
			310	Tool	fragment	Endscraper fr		f5	S99	1		BCM	Missing one side.	23	19	8	
			311	Flake(s)	complete			f7	S105		1	RSS					
			312	Tool	complete	Hammerstone		f8	S106	1		TBD		62	57	47	
			313	Flake(s)	shatter			f8	S106		1	GGS					
			313	Flake(s)	shatter			f8	S106		3	GSA	Very thin.				
			314	Flake(s)	complete			f8	S107		1	GCT					
			315	Tool	complete	Biface preform		f8	S108	1		GSA		96	32	7	
			316	Tool	fragment	Celt fr		f8	S108	1		RSS	Large flake struck from celt?	45	44	11	
			317	Flake(s)	proximal			f8	S108		1	GGS					
			318	Tool	complete	Hammerstone		f8	S109	1		TBD		77	61	34	
			319	Flake(s)	distal			f8	S110		1	GGS					
			320	Flake(s)	complete			f8	S111		1	GCT					
			320	Flake(s)	complete			f8	S111		1	GGS	BRF.				
			321	Flake(s)	complete			f8	S112		1	GGS					
			322	Flake(s)	complete			f7	S113		1	RAC					
			323	Tool	fragment	Endscraper fr		f7	S114		1	QZZ					
			324	Tool	mesial	Celt fr	102, 103	f8	S115	1		GGS	Refits with 102 and 103 found in 2022; refitted celt dimensions L160, W58, Th21.	55	45	21	
			325	Tool	complete	Core		f8	S116	1		GCT	Use wear also visible.	45	27	16	
			326	Tool	complete	Celt preform		f8	S116	1		RSS		137	65	20	
			327	Tool	fragment	Undetermined tool fr		f8	S116	1		GCT	Retouch on one edge.	24	23	10	
			328	Historic	complete	Shell casing		f7	S117			BRS	Headstamp: IMPERIAL 30 - 60 SPRG.	63			12
			329	Tool	poll	Celt poll fr		f5	S118	1		GGS		97	70	15	
			330	Tool	complete	Core		f7	S119	1		GGS	Evidence of battering.	155	103	65	
			331	Tool	complete	Core		f8	S120	1		GCT	flakes.	30	30	12	
			332	Flake(s)	distal			f8	S121		1	GCT	Burnt?				
			332	Flake(s)	complete			f8	S121		1	RCT	Burnt?				
			333	Flake(s)	shatter			f8	S122		1	GCT	Burnt?				
			334	Tool	complete	Core		f2	S124	1		GCT	Possible cortext on one surface.	44	35	18	
			335	Flake(s)	complete			f2	S125		1	RCT					
			336	Flake(s)	complete			f2	S126		1	RCT					
			337	Flake(s)	shatter			f2	S127		1	RCT					
			338	Flake(s)	shatter			f2	S128		1	GCT					
			339	Flake(s)	distal			f2	S129		1	RCT					
			340	Flake(s)	complete			f2	S130		1	RCT					
			341	Flake(s)	complete			f2	S131		1	GCT					
			342	Tool	fragment	Sidescraper fr	34	f2	S132	1		MOC	Refits with 34 found in 2022; refitted sidescraper dimensions L88, W54, Th8.	61	54	8	
			343	Flake(s)	distal			f2	S133		1	RCT					
			343	Flake(s)	shatter			f2	S133		1	GCT					
			344	Flake(s)	shatter			f2	S134		1	RCT					
			345	Flake(s)	complete			f2	S135		1	GCT					
			345	Flake(s)	proximal			f2	S135		1	RCT					
			345	Flake(s)	shatter			f2	S135		1	GSA					
			346	Flake(s)	complete			f2	S136		1	RCT					
			347	Flake(s)	shatter			f2	S137		1	RCT					
			348	Flake(s)	complete			f2	S138		1	GCT					
			349	Flake(s)	distal			f2	S139		1	GCT					
			350	Tool	fragment	Endscraper fr		f2	S140	1		GCT		10	8	4	
			351	Flake(s)	complete			f2	S140		1	GCT					
			351	Flake(s)	distal			f2	S140		1	GCT					
			352	Flake(s)	distal			f2	S141		1	RCT					
			353	Flake(s)	shatter			f2	S142		1	RCT					
			354	Flake(s)	proximal			f2	S143		1	BCT					
			355	Flake(s)	complete			f2	S144		1	GCT					
			356	Flake(s)	complete			f2	S145		1	RCT					
			356	Flake(s)	shatter			f2	S145		1	GCT					
			357	Flake(s)	shatter			f2	S146		1	RCT					
			358	Tool	edge fragment	Biface edge fr		f4	S147	1		GCT		28	12	5	
			359	Flake(s)	complete			f4	S147		6	GCT					
			359	Flake(s)	complete			f4	S147		1	BLC					
			359	Flake(s)	proximal			f4	S147		1	GCT					
			359	Flake(s)	distal			f4	S147		1	GCT					
			359	Flake(s)	shatter			f4	S147		4	GCT					
			359	Flake(s)	complete			f4	S147		2	GGS					
			359	Flake(s)	shatter			f4	S147		1	GGS					
			360	Tool	complete	Wedge		f4	S148		1	BCM	Pièce esquillée.	17	18	3	
			361	Flake(s)	proximal			f4	S148		3	BLC					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			361	Flake(s)	shatter			f4	S148		2	BLC					
			361	Flake(s)	complete			f4	S148		3	GGS					
			361	Flake(s)	shatter			f4	S148		4	GGS					
			361	Flake(s)	complete			f4	S148		3	GCT					
			361	Flake(s)	proximal			f4	S148		1	GCT					
			361	Flake(s)	shatter			f4	S148		5	GCT					
			362	Flake(s)	complete			f4	S149		1	GGS	Large flake.				
			363	Flake(s)	complete			f5	S150		1	GGS					
			364	Flake(s)	complete			f5	S151		2	GGS					
			364	Flake(s)	distal			f5	S151		1	GGS					
			364	Flake(s)	complete			f5	S151		5	GGS					
			365	Tool	edge fragment	Biface edge fr		f5	S152	1		GCT	Evidence of rounded base on one side.	55	20	13	
			366	Tool	fragment	Biface tip fr		f5	S152	1		GCT	Tip fragment?	62	28	11	
			367	Flake(s)	complete			f5	S152		3	GCT					
			367	Flake(s)	proximal			f5	S152		2	GCT					
			367	Flake(s)	shatter			f5	S152		2	GCT					
			367	Flake(s)	complete			f5	S152		5	GGS					
			367	Flake(s)	shatter			f5	S152		2	GGS					
			367	Flake(s)	shatter			f5	S152		1	GSA					
			368	Flake(s)	complete			f7	S153		1	GGS	Large flake, BRF.				
			369	Tool	fragment	Wedge fr		f7	S154	1		QZZ	Pièce esquillée	20	14	7	
			370	Flake(s)	complete			f7	S154		1	GCT					
			371	Tool	fragment	Undetermined tool fr		f7	S155	1		GCT		11	15	4	
			372	Flake(s)	distal			f7	S155		1	GGS	Celt fragment?				
			373	Tool	mesial	Biface preform fr		f7	S156	1		GCT		10	49	15	
			374	Flake(s)	complete			f7	S156		1	GCT					
			374	Flake(s)	proximal			f7	S156		1	GCT					
			374	Flake(s)	distal			f7	S156		1	GCT					
			374	Chunk(s)	fragment			f7	S156		2	GCT	1 may be tool fragment.				
			375	Tool?	edge fragment?	Biface edge fr?		f5	S157	1		GCT	Fractured along rough area.	38	25	6	
			376	Flake(s)	complete			f5	S157		3	GCT					
			376	Flake(s)	proximal			f5	S157		1	GCT					
			376	Flake(s)	shatter			f5	S157		2	GGS					
			377	Tool?	complete	Utilized cobble?		f7	S158	1		GGS		87	62	18	
			378	Tool?	complete	Core?		f5	S159	1		GCT	Expended flake core?	19	15	9	
			379	Flake(s)	complete			f5	S159		1	GCT					
			379	Flake(s)	distal			f5	S159		1	GGS					
			380	Flake(s)	proximal			f5	S160		1	GCT					
			380	Flake(s)	proximal			f5	S160		1	QZZ					
			380	Flake(s)	shatter			f5	S160		2	QZZ					
			381	Flake(s)	complete			f5	S161		1	GCT					
			381	Flake(s)	shatter			f5	S161		3	QZZ					
			382	Tool	complete	Wedge		f5	S162	1		QZZ	Pièce esquillée.	15	13	6	
			383	Flake(s)	complete			f5	S162		1	GCT					
			383	Flake(s)	proximal			f5	S162		1	GCT					
			383	Flake(s)	shatter			f5	S162		4	QZZ					
			384	Tool	complete	Endscraper		f5	S163	1		BCM		29	24	10	
			385	Tool?	complete	Undetermined tool fr?		f5	S163	1		GCT	Pièce esquillée?, bipolar crushing.	35	22	8	
			386	Flake(s)	complete			f5	S163		1	GCT					
			386	Flake(s)	shatter			f5	S163		1	GCT					
			386	Flake(s)	proximal			f5	S163		1	GCT					
			386	Flake(s)	complete			f5	S163		1	QZZ					
			386	Chunk(s)	fragment			f5	S163		2	QZZ					
			386	Flake(s)	complete			f5	S163		2	GGS					
			386	Flake(s)	shatter			f5	S163		3	GGS					
			387	Flake(s)	complete			f5	S164		2	GCT					
			387	Flake(s)	complete			f5	S164		2	QZZ					
			388	Tool	complete	Core		f5	S165	1		GCT	Expended flake core resulting in cube,	23	20	18	
			389	Tool	poll	Celt poll fr		f5	S165	1		GGS		70	38	23	
			390	Flake(s)	complete			f5	S165		1	GCT					
			390	Flake(s)	complete			f5	S165		1	QZZ					
			390	Flake(s)	proximal			f5	S165		1	GGS					
			390	Flake(s)	shatter			f5	S165		1	GGS					
			391	Flake(s)	complete			f5	S166		2	QZZ					
			391	Flake(s)	shatter			f5	S166		2	QZZ					
			391	Flake(s)	complete			f5	S166		2	GGS					
			391	Flake(s)	proximal			f5	S166		2	GGS					
			391	Flake(s)	shatter			f5	S166		5	GGS					
			392	Tool	fragment	Celt fr		f4	S167	1		GGS	Grinding striations visible on dorsal.	17	18	5	
			393	Flake(s)	complete			f4	S167		5	GCT					
			393	Flake(s)	complete			f4	S167		1	BCM					
			393	Flake(s)	shatter			f4	S167		1	GCT					
			393	Flake(s)	complete			f4	S167		1	BLC					
			393	Chunk(s)	fragment			f4	S167		1	QZZ					
			393	Chunk(s)	fragment			f4	S167		1	GCT					
			393	Flake(s)	complete			f4	S167		4	GGS					
			393	Flake(s)	shatter			f4	S167		18	GGS					
			394	Tool	fragment	Undetermined tool fr		f4	S168	1		GCT		31	20	9	
			395	Flake(s)	shatter			f4	S168		2	BLC					
			395	Flake(s)	complete			f4	S168		4	GGS					
			395	Flake(s)	shatter			f4	S168		1	RSS					
			395	Flake(s)	shatter			f4	S168		18	GGS					
			396	Tool	edge fragment	Biface edge fr		f4	S169	1		GCT		25	16	4	
			397	Tool	complete	Core		f4	S169	1		GCT	Expended flake core.	43	20	9	
			398	Tool?	mesial	Biface mesial fr?		f4	S169	1		GCT	Burnt.	26	11	4	
			399	Flake(s)	complete			f4	S169		5	GCT					
			399	Flake(s)	shatter			f4	S169		1	GCT					
			399	Flake(s)	proximal			f4	S169		1	QZZ					
			399	Flake(s)	shatter			f4	S169		1	QZZ					
			399	Flake(s)	complete			f4	S169		1	GGS					
			399	Flake(s)	shatter			f4	S169		17	GGS					
			400	Flake(s)	complete			f4	S170		3	GCT					
			400	Chunk(s)	fragment			f4	S170		3	GCT					
			400	Flake(s)	complete			f4	S170		2	GGS					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			400	Flake(s)	shatter			f4	S170		9	GGS					
			401	Tool	fragment	Undetermined tool fr		f4	S171	1		GCT		25	12	12	
			402	Tool?	fragment	Core fr?		f4	S171	1		GCT		45	40	7	
			403	Flake(s)	complete			f4	S171		5	GCT					
			403	Flake(s)	complete			f4	S171		1	BLC					
			403	Flake(s)	shatter			f4	S171		6	GCT					
			403	Flake(s)	complete			f4	S171		1	RSS					
			403	Flake(s)	shatter			f4	S171		13	GGS					
			404	Tool	complete	Core?		f4	S172	1		GCT		33	18	9	
			405	Tool	fragment	Celt fr		f4	S172	1		RSS	Flake with grinding striations visible on dorsal.	40	32	4	
			406	Flake(s)	complete			f4	S172		1	GCT	Cortex and red chert visible				
			406	Flake(s)	proximal			f4	S172		1	GCT					
			406	Chunk(s)	fragment			f4	S172		2	GCT	Tool fragments?				
			406	Flake(s)	complete			f4	S172		1	GCT					
			406	Flake(s)	shatter			f4	S172		2	GCT					
			406	Flake(s)	shatter			f4	S172		2	QZZ					
			406	Flake(s)	complete			f4	S172		1	TBD					
			406	Flake(s)	shatter			f4	S172		2	GGS					
			407	Tool	complete			f4	S173	1		GGS	Burnt.	60	48	15	
			408	Tool	fragment	Celt fr		f4	S173	1		GGS	Flake struck from celt, with grinding and pecking (?) visible on dorsal.	58	50	11	
			409	Tool?	edge fragment?	Biface edge fr?		f4	S173	1		GCT		40	15	10	
			410	Tool	bit	Celt bit fr	300, 301, 305	f4	S173			RSS		44	42	12	
			411	Tool?	fragment	Undetermined tool fr		f4	S173	1		GCT	Burnt.	19	8	11	
			412	Flake(s)	complete			f4	S173		2	GCT					
			412	Flake(s)	proximal			f4	S173		1	GCT					
			412	Flake(s)	shatter			f4	S173		3	GCT					
			412	Flake(s)	shatter			f4	S173		1	BLC					
			412	Flake(s)	shatter			f4	S173		1	RSS					
			412	Flake(s)	shatter			f4	S173		8	GGS					
			413	Flake(s)	complete			f4	S174		3	GCT					
			413	Flake(s)	shatter			f4	S174		3	GGS					
			414	Flake(s)	complete			f4	S175		1	GCT					
			414	Flake(s)	shatter			f4	S175		3	GCT					
			414	Flake(s)	complete			f4	S175		1	GGS					
			414	Flake(s)	shatter			f4	S175		7	GGS					
			414	Flake(s)	shatter			f4	S175		1	GSA					
			415	Flake(s)	complete			f4	S176		1	GCT					
			415	Flake(s)	proximal			f4	S176		2	GCT					
			415	Flake(s)	proximal			f4	S176		1	BLC					
			415	Flake(s)	complete			f4	S176		1	GGS					
			415	Flake(s)	shatter			f4	S176		3	GGS					
			416	Tool	fragment	Uniface tool fr		f4	S177	1		TBD	Retouch on lithic material not previously seen on site or in region.	65	57	13	
			417	Flake(s)	complete			f4	S177		2	TBD	Same lithic material as 416.				
			417	Flake(s)	shatter			f4	S177		4		Same lithic material as 416.				
			418	Tool	fragment	Celt fr?		f4	S178	1		RSS		28	33	7	
			419	Flake(s)	complete			f4	S178		1	GCT					
			419	Flake(s)	shatter			f4	S178		2	GCT					
			419	Flake(s)	complete			f4	S178		1	GGS					
			419	Flake(s)	shatter			f4	S178		2	GGS					
			420	Flake(s)	complete			f4	S179		1	GCT					
			420	Flake(s)	complete			f4	S179		2	GGS					
			420	Flake(s)	shatter			f4	S179		2	GGS					
			421	Tool	fragment	Core fr?		f4	S180	1		BCM	Same chert as 429.	26	14	9	
			422	Flake(s)	complete			f4	S180		1	TBD	Mauve chert.				
			422	Flake(s)	complete			f4	S180		2	GCT					
			422	Flake(s)	proximal			f4	S180		2	GCT					
			422	Flake(s)	complete			f4	S180		2	BLC					
			422	Flake(s)	distal			f4	S180		1	BLC					
			422	Flake(s)	shatter			f4	S180		1	GCT					
			422	Flake(s)	complete			f4	S180		4	GGS					
			422	Flake(s)	shatter			f4	S180		2	GGS					
			423	Tool	fragment	Hammerstone fr		f7	S181	1		QZZ	2 largest fragments refit.	70	40	40	
			424	Flake(s)	complete			f7	S182		1	GCT					
			424	Flake(s)	complete			f7	S182		2	GGS					
			425	Flake(s)	proximal			f7	S183		2	BCM	Struck from 428?				
			426	Tool	complete	Core?		f7	S184	1		GCT	Expedient tool? Utilized? Retouched?	55	40	15	
			427	Tool	edge fragment	Biface preform edge fr?		f7	S184	1		GCT	Or core fragment?	52	21	8	
			428	Tool	complete	Hammerstone		f7	S185	1		GCT		31	31	23	
			429	Tool	complete	Core		f7	S186	1		BCM		52	34	25	
			430	Tool	edge fragment	Celt edge fr		f7	S186	1		GGS		70	30	12	
			431	Flake(s)	complete			f7	S186		2	GGS					
			431	Flake(s)	shatter			f7	S186		1	GGS					
			432	Flake(s)	complete			f7	S187		1	GCT					
			432	Flake(s)	proximal			f7	S187		1	GCT					
			432	Flake(s)	proximal			f7	S187		1	RAC	Burnt.				
			432	Flake(s)	complete			f7	S187		2	GGS					
			432	Flake(s)	shatter			f7	S187		1	GGS					
			433	Tool	complete	Hammerstone?		f7	S188	1		GCT	Burnt, or core?	32	27	18	
			434	Tool	complete	Wedge		f7	S188	1		QZZ		30	11	11	
			435	Flake(s)	complete			f7	S188		1	GCT					
			435	Flake(s)	proximal			f7	S188		2	GGS					
			435	Flake(s)	shatter			f7	S188		1	GGS					
			436	Flake(s)	complete			f7	S189		1	RAC					
			436	Flake(s)	complete			f7	S189		1	GGS					
			436	Flake(s)	shatter			f7	S189		1	GGS					
			437	Tool	fragment	Projectile point ear fr?		f7	S190	1		BCM		14	11	3	
			438	Flake(s)	complete			f7	S190		1	GCT	Burnt.				
			439	Flake(s)	complete			f7	S191		2	GGS	Struck from celts.				
			439	Flake(s)	complete			f7	S191		2	GCT					
			440	Tool	fragment	Celt fr		f7	S192	1		RSS		42	30	7	
			441	Flake(s)	complete			f7	S192		3	RSS	Related to celt flaking.				

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			441	Flake(s)	shatter			f7	S192		1	RSS					
			441	Flake(s)	complete			f7	S192		2	GCT					
			442	Flake(s)	complete			f7	S193		1	GCT					
			442	Flake(s)	proximal			f7	S193		1	GCT					
			442	Flake(s)	shatter			f7	S193		1	GCT					
			442	Flake(s)	shatter			f7	S193		2	GGS					
			442	Chunk(s)	fragment			f7	S193		1	GCT	2 pieces refit.				
			442	Flake(s)	proximal			f7	S193		2	UND	Dark brown siltstone?				
			443	Tool	fragment	Sidescraper fr?		f7	S194	1		GCT	Expedient tool?	48	29	13	
			444	Flake(s)	proximal			f7	S194		2	GCT					
			444	Flake(s)	complete			f7	S194		1	GGS	Large flake.				
			444	Flake(s)	shatter			f7	S194		1	GGS					
			445	Chunk(s)	fragment			f7	S195		1	GGS	Large piece.				
			446	Chunk(s)	fragment			f7	S196		1	GCT	Cortex on one surface?				
			447	Tool	fragment	Celt fr		f7	S196	1		RSS		36	30	8	
			448	Flake(s)	shatter			f7	S196		1	GCT	Burnt.				
			448	Flake(s)	shatter			f7	S196		1	GGS					
			449	Tool	fragment	Celt fr		f7	S197	1		RSS		48	38	10	
			450	Flake(s)	shatter			f7	S197		1	GCT					
			450	Flake(s)	shatter			f7	S197		1	GGS	Celt fragment?				
			450	Flake(s)	complete			f7	S197		2	RSS					
			451	Tool	fragment	Celt fr		f8	S198	1		RSS		53	45	9	
			452	Flake(s)	complete			f8	S198		1	GGS					
			453	Tool	base	Biface base fr		f8	S199	1		RAC	Square-based with slightly rounded corners; edges may be ground	53	36	9	
			454	Flake(s)	proximal			f8	S199		1	GCT					
			455	Tool	complete	Hammerstone		f8	S200	1		GCT		59	56	31	
			456	Tool	fragment	Core fr?		f8	S201	1		GCT	Or hammerstone fragment?	53	49	17	
			457	Flake(s)	complete			f8	S201		1	GCT					
			458	Tool	poll	Celt poll fr		f8	S202			GGS		70	52	16	
			459	Tool	fragment	Celt fr		f8	S202	1		GGS		43	37	10	
			460	Tool	fragment	Celt preform fr?		f8	S203	1		RSS		75	43	20	
			461	Tool	poll	Celt poll fr		f8	S204	1		GGS	2 pieces refit.	102	50	19	
			462	Tool	poll	Celt poll fr		f8	S205	1		UND		38	49	20	
			463	Tool	complete	Celt		f7	S206	1		GGS		92	50	14	
			464	Flake(s)	complete			f5	S207		1	GCT					
			464	Flake(s)	complete			f5	S207		26	GGS					
			464	Flake(s)	proximal			f5	S207		10	GGS					
			464	Flake(s)	shatter			f5	S207		11	GGS					
			464	Chunk(s)	fragment			f5	S207		2	GGS	Celt fragments?				
			465	Flake(s)	complete			f5	S208		4	RSS	Related to celt flaking.				
			465	Flake(s)	shatter			f5	S208		2	RSS					
			466	Flake(s)	complete			f4	S209		1	RAC	Burnt.				
			466	Flake(s)	complete			f4	S209		4	GGS					
			466	Flake(s)	proximal			f4	S209		5	GGS					
			466	Flake(s)	shatter			f4	S209		1	GGS					
			467	Tool	edge fragment	Biface edge fr		f7	S156	1		GCT		36	18	5	
			468	Flake(s)	complete			f4	S210		4	GGS					
			468	Flake(s)	proximal			f4	S210		4	GGS					
			468	Flake(s)	shatter			f4	S210		4	GGS					
			468	Chunk(s)	fragment			f4	S210		1	GGS	Celt fragment.				
			469	Flake(s)	complete			f2	S211		1	GCT					
			469	Flake(s)	proximal			f2	S211		1	GCT					
			469	Flake(s)	complete			f2	S211		1	RCT					
			469	Flake(s)	distal			f2	S211		1	RCT					
			469	Flake(s)	shatter			f2	S211		1	BLC					
			470	Flake(s)	shatter			f2	S212		3	RCT					
			471	Flake(s)	complete				S214		1	RAC	Blown to location from f9?				
			472	Flake(s)	complete				TE2, NW		1	GCT	Surface; striking platform covered in cortex.				
			472	Flake(s)	distal				TE2, NW		2	GCT	Surface; burnt.				
			473	Flake(s)	complete				TE2, NE		1	GCT	Surface; BRF.				
			474	Chunk(s)	fragment				TE2, SW		1	GCT	Surface.				
			475	Flake(s)	proximal			f4	TE4, NW		1	GCT	Surface.				
			475	Flake(s)	shatter			f4	TE4, NW		1	GCT	Surface; burnt.				
			475	Flake(s)	proximal			f4	TE4, NW		1	GGS	Surface.				
			475	Flake(s)	shatter			f4	TE4, NW		2	GGS	Surface.				
			476	Flake(s)	complete			f4	TE4, NE		1	GGS	Mottled sand layer.				
			477	Flake(s)	shatter			f4	TE4, SW		1	GCT	Orange sand layer below surface rocks.				
			477	Flake(s)	shatter			f4	TE4, SW		1	GGS	Orange sand layer below surface rocks.				
			478	Flake(s)	complete			f4	TE4, SE		1	GCT	Mottled sand layer at depth of about 3 cm.				
			478	Flake(s)	proximal			f4	TE4, SE		1	GGS	Mottled sand layer at depth of about 3 cm.				
			479	Flake(s)	complete			f4	TE4, SE		3	GCT	Orange sand layer below top sand and in screen.				
			479	Flake(s)	proximal			f4	TE4, SE		2	GCT	Orange sand layer below top sand and in screen.				
			479	Flake(s)	shatter			f4	TE4, SE		1	GCT	Orange sand layer below top sand and in screen.				
			479	Flake(s)	shatter			f4	TE4, SE		2	QZZ	Orange sand layer below top sand and in screen.				
			479	Flake(s)	complete			f4	TE4, SE		9	GGS	Orange sand layer below top sand and in screen.				
			479	Flake(s)	proximal			f4	TE4, SE		1	GGS	Orange sand layer below top sand and in screen.				
			479	Flake(s)	shatter			f4	TE4, SE		8	GGS	Orange sand layer below top sand and in screen.				
			480	Tool	complete	Hammerstone		f7	TE5, NE	1		GCT	Surface.	49	46	35	
			481	Flake(s)	shatter			f7	TE5, NE		1	BCM	Surface.				
			482	Flake(s)	complete			f5	Rock 2		3	GGS	Found under Rock 2 when M. Rizza extracted sand sample for OSL dating.				
			482	Flake(s)	proximal			f5	Rock 2		1	GGS	Found under Rock 2 when M. Rizza extracted sand sample for OSL dating.				
			482	Flake(s)	shatter			f5	Rock 2		3	GGS	Found under Rock 2 when M. Rizza extracted sand sample for OSL dating.				
			483	Flake(s)	proximal			f5	Rock 3		1	GGS	Found under Rock 3 when M. Rizza extracted sand sample for OSL dating.				

			484	Tool?	mesial	Leister fr?		f9	SA12	1		BON	Possible leister fragment TBD. Found in bone sample from secondary concentration.	28	8	7	
			SA1	Sample (wood)	fragment			f5	Rock 2				Found under Rock 2 when M. Rizza extracted sand sample for OSL dating.				
			SA2	Sample (bone)	fragment			f2	S84				(n=1)				
			SA3	Sample (bone)	fragment			f4	S90				(n=6)				
			SA4	Sample (bone)	fragment			f4	S97				(n-1)				
			SA5	Sample (bone)	fragment			f5	S100				(n-1)				
			SA6	Sample (bone)	fragment			f5	S101				(n-1)				
			SA7	Sample (bone)	fragment			f7	S102				(n-10)				
			SA8	Sample (bone)	fragment			f7	S103				(n-1)				
			SA9	Sample (bone and wood)	fragment			f7	S104				(bone n-2, wood n=2)				
			SA10	Sample (bone)	fragment			f7	surface				(n-10)				
			SA11	Sample (bone)	fragment			f9	surface				Main concentration (n=140).				
			SA12	Sample (bone)	fragment			f9	surface				Secondary concentration (n=150).				
				TOTALS						**86**	**769**						
Borden code	**Temp code**	**Area**	**Cat no**	**Object type**	**Object type**	**Tool type**	**Refits**	**Feature**	**Identifier**	**Qty Tools**	**Qty Flakes**	**Raw mat**	**Description**	**Length mm**	**Width mm**	**Thick mm**	**Diam mm**
HdEh-2	**NAP22-24**																
Catalogue numbers .1 to .31 were used in 2022.																	
		A	32	Tool?	poll	Celt poll fr?			S1	1		RSS	75	48	30		
		A	33	Tool?	fragment	Celt fr?			S1	1		RSS	33	29	9		
		A	34	Tool?	fragment	Utilized flake?			S2	1		RAC	Possible usewear along one margin.	29	5		
		A	35	Tool?	fragment	Undetermined tool fr?			S3	1		GGS		26	7		
		A	36	Flake(s)	complete				S4		1	RAC					
		A	37	Flake(s)	complete				S5		1	RAC					
		A	38	Flake(s)	complete				S6		1	CTC					
		A	39	Flake(s)	complete				S7		1	RAC	BRF.				
		A	40	Flake(s)	complete				S8		1	CTC					
		A	41	Flake(s)	complete				S11		1	CTC					
		A	42	Flake(s)	complete				S12		1	GCT					
		B	43	Tool	base	Side-notched projectile point base fr			S13	1		GCT	No obvious grinding on edges.	21	5		
		B	44	Tool	mesial	Uniface	45		S14			GCT	Unifacial retouch on dorsal.				
		B	45	Tool	proximal	Uniface	44		S15	1		GCT	Unifacial retouch on ventral.	36	6		
		B	46	Tool	mesial	Projectile point mesial fr			S16	1		GCT	Tip and base broken; may have been stemmed; no obvious grinding on edges.	27	6		
		B	47	Tool?	fragment	Undetermined tool fr?			S17	1		GGS	Ground stone tool? Uniform green siltstone.	26	8		
		B	48	Tool?	poll	Celt poll fr?			S19	1		TBD		38	21		
		A	49	Flake(s)	shatter				S20		1	GCT					
		A	50	Flake(s)	proximal				S21		1	GGS					
		A	51	Flake(s)	proximal				No GPS		1	RAC	Found on slope below area A.				
		A	51	Flake(s)	distal				No GPS		1	CTC	Found on slope below area A.				
		B	52	Chunk(s)	fragment				No GPS		1	RCM	notched point?				
		A	SA1	Sample (bone)	fragment				S9			BON	Bone, calcined? (n=1)				
		A	SA2	Sample (bone)	fragment				S10			BON	Bone, calcined? (n=1)				
		B	SA3	Sample (bone)	fragment				S18			BON	Bone, sun-bleached? (n=1)				
				TOTALS						**9**	**12**						
Borden code	**Temp code**	**Area**	**Cat no**	**Object type**	**Portion**	**Tool type**	**Refits**	**Feature**	**Identifier**	**Qty Tools**	**Qty Flakes**	**Raw mat**	**Description**	**Length mm**	**Width mm**	**Thick mm**	**Diam mm**
HcEg-2	**NAP24-07**																
			1	Flake(s)	complete				T1		4	RAC					
			1	Flake(s)	complete				T1		2	QZZ					
			1	Flake(s)	complete				T1		3	RSS					
			1	Chunk(s)	fragment				T1		1	GCT					
			1	Flake(s)	shatter				T1		1	TBD	Lithic is red, very coarse grained, opaque.				
			2	Historic	complete	Can lid			T2		1	MET	Crushed can lid found just under moss. Rim H 12 mm.				120
			3	Tool	complete	Uniface			T2	1		RAC	Unifacial retouch alternately on dorsal and ventral; missing small piece of base.	63	21	6	
			4	Flake(s)	complete				T2		3	RAC					
			4	Flake(s)	proximal				T2		3	RAC					
			4	Flake(s)	shatter				T2		5	RAC					
			4	Flake(s)	shatter				T2		1	GCT					
			4	Flake(s)	shatter				T2		1	GSS					
			5	Flake(s)	complete				T3		1	GCT					
			5	Flake(s)	proximal				T3		1	GCT					
			5	Chunk(s)	fragment				T3		1	GCT					
			5	Flake(s)	complete				T3		1	TBD	Beige cortext? Beige siltstone?				
			5	Flake(s)	shatter				T3		2	TBD	Beige cortext? Beige siltstone?				
			6	Tool	complete	Hammerstone			T3	1		TBD	Battering visible at one end.	107	37	26	
			7	Tool?	fragment	Ground stone tool fr?			T3	1		GSS	3 pieces of possible ground stone tool; dimensions are of largest piece.	54	49	7	
			7	Flake(s)	shatter				T3		28	GSS	Fragments of above possible ground stone tool.				
			SA1	Sample (charcoal)					T1				From second black layer near rocks; seems more like lumps of grease than charcoal.				
			SA2	Sample (charcoal)					T3				From black layer; very small flakes of charcoal visible.				
				TOTALS						**3**	**59**						
Borden code	**Temp code**	**Area**	**Cat no**	**Object type**	**Portion**	**Tool type**	**Refits**	**Feature**	**Identifier**	**Qty Tools**	**Qty Flakes**	**Raw mat**	**Description**	**Length mm**	**Width mm**	**Thick mm**	**Diam mm**
ZIA	**NAP24-05**																
			1	Flake(s)	complete				S1		3	RSS	Sample only				
			2	Flake(s)	proximal				S2		1	GCT	Burnt				
			3	Flake(s)	complete				S3		5	GGS	Sample only				
			3	Flake(s)	shatter				S3		2	GGS	Sample only				
			4	Flake(s)	complete				S4		5	GGS	Sample only				
				TOTALS							**16**						

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
ZIA	**NAP24-03**																
			1	Tool	complete	Celt			S1	1		GGS		126	51	23	
			2	Chunk(s)	fragment				S2		1	GGS					
			3	Chunk(s)	fragment				S3		1	GGS					
			4	Chunk(s)	fragment				S4		1	GGS					
				TOTALS						**1**	**3**						

Study locale 2: Aapiihtaamischuun (Shale Falls)

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
HeEg-8	**NAP24-04**																
		A	1	Tool	base	Biface preform base fr			S1	1		GCT	Biface preform base with flat bottom and rounded corners.	49	43	13	
		A	2	Tool	base	Side-notched projectile point base fr?			S1	1		GCT		20	11	5	
		A	3	Tool	complete	Awl?			S1	1		GCT		27	9	6	
		A	4	Flake(s)	complete				S1		1	GCT					
		A	4	Flake(s)	proximal				S1		1	GCT					
		A	5	Tool	base	Biface base fr			S2	1		GCT	Base or tip fragment?	37	34	9	
		A	6	Flake(s)	complete				S2		1	GCT					
		A	6	Flake(s)	shatter				S2		1	GCT					
		A	6	Chunk(s)	fragment				S2		1	GCT					
		A	7	Tool	fragment	Undetermined tool fr			S3	1		GCT	Possible retouch scars visible on both surfaces.	26	15	6	
		A	8	Flake(s)	complete				S3		3	GCT	Burnt.				
		A	8	Flake(s)	complete				S3		1	RBC					
		A	8	Flake(s)	proximal				S3		1	GCT					
		A	8	Flake(s)	shatter				S3		1	GCT					
		A	9	Tool	base	Biface preform base fr			S4	1		GCT	Biface preform base with flat bottom and rounded corners.				
		A	10	Flake(s)	complete				S4		1	GCT					
		A	10	Flake(s)	distal				S4		1	GCT					
		A	10	Flake(s)	shatter				S4		2	GSA					
		A	11	Tool	fragment	Undetermined tool fr			S5	1		GCT	Bifacial retouch.	14	16	5	
		A	12	Tool	fragment	Undetermined tool fr			S5	1		GCT	Unifacial retouch.	26	16	6	
		A	13	Tool	fragment	Utilized flake			S5	1		GCT	Traces of use on some margins.	31	12	11	
		A	14	Tool	base or tip	Biface preform base or tip fr			S6	1		GCT		16	21	8	
		A	15	Tool	fragment	Undetermined tool fr			S6	1		GCT	Shape suggests biface edge fragment.	19	19	7	
		A	16	Flake(s)	complete				S6		3	GCT					
		A	16	Flake(s)	proximal				S6		1	GCT					
		A	16	Flake(s)	shatter				S6		1	GCT					
		A	17	Tool	edge	Biface edge fr	115		S7	1		GCT		65	16	8	
		A	18	Flake(s)	complete				S8		1	GCT					
		A	19	Flake(s)	shatter				S9		1	GCT					
		A	19	Flake(s)	shatter				S9		2	GSA					
		A	20	Flake(s)	proximal				S10		1	GCT	Burnt.				
		A	20	Flake(s)	shatter				S10		2	GCT					
		A	21	Flake(s)	proximal				S11		1	GCT					
		A	22	Flake(s)	shatter				S12		1	GCT					
		A	23	Flake(s)	shatter				S13		1	GCT					
		A	24	Flake(s)	shatter				S14		2	GCT	1 burnt.				
		A	25	Flake(s)	shatter				S15		1	GCT					
		A	26	Flake(s)	complete				S16		1	GCT					
		A	26	Flake(s)	shatter				S16		1	GCT					
		A	27	Flake(s)	complete				S17		2	GCT	1 burnt.				
		A	27	Flake(s)	proximal				S17		1	GCT					
		A	28	Flake(s)	complete				S18		1	GCT	BRF, very fine working of biface edge.				
		A	29	Flake(s)	complete				S19		1	GCT					
		A	29	Flake(s)	distal				S19		1	GCT					
		A	30	Flake(s)	proximal				S20		1	GCT					
		A	30	Flake(s)	shatter				S20		1	GCT					
		A	31	Flake(s)	distal				S21		1	GCT					
		A	32	Flake(s)	shatter				S22		3	GCT					
		A	33	Flake(s)	proximal				S23		1	GCT					
		A	34	Flake(s)	shatter				S24		2	GCT					
		A	34	Flake(s)	shatter				S24		1	GSA					
		A	35	Flake(s)	shatter				S25		1	GCT					
		A	36	Flake(s)	complete				S26		1	GCT					
		A	36	Flake(s)	shatter				S26		1	GCT					
		A	37	Flake(s)	complete				S27		2	GCT	BRFs.				
		A	37	Flake(s)	proximal				S27		1	GCT					
		A	37	Flake(s)	distal				S27		2	GCT					
		A	37	Flake(s)	shatter				S27		4	GCT					
		A	37	Flake(s)	shatter				S27		1	TBD					
		A	38	Flake(s)	complete				S28		1	RBC					
		A	39	Flake(s)	complete				S29		1	GCT					
		A	39	Flake(s)	proximal				S29		1	GCT					
		A	39	Flake(s)	shatter				S29		2	GCT					
		A	39	Flake(s)	shatter				S29		1	TBD					
		A	40	Flake(s)	complete				S30		2	GCT					
		A	40	Flake(s)	proximal				S30		2	GCT	Burnt.				
		A	40	Flake(s)	shatter				S30		2	GCT					
		A	41	Flake(s)	complete				S31		2	GCT					
		A	41	Flake(s)	proximal				S31		1	GCT					
		A	42	Flake(s)	complete				S32		3	GCT	Tool finishing or resharpening.				
		A	43	Flake(s)	shatter				S33		1	GCT					
		A	44	Flake(s)	complete				S34		2	GCT					
		A	44	Flake(s)	proximal				S34		1	GCT					
		A	44	Flake(s)	proximal				S34		1	RBC					
		A	44	Flake(s)	shatter				S34		3	GCT					
		A	45	Flake(s)	complete				S35		2	GCT					
		A	45	Flake(s)	shatter				S35		2	GCT					
		A	46	Flake(s)	complete				S36		3	GCT					
		A	46	Flake(s)	shatter				S36		1	GCT					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
		A	47	Flake(s)	complete				S37		2	GCT					
		A	48	Tool	complete	Utilized flake			S38	1		GCT	Use wear visible along longest margin.	34	18	3	
		A	49	Flake(s)	complete				S38		4	GCT					
		A	49	Flake(s)	proximal				S38		1	BCM					
		A	49	Flake(s)	shatter				S38		1	GCT					
		A	49	Flake(s)	shatter				S38		1	RBC					
		A	50	Tool	fragment	Utilized flake			S39	1		GCT	Use wear below striking platfrom.	20	15	11	
		A	51	Flake(s)	complete				S39		3	GCT					
		A	51	Flake(s)	distal				S39		1	GCT					
		A	51	Flake(s)	shatter				S39		1	GCT					
		A	51	Chunk(s)	fragment				S39		2	GCT					
		A	52	Flake(s)	complete				S40		6	GCT					
		A	52	Flake(s)	proximal				S40		1	GCT					
		A	52	Flake(s)	proximal				S40		1	RBC					
		A	52	Flake(s)	distal				S40		1	GCT					
		A	53	Flake(s)	complete				S41		1	GCT					
		A	54	Flake(s)	complete				S42		4	GCT					
		A	54	Flake(s)	complete				S42		1	RBC					
		A	54	Flake(s)	distal				S42		2	GCT					
		A	55	Flake(s)	complete				S43		1	GCT					
		A	55	Flake(s)	proximal				S43		1	GCT					
		A	55	Flake(s)	shatter				S43		5	GCT					
		A	56	Flake(s)	complete				S44		5	GCT					
		A	56	Flake(s)	proximal				S44		1	GCT					
		A	56	Flake(s)	shatter				S44		6	GCT					
		A	57	Flake(s)	complete				S45		1	GCT					
		A	57	Flake(s)	proximal				S45		4	GCT					
		A	57	Flake(s)	shatter				S45		1	GCT					
		A	58	Flake(s)	complete				S46		8	GCT					
		A	58	Flake(s)	proximal				S46		3	GCT					
		A	58	Flake(s)	distal				S46		2	GCT					
		A	58	Flake(s)	shatter				S46		7	GCT					
		A	59	Tool	edge	Biface edge fr			S47	1		GCT		36	9	5	
		A	60	Flake(s)	complete				S47		5	GCT					
		A	60	Flake(s)	proximal				S47		1	GCT					
		A	60	Flake(s)	distal				S47		2	GCT					
		A	60	Flake(s)	shatter				S47		1	GCT					
		A	61	Tool?	fragment	Biface fr?			S48	1		GCT	Bifacial retouch?	17	6	3	
		A	62	Flake(s)	complete				S48		1	GCT					
		A	62	Flake(s)	distal				S48		1	GCT					
		A	62	Flake(s)	shatter				S48		1	GSA					
		A	63	Flake(s)	distal				S49		1	GCT					
		A	64	Flake(s)	complete				S50		2	GCT					
		A	64	Flake(s)	shatter				S50		2	GCT					
		A	64	Flake(s)	shatter				S50		1	GSA					
		A	65	Flake(s)	distal				S51		1	GCT					
		A	66	Flake(s)	complete				S52		2	GCT					
		A	66	Flake(s)	shatter				S52		1	GCT					
		A	66	Flake(s)	shatter				S52		1	GSA					
		A	67	Flake(s)	complete				S53		1	GCT					
		A	67	Flake(s)	proximal				S53		1	GCT	Green-grey chert.				
		A	67	Flake(s)	shatter				S53		1	GCT					
		A	68	Flake(s)	complete				S54		5	GCT					
		A	68	Flake(s)	proximal				S54		2	GCT					
		A	69	Flake(s)	complete				S55		1	GCT					
		A	69	Flake(s)	proximal				S55		2	GCT					
		A	69	Flake(s)	shatter				S55		2	GCT					
		A	70	Flake(s)	complete				S56		4	GCT					
		A	70	Flake(s)	proximal				S56		2	GCT					
		A	71	Flake(s)	complete				S57		3	GCT					
		A	71	Flake(s)	proximal				S57		4	GCT					
		A	71	Flake(s)	shatter				S57		2	GCT					
		A	72	Flake(s)	complete				S58		2	GCT					
		A	72	Flake(s)	proximal				S58		1	GCT					
		A	72	Flake(s)	shatter				S58		1	GCT					
		A	72	Flake(s)	shatter				S58		1	GSA					
		A	73	Flake(s)	complete				S59		1	GCT					
		A	74	Flake(s)	proximal				S60		1	GCT					
		A	74	Flake(s)	shatter				S60		1	GCT					
		A	74	Flake(s)	shatter				S60		1	GSA					
		A	75	Flake(s)	complete				S61		5	GCT					
		A	75	Flake(s)	distal				S61		1	GCT					
		A	76	Tool?	fragment	Undetermined tool fr?			S62	1		GCT	Bifacial retouch?	20	18	5	
		A	77	Flake(s)	complete				S62		5	GCT					
		A	77	Flake(s)	proximal				S62		1	GCT					
		A	77	Flake(s)	shatter				S62		2	GCT					
		A	78	Flake(s)	complete				S63		3	GCT					
		A	78	Flake(s)	proximal				S63		1	GCT					
		A	78	Flake(s)	distal				S63		1	GCT					
		A	78	Flake(s)	shatter				S63		1	GCT					
		A	79	Flake(s)	complete				S64		3	GCT					
		A	79	Flake(s)	complete				S64		1	RBC					
		A	79	Flake(s)	distal				S64		1	GCT					
		A	79	Flake(s)	shatter				S64		1	GCT					
		A	80	Flake(s)	shatter				S65		1	GCT					
		A	81	Flake(s)	complete				S66		1	GCT					
		A	81	Flake(s)	shatter				S66		1	GSA					
		A	82	Flake(s)	complete				S67		2	GCT					
		A	82	Flake(s)	shatter				S67		1	GCT					
		A	83	Flake(s)	complete				S68		8	GCT					
		A	83	Flake(s)	proximal				S68		1	GCT					
		A	83	Flake(s)	distal				S68		1	GCT					
		A	83	Flake(s)	shatter				S68		4	GCT					
		A	83	Flake(s)	shatter				S68		1	GSA					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
		A	83	Flake(s)	shatter				S68		1	TBD	Green quartzite?				
		A	84	Tool	fragment	Utilized flake			S69	1		GCT	Use wear along one margin.				
		A	85	Flake(s)	shatter				S69		1	GSA					
		A	86	Flake(s)	complete				S70		2	GCT					
		A	86	Flake(s)	proximal				S70		2	GCT					
		A	87	Flake(s)	complete				S71		9	GCT					
		A	87	Flake(s)	proximal				S71		1	GCT	Burnt.				
		A	87	Flake(s)	shatter				S71		3	GCT					
		A	87	Flake(s)	shatter				S71		1	GSA					
		A	88	Flake(s)	complete				S72		5	GCT					
		A	88	Flake(s)	proximal				S72		2	GCT					
		A	88	Flake(s)	shatter				S72		2	GCT					
		A	88	Flake(s)	shatter				S72		1	GSA					
		A	89	Flake(s)	distal				S73		1	GCT					
		A	89	Flake(s)	shatter				S73		1	GCT					
		A	90	Flake(s)	complete				S74		2	GCT					
		A	90	Flake(s)	proximal				S74		1	GCT					
		A	90	Flake(s)	proximal				S74		1	RBC					
		A	91	Tool?	fragment	Utilized flake?			S75	1		GCT		23	9	3	
		A	92	Flake(s)	complete				S75		3	GCT					
		A	92	Flake(s)	proximal				S75		1	GCT					
		A	92	Flake(s)	proximal				S75		1	RAC	Ramah chert?				
		A	92	Flake(s)	distal				S75		2	GCT					
		A	92	Flake(s)	shatter				S75		1	GSA					
		A	93	Flake(s)	complete				S76		3	GCT					
		A	93	Flake(s)	proximal				S76		1	GCT					
		A	94	Flake(s)	complete				S77		3	GCT					
		A	94	Flake(s)	proximal				S77		1	GCT					
		A	94	Flake(s)	distal				S77		1	GCT					
		A	95	Flake(s)	proximal				S78		1	GCT					
		A	96	Flake(s)	proximal				S79		1	GCT					
		A	97	Flake(s)	proximal				S80		2	GCT					
		A	97	Flake(s)	shatter				S80		1	GCT					
		A	97	Flake(s)	shatter				S80		1	GSA					
		A	98	Flake(s)	complete				S81		2	GCT					
		A	99	Flake(s)	complete				S82		2	GCT					
		A	99	Flake(s)	proximal				S82		2	GCT					
		A	99	Flake(s)	shatter				S82		1	GCT					
		A	99	Flake(s)	shatter				S82		1	GSA					
		A	100	Flake(s)	complete				S83		1	GCT					
		A	101	Flake(s)	complete				S84		2	GCT					
		A	101	Flake(s)	proximal				S84		1	GCT					
		A	102	Flake(s)	proximal				S85		1	GCT					
		A	102	Flake(s)	shatter				S85		1	GCT					
		A	103	Flake(s)	complete				S86		1	GCT	BRF.				
		A	104	Flake(s)	complete				S87		1	GCT					
		A	105	Flake(s)	complete				S88		1	GCT					
		A	106	Flake(s)	proximal				S89		1	GCT					
		A	107	Flake(s)	distal				S90		2	GCT					
		A	108	Flake(s)	complete				S91		1	GCT					
		A	108	Flake(s)	proximal				S91		2	GCT					
		A	108	Flake(s)	distal				S91		2	GCT	Possible red coloured cortex on grey chert.				
		A	108	Flake(s)	shatter				S91		1	GCT					
		A	109	Flake(s)	complete				S92		2	GCT					
		A	109	Flake(s)	distal				S92		1	GCT					
		A	110	Flake(s)	complete				S93		1	GCT					
		A	111	Flake(s)	distal				S94		1	GCT					
		A	112	Flake(s)	complete				S95		1	GCT	BRF, possible bifacial tool edge.				
		A	113	Flake(s)	shatter				S96		1	GCT					
		A	114	Flake(s)	shatter				S97		1	GCT					
				TOTALS						**19**	**378**						
		B	115	Tool	edge	Biface edge fr	17		S98			GCT					
		B	116	Flake(s)	complete				S99		1	GCT					
		B	116	Flake(s)	distal				S99		1	GCT					
		B	117	Flake(s)	proximal				S100		1	GCT					
		B	118	Flake(s)	proximal				S101		1	GCT	BRF.				
		B	119	Flake(s)	distal				S102		1	GCT					
		B	120	Tool	base	Biface preform base fr			S103	1		GCT	Base appears to be stemmed.				
		B	121	Flake(s)	complete				S104		1	GCT	BRF.				
		B	122	Flake(s)	distal				S105		1	GCT					
		B	123	Flake(s)	complete				S108		1	GCT					
				TOTALS						**1**	**8**						
Borden code	**Temp code**	**Area**	**Cat no**	**Object type**	**Portion**	**Tool type**	**Refits**	**Feature**	**Identifier**	**Qty Tools**	**Qty Flakes**	**Raw mat**	**Description**	**Length mm**	**Width mm**	**Thick mm**	**Diam mm**
HeEg-9	**NAP24-06**																
			1	Flake(s)	proximal				S1		1	RCM					
			2	Flake(s)	complete				S2		1	RCM					
			3	Tool	fragment	Undetermined tool fr			S3	1		RCM	Possible edge of bifacial preform.	36	31	10	
			4	Flake(s)	complete				S3		9	RCM					
			4	Flake(s)	proximal				S3		1	RCM					
			4	Flake(s)	shatter				S3		2	RCM					
			5	Flake(s)	complete				S4		2	RCM					
			5	Flake(s)	shatter				S4		1	RCM					
			6	Flake(s)	complete				S5		1	RCM					
			7	Flake(s)	complete				S6		4	RCM					
			7	Flake(s)	shatter				S6		1	RCM					
			7	Chunk(s)	fragment				S6		1	RCM					
			8	Chunk(s)	fragment				S7		1	RCM					
			9	Flake(s)	complete				S8		3	RCM					
			10	Flake(s)	complete				S9		7	RCM					
			10	Flake(s)	proximal				S9		2	RCM					
			11	Flake(s)	complete				S10		5	RCM					
			12	Flake(s)	complete				S11		3	RCM					

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
			12	Flake(s)	distal				S11		1	RCM					
			13	Flake(s)	complete				S12		4	RCM					
			14	Flake(s)	complete				S13		1	RCM					
			14	Chunk(s)	fragment				S13		1	RCM					
			15	Flake(s)	complete				S14		6	RCM					
			15	Flake(s)	distal				S14		1	RCM					
			15	Flake(s)	shatter				S14		1	RCM					
			16	Flake(s)	complete				S15		1	RCM					
			16	Flake(s)	proximal				S15		1	RCM					
			16	Flake(s)	shatter				S15		1	RCM					
			17	Flake(s)	complete				S16		1	RCM					
			17	Flake(s)	distal				S16		1	RCM					
			18	Flake(s)	complete				S17		1	RCM					
			19	Flake(s)	complete				S18		1	RCM					
			20	Flake(s)	complete				S19		1	RCM					
			20	Chunk(s)	fragment				S19		1	RCM					
			21	Flake(s)	complete				S20		1	RCM					
			22	Flake(s)	complete				S21		1	RCM					
			22	Chunk(s)	fragment				S21		1	RCM					
			23	Flake(s)	complete				S22		3	RCM					
			23	Flake(s)	distal				S22		1	RCM					
			24	Flake(s)	complete				S23		5	RCM					
			24	Flake(s)	shatter				S23		1	RCM					
			24	Chunk(s)	fragment				S23		1	RCM					
			25	Flake(s)	shatter				S24		1	RCM					
			26	Flake(s)	distal				S25		1	RCM					
			27	Flake(s)	complete				S26		1	RCM					
			28	Flake(s)	complete				S27		2	RCM					
			28	Chunk(s)	fragment				S27		1	RCM					
			29	Flake(s)	complete				S28		3	RCM					
			29	Flake(s)	shatter				S28		1	RCM					
			29	Chunk(s)	fragment				S28		1	RCM	Core fragment?				
			30	Flake(s)	shatter				S29		1	RCM					
			31	Flake(s)	complete				S30		1	RCM	BRF off a large preform.				
			32	Flake(s)	complete				S31		3	RCM					
			33	Flake(s)	complete				S32		2	RCM					
			33	Flake(s)	shatter				S32		1	RCM					
			34	Flake(s)	complete				S33		1	RCM					
			35	Flake(s)	complete				S34		3	RCM					
			36	Flake(s)	complete				S35		1	RCM					
			37	Tool	fragment	Undetermined tool fr			S36	1		RCM	Corner of bifacial preform?	30	26	10	
			38	Flake(s)	shatter				S36		1	RCM	Very weathered.				
			39	Flake(s)	complete				S37		4	RCM	1 BRF.				
			40	Flake(s)	complete				S38		1	RCM					
			40	Flake(s)	shatter				S38		2	RCM					
			41	Chunk(s)	fragment				S39		1	RCM					
			42	Flake(s)	complete				S40		1	RCM					
			43	Flake(s)	complete				S41		2	RCM					
			43	Flake(s)	proximal				S41		1	RCM					
			44	Flake(s)	complete				S42		1	RCM	BRF.				
			44	Flake(s)	shatter				S42		1	RCM					
			45	Flake(s)	complete				S43		1	RCM	BRF.				
			46	Flake(s)	complete				S44		3	RCM					
			47	Flake(s)	complete				S45		1	RCM					
			48	Flake(s)	complete				S46		1	RCM					
			49	Flake(s)	complete				S47		1	RCM					
			50	Flake(s)	complete				S48		1	RCM					
			51	Flake(s)	complete				S49		2	RCM					
			52	Flake(s)	complete				S50		3	RCM					
			52	Flake(s)	proximal				S50		1	RCM					
			52	Flake(s)	distal				S50		1	RCM					
			52	Flake(s)	shatter				S50		2	RCM					
			53	Flake(s)	complete				S51		3	RCM					
			53	Flake(s)	proximal				S51		2	RCM					
			53	Flake(s)	distal				S51		2	RCM					
				TOTALS						**2**	**146**						

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
ZIA	**NAP24-01**																
			1	Tool	complete	Utilized flake			S1	1		GCT		62	48	10	
				TOTALS						**1**							

Study locale 3: Central Nachicapau Lake

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
HdEa-1	**NAP24-08**																
			1	Flake(s)	complete				T1		6	QZZ					
			1	Flake(s)	proximal				T1		6	QZZ					
			1	Flake(s)	shatter				T1		6	QZZ					
			1	Chunk(s)	fragment				T1		5	QZZ					
			1	Flake(s)	shatter				T1		2	TBD	Material looks like beige siltstone.				
			2	Flake(s)	complete				T2		5	QZZ					
			2	Flake(s)	proximal				T2		1	QZZ					
			2	Flake(s)	shatter				T2		3	QZZ					
			2	Chunk(s)	fragment				T2		1	QZZ					
			SA1	Sample (red ochre)					T2								
				TOTALS							**35**						

Study locale 4: Central Mistisipu Nipiy (Central Cambrien Lake)

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
HcEg-2	**NAP24-07**																
			1	Flake(s)	complete				T1		4	RAC					
			1	Flake(s)	complete				T1		2	QZZ					
			1	Flake(s)	complete				T1		3	RSS					
			1	Chunk(s)	fragment				T1		1	GCT					
			1	Flake(s)	shatter				T1		1	TBD	Lithic is red, very coarse grained, opaque.				
			2	Historic	complete	Can lid			T2		1	MET	Crushed can lid found just under moss. Rim H 12 mm.				120
			3	Tool	complete	Uniface			T2	1		RAC	Unifacial retouch alternately on dorsal and ventral; missing small piece of base.	63	21	6	
			4	Flake(s)	complete				T2		3	RAC					
			4	Flake(s)	proximal				T2		3	RAC					
			4	Flake(s)	shatter				T2		5	RAC					
			4	Flake(s)	shatter				T2		1	GCT					
			4	Flake(s)	shatter				T2		1	GSS					
			5	Flake(s)	complete				T3		1	GCT					
			5	Flake(s)	proximal				T3		1	GCT					
			5	Chunk(s)	fragment				T3		1	GCT					
			5	Flake(s)	complete				T3		1	TBD	Beige cortext? Beige siltstone?				
			5	Flake(s)	shatter				T3		2	TBD	Beige cortext? Beige siltstone?				
			6	Tool	complete	Hammerstone			T3	1		TBD	Battering visible at one end.	107	37	26	
			7	Tool?	fragment	Ground stone tool fr?			T3	1		GSS	3 pieces of possible ground stone tool; dimensions are of largest piece.	54	49	7	
			7	Flake(s)	shatter				T3		28	GSS	Fragments of above possible ground stone tool.				
			SA1	Sample (charcoal)					T1				From second black layer near rocks; seems more like lumps of grease than charcoal.				
			SA2	Sample (charcoal)					T3				From black layer; very small flakes of charcoal visible.				
				TOTALS						**3**	**59**						

Study locale 5: Piyaaskwaastikw (Pons River)

No collections

Study locale 5: Northern Caniapiscau River

Borden code	Temp code	Area	Cat no	Object type	Portion	Tool type	Refits	Feature	Identifier	Qty Tools	Qty Flakes	Raw mat	Description	Length mm	Width mm	Thick mm	Diam mm
HiEh-1	**NAP24-09**																
			1	Flake(s)	complete				S1		1	BCM					
			2	Flake(s)	complete				S2		1	BCM					
			3	Chunk(s)	fragment				S3		2	BCM					
			3	Flake(s)	complete				S3		1	BCM	Very worn edges; struck from curated tool?				
			4	Flake(s)	complete				S4		3	BCM					
			5	Flake(s)	complete				S5		4	BCM					
			5	Flake(s)	shatter				S5		1	GSS					
			6	Flake(s)	complete				S6		1	BCM					
			6	Flake(s)	shatter				S6		1	BCM					
			7	Flake(s)	complete				S7		2	BCM					
			8	Flake(s)	complete				S8		5	BCM					
			8	Flake(s)	proximal				S8		3	BCM					
			8	Flake(s)	distal				S8		2	BCM					
			8	Flake(s)	shatter				S8		1	BCM					
			9	Flake(s)	distal				S9		1	BCM					
			10	Tool	fragment	Undetermined tool fr			S9	1		BCM	Fragment with retouch on dorsal surface creating large notch.	60	13	12	
			11	Tool	complete	Hammerstone			S9	1		TBD		55	47	32	
			12	Flake(s)	complete				S10		1	BCM					
			13	Tool	fragment	Undetermined tool fr			S10	1		TBD	Unifacial retouch visible in one small location; material might be weathered BCM.	39	20	12	
			14	Flake(s)	complete				S11		3	BCM					
			14	Flake(s)	proximal				S11		1	BCM					
			15	Tool	proximal	Biface preform base fr			S11	1		BCM	Biface preform base with rounded corners; top half broken off due to hinge fracture.	62	50	12	
			16	Flake(s)	complete				S12		11	BCM					
			16	Flake(s)	shatter				S12		5	BCM					
			16	Chunk(s)	fragment				S12		2	BCM					
			17	Flake(s)	complete				S13		13	BCM	One is small BRF.				
			17	Flake(s)	shatter				S13		3	BCM					
			18	Flake(s)	complete				S14		3	BCM					
			18	Flake(s)	shatter				S14		3	BCM					
			19	Flake(s)	complete				S15		7	BCM					
			19	Flake(s)	proximal				S15		1	BCM					
			19	Flake(s)	shatter				S15		1	BCM					
			20	Flake(s)	complete				S16		3	BCM					
			20	Flake(s)	shatter				S16		2	BCM					
			21	Chunk(s)	fragment				S16		1	BCM					
				TOTALS						**4**	**89**						

B | Radiocarbon dates

André E. Lalonde National Facility in AMS
Radiocarbon Laboratory
ams.uottawa.ca

Analysis Report

SUBMITTER SUMMARY			
Submitter Name(s):	Moira McCaffrey	**Affiliation:**	Naskapi Nation of Kawawachikamach
Submitter Email(s):	moira.mccaffrey@gmail.com	**Street Address:**	P.O. Box 5111
Primary Submitter Phone:	613-203-4336	**City, Province:**	Kawawachikamach, Quebec
Principal Investigator Name(s):	Moira McCaffrey	**Postal Code:**	G0G 2Z0
Principal Investigator Email(s):	moira.mccaffrey@gmail.com	**Country:**	Canada
Principal Investigator Phone:	613-203-4336	**Date Submitted:**	2024-12-12

PROJECT INFORMATION	
Project Title:	Naskapi Archaeological Project
Country:	Canada
Site Name:	HdEh-1
Collection Date:	August 2024

SUBMISSION TIMELINE	
Date samples received (YYYY-MM-DD)	Report date (YYYY-MM-DD)
2024-12-17	2025-02-20

ANALYTICAL NOTES
Samples processed wihout issue.

Please note: Unless otherwise specified in the submission form, any remaining sample material will be held for a period of two (2) months, after which time it will be discarded.

CONTACT INFORMATION	
Should you have any questions regarding your data or sample preparation please contact:	
Name:	Sarah Murseli
Email:	smurseli@uottawa.ca
Phone:	613-562-5800 x6864

Researchers are asked to report any publications that include data generated at the AEL AMS facility. Publication notifications should be sent to ael-ams@uottawa.ca. Published data should include the unique UO identifier number provided in this analytical report.

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Analysis Report

Table 1. Radiocarbon results. Errors for Conventional Radiocarbon Ages (14C yr BP) are 1σ. Confidence intervals for calibrated ages (calBP) are within 2σ. Calibration was performed using OxCal v4.4 (Bronk Ramsey, 2009) and the IntCal20 calibration curve (Reimer et al., 2020) or Bomb21 calibration curve (Hua et al., 2022). Material codes are described in Crann et al. (2017) and Murseli et al. (2019).

Lab ID	Submitter ID	Material	Material Code	14C yr BP	±	F14C	±	D14C ‰	±	Δ14C ‰	±	cal BP
UOC-27426	HdEh-1.SA7	Calcined bone	CB	3070	20	0.6832	0.0015	-316.80	1.54	-322.89	1.54	3350-3213 (95.4%)
UOC-27427	HdEh-1.SA11	Calcined bone	CB	4140	20	0.5973	0.0014	-402.65	1.44	-407.98	1.44	4820-4575 (95.4%)

Analysis Report

Sample Processing

Sample pretreatment techniques, processing and definitions of media codes can be found in Crann et al. (2017) and Murseli et al. (2019). For more information about the equipment used for sample preparation, please see St-Jean et al. (2017). All manuscripts can be found at https://www.uottawa.ca/research-innovation/national-ael-ams-facility/publications

Radiocarbon Analysis

Radiocarbon analyses are performed on an Ionplus AG MICADAS (Mini Carbon Dating System). 12,13,14C+1 ions are measured after tandem acceleration by a terminal at 185 kV and equipped with He stripping. Data is processed using the BATS data reduction software as described by Wacker et al. (2010). The fraction-modern (F14C) is calculated according to Reimer et al. (2004) as the ratio of the sample 14C/12C to that of primary standard Ox-II, measured quasi-simultaneously. Both 14C/12C ratios are background-corrected and fractionation-corrected (occurring both from spectrometer and sample preparation fractionation) to δ13C_PDB = -25 permille. Conventional Radiocarbon Ages (14C yrs BP) are calculated as -8033ln(F14C) and reported in 14C yr BP (BP=AD 1950), as described by Stuiver and Polach (1977). Quoted uncertainties (1σ) are based on Poisson counting statistics, variability among repeated 14C/12C and 13C/12C measurements, and blank variability based on historical laboratory performance. We do not report online AMS δ13C as it contains machine-induced fractionation.

Reporting of Data

In this analysis report, we have followed the conventions recommended by Millard (2014).

Conventional radiocarbon ages (CRA) are rounded following the conventions of Stuiver & Polach (1977):

CRA	rounding	Error	rounding
0-1000	nearest 5 up	<100	nearest 5 up
1000-10000	nearest 10	100-1000	nearest 10
10000-20000	nearest 50	>1000	nearest 100
>20000	nearest 100	---	---

D14C (defined as per mil Depletion or Enrichment Relative to Standard Normalized for Isotope Fractionation, equivalent to stable isotope δ notation) is calculated as: $(F^{14}C - 1) \cdot 1000$

Δ14C (defined as the absolute amount of ^{14}C in the sample in the year it was measured) is calculated as:
F14C · (e(1950-y)/8267) – 1) · 1000
Please note: If the year of measurement (y) is not the same as the year of collection (z), calculate as follows:
*F14C · (e(1950-z)/8267) – 1) * 1000)*

Calibration

Calibration is performed using OxCal v4.4 (Bronk Ramsey, 2009). Calibrated results are given as a range (or ranges) with an associated probability, as point estimates (mean, median) cannot represent the uncertainties involved (Millard, 2014). We acknowledge that point estimates are often desired and are thus included on the calibration plots in the Appendix, but we recommend that data tables used in publication maintain calibrated age ranges.

Where the F14C is less than 1, the IntCal20 calibration curve was used for Northern Hemisphere samples (Reimer et al., 2020) and ShCal20 for Southern Hemisphere samples (Hogg et al., 2020). For samples with an F14C greater than 1, the post-bomb atmospheric curve was used (Hua et al., 2022). Post-bomb samples have two age ranges due to calibration on both sides of the bomb pulse. There are methods for deciding which side of the bomb pulse to select as the more appropriate date so feel free to contact us for further information.

Samples that calibrate between the 1700's and early 1950's will always result in a calibrated age range covering the majority of this period. This is due to the "Seuss Effect", which is a flat portion of the calibration curve caused by the burning of fossil fuels.

Rounding

Calibrated ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr, but rounding should only be done at the final reporting stage as intermediate rounding may introduce errors (Millard, 2014).

References

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9. Stuiver M, Polach HA. 1977. Discussion: reporting of 14C data. Radiocarbon 19(3):355–63.

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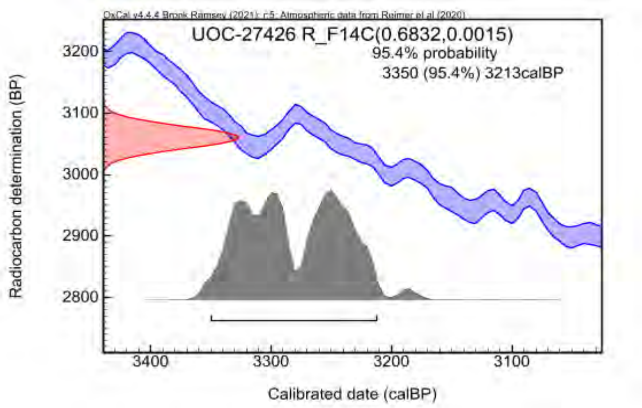
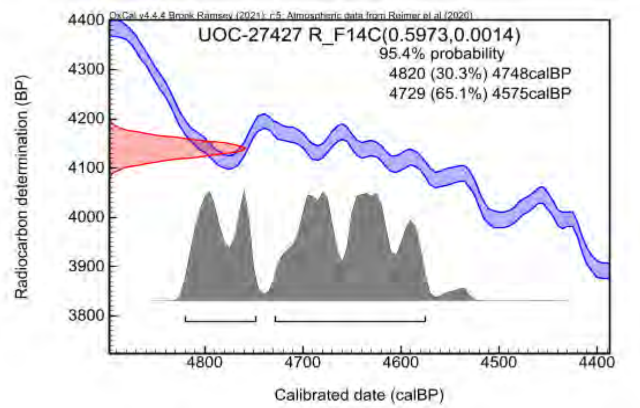
Analysis Report





ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
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Tel: (305) 667-5167
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April 1, 2025

David Denton
Naskapi Nation of Kawawachikamach (Canada)
174 Dennison Blvd
Val-d'Or, Quebec (QC) J9P 2K5
Canada

Dear David Denton,

Enclosed is the radiocarbon dating result for the sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Digital signature on file

Mr. Ron Hatfield
Laboratory Management Group / President

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSIS

Submitter	**David Denton**
Company	**Naskapi Nation of Kawawachikamach (Canada)**
Received Date	**March 18, 2025**
Report Date	**April 1, 2025**
Laboratory Number	**Beta-740440**
Sample Code	HdEh-1-S12

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Conventional Radiocarbon Age **4300 +/- 30 BP**

Ratio of Stable Isotopes **IRMS δ13C: -23.57 ± 0.15 o/oo**
IRMS δ18O: -15.14 ± 0.25 o/oo

95.4% Probability Calibrated Range(s)

(80.9%)	**2938 - 2880 cal BC**	**(4888 - 4830 cal BP)**
(10.6%)	**3009 - 2978 cal BC**	**(4959 - 4928 cal BP)**
(3.7%)	**2969 - 2947 cal BC**	**(4919 - 4897 cal BP)**
(0.2%)	**2976 - 2975 cal BC**	**(4926 - 4925 cal BP)**

Submitter Material	Bone (Cremated)
Pretreatment	(Cremated bone carbonate):bone carbonate extraction (acid wash prior to acidification)
Analyzed Material	Cremated bone carbonate
Analysis Service	AMS-Standard Delivery
Percent Modern Carbon	58.55 +/- 0.22 pMC
Fraction Modern Carbon	0.5855 +/- 0.0022
D14C	-414.50 +/- 2.18 o/oo
△14C	-419.79 +/- 2.18 o/oo (1950:2025)
Measured Radiocarbon Age	(without d13C correction): 4280 +/- 30 BP
Calibration	BetaCal 5.0: High Probability Density Range Method: INTCAL20

Results are ISO/IEC-17025 accredited. All work was done at Beta in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half -life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable.The Age is rounded to the nearest 10years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1sigma counting statistics. Calculated sigmas less than 30BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB. References for calendar calibrations are cited at the bottom of calibration graph pages.

SGS BETA

ISO/IEC 17025:2017-Accredited Testing Laboratory

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BetaCal 5.0

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method: INTCAL20)

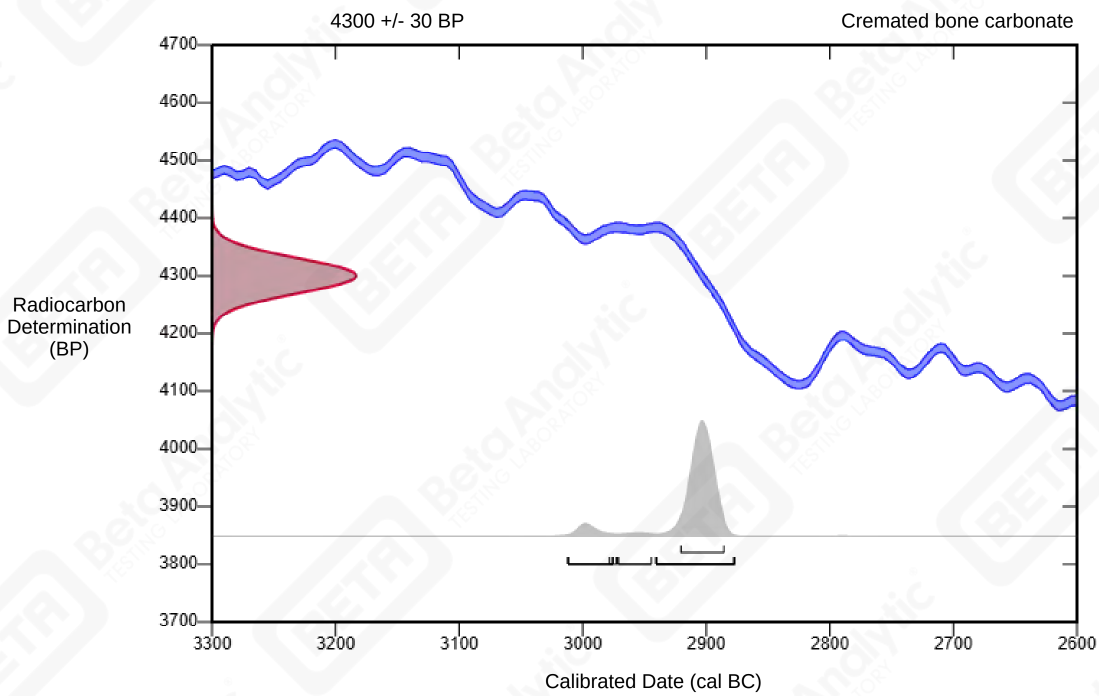
(Variables: d13C = -23.6 o/oo)

Beta-Laboratory Number **740440**

Conventional Radiocarbon Age (BP) **4300 +/- 30 BP**

95.4% Probability Calibrated Range(s)		
(80.9%)	2938 - 2880 cal BC	(4888 - 4830 cal BP)
(10.6%)	3009 - 2978 cal BC	(4959 - 4928 cal BP)
(3.7%)	2969 - 2947 cal BC	(4919 - 4897 cal BP)
(0.2%)	2976 - 2975 cal BC	(4926 - 4925 cal BP)
68.2% Probability Calibrated Range(s)		
(68.2%)	2918 - 2888 cal BC	(4868 - 4838 cal BP)

HdEh-1-S12



Database Used
INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL20

ISO/IEC 17025:2017-Accredited Testing Laboratory

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Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date	April 1, 2025
Submitter	David Denton

QA MEASUREMENTS

Reference 1	
Expected Value	129.41 +/- 0.06 pMC
Measured Value	129.39 +/- 0.32 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	95.86 +/- 0.24 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation Date April 1, 2025

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C | Science team reports

C.1 M. Rizza: Geomorphological investigations and sample collection to assist in dating landscape evolution and human occupation in the Cambrien Lake area

Geomorphological investigations and sample collection to assist in dating landscape evolution and human occupation in the Cambrien Lake area

Magali Rizza
Professor, Department of Earth and Atmospheric Science, Geotop, UQAM

PART 1: Activity Report, Field research and sample collection (October 31, 2024)

1.1. Objective

This fieldwork aimed to describe sedimentary units to establish the stratigraphic relationship between cultural layers and long-term landscape evolution at archaeological sites, specifically HdEh-1. We collected a large number of samples for quaternary dating methods: Terrestrial Cosmogenic Nuclides (TCN, 10 samples), Optically Stimulated Luminescence (OSL, 19 samples), and radiocarbon (^{14}C, 13 samples). Magali Rizza and Stephen (Steve) Wolfe made detailed stratigraphic logs and carried out the sampling.

1.2. Fieldwork

Fieldwork was conducted over an eight-day period between August 3 to 10, 2024.

Day 1 (August 3) – Steve, Magali, and Ariane Lefebvre were transported to Norpaq Adventures Châteauguay camp by floatplane from Schefferville. Natasha Roy joined the team later from Kuujjuaq by helicopter. In the afternoon, the team visited the principal site (HdEh-1) to assess the area's archeological context and general landscapes.

Day 2 (August 4) – The HdEh-1 site was surveyed by drone flights and, based on the topographic relationships, Magali and Steve opened PIT-1 across a rich-organic layer in the dune system (figure 1). This organic-rich layer is continuous in the topography and was found as an excellent stratigraphic horizon layer (named unit 2 in PIT-2 or figure 2). We think that this organic-rich unit was probably a soil unit developed at the top of a sand dune and that the paleotopography has been modified, even inverted, by the process of the wind deflation.

In PIT-1, we recognized four different unit layers.

Day 3 (August 5) – PIT-2 was opened across the same organic-rich layer found within PIT-1. In PIT-2 (figures 2 and 3) we recognized a coarse sandy unit (unit 7) that lies stratigraphically below a layer made of gravel to pebbles with iron lenses (unit 6) that is overlapped by a sand layer (unit 5). We interpret the unit 7-6-5 sequence as a glacial-marine terrace level. On top, unit 4 is defined as a continuous, sloping sandy layer, interpreted as beach sands. No erosional contact is found between unit 4 and unit 3, which is easily identified as orange to yellow, medium to coarse sands, which we recognized as eolian sand (dune accumulation). In the upper part, we see a wavy stratigraphy, indicating a period of stabilisation of the dune. Above unit 3, the organic-rich layer (unit 2) is 10-15 cm thick and corresponds with clay and fine sand with huge pieces of charcoal. We interpret this as a soil layer that developed on top of the dune and was burnt. Loose gray sands (unit 1) are found on top of PIT-2 and are eolian deposits.

All units described in PIT-2 are also correlated with units found in PIT-1.

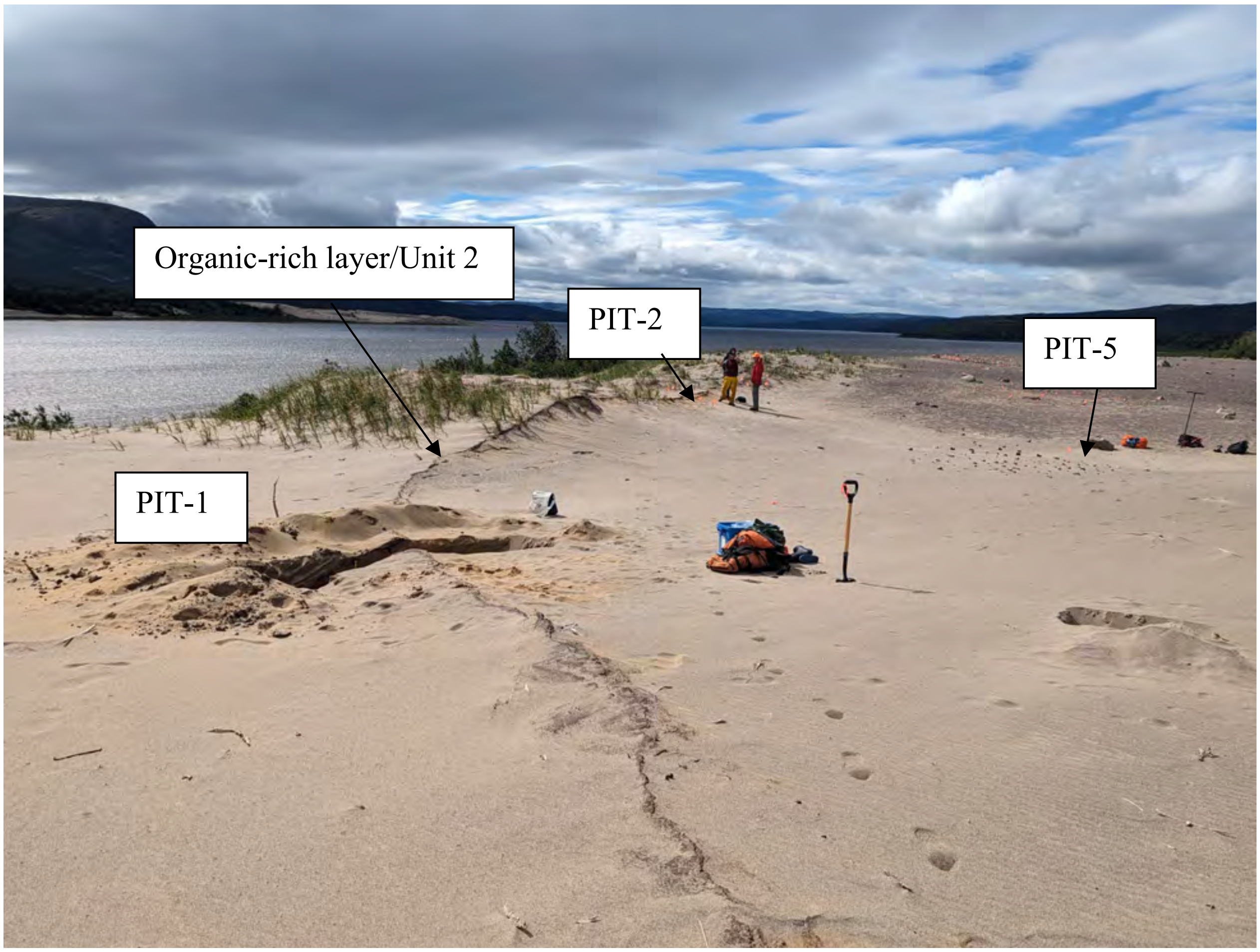

Figure 1: View of site HdEh-1 showing location of PITs and the organic-rich layer that is used as an horizon control layer in our stratigraphy.

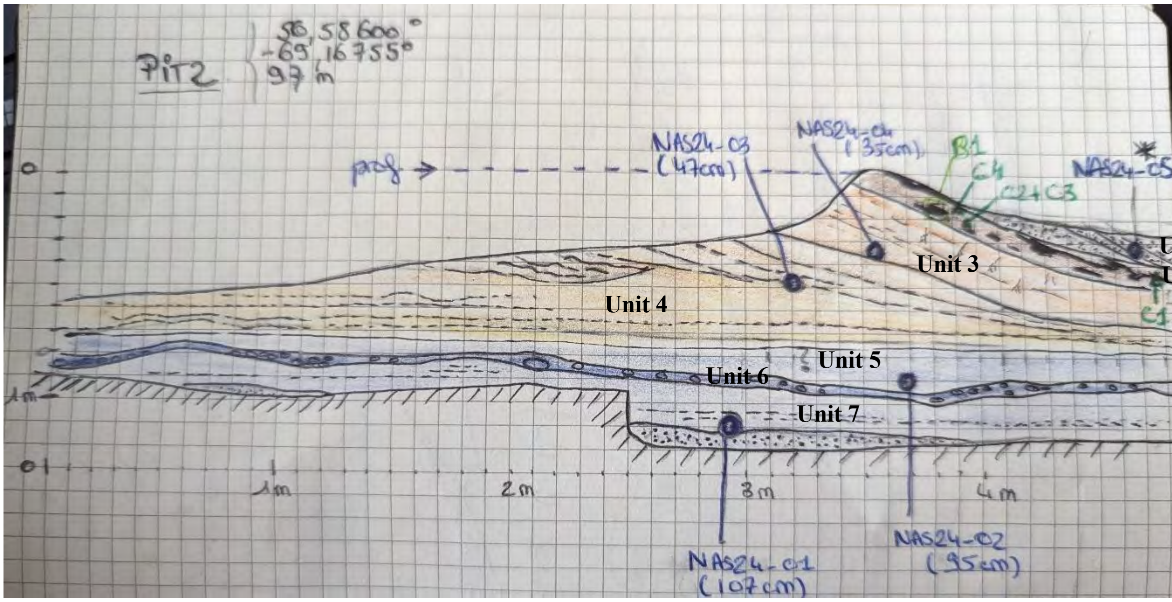

Figure 2: Sketch of the log section made for PIT-2 with the different units and positions of samples.

Figure 3: View of PIT-2. Unit 6 is observed as a dark layer found at the bottom of the trench and unit 3 is recognized as the orange layer.

Other very small pits were also opened across organic-rich layers (labeled N1 to N4) found in the dune deposits, to collect samples (table 1).

We started to collect radiocarbon samples and OSL samples in PIT-1, PIT-2, and across the dune (see tables 1 and 2).

Day 4 (August 6) – PIT-4 was excavated within the marine-glacial level in which we identified stratigraphic units similar to units 7-6-5 in PIT-2. OSL samples NAS24-06 and 07 were collected (figure 4).

The top of large boulders standing on the marine-glacial terrace level was sampled for TCN (see table 3 and figure 4), in order to constrain the age of the placement of these boulders.

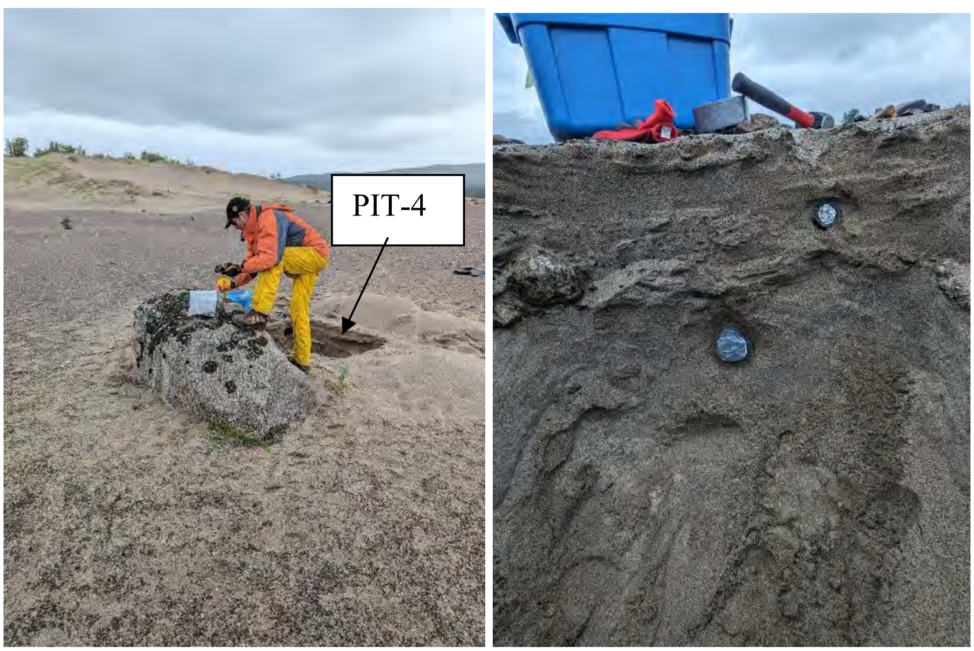

Figure 4: Left, Steve collecting a sample on the top of a boulder for TCN dating and location of PIT-4. Right, View of the two OSL samples collected in PIT-4 within the marine-glacial terrace level.

PIT-5 located in the sand dune is a borehole made at the corner of feature f1 on site HdEh-1 where evidence of human occupation, such as stone flakes and fire-cracked rocks, was found (see figure 1). We collected OSL sample NAS24-08 from within a level of eolian sand (like units 4 and 3 in PIT-2), in a stratigraphic position below the artifacts.

Work was undertaken within feature f5. After improvising a light-blocking “blanket” to work under, fine layers of sand were collected below three boulders. The goal of this sampling was to establish the chronology of the last time the boulders - interpreted as possibly used to hold down the walls of a tent - were moved. The sand samples have not been exposed to light since the boulders were put in place, shielding the sun's rays. Three samples were collected: NAS24-F5-01, NAS24-F5-02, and NAS24-F5-03 (figure 5). Below NAS24-bloc 02, Magali also found a piece of wood and several flakes of green siltstone, that appear to have been protected from surficial processes since the boulder was put in place.

Four fire-cracked rocks were collected from feature f5 for OSL dating: NAS24-F4-M1, NAS24-F4-M2, NAS24-F4-M3, NAS24-F4-M4.

Figure 5: Bags of sand collected below three boulders that may have been part of a tent structure.

Day 5 (August 7) – After David Denton completed a one metre square test excavation in the southeast corner of feature f4, Magali and Steve used the excavation unit to collect three other OSL samples (table 3 and figure 6). We recognized three stratigraphic units in this test excavation. A unit of brown sand with traces of oxidation of gravels and pebbles, from the surface to a depth of 15 cm, was interpreted as the stratigraphic unit corresponding to the human occupation (NAS24-09A and 09B were collected in this unit, see figure 6). Between 15 and 30 cm in depth, orange to light-coloured medium sands were found interstratified with clay horizons. Below, for a thickness of 10 cm, coarse gray sand was found, possibly corresponding to the glacial-marine level (NAS24-10 was collected in this unit).

Figure 6: View of the excavation unit in the corner of feature f4 and location of OSL samples. The stratigraphic units can be correlated with the human occupation.

During the afternoon, we joined the group at the site named Moose Lake (unofficial name) for field reconnaissance.

Day 6 (August 8) – Steve and Magali excavated two boreholes up to 160 cm in depth on the shoreline of Moose Lake. OSL and radiocarbon samples were collected in one of them.

We found three different stratigraphic sequences from top to bottom: terrestrial sediments up to 20 cm with soil horizons in a sandy matrix, a lake environment from 25 to 100 cm in depth with interstratified sands and silts, and a fluvial sequence from 100 to 160 cm in depth with very coarse sands and pebbles. The reason for these borehole investigations was to reach the fluvial sequence corresponding to the paleo-river bed before the river course was deviated and the meander abandoned. The lake then formed in this paleo-topographic depression.

NAS24-11 is an OSL sample collected between 120-127 cm in depth in a layer corresponding to a fluvial unit with very coarse sands and pebbles. NAS24-C11 is an organic-rich bulk sample collected at 21-24 cm in depth and is interpreted to be at the transition level between the lake and terrestrial conditions.

During the afternoon, Magali and Tshiueten Vachon were brought by helicopter to the top of a high ridge to collect TCN samples (figure 7). The reason for these samples is to have a lower boundary in the landscape evolution. We collected striated bedrock (red sandstone, NAS24-BR-01) and erratic boulders (NAS24-EB-01, 02 and 03) to establish the timing of deglaciation at this site, which is necessarily older than the marine-glacial level. It will help our interpretations if we suspect any inheritance in the boulder's TCN concentrations collected at the HdEh-1 site. Indeed, cobbles at the HdEh-1 site may have TCN concentrations similar to this ridge, as the boulders situated on top of the glacial-marine terrace may have been reworked (transported) by the river, by the lake level, or by other surface processes since deglaciation.

Figure 7: Bedrock surface showing traces of glacial striations and crescentic gouging. Erratic boulders situated on top of the bedrock surface were sampled.

Day 7 (August 9) – Natasha, Ariane, and Magali stayed at Châteauguay camp and prepared the samples for cargo transport to Montréal, and then to Geotop at UQAM for further analysis.

Day 8 (August 10) – Steve, Magali, Natasha, and Ariane left the Châteauguay camp by floatplane for Schefferville.

1.3. Next steps

Autumn 2024

- Selection of five samples for OSL dating (first batch of samples – high priority).

Winter 2025

- Chemical treatments of the selected samples and OSL measurements for equivalent doses.
- Preparation of the material for U, Th, and K measurements (gamma spectrometer) to determine the OSL dose rate on all collected samples.
- Sedimentological analysis if needed on some of the samples.
- Fundraising to cover project costs for OSL, ^{14}C and TCN dating (e.g. Alliance program CRSNG).

Spring 2025

- Determination of the ten OSL ages and report with graphical abstract and detailed measurements.
- Selection of five samples for OSL dating (second batch of samples).
- Chemical treatments of the selected samples and first OSL measurements for equivalent doses.

Table 1 : Radiocarbon samples collected during August 2024

Name	Loc name	Depth (cm)	Latitude	Longitude	Unit
NAS24-C1	PIT-2	15	56.58600°N	69.16755°W	Unit 2
NAS24-C2	PIT-2	7	56.58600°N	69.16755°W	Unit 2
NAS24-C3	PIT-2	7	56.58600°N	69.16755°W	Unit 2
NAS24-C4	PIT-2	5	56.58600°N	69.16755°W	Unit 2
NAS24-B1	PIT-2	7	56.58600°N	69.16755°W	Unit 2- BULK
NAS24-C5	PIT1	9-10	56.58620°N	69.16735°W	Unit 2
NAS24-C6	PIT1	9-10	56.58620°N	69.16735°W	Unit 2
NAS24-C7	Sand dune – level N1	4	56.58627°N	69.16780°W	Equivalent to Unit 2
NAS24-C8	Sand dune – level N2	4	56.58627°N	69.16780°W	Level N2

NAS24-C9	Sand dune – level N3	5	56.58624°N	69.16779°W	Level N3
NAS24-C10	Sand dune – level N4	3	56.58627°N	69.16777°W	Level N4
HdEh-1-SA1	Feature f5	1	56.585717°N	69.168092°W	Wood below cobble in feature f5
NAS24-C11	Moose Lake	21-24	56.5878092°N	69.10919°W	Ground level

Figure 8: Level N1, N2, N3 and N4 are rich-organic layers found on the sand dune. N1 is on top and the deepest is N4.

Table 2: OSL samples collected during August 2024

Name	Loc name	Depth (cm)	Latitude	Longitude	Unit
NAS24-01	PIT-2	107	56.58600°N	69.16755°W	Unit 7
NAS24-02	PIT-2	95	56.58600°N	69.16755°W	Unit 5
NAS24-03	PIT-2	47	56.58600°N	69.16755°W	Unit 4
NAS24-04	PIT-2	35	56.58600°N	69.16755°W	Unit 3

NAS24-05	PIT-2	15	56.58600°N	69.16755°W	Unit 1
NAS24-06	PIT-4	40	56.585994°N	69.16886°W	Coarse sand and gravel Glacial-marine level?
NAS24-07	PIT-4	15	56.585994°N	69.16886°W	Medium sand upper section. Glacial-marine level?
NAS24-08	PIT-5	15	56.58611°N	69.16756°W	Eolian sands
NAS24-F5-01	Feature f5	1	56.585714°N	69.168100°W	Below boulder
NAS24-F5-02	Feature f5	1	56.585717°N	69.168092°W	Below boulder
NAS24-F5-03	Feature f5	1	56.585714°N	69.168091°W	Below boulder
NAS24-F4-M1	Feature f4	surface	N/A	N/A	Fire-cracked rock
NAS24-F4-M2	Feature f4	surface	N/A	N/A	Fire-cracked rock
NAS24-F4-M3	Feature f4	surface	N/A	N/A	Fire-cracked rock
NAS24-F4-M5	Feature f4	surface	N/A	N/A	Fire-cracked rock
NAS24-09A	Feature f4	6	56.585722°N	69.16803°W	Human occupation?
NAS24-09B	Feature f4	6	56.585722°N	69.16803°W	Human occupation?
NAS24-10	Feature f4	28	56.585722°N	69.16803°W	Marine-glacial level
NAS24-11	Moose Lake	120-127	56.78092	69.10919°W	Fluvial level

Table 3: TCN samples collected in August 2024

Name	Latitude	Longitude	Lithology
NAS24-CB-01	56.58598°N	69.16869°W	Granite
NAS24-CB-02	56.58633°N	69.16968°W	Granite
NAS24-CB-03	56.58527°N	69.16974°W	Granite
NAS24-CB-04	56.58561°N	69.16859°W	Granite
NAS24-CB-05	56.58611°N	69.16880°W	Granite
NAS24-CB-06	56.58577°N	69.16869°W	Granite
NAS24-BR-01	56.767753°N	69.125003°W	Bedrock - sandstone
NAS24-EB-01	56.76836°N	69.12591°W	White granite
NAS24-EB-02	56.76836°N	69.12591°W	Pink granite
NAS24-EB-03	56.76828°N	69.12589°W	Red sandstone

PART 2: Sample preparation and preliminary dating (March 31, 2025)

2.1. Sample preparation

From the 10 samples collected in the field, a first batch of 5 samples were selected for OSL dating:

a) NAS24-F5-01: collected at the top of the fluvio-marine terrace level, interpreted as a former ground surface exposed to sunlight before being shielded by a boulder moved during human occupation.
b) NAS24-9A: sands interpreted as the top of fluvio-marine terrace deposits (within HdEh-1, Pit 4)
c) NAS24-10: collected in fluvio-marine terrace deposits ((within HdEh-1, Pit 4)
d) NAS24-04: collected within an eolian sand deposition (Pit 2)
e) NAS24-02: collected within a coarse pebbly layer with fines, probably representing the top of the fluvial-marine terrace (Pit 2)

Samples were processed under red light conditions at the Luminescence laboratory LUX (Montréal, Canada). First, samples were retrieved from the sampling PVC tubes or bags. The different size fractions ranging from 63 to 250 µm were obtained through wet sieving. Then, carbonates were removed through HCl treatment and organics through H_2O_2 treatment. To isolate quartz grains from heavy minerals and K-rich feldspar grains, we used density separation with Lithium heteropolytungstate (LST) solutions at densities of 2.67 and 2.58 g/cm^3, respectively.

Afterwards, quartz grains received a bath of 40% HF for 40 minutes to etch the outer rind of the quartz grains and to remove any remaining feldspar. The residual grains were washed in distilled water, and to eliminate potential Ca-fluorides precipitated during HF etching, the samples were soaked in 10% HCl overnight and then sieved at a smaller mesh due to reduction in grain size.

2.2. Luminescence signal measurements

2.2.1. Dose rate measurements

From sub-samples of the sampling tubes or bags, the abundance of uranium (U), thorium (Th) potassium (K) was assessed using neutron activation analysis and radioactive equilibrium is assumed. Elemental concentrations were converted to dose rates using the conversion factors of Liritzis et al. (2013), and appropriate adjustments for grain size attenuation (Guérin et al., 2012; Bell, 1979) and sample water content (Adamiec and Aitken, 1998) (see table 2). Alpha effectiveness (a) is set at 0.1. An internal beta contribution is added to the total dose-rate based on the assumption of 10 to 12.5 % K in our feldspar (Huntley and Baril, 1997). The water content is estimated between 8 and 12 ± 4 %, a value above the measured in situ value but interpreted as an average of the water content over the burial period. Cosmic dose rates were determined based on the present sample depths.

2.2.2. Equivalent dose (De) and IRSL age calculation

IRSL measurements were performed using a TL/OSL-DA-15 Risø reader, with a 90Sr beta source calibrated at 0.098 Gy/sec. A beta source calibration uncertainty of 0.004 Gy was also propagated into the final equivalent dose uncertainty. Blue-violet luminescence emission was detected through a Schott BG39/Corning 7-59 filter combination. Measurements carried out on the Risø reader are from a strong 100 s IR illumination, depleting more than 90% of the signal.

Mounted grains (10 grains/disc) were analyzed following a modified version of the single-aliquot regenerative-dose (SAR) technique first introduced by Murray and Wintle (2000): A pIRIR SAR protocol was used to measure a standard IRSL signal at 50 °C ($IRSL_{50}$), as well as $pIRIR_{225}$ (see table 1). The aliquots used for equivalent dose estimation were selected on the basis of SAR performance quality tests (signal to background ratio of 3:1, and recuperation less than 5%). For every measurement, the same preheat for both dose and test dose was utilized (Auclair et al., 2003; Lamothe, 2004).

Table 1: pIRIR SAR protocol applied in this study

Step	Treatment	Observed
1	Dose	
2	Preheat at 250 °C for 60 s	
3	IRSL measurement at 50°C for 100 s	Ln1/Lx1
4	IRSL measurement at 225 °C for 100 s	Ln2/Lx2
5	Test dose (300 sec)	
6	Preheat at 250 °C for 60 s	
7	IRSL measurement at 50 °C for 100 s	Tn1/Tx1
8	IRSL measurement at 225 °C for 100 s	Tn2/Tx2
9	Return to step 1	

The De of selected grains were then analyzed for the assessment of the total cumulative dose since burial. The final De were obtained following an anomalous fading correction (when measured) using the method of Huntley and Lamothe (2001). The g value used for the fading correction is based on prompt and delayed measurements of multiple grains aliquots. The final equivalent dose was calculated following the Central Age Model (Galbraith and Roberts, 2012) with overdispersion, both were calculated with the calc CentralDose function (Burow, 2019). Dose rates and final age calculations are compiled using the CAM and DRAC R-function (Kreutzer et al., 2019; Durcan et al., 2015). All data and calculations are reported in table 2.

NB: No quartz grains were analyzed as the reader is under maintenance for technical issues.

2.3. Results

Two granulometric fractions were selected (212-180 µm and 180-125 µm) and chemically processed, showing no carbonate or organic contents. The potassium feldspar grains extracted from the sediments only represent between 3 and 6% of the material, in agreement with Stefen's analysis.

At present, only the 180-125 µm fractions were measured. The data show that the $pIRIR_{225}$ signal was not reset completely in the samples before burial. This is in agreement with previous studies that have shown that the IRSL recorded at 50 °C (IR_{50}) signal from feldspar bleach faster than the IR_{225} signals (Thomsen et al., 2008, Buylaert et al., 2011, Buylaert et al., 2012). For this reason, only IR_{50} luminescence data are presented in this report (see figure 1) and ages are calculated using only the first peak in equivalent doses distribution to minimize the effect of poorly bleached grains (as close as a Minimum Age Model, MAM).

2.3.1. Equivalent doses, Central Age Model (CAM) and ages.

NAS24-F5-01 presents over-dispersion of 22.9%, the KDE plot (figure 1a) reveals a skewed distribution toward higher dose values, suggesting that some aliquots may have undergone insufficient bleaching. We estimate a g value of 2.78 ± 0.3%/decade. Taking the first peak in the De distribution (n=20, well-bleached aliquots), we calculate a Central Age Model (CAM) at 9.42 ± 0.29 Gy corresponding to an age of 2,415 ± 130 years.

NAS24-9A presents over-dispersion of 19%, and the KDE plot (figure 1b) reveals a skewed distribution and higher dose values around 14-16 Gy (n=6) that have been not used to calculate the CAM as these aliquots have undergone insufficient bleaching. We estimate a g value of 3.2 ± 0.4%/decade (average value for samples F5-01, 10 and 04 as the fading was not yet estimated). Taking the first peak in the De distribution (n=18, well-bleached aliquots), the CAM is calculated at 10.38 ± 0.36 Gy (n=18) corresponding to an age of 2,560 ± 140 years.

NAS24-10 presents over-dispersion of 34.5%, and the KDE plot (figure 1c) highlights a very scattered distribution and high dose values up to 100 Gy, indicating that this sample contains inherited doses that have been insufficiently bleached by sunlight exposition. We can interpret the distribution as due to inheritance from glacial sources, **with little reworking and minimum sunlight exposition under glacial and fluvial processes**. For this reason, the age reported for this sample may only be considered as a **maximum age** of the glacio-marine terrace. The CAM is calculated at 68.51 ± 4.38 Gy (n=23) corresponding to an age of 23,980 ± 1,980 years. However, this age might be much younger if we consider only the lowest equivalent doses. **<u>Therefore, we do not recommend using this age as a control age.</u>**

NAS24-04 presents over-dispersion of 42.2%. The KDE plot (figure 1d) reveals a skewed distribution toward higher dose values, suggesting that some aliquots (n= 8) may have undergone insufficient bleaching (local reworking of the marine terrace in aeolian deposits by wind?). We estimate a g value of 3.37 ± 0.39%/decade. Taking the first peak in the De distribution (n=16, well-bleached aliquots), we calculate a CAM at 4.66 ± 0.21 Gy corresponding to an age of 1,515 ± 100 years.

NAS24-02 presents over-dispersion of 33.6%. The KDE plot (figure 1e) reveals a skewed distribution toward higher dose values, suggesting that some aliquots (n= 9) may have undergone insufficient bleaching. We estimate a g value of 3.2 ± 0.4%/decade (average value for samples F5-01, 10, and 04 as the fading was not yet estimated). Taking the first peak in the De distribution (n=16, well-bleached aliquots), we calculate a CAM at 10.78 ± 0.40 Gy corresponding to an age of 2,670 ± 150 years.

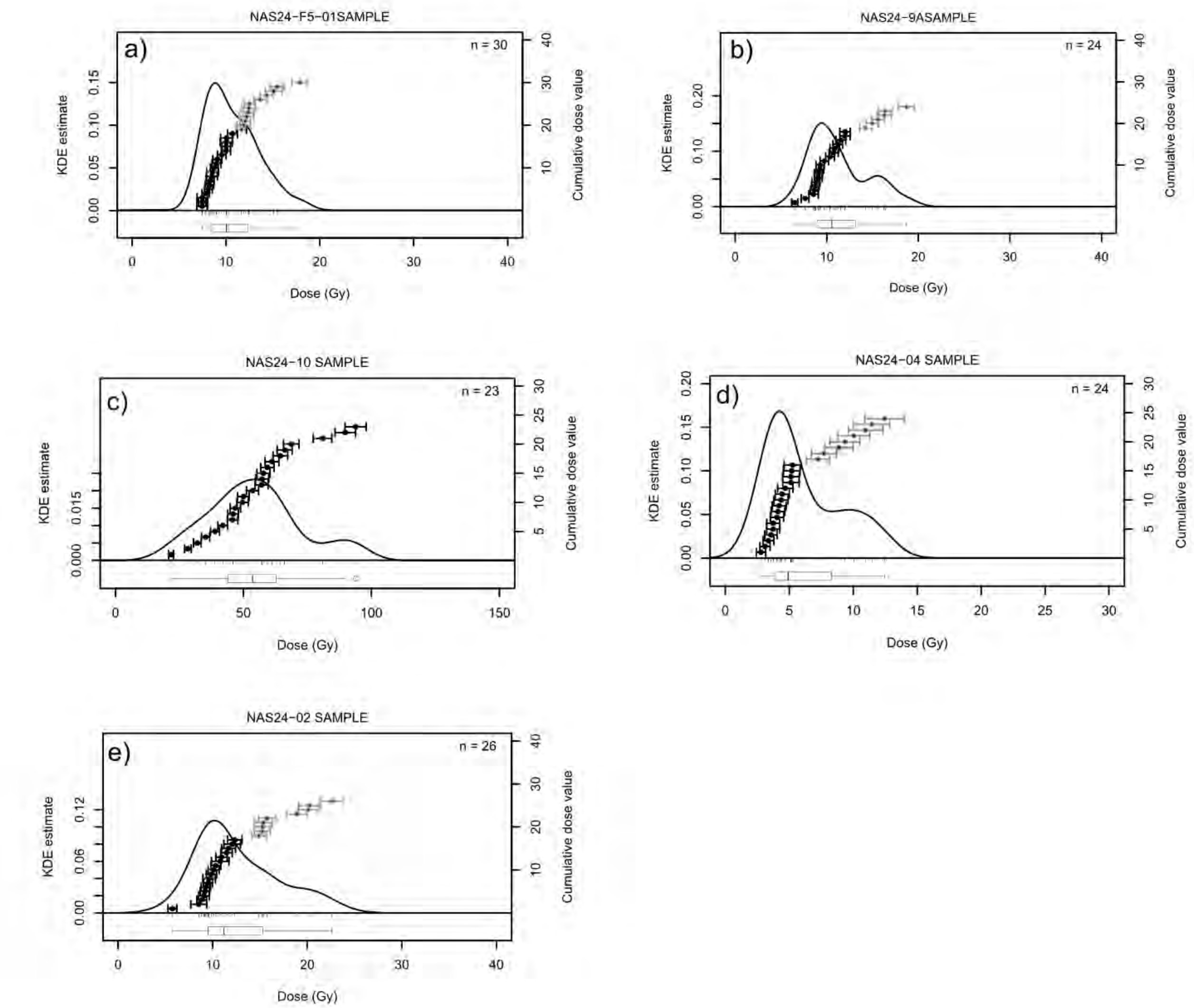

Figure 1: The conventional OSL results are displayed as cumulative distribution plots (KDE). The gray values corresponding to the aliquots were not used for CAM calculations.

2.4. Age Discussions

To summarize, all samples exhibit overdispersion in equivalent dose distributions and are skewed toward higher values, suggesting the presence of unbleached grains or post-depositional processes affecting the units, even in aeolian sediments. Partial grain mixing may occur when sediments are exposed to the subsurface, and the sediment can be reworked or disturbed by post-depositional processes such as rain splash, wind deflation, or bioturbation (disturbance by organisms).

All samples maintain a good stratigraphic order, with the three collected from the top of the fluvio-marine terrace yielding similar ages and elemental concentrations (see table 2),

Sample name	Altitude (m)	Depth (m)	in situ H20 (wt%)	modeled H20 (wt%)	K2O (%)	Th (ppm)	U (ppm)	Cosmic dose rate (Gy/Kyr)	Total dose rate (Gy/kyr)	analyzed granulometric fraction (µm)	g value (%)	Number of aliquots	De corrected from fading (Gy)	IRSL50 age (yrs)
NAS24-F5-01	97	0.01	NA	8 ± 4	2.03 ± 0.05	10.51 ± 0.26	1.85 ± 0.08	0.29 ± 0.03	3.90 ± 0.16	180-125	2.78 ± 0.3	20(36)	9.42 ± 0.29	2,415 ± 130
NAS24-9A	97	0.06	4.89	8 ± 4	2.03 ± 0.05	14.54 ± 0.27	2.34 ± 0.08	0.28 ± 0.03	4.05 ± 0.17	180-125	*3.20 ± 0.4**	18(24)	10.38 ± 0.36	2,560 ± 140*
NAS24-10	97	0.28	3.36	12 ± 4	1.38 ± 0.08	5.56 ± 0.25	2.16 ± 0.05	0.23 ± 0.2	2.86 ± 0.15	180-125	3.62 ± 0.30	20(24)	68.51 ± 4.38	23,980 ± 1,980
NAS24-04	97	0.35	3.37	8 ± 4	0.95 ± 0.08	4.47 ± 0.25	1.93 ± 0.04	0.22 ± 0.02	3.08 ± 0.15	180-125	3.37 ± 0.39	16(24)	4.66 ± 0.21	1,515 ± 100
NAS24-02	97	0.95	4.75	12 ± 4	2.43 ± 0.08	16.60 ± 0.27	1.82 ± 0.04	0.19 ± 0.02	4.04 ± 0.16	180-125	*3.2 ± 0.4**	16(31)	10.78 ± 0.40	2,670 ± 150*

Table 2: Summarized information and Elemental Concentrations for Dose Rate calculation and Equivalent Dose measurements. The in-situ water content is from Stephen Wolfe's report. The total number of measured aliquots are in brackets.

* g-value in italics are the average from analyses made on NAS24-F5-0, NAS24-10, and NAS24-04 samples and IRSL ages are calculated using this value.

while the aeolian sands are significantly younger. Considering the 2-sigma uncertainties, however, no significant age difference (~200 years) is observed between NAS24-02 (depositional unit) and NAS24-F5-01 and 9A (interpreted as a human occupation level).

2.5. Important remarks

1) The ages were calculated using the fading correction measured for sample NAS24-F5-01. However, as g-values may vary between samples, **the reported ages should be considered preliminary.** The g-values for samples NAS24-9A and NAS24-02 will be measured by June 2025, and the ages will be recalculated accordingly.
2) The high Th concentrations in samples NAS24-F5-01, 9A, and 02 are currently under investigation and may impact the final dose rate calculations. We already noticed that **the fraction 600-250 µm only contains ~ 6 ppm of Th.**
3) Additional gamma spectrometry and Neutron activation analysis (NAA) analyses will be conducted between **June and September 2025**, and the ages will be revised based on the new data.

2.6. Next steps

The five remaining samples will be processed in the fall of 2025 **if requested**.

Quartz measurements will be performed during the summer of 2025, as soon as the reader is repaired.

Fire-cracked rock samples could be analyzed, but this depends on securing funding to support a student who can take on this workload.

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C.2 N. Roy, A. Lefebvre, and A. de Vernal: Paleoecological fieldwork to assess the evolution of natural and anthropogenic landscapes in the Cambrien Lake region

Palaeoecological fieldwork to assess the evolution of natural and anthropogenic landscapes in the Cambrien Lake region

Project report

Prepared For

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I. Palaeoecological fieldwork to assess the evolution of natural and anthropogenic landscapes in the Cambrien Lake area

1. The objective

The summer 2024 fieldwork aimed to collect new lake sediment and peat cores to document past climate and environmental changes using different proxies (e.g., pollens, spores, macro remains, charcoal, organic carbon isotopes, etc.). Multiproxy analyses will be carried out to provide insight into the long-term development of terrestrial and aquatic ecosystems in the vicinity of archaeological site HdEh-1, and to better understand the context of climate and anthropogenic changes in the region. The analyses of lake sediment and peat cores have two primary objectives: (i) to reconstruct the environmental and climatic conditions of past millennia, thus providing information on the ecological context in which the Naskapi Nation lived, and (ii) to investigate the interactions between human activities and ecosystem evolution.

2. Study sites

2.1 Peatland

A peatland located 1.15 km northwest of the archaeological site HdEh-1 was sampled to obtain local information about vegetation and climate changes. Anaerobic environments, such as peatland, are known to be favourable for preserving plant remains. The peatland covers an area of approximately 0.09 km2 at about 112 m asl (table 1; figure 1). The sampling was carried out using a Russian peat corer to extract a long core and a shovel to collect a monolith (a surface peat block). The core and monolith were described in terms of stratigraphy and pedology. They will help document the natural history of the local vegetation and the hydrological conditions of the last millennium, and to distinguish any anthropogenic impact on the environment.

Table 1: Lakes and peatland sampled during the summer 2024 fieldwork

Name	Elevation (m)	Water depth (m)	Latitude	Longitude	Core length (cm)
Peatland	112	NA	56°35'33.4"N	69°10'59.1"O	135
Moose Lake	83	2.2	56°46’54.6"N	69°06'37.8"O	50
Kettle Lake	88	4.8	56°37'44.1"N	69° 8'27.7"O	30

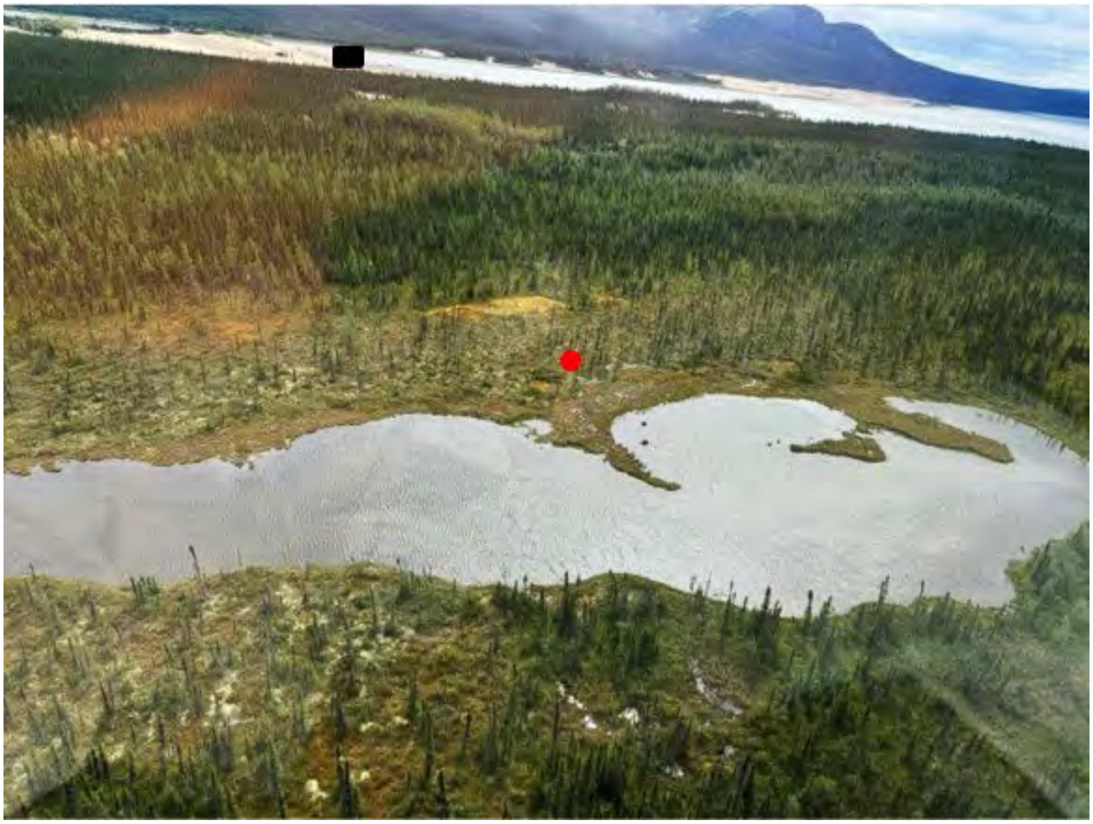

Figure 1: Peatland near archaeological site HdEh-1. The location of the peatland sampling site is indicated by a red dot and the archaeological site by a black square.

2.2 Moose Lake

Moose Lake was informally named after the moose footprints that were seen around the lake during fieldwork. Moose Lake is 22 km north of archaeological site HdEh-1 and about 83 m asl (table 1). It is a small lake with a rectangular shape, 190 m long and 80 m wide (figure 2). The Moose Lake sediment core was extracted using a percussion corer from an inflatable boat.

2.3 Kettle Lake

Kettle Lake was informally named based on its geomorphology (figure 3). Kettle Lake is 4.8 km northeast of the site HdEh-1 and about 88 m asl (table 1). It is a small lake with a round shape, 100 m long and 100 m wide. A sediment core about 30 cm long was extracted at a depth of around 4.8 m (figure 6). The Kettle Lake core was extracted using a percussion corer from an inflatable boat. The sediment consisted mainly of sand, so we wrapped the core in a black bag to protect it from light rays to test OSL dating on lake sediments with Magali Rizza.

Figure 3: Moose Lake.

Figure 3: Kettle Lake. Ariane holds the core vertically until the zorbitrol fixes the sediment while Tshiueten and Jaylen gather the equipment.

2.4 Paleosol exposure at the HeEg-8 site

Two cores were collected at the HeEg-8 site, where a paleosol is exposed. The two cores were collected about 20 m apart along a trench section (figure 4). They are about 60 cm in length and were extracted at about 92 m asl (table 2). The core NAS24-T1 was collected about 5 m from an exposed paleosol, and the core NAS24-T2 was taken ~ 50 cm on the northeast side of the paleosol.

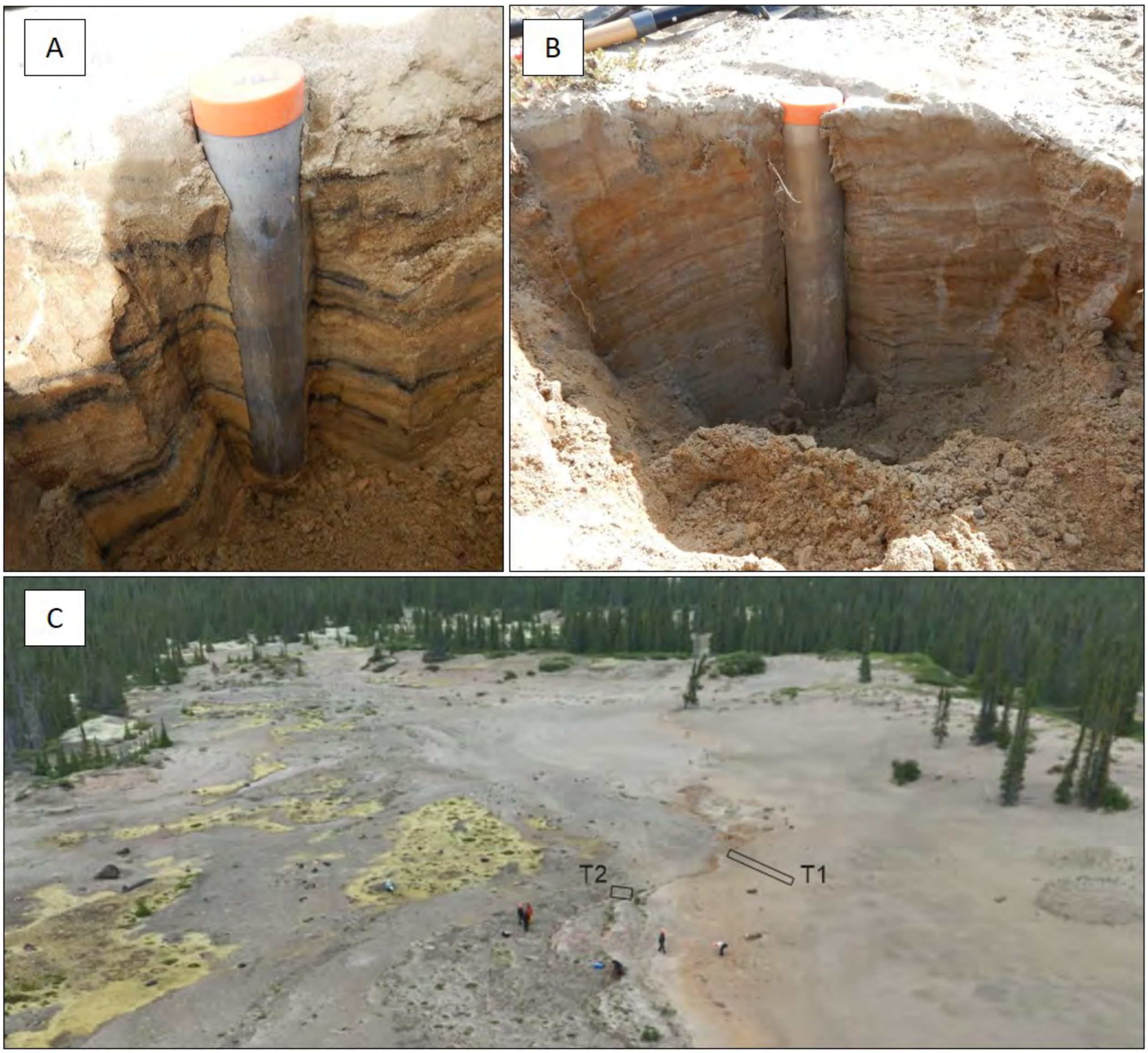

Figure 4: Trench section across the paleosol exposure at the HeEg-8 site: A) NAS24-T1 core, B) NAS24-T2 core, and C) trench section illustrating the location of the cores NAS24-T1 and T2 (Photo: Stephen Wolfe).

The core NAS24-T2 contains five or six distinct charcoal layers. Radiocarbon dating of these layers, coupled with the analysis of the macrofossils will contribute to documenting the wildfire dynamics in the region over the past.

Table 2: Sediment cores sampled in a section at site HeEg-8 during the summer 2024 fieldwork

Name	Elevation (m)	Latitude	Longitude	Core length (cm)
NAS24-T1	92	56.784850	-69.105693	60
NAS24-T2	92	56.784985	-69.106120	60

3. Methodology

To study and document environmental and climatic change, including the relationship between humans and their environment, the most appropriate means is to use a cross-sectional, diachronic, and multiscale approach. In this study, which aims to reconstruct the evolution of the landscape in the Lake Cambrien region that has been affected by climate and anthropic action, combining paleoecological tracers, stable isotope geochemistry and archaeology is highly relevant.

3.1 Paleoenvironmental and paleoclimatic reconstruction of the Lake Cambrien region

In this study, the paleoecological tracers to be used are the macrofossil remains, including plant and charcoal, and the spore and pollen assemblages. Their analysis will enable us to document the history of vegetation and reconstruct the climatic, hydrological and anthropogenic fluctuations that have affected the study sites. It is often difficult to disentangle climatic from anthropogenic factors. Harsh climatic conditions (e.g. severe cooling) may cause a gradual degradation of the ecosystem, whereas anthropogenic activity, albeit for a short time (e.g. excessive drainage of a peat bog), can cause a significant and sometimes irreversible transformation of the environment. This transformation is generally visible as a sudden and significant change in plant biodiversity following the disturbance of an environment.

The use of macrofossils, in addition to spore and pollen, will permit the documentation of the climatic and environmental changes that have taken place in central Nunavik over the last millennia.

3.1.3 Macrofossil analysis

This analysis will be conducted on the peat core and the monolith. They both come from the exact sampling location. The core was extracted 30 m from the edge of a small pond that characterizes the centre of the peat bog. The core is 135 cm long (table 1). The monolith consists of a 24 cm long peat block. It allows for the collection of a larger volume of sediment. Analyzing macrofossils involves identifying and counting the fossilized pieces in the sediments, such as seeds, leaves, needles, cones, twigs, etc. It is used to reconstruct the temporal evolution of local vegetation. The treatment and analysis of the samples will be carried out according to the method of Bhiry and Filion (2001). The samples were cut into 1 cm thick slices. From these, approximately 5 cm^3 will be taken and brought to a boil for 2 or 3 minutes in a solution consisting of 200 ml of water and 50 ml of 5% KOH. This treatment allows the deflocculation of organic matter and facilitates the observation and identification of macrofossil pieces. The samples will then be rinsed and sieved through a column of three mesh sieves of 850, 425, and 180 µm and stored in a cool place, protected from light until the analysis step. The identification of fossil specimens will be performed under a binocular microscope with a magnification ranging from 16x to 40x. The remains of brown mosses and *Sphagnum* will be identified at the species level using an optical microscope based on identification guides (Montgomery, 1977; Crum and Anderson, 1981; Porsild and Cody, 1979; Ireland, 1982; Blondeau and Roy, 2004). Charcoal will also be counted. Ohlson and Tryterud (2000) demonstrated that charcoal particles ≥ 0.5 mm ($\geq$ 500 µm) in sediment samples tend to be of local origin due to the limited transport of large particles.

3.1.3 Pollen and spore analysis

Pollen and spore analysis will be conducted on the peat et Moose Lake sediment cores. The Moose Lake core is about 50 cm long and was extracted at a depth of around 2.2 m. Pollen and spore analysis involves the systematic count of pollen grain and spore taxa in a series of samples from a lacustrine or peat sedimentary sequence to reconstruct the history of local and regional vegetation. Following the method of Faegri et al. (1989) and Lavoie (2001), the chemical treatment of the samples is made on 2 cm^3 taken at 2 cm intervals for the peat and at 1 cm intervals for the lake sediment core. The treatment involves the destruction of organic sediments and minerals using acids and bases to extract the pollen grains and spores. After the treatment, the residue is stained with neutral red and mounted between a slide and a cover slip. The identification and count of the pollen grains and spores is carried out under an optical microscope at a magnification of 400×. A minimum of 300 pollen grains from vascular plants is usually counted. The identification is based on the reference collection from the Laboratory of Micropaleontology and Marine Palynology and the literature (Richard, 1970; McAndrews et al., 1973).

3.1.4 reconstruction of climate parameters using pollen date

Climate parameters will be reconstructed using the Modern Analogue Technique (MAT), which is based on the similarities between fossil and modern assemblages (e.g., Guiot et al., 1989; Fréchette et al., 2008). The MAT calculations will be conducted using the Bioindic package, a freeware statistical tool for analyzing ecological and paleoclimatological indicators, in the R software environment (version 3.5.3), a platform for statistical computing and graphics (http://cran.r-project.org/). The climate parameters to be reconstructed include July and January temperatures, total annual precipitation, and summer sunshine. These parameters have been identified as key determinants for the distribution of vegetation and pollen assemblages across the Boreal, Subarctic, and Arctic biomes of North America and Greenland (cf. Fréchette et al., 2008).

3.1.5 ^{14}C dating

Radiocarbon dating of plant remains and charcoal is employed to establish the chronology of environmental and climatic changes, as well as to identify forest disturbances, including wildfires. To date, six samples have been submitted to the André E. Lalonde Accelerator Mass Spectrometry (AMS) Laboratory (table 3). Of these, three samples come from the peat core, and two come from buried organic matter deposits located near the archaeological site HdEh-1 in stratigraphic cuts C1 and C4 (see Rizza's report). The last submitted sample comes from a buried organic matter deposit at the NAS24-C11 site 7 (see Rizza's report). The samples were previously cleaned of recent material to avoid contamination by contemporary organic matter. The CALIB 8.2 software and the IntCal20 database (Reimer et al., 2020) were used to determine the probability distributions for each of the 14C dates (± 2σ). The median of the probability distribution was selected as the calibrated date. Calibrated ages (cal BP) were rounded to the nearest decade.

Table 3: Radiocarbon ages from Lake Cambrien sites, calibrated with the IntCal20 calibration curve (Reimer et al. 2020) using Calib software version 8.2.

Site	Sample	Lab. number	Age (BP)	Age (BCE/CE)*	Age (cal BP)*	Calibrated (cal BP)	Dated material
Peatland	LC 20-21cm	UOC-27929	645 ± 20	CE 1360-1390	560-600	590	Charcoal*
	LC 70-71cm	UOC-27930	2490 ± 15	BCE 650-540	2490-2600	2580	Charcoal*
	LC 134-135 cm	UOC-27931	3600 ± 20	BCE 1980-1890	3940-3970	3910	Charcoal*
HdEh-1	NAS24-C1 Pit2	UOC-27932	370 ± 15	CE 1460-1520	430-490	450	Wood charcoal
	NAS24-C4 Pit 2	UOC-27933	330 ± 15	CE 1540-1600	350-310	380	Wood charcoal
NAP24-04	NAS24-C11 site 7	UOC-27934	940 ± 15	CE 1060-1160	790-890	850	Charcoal*

Age: The ages were calibrated using 2-sigma*
Charcoal: spruce needles and leaves*

3.1.6 Geochemistry and stable isotopic composition analysis

The Moose Lake sediment will be analyzed for its geochemical content. The study parameters will include the weight percentage of total nitrogen (%Ntot) and the organic (%Corg) and inorganic carbon (%Cinorg) fractions of total carbon (Ctot), and the carbon isotope composition of Corg (δ13Corg).

The stable isotopes of organic carbon yield information on the nature of organic matter, with values that depend upon the type of plants, carbon cycling dynamics, microbial activity and climate conditions (e.g. Rao et al., 2017).

3.1.7 To do - densitometry analysis (CT-scan) and Itrax core scanner

Radiographic and high-resolution chemical analyses of three sediment cores were conducted at the CT Scanning for Civil Engineering and Natural Resources Laboratory, and the Geochemistry, Imaging, and Radiography of Sediments Laboratory, both situated at the Institut National de la

Recherche Scientifique – Eau, Terre et Environnement, Québec.

The operating principle of the Itrax core scanner is based on the simultaneous acquisition of microvariations in density (micro-radiography) and chemical composition (micro X-ray fluorescence) of the sample using two distinct X-ray radiation detection systems. Thus, the ITRAX enables the acquisition of high-resolution geochemical data and radiographs from sediment cores without losing or destroying the material being analyzed. This information is a prerequisite for describing the lithostratigraphy and documenting the depositional environment of the collected sediment.

The Moose Lake core, along with the two sediment cores NAS24 T1 and T2, were initially scanned using CT imaging to generate a 3D radiograph of the analyzed cores (figure 5). Following this, the cores were sectioned longitudinally. One half was preserved as a sedimentary archive, while the other half will be used for the subsampling of sediment for further analyses including pollen, macrofossils, stable isotopes, and dating. The cores underwent Itrax analysis at a resolution of 1 mm. The results will be processed and analyzed during the summer of 2025.

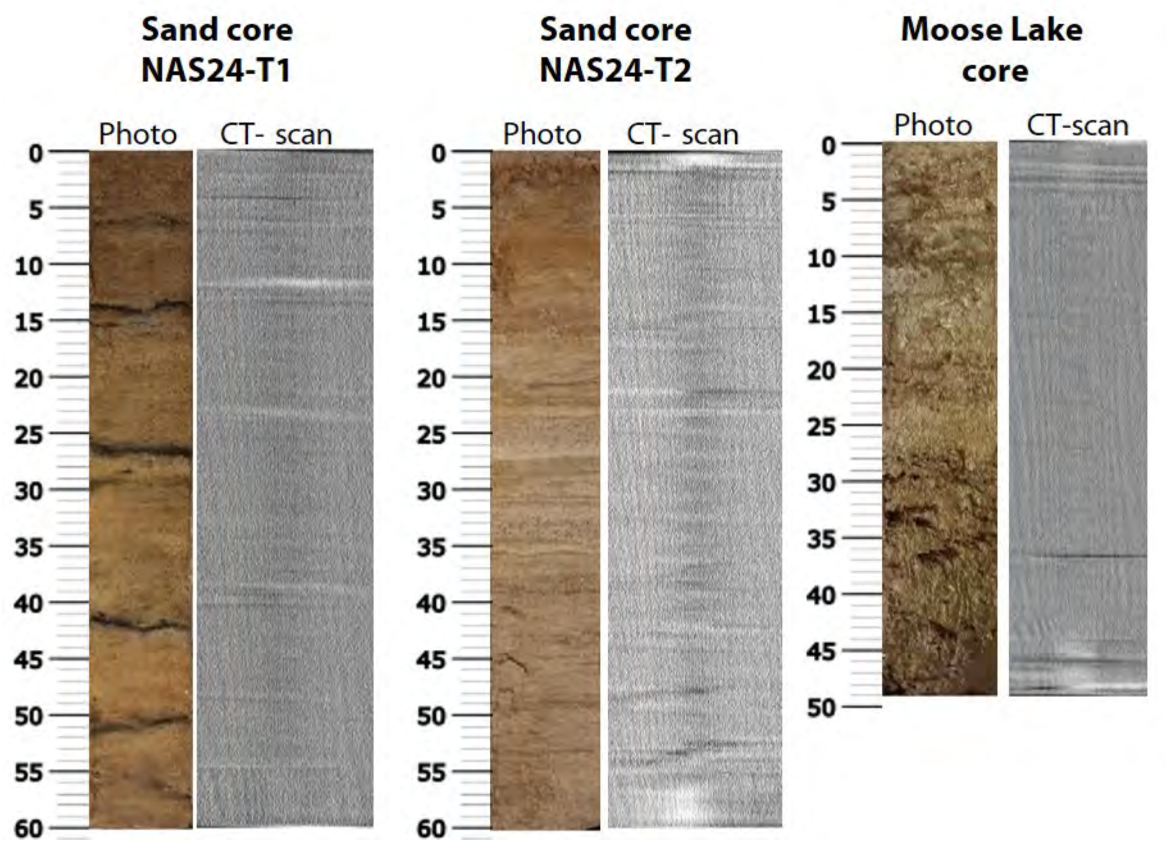

Figure 5: Pictures and radiographs of the cores that have been processed and analyzed at the CT-scan and Itrax

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C.3 S. Wolfe: Surficial geology and depositional environments

Protecting the Cambrien and Nachicapau Lakes Area
Naskapi Archeological Project - 2024 Field Season

Surficial geology and depositional environments (Final Report)

Stephen Wolfe
Natural Resources Canada, Geological Survey of Canada

PART 1: Interpretation of geomorphic events related to site HdEh-1, Caniapiscau River (September 22, 2023)

1.1. Active dunes and river regime changes

The Caniapiscau River flows northward from Cambrien Lake to Shale Falls, and onward to the confluence of the Swampy Bay River. At Cambrien Lake, the river surface elevation is ~ 82 m asl and remains at that elevation until Shale Falls, where it drops by ~ 22 m to an elevation of ~ 60 m. This is a significant change in surface elevation.

Several active dunes and stabilized fields reside along the Caniapiscau River, between Cambrian Lake and Shale Falls, south of the Swampy Bay (Fig. 1). At the northern outlet of Cambrian Lake, two active dune fields occur along the eastern and western shorelines of the river, respectively. These are at locations where the lake outlet constricts with the continuation of the river (Fig. 1A). The active dunes are migrating towards the north-northeast, with parabolic dune crests and bare sand sheets. The western dune field includes the location of the archaeological site HdEh-1, with fire-cracked rock features, stone axes, and chert tools and flakes that have become exposed by wind erosion. Each of these active dune locations represents alterations in the river flow regime, and locations of localized sediment erosion and deposition. The dunes themselves, appear to reside on former marine terraces at elevations of about 98 and 100 m asl, respectively (Fig. 1A). Thus, the surface of these terraces is ~ 16 to 18 m above the present-day surface height of the river at these locations.

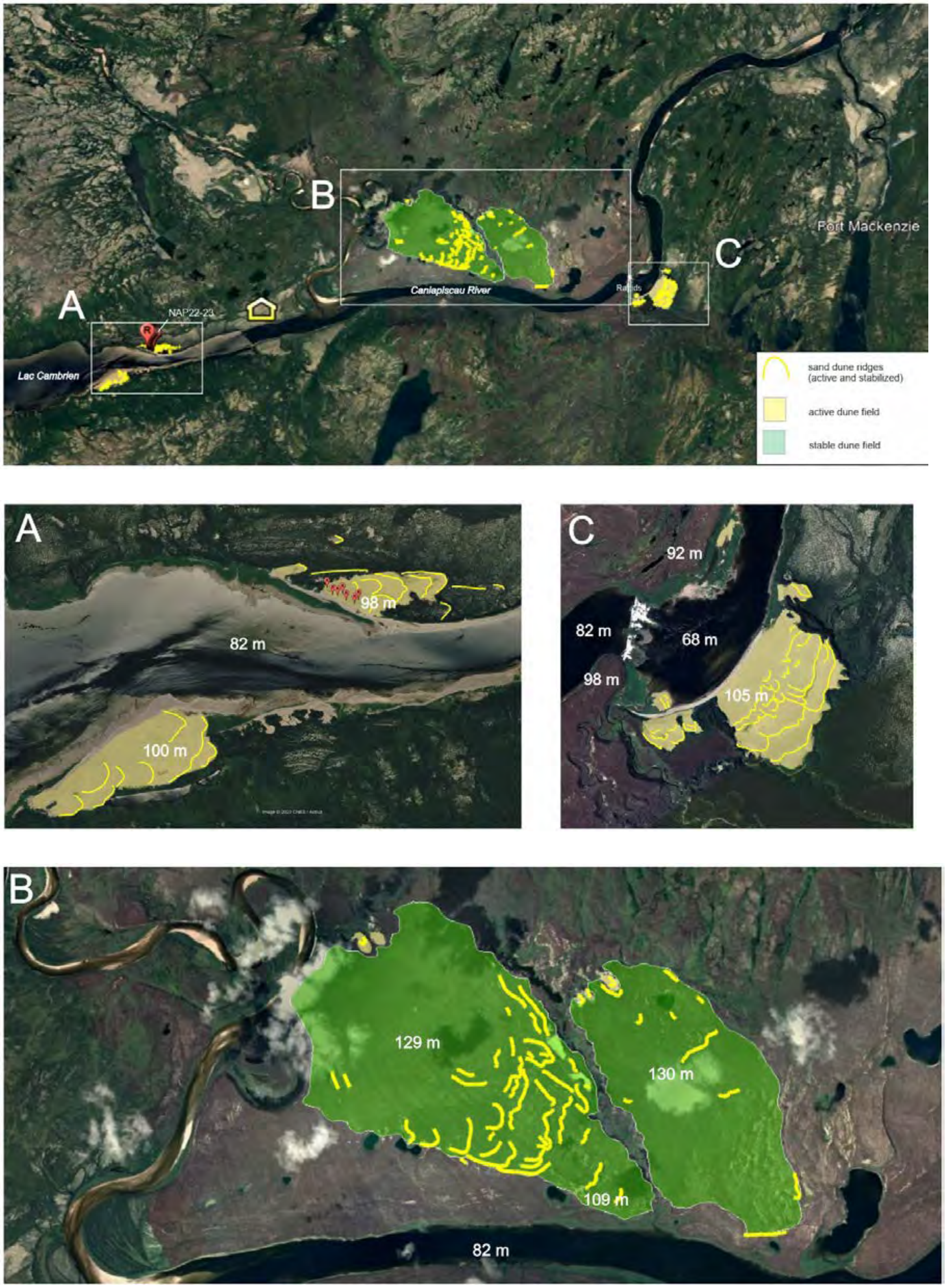
About 21 km to the north, just beyond Shale Falls, a third area of active dunes occurs on the eastern shoreline where the river bends sharply towards the west (figure 1C). This occurs immediately downstream of Shale Falls, where the surface river elevation drops from ~ 82 m asl to ~ 60 m asl. Exposed bedrock on the east and west side of the falls attains elevations of ~ 98 and ~ 92 m asl, respectively, and elevated exposed bedrock is also present at the falls. This area represents another significant location where embankment erosion by the river occurs on the outward (eastern) side of the bend, with deposition on the inward (western) side of the bend.

All of these locations of active dunes appear to represent significant modern points of erosion and may reflect recent river flow regime changes. The active dunes at these locations appear to represent source-bordering dune fields where recent erosion of the river shoreline and marine terraces provide sediment sources for eolian transport and deposition.

1.2. Stabilized dune fields and incised streams

In addition to the active dune fields noted above, a large area of stabilized dunes occurs on former marine terraces on the western side of the river between 3 and 10 km south of Shale Falls (Fig. 1B). The surfaces reside at ~ 130 m asl, with lower portions at ~ 100 m asl. They are separated by a deeply incised tributary stream, which flows into the Caniapiscau River. The incised stream includes recent and modern meanders, depositional sand bars, some active sand dunes, and an active delta at its mouth with the Caniapiscau River, indicating considerable sediment flux. Stabilized parabolic dune crests are evident on the terrace surfaces. The dunes here have migrated to the east and northeast, and their transport direction may be controlled, in part, by the valley configuration. The more northern stabilized dune field includes an intriguing surface topography, which appears to show incised stream valleys that have been subsequently partially infilled to become an eolian sand sheet (Fig. 3C). This indicates that the eolian sand deposition postdates the stream incision.

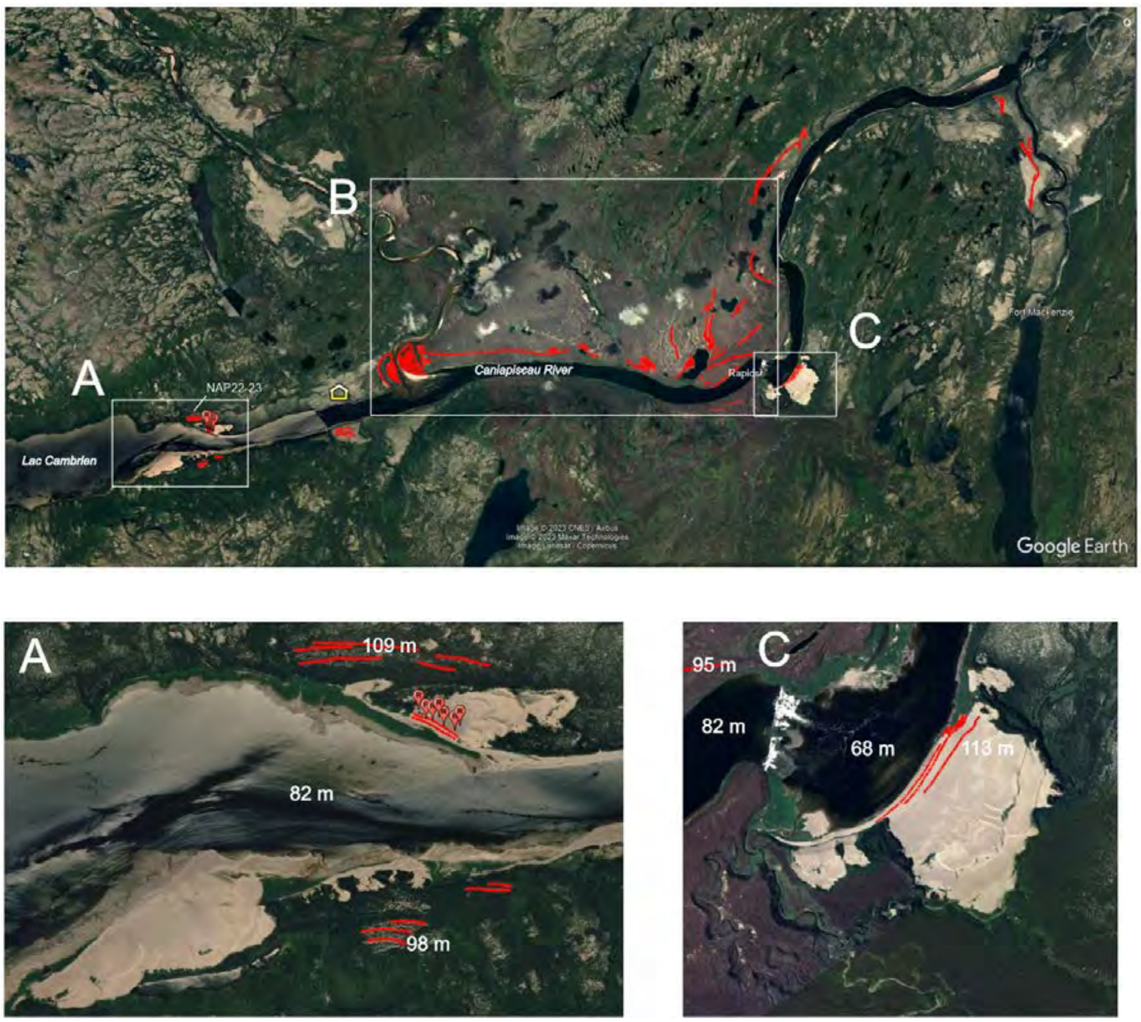
Figure 1. Active and stabilized dune fields along the Caniapiscau River. Insets show locations of active and stabilized dunes with elevations above sea level.



1.3. Raised shorelines

Throughout this stretch of the Caniapiscau River, higher level shorelines, mostly related to former river elevations, are evident from ~ 130 m asl to the modern river level (Fig. 2). This includes river shorelines residing both above and below the active dunes near the outlet of the Cambrien Lake (Fig. 2A). These shorelines record a history of declining water (marine and river) levels in this area, in addition to providing some insight into the former river channel configuration and routing. Other shorelines are noted both in the area of the stabilized dunes (Fig. 2B) and the active dunes north of Shale Falls (Fig. 2C).

Figure 2. Raised river shorelines indicating higher elevations and past configurations of the river. Red lines denote step changes on raised river terraces.



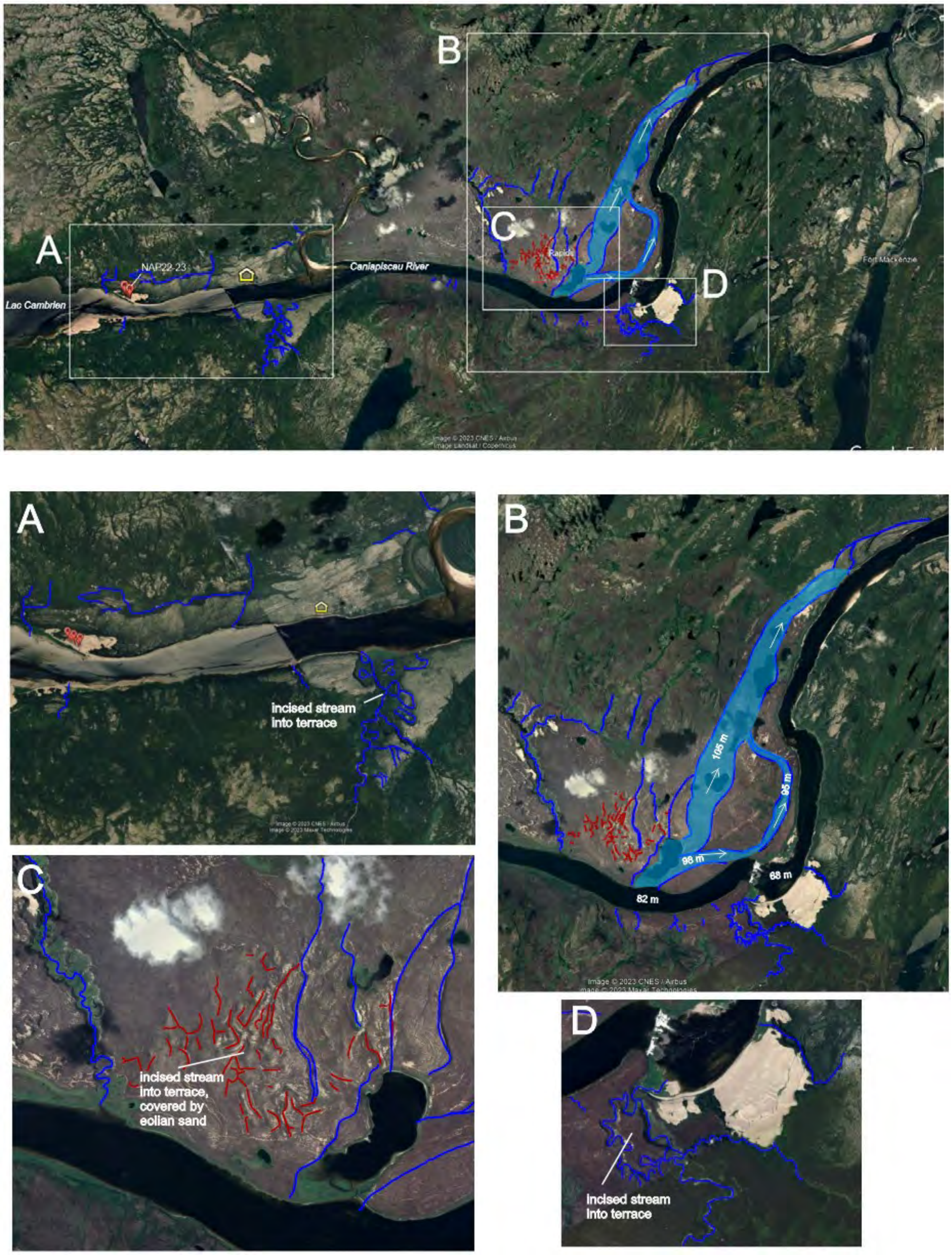
1.4. Modern and former stream channels

In addition to the raised shorelines, evidence of former and modern stream and river channels exists in the area, which is likely related to lowering of the river base level in this region (Fig. 3). For example, marine terraces show evidence of deep stream incision (Fig. 3A) that has occurred as the river base level has declined. Other streams have become blocked by eolian sand, which has blown into the stream catchment areas, and partially dammed the surface flow of water (Fig. 3A).

Most pronounced, however, is the apparent change in stream course of the Caniapiscau River, south of Shale Falls. Former shorelines (Fig. 2B) appear to indicate that the river previously turned westward, prior to the erosion and formation of Shale Falls, which would not have existed at that time (Fig. 2B). Evidence for a higher surface elevation of the river is apparent from shorelines when the river had an earlier course. It is possible that this higher surface river elevation corresponds to the timing of occupation of the marine terrace at HdEh-1, which is ~ 16 to 18 m above the present surface elevation.

Several other incised streams are also evident. For example, an incised stream immediately north of Shale Falls (Fig. 3D) and north of Cambrian Lake on the eastern side (Fig. 3A). In addition, as noted earlier, it appears that a set of incised streams were subsequently partially infilled by eolian sand on the western side of the river (Fig. 3C).

Figure 3. Interpretation of former river courses of the Caniapiscau River, and locations of the incised streams along the river (blue lines) and stream channels covered by eolian sand (dark red lines).



1.5. Interpretation and summary of events

Based on the geomorphologic mapping and interpretation, it appears that the active dune fields along this section of the Caniapiscau River are likely the result of sediment supply from the marine terraces, which were then made locally available by river erosion at these specific locations. This has been the result of river level lowering, incision, and changes in river course configuration.

An hypothesis of the sequence of events relative to former river/marine level can be inferred as follows.

River/marine levels at HdEh-1:

- 130 m asl: Post-glacial marine valley inundation.

- 130 to 100 m asl: Valley marine/fluvial terraces deposited / exposed with lowering of marine levels. Surfaces were probably vegetated during or soon after terrestrial exposure. Some surfaces may have been wind eroded, but this does not appear extensive as many terraces do not seem to have stabilized dunes on them. Surfaces may be armored with coarse sediments. Human occupation of the terrace deposit at HdEh-1 may date to this period when water/river levels were near the height of the terraces at ~ 100 m asl. The Caniapiscau River does not appear to have flowed over Shale Falls at that time.

- 100 to 82 m asl: River level falls abruptly with alteration in river course and flow over Shale Falls, resulting in a rapid lowering in the base level. Stream incision occurred rapidly into marine terraces. Localized sources of sand became available along valley sides with exposed sediments in sections and on the valley bottoms. Wind erosion, with flow acceleration over steep slopes and valley sides, results in source-bordering sand dunes that originate from alluvial sediments and exposed marine deposits. The sand dunes that formed migrated over marine terraces and locally eroded these surfaces. In some areas, incised valleys became partially infilled by eolian sand. In other areas, where river erosion continues to modern times, active sand dunes remain. In these areas, sediment on marine terraces can be eroded down to create a lag deposit of coarse sediment. These areas include the outlet of Cambrien Lake and downstream of Shale Falls.

Under this interpretation, active and stabilized dunes have likely formed under modern and late Holocene wind regimes, and not related to winds associated with glacial ice. Locations of active dunes are most likely related to high sediment supply related to erosion and deposition by fluvial process (i.e., the Caniapiscau River and small tributary streams incised into marine terraces. Dune migration is probably related to localized wind acceleration and directions affected by river valley configuration and airflow over raised terraces.

1.6. Evaluation of events using chronological methods

In order to evaluate the sequence of geomorphic events, including the timing of fluvial base-level reduction, human occupation at HdEh-1, and eolian activity, both optical stimulation luminescence (OSL) dating and radiocarbon dating could be applied in the study area.

Direct dating of site HdEh-1 using radiocarbon methods would be the most preferred technique. If possible, dating of charcoal remnants within burn hearths would be a preferred method. If hearths are clearly distinguishable, but charcoal remnants are not available, then consideration could be given to dating of fire-cracked rock or sediment using thermoluminescence dating. Lastly, it may be possible to date this site using OSL dating, though this runs the risk of either dating terrace sediments that either pre-date the occupation site (and that may not be well-zeroed by sunlight exposure) or eolian sediments that post-date the occupation. If OSL dating were utilized, a number of samples for dating would be recommended in order to bracket the period of occupation.

Given the hypothesis presented, that both abandonment and eolian activity at the site was potentially the result of a rapid drawdown in river base level caused by fluvial erosion and formation of Shale Falls, then additional dating focused on bracketing the timing of this event would be advantageous for context. In this case, it is recommended to focus dating both on former river terraces and on terrestrial (organic) development on former river sediments. In particular, OSL ages should be obtained from sediments that represent fluvial deposits on terrace steps at elevations above and below the terrace elevation of HdEh-1 (i.e., ~ 98 m asl). Terraces marked in red in Figures 1A-D denote potential locations for dating. In particular, these should include terrace steps in Figure 1A, which are located at elevations ~109 m asl near HdEh-1 and terrace steps located at 98 m asl across the river from HdEh-1. In addition, an effort should be made to date the timing of when the Caniapiscau River flowed through the former channel, prior to cutting the channel that now flows across Shale Falls. This could be done using OSL dating of terrace steps ranging in elevation from 125 to 108 m asl along the former channel (Fig. 2A) or, alternatively, by obtaining basal organic ages in organic deposits that overlie the fluvial channel deposits in the former river bed.

1.7. Background and Context (based on Vallée et al. 2023)

Low-lying terraces along the Caniapiscau River are considered to be of marine origin, deposited during post-glacial marine incursion into north-central Quebec as a result of isostatic depression resulting from glacial loading. The morphology of the raised terraces appears typical of marine terraces in the region. Raised beaches present in this area, which form a canvas typical of marine littoral forms. The maximum elevation of marine invasion into Caniapiscau River valley is about 175 m asl.

The terrace located at sites HdEh-1 and HdEh-2 resides at elevations of only about 20 m above the modern river level (82 m asl) and, consequently, may have formed late in the period of post-glacial inundation. The steep slope on the east side of the terrace suggests erosion by the Caniapiscau River. Terraces and beach bars at elevation of about 90-100 m asl for the lowest relatively continuously observable paleo- shore cluster in the valley before falling to the level of the modern fluvial terraces associated with the the current drainage network; the river currently residing at about 80 m asl upstream of Shale Falls and 70 m downstream.

The age of these raised terraces in the 90-100 m range may correspond to an isostatic depression dating to about 5-6 ka. The occupation of the archaeological site post-dates the formation of the terrace.

Questions remain regarding to the association between the dunes and the archaeological site. Active and ongoing wind erosion has eroded the site. It might appear that the site was never colonized by vegetation, which might otherwise have inhibited the formation of dunes, which are still active today. Nevertheless, the absence of trees at this location is intriguing, especially as they occur everywhere else in the Caniapiscau valley. Could deforestation have contributed maintaining wind erosion at this location? Occupation sites may have chosen sites where there were openings in the vegetation, which could have been increased during occupation. Consequently, could other bare sites, such as the terrace east of the waterfall at Shale Falls (CAMB14) have also been occupation sites. Alternatively, these poorly-vegetated sites could reflect locations where the erosion of the slopes on the edges of the terraces was more marked, making the sites unstable and less hospitable for vegetation.

It is thought that, as soon as the terraces emerged from the water, wind processes should have been active. The context of deglaciation suggests that the winds were most likely greater throughout just at the time of the exposure due to the proximity and the importance of the masses of ice residual that should still be present in the territory. The ice fed the formation of high pressure which then generated strong winds. As the glacial retreat (and the decrease in ice masses), the importance of wind remobilization must have subsided. So, although the dunes are not fixed today, most of their formation/migration happened a while ago and would have slowed down thereafter.

Note by S. Wolfe: However, if these terraces formed at about 5-6 ka, then there would have been no residual ice at that time and the winds then may have been essentially identical to modern-day winds. The above statement would only apply to old terraces at higher elevations.

It is conceivable that the first occupants initially deforested the site in order to settle there, which may have initiated aeolian processes. Many dunes are noted elsewhere in the region and, thus there was most likely a period when the wind processes were very strong at a time after the abandonment of the terraces by the sea and the arrival of vegetation.

Various chronological methods could be used to date events in the region. The age of terrace formation could be determined by cosmogenic dating of large blocks on the terrace. An age at site CAMB14 should be returned very soon. This method could be applied to the pebbles that form the reg, so as to refine the maximum occupancy limit. The dune could be dated by optical luminescence. Note that the challenge here would be to retrieve a sample that represents the earliest onset of eolian erosion and dune formation, as opposed to a relatively modern age. Organic material could be retrieved from the dune, or archaeological site, or a soil. Dating by thermoluminescence of fire-cracked stones or hearths could also provide an age. Bog samples for radiocarbon dating may also provide contextual information.

PART 2: Activity Report, Cambrien Lake paleoenvironmental investigations (October 31, 2024)

2.1. Objective

The objective of the field work was to describe the geomorphic settings related to the periods of occupation along the Caniapiscau River region and Cambrien Lake. In addition, to document the sedimentary deposits associated with occupation sites and provide chronological context through dating via optical stimulation luminescence and radiocarbon methods. Other objectives were to assist in the collection of cosmogenic nuclide dating sampling and in interpretations of settings associated with these and other deposits.

2.2. Background

The Cambrien Lake area was glaciated by the Laurentide Ice Sheet. Glacial landforms including drumlins, moraines and streamlined bedrock surfaces are indicative of glacial ice flow in the region. In addition, glaciofluvial deltas (i.e., sorted sand and gravel deposits associated with glacial meltwater), including outwash plains, are abundant on plateau areas and within river valleys, including the Caniapiscau. The modern Caniapiscau River channel contains abundant sandy deposits along the river margin and shoreline that form large sand bars. In addition, raised sandy terraces are abundant within the valley, described previously as marine terraces. At one time terraces were a part of the sandy river/marine shorelines when water levels were higher. As such, they represent an analogy to the modern sandy bars that presently occur at river level.

2.3. Fieldwork

Fieldwork was conducted over an eight-day period between August 3 to 10, 2024.

Day One – first reconnaissance visit to site HdEh-1. Traversed dunes to examine morphology and to examine sediments and the surface of the “marine terrace” on which occupation sites reside. Surface is mostly wind-eroded with a lag of coarse sediments signifying denudation of overlying sediments. Larger boulders are eroded on the windward side but remain uneroded on the protected side. Stones and cobbles associated with occupation sites tend to reside higher than other sedimentary debris. This might suggest less erosion at these sites than on the broader surface or that the occupational debris was placed onto the surface, rather than residing within it. The site area contains an exposed paleosol with finer sediments associated with it. In general, eolian sand and other fine, well-sorted sand (of marine or fluvial origin) reside over more poorly sorted sands and gravels (likely of deltaic origin) that constitute the thick terrace sediments. Overall, it appears likely that occupation of the site occurred when water levels were higher and in proximity to the site.

Day Two – Returned to HdEh-1. Undertook excavation of several pits for examination of sediments and structures and to prepare for sampling for OSL and radiocarbon dating. Excavated pits included two through upper soils and a third into the terrace sediments.

Day Three – Returned to HdEh-1. Assisted Magali Rizza in sampling of sediments for OSL dating in the excavated pit. Pit contains several significant sedimentary horizons, including modern eolian sand, a layer of orange sand representative of a former surface (eolian or fluvial) on which site HdEh-1 may be associated, underlying well-sorted sand, and deeper gravels, pebbles and cobbles that likely represent the former marine terrace surface, and a lower layer of coarsely-bedded sand that likely constitutes the terrace sediments (possibly of deltaic origin).

Day Four – Returned to HdEh-1 to assist in completing sampling for OSL and radiocarbon dating in the excavation pit. Augered several holes to assess the general thickness of sediments overlying marine terrace deposits.

Day Five – Returned to HdEh-1 to assist in sampling for OSL dating of marine terrace sediments. In addition, several pits were excavated where fire-cracked rock was observed to assess underlying sediments and to determine if cultural artifacts were present below the surface (no). Also assisted in collecting surface rock samples from large boulders for cosmogenic nuclide dating. This included four samples from large boulders that were 30-50 cm above the local surface, three samples from smaller rocks and four fire-cracked rocks. Also assisted in the collection of three OSL samples that were taken from below rocks that were perceived to have been put in place by former occupants of site HdEh-1. A piece of wood was also found beneath one rock, which could be radiocarbon dated, and a cultural stone flake was found beneath a second rock.

Day Six – Returned to HdEh-1 to complete work in that area. Measured heights of boulders that were sampled for cosmogenic dating. Assisted in retrieving OSL samples from a test point in feature f4. Then went to a location north of Shale Falls to examine the area for potential cultural/occupation sites and to assess related stratigraphy and environmental context. A new site, HeEg-8, was discovered with evidence of stone tools and many flakes. In general, the archaeological site tended to be associated with the same type of paleosol as associated with HdEh-1. This suggests that both sites had some environmental similarities during the periods of occupation.

Day Seven – Returned to HeEg-8. Collected an OSL auger sample from sands at a depth of about 125 cm adjacent to a small lake that was sampled for lake sediments containing fossil pollen by Natasha Roy. This and other small lakes may have been ice-contact kettle lakes at one time. Dug several trenches near site HeEg-8 to examine stratigraphy and understand past depositional environments. Noted paleosol and multiple charcoal horizons in sands underlying the paleosols. Also noted apparently water-lain sand and silt layers with contorted bedding that appears to be related to soft-sediment deformation, possibly due to the drainage of a small, impounded waterbody. This suggests that the site may have been associated with a small pond or back-channel of the river near the same level during the time of occupation. Other test pits revealed “sand wedges” at depth, suggesting a colder climate in the past than at present.

Day Eight – Went to site HdEh-2, which is located south of HdEh-1 on essentially the same marine terrace. An eroded archaeological site was identified in 2022 and, during our visit, a new feature with fire-cracked rocks and a new zone with stone artifacts and flakes were recorded. Found a similar paleosol as that located at other sites. Overall, the site appears to have a similar environmental context to the others observed. Collected four OSL samples including underlying marine terrace sediments, flood plain deposits, paleosol sediments and modern eolian sands. Also obtained one sample for radiocarbon dating. Then returned to site HeEg-8, where two intact sediment samples approximately 50 cm in length were collected from the location with multiple charcoal layers and from the water-lain deposits of sand and silt accumulated adjacent to the deformed sediments.

2.4. Next steps

Collected sediment samples have been submitted to the Geological Survey of Canada sedimentology and mineralogy laboratories for particle size and grain mineralogical analysis. Five additional samples have been submitted to the University of the Fraser Valley Luminescence Dating Laboratory. In addition, visual inspection of all samples collected will be made to assess grain colour, grain shape and sorting. Together, data results will help to assess the deposition environments and ages of these sediments.

Figure 1. Aerial view of northern section of HdEh-1 showing marine terrace and eolian sands. Also shown are two pits dug into paleosols (former soils) towards the left, and a third pit dug into terrace sediment in the upper right.

Figure 2. Aerial view of paleosol and eolian sands with two excavation pits.

Figure 3. Aerial view of excavation pit within sediments near HdEh-1.

Figure 4. View of HdEh-1 and sand dunes overlying marine terrace sediments.

PART 3: Final Report, 2024 Field Season (March 31, 2025)

3.1. Sediment sampling purpose

Sediment samples were collected to gain geological and sedimentological insights into past environmental settings related to human occupation of the area, and context for the samples collected for optical dating. To this end, at each location where a sample was collected for optical dating, additional samples were collected to determine moisture content, grain size and distribution, mineralogy, and field characteristics (roundness and colour). In addition, photo microscope images were taken of all samples. From the stratigraphic settings and sedimentological analyses, a depositional environment was interpreted for each optical sample collected.

3.2. Sediment sample locations

Sediment samples were collected at three distinctive locations: site HdEh-1, Moose Lake, and site HdEh-2. Within location HdEh-1, 11 samples were collected from four pits (Pit 2, 4, 5, and 6) excavated in the area. At Moose Lake, 1 sample was collected in an auger hole at a depth of 125 cm. At site HdEh-2, 4 samples were collected from three pits (Pit 8, 9, and 10).

Location and Sample	Site	Latitude	Longitude	Depth (cm)	Coarse sand	Interpreted environment
HdEh-1						
NAS24-01	Pit 2	56.585999	69.167548	107	Coarse sand	Marine terrace
NAS24-02A	Pit 2	56.585999	69.167548	100	Sand	Beach
NAS24-02	Pit 2	56.585999	69.167548	95	Sand	Beach
NAS24-03	Pit 2	56.585999	69.167548	47	Sand	Shallow fluvio-marine
NAS24-04	Pit 2	56.585999	69.167548	38	Sand	Overbank
NAS24-05	Pit 2	56.585999	69.167548	15	Coarse Sand	Eolian
NAS24-06	Pit 4	56.586020	69.168677	40	Coarse Sand	Marine terrace
NAS24-07	Pit 4	56.586020	69.168677	15	Sand	Shallow fluvio-marine
NAS24-08	Pit 5	56.586105	69.167556	15	Coarse Sand	Eolian
NAS24-09B	Pit 6	56.585559	69.168478	6	Coarse Sand	Shallow fluvio-marine
NAS24-09A	Pit 6	56.585559	69.168478	6	Coarse Sand	Shallow fluvio-marine
NAS24-10	Pit 6	56.585559	69.168478	28	Coarse Sand	Shallow fluvio-marine

Moose Lake						
NAS24-11	Moose Lake	56.780902	69.109271	125	Coarse Sand	Fluvio-marine
HdEh-2						
NAS24-12	Pit 9	56.582633	69.177150	100	Sand	Marine Terrace
NAS24-13	Pit 8	56.582681	69.177253	50	Sand	Overbank
NAS24-14	Pit 8	56.582681	69.177253	25	Sand	Overbank
NAS24-15	Pit 10	56.582769	69.177243	14	Coarse Sand	Eolian

3.3. Site HdEh-1

Site HdEh-1 is the general location given to the various tent rings and lithic materials found on the marine terrace along the Caniapiscau River. Several pits were excavated in the general area to understand the depositional history and for chronological dating. Figure 1 shows the marine terrace (in the background) where most of the lithic materials were located and the more modern dune sand deposits in the foreground. The area between the buried soil and the marine terrace was the focus of much of the excavation efforts, in addition to the marine terrace itself. It is probable that the period of human occupation dates to the time between the exposure of the marine terrace (ca. 4400 +/- 100 years ago as per cosmogenic nuclide dating) and the development of the buried soil. Understanding the timing and environment of deposition within these sequences of sediments was therefore the focus of efforts at this site.

Figure 1. Photo of site HdEh-1 and surrounding area (by Stephen Wolfe).

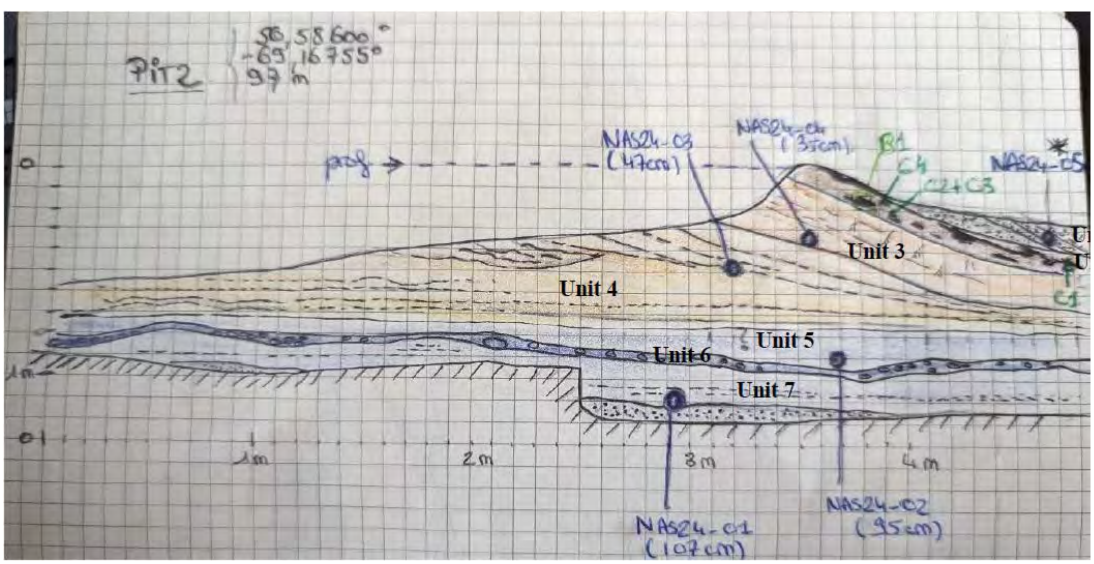


Figure 2. Sketch of Pit 2 showing units and locations of samples NAS24-01 to 05 (by Magali Rizza).

3.3.1. Pit 2 near HdEh-1

Pit 2 was located near the edge of fluvial-marine terrace. The dug trench intersected the marine terrace deposits and modern eolian deposits with intervening units. The pit was between 40 and 100 cm deep and about 4 m long and consisted of 7 Units.

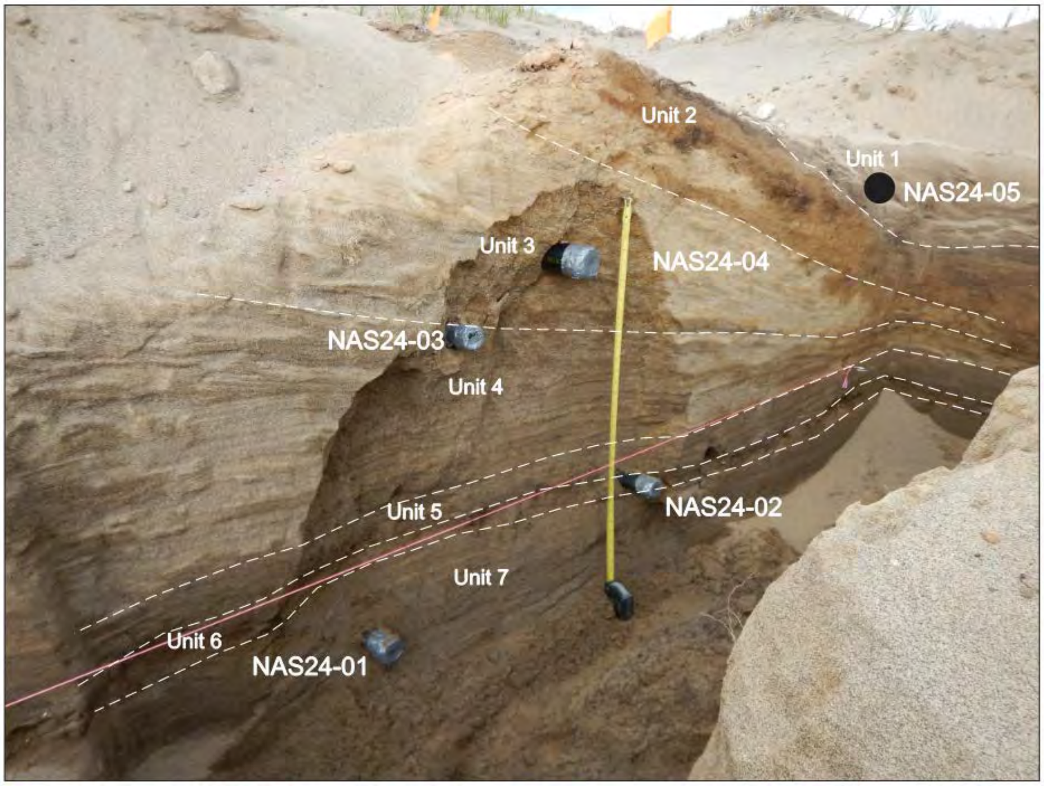


Figure 3. Photo of Pit 2 showing units and locations of samples NAS24-01 to 04 (by Stephen Wolfe).

Figures 2 and 3 show an illustrated sketch (by Magali Rizza) and photograph (by Stephen Wolfe) of Pit 2, identifying 7 different units.

These units and the corresponding sediment samples are described as follows:

Unit 1: grey eolian sand, modern. Sample NAS24-05 is interpreted as eolian.

Unit 2: medium-fine sand, dark orange-brown (soil), with charcoal. This unit may correspond to the period of human occupation along with unit 3. It is interpreted primarily as an aggrading eolian unit under the influence of forest vegetation. This unit would represent the youngest period of human occupation of the site, as the overlying unit is modern.

Unit 3: wavy, orange sand. This unit represents eolian sand deposition under the influence of vegetation. It is possible that human occupation at the time was contemporaneous with this unit and Unit 2. Sample NSA24-04 is from the middle of this unit and is interpreted as eolian.

Unit 4: continuous, sloping grey-brown sand. This unit is probably eolian / overbank deposits and may have been a few metres above the water level. Sample NAS24-03 at the upper portion of this unit is interpreted primarily as eolian.

Unit 5: A coarse sand unit with fine sediment, possibly representing floodplain deposits. These deposits may be similar to the fluvial sand bars that are observed in the modern Caniapiscau River and, as such, as sub-aqueous.

Unit 6: A coarse pebbly layer with fines. Top of fluvio-marine terrace. Sample NAS24-02 probably represents the top of the fluvial-marine terrace.

Unit 7: coarse, bedded sand, interpreted as fluvio-marine terrace sediments. Sample NAS24-01 is interpreted as fluvio-marine terrace deposits.

In summary, this location represents a fluvio-marine terrace sediments (Unit 7) with a buried surface (Unit 6) overlain by floodplain deposits (Unit 5) and a thick layer of possibly beach (eolian and overbank deposits) (Unit 4) and eolian (Unit 3) deposits with a buried terrestrial surface (Unit 2) which may have been covered by forest. This unit, in turn, is overlain by modern eolian deposits (Unit 1).

NAS24-01

Figure 4. Microscope image of NAS24-01.

Sample NAS24-01 was obtained from a depth of 107 cm in Pit 2 (Figs. 2 and 3). Sample NAS24-01 is a greyish brown (10YR 5/2) medium sand (mean = 3.49 mm). It is a clean sand (99.1%) with low percent of silt (0.6%) and clay (0.3%). It is well sorted, symmetrically skewed with angular grains. It contains 42% quartz, with 37% plagioclase feldspar, 8% potassium feldspar, 4% chlorite, and some heavy minerals. The sample was moist (3.49% H_20 g/g). The sample is interpreted as fluvio-marine terrace deposits. The angular nature of sediments indicates that retain inheritance from a glacial source, with little reworking under glacio-fluvial processes.

NAS24-02

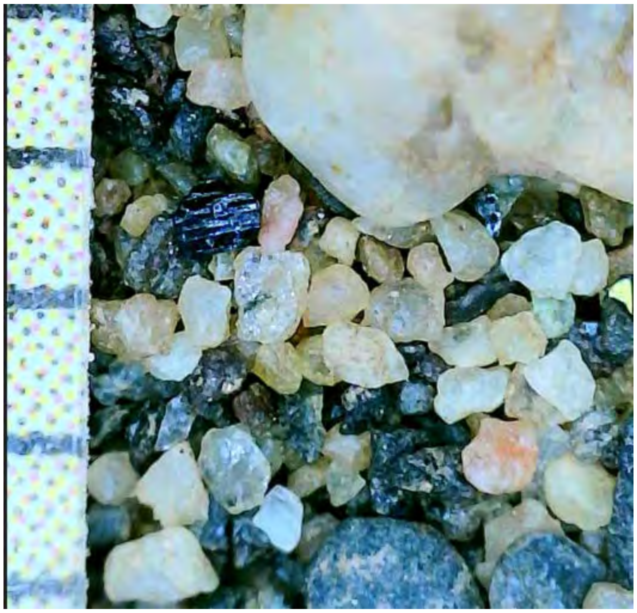


Figure 5. Microscope image of NAS24-02.

Sample NAS24-02 was obtained from a depth of 95 cm in Pit 2 (Figs. 2 and 3). Sample NAS24-02 is a dark greyish brown (10YR 4/2) medium sand (mean = 2.76 mm). It is sand (97.0%) with a noticeable amount of pebbles (3.5%) and silt 2.3%, and some clay (0.7%). It is moderately sorted, and fine-skewed with angular grains. It contains 40% quartz, with 32% plagioclase feldspar, 6% potassium feldspar, 5% chlorite, 5% hematite, and some heavy minerals. The sample was moist (4.75% H20 g/g). The sample is interpreted as the upper unit of fluvio-marine terrace deposits. The angular nature of sediments indicates that retains inheritance from a glacial source, with little reworking under fluvial processes. Larger grains, however, are rounded to sub-rounded. The grains contain some silt coatings and are less clean than NAS24-01. The higher proportion of both coarser and finer grains suggests that this represents a lowering in fluvial/marine energy levels. Fine sediments were probably deposited in a shallow environment, and pebbles represent a lag of coarse sediment on the surface. This unit probably represents the top of the fluvial-marine terrace.

NAS24-03

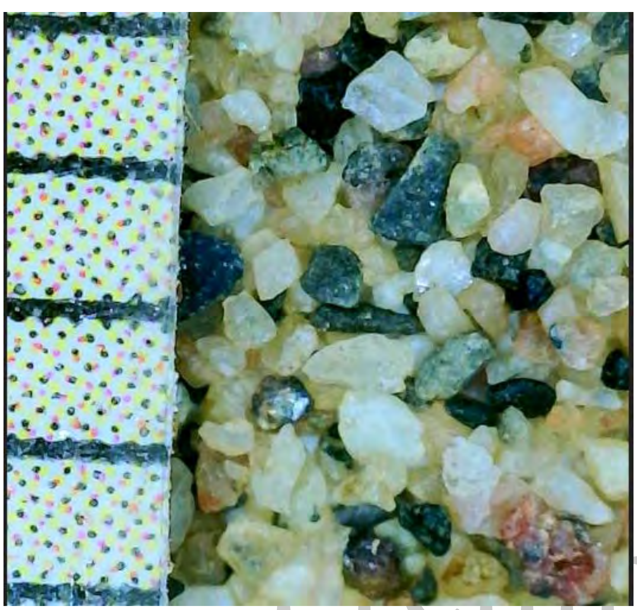


Figure 6. Microscope image of NAS24-03.

Sample NAS24-03 was obtained from a depth of 95 cm in Pit 2 (Figs. 2 and 3). Sample NAS24-03 is a greyish brown (10YR 2/2) medium sand (mean = 3.47 mm). It is a sand (99.5%) with trace silt (0.4%) and clay (0.2%). It is moderately sorted and symmetrically skewed with sub-angular grains. It contains 46% quartz, with 33% plagioclase feldspar, 4% potassium feldspar, 4% chlorite, 4% hematite and some heavy minerals. The sample was moist (3.72% H20 g/g). The sample is interpreted as eolian, as it is moderately sorted with no coarse or fine sediment, although the grains retain little signature of eolian transport.

NAS24-04

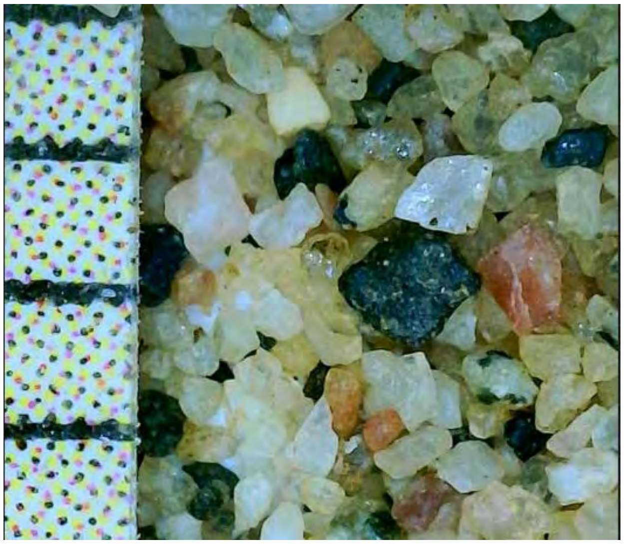


Figure 7. Microscope image of NAS24-04.

Sample NAS24-04 was obtained from a depth of 38 cm in Pit 2 (Figs. 2 and 3). Sample NAS24-04 is a brown (10YR 5/3) medium sand (mean = 3.42 mm). It is a sand (99.2%) with trace silt (0.5%) and clay (0.3%). It is well-sorted and symmetrically skewed with sub-angular grains. It contains 45% quartz, with 32%, plagioclase feldspar 8% potassium feldspar, 3% chlorite, 2% hematite, and some heavy minerals. The sample was moist (3.37% H20 g/g). The sample is interpreted as eolian, as it is well-sorted with no coarse or fine sediment, although the grains retain little signature of eolian transport.

NAS24-05

Figure 8. Microscope image of NAS24-05.

Sample NAS24-05 was obtained from a depth of 15 cm in Pit 2 (Figs. 2 and 3). Sample NAS24-05 is brown (10YR 5/3) medium sand (mean = 4.13 mm). It is sandy (99.4%) with trace silt (0.4%) and clay 0.3%) and no pebbles. It is clean, without silt or clay coatings. It is moderately-well sorted, and symmetrical with sub-angular to sub-rounded grains. It contains 46% quartz, with 34% plagioclase feldspar , 6% potassium feldspar, 4% chlorite, and small amounts of other minerals. The sample was moist (4.08% H20 g/g). The sample is interpreted as a modern eolian sand deposit. The more well sorted nature of the sand, with little silt or clay, the sub-rounded grains, and the absence of hematite may all be the result of sorting and modification by eolian transport.

3.3.2. Pit 4 near HdEh-1

Pit 4 was located on the fluvial-marine terrace and adjacent to a large boulder. The pit was ~ 60 cm deep and consisted of three units.

Figure 9. Photo of Pit 4 showing units and locations of sample NAS24-06 to 07 (by Stephen Wolfe). Inset shows the location of the pit adjacent to the boulder.

The surface is a coarse sand with lag of pebbles and contains cobbles and boulders. The surface is exposed to intense eolian processes and, as such, the surface represents an erosion lag of sediment. This lag implies that a thicker layer of sediment existed in the past, but that removal of sand and fine sediment by wind erosion has caused the surface to erode downward, leaving a layer of sediment that cannot be transported by the wind. Also noted are wind-eroded cobbles and boulders known as ventifacts. These units and the corresponding sediment samples are described as follows:

Unit 1 is a coarse, parallel-bedded, grey-brown sand. It is interpreted as fluvio-marine terrace sediments. Sample NAS24-07.

Unit 2 is a coarse sand and gravel layer with cobbles with parallel dipping beds. The unit could correspond to Unit 6 in Pit 2 and as such, represents a unit near the top of the fluvial-marine terrace unit. It is a higher-energy water lain unit.

Unit 3 is similar to Unit 1. It is a coarse, grey, wavy, sub-horizontally-bedded grey medium-to-coarse sand with occasional cobbles. This unit could correspond to Unit 7 in Pit 2. As such, it is interpreted as fluvio-marine terrace sediments. Sample NAS24-06.

In summary, this location represents fluvio-marine terrace sediments and a wind-eroded surface.

NAS24-06

Figure 10. Microscope image of NAS24-06.

Sample NAS24-06 was obtained from a depth of 40 cm in Pit 4 (Fig. 9). Sample NAS24-06 is a greyish brown (10YR 5/2) medium sand (mean = 4.11 mm). It is a clean sand (99.3%) with low percent of silt (0.4%) and clay (0.2%) and trace pebbles (0.01%). It is moderately-well sorted, symmetrically-skewed with sub-angular grains. It contains 45% quartz, with 37% plagioclase feldspar, 5% potassium feldspar, 4% chlorite, 5% pyroxene, and some heavy minerals. The sample was moist (3.86% H_20 g/g). The sample is interpreted as fluvio-marine terrace deposits. The sub-angular nature of sediments indicates fluvial reworking from a glacial source.

NAS24-07

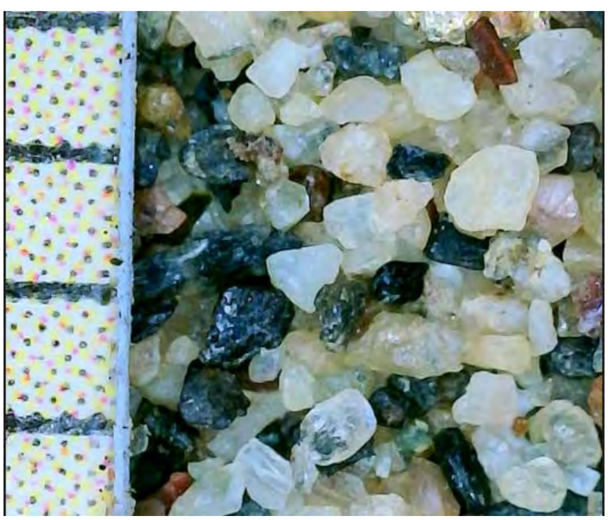


Figure 11. Microscope image of NAS24-07.

Sample NAS24-07 was obtained from a depth of 15 cm in Pit 4 (Fig. 9). Sample NAS24-07 is a greyish brown (10YR 5/2) medium sand (mean = 3.64 mm). It is sandy (99.4%) with low percent of silt (0.3%) and clay (0.3%) and with pebbles (2.0%). It is moderately-well sorted, symmetrically-skewed with sub-angular grains. It contains 44% quartz, with 36% plagioclase feldspar, 5% potassium feldspar, 5% chlorite, 4% pyroxene, and some heavy minerals. The sample was moist (3.20% H_20 g/g). The sample is interpreted as fluvio-marine terrace deposits. The sub-angular nature of sediments indicates fluvial reworking from a glacial source. It is interpreted as the upper portion of the glacial-fluvial terrace.

3.3.3. Pit 5 near HdEh-1

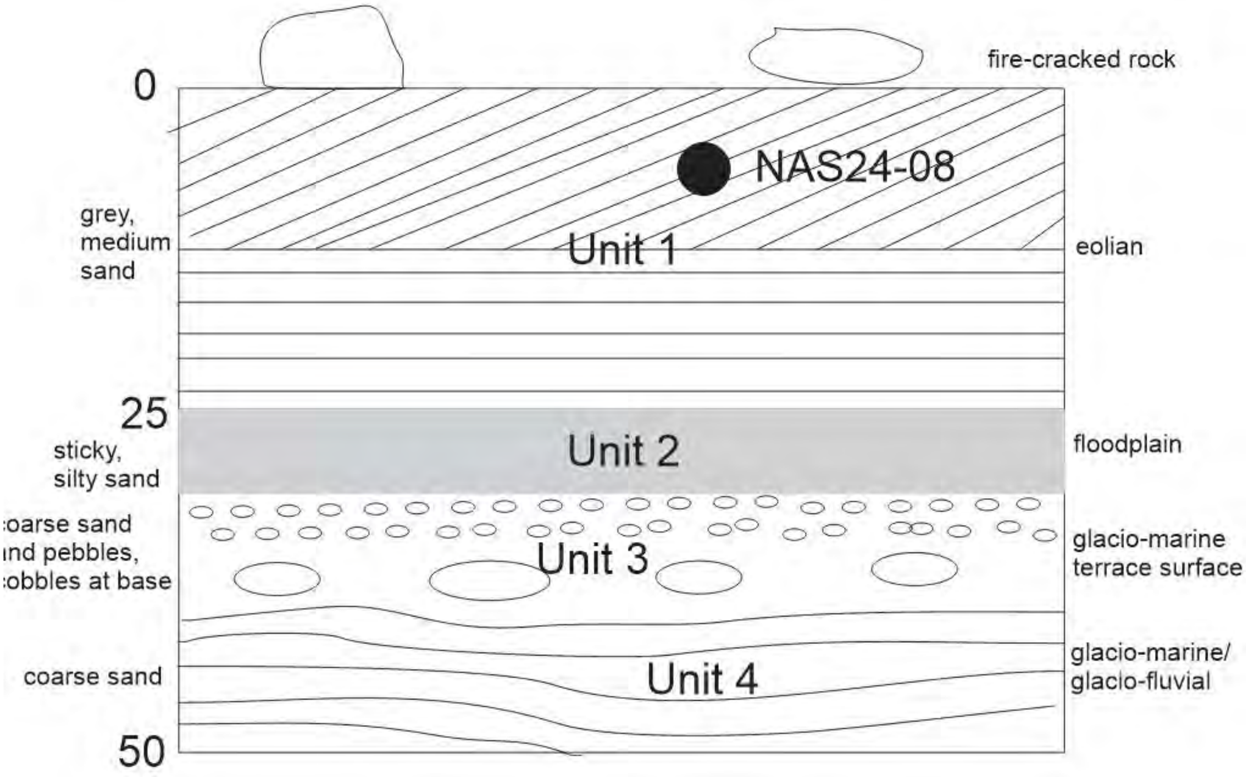


Figure 12. Sketch of Pit 5 showing units and locations of sample NAS24-08 (by Stephen Wolfe).

Pit 5 was near Pit 2 in an area with eolian sand cover, and with several large lithic materials including fire-cracked rock. The site was excavated in layers to determine if any lithic materials related to human occupation were present – but there were none. Sample NAS24-08 was collected from this location to obtain a maximum-limiting age of human occupation, as the lithic materials were residing over this unit (i.e., Unit 1).

Figure 12 shows an illustrated sketch of Pit 5, identifying 4 different units. These units and the corresponding sediment samples are described as follows:

Unit 1: grey eolian sand. Sample NAS24-08 is interpreted as eolian.

Unit 2: medium- sand with silt. Interpreted as floodplain sediments, which would have been deposited very near to the high-water level.

Unit 3: coarse sand with pebbles and a layer of cobbles. Interpreted as the upper unit of marine terrace sediments.

Unit 4: a medium-to-coarse sub-horizontally bedded sand. Interpreted as glacio-fluvial / glacio-marine sediments representing the terrace sediments.

NAS24-08

Figure 13. Microscope image of NAS24-08.

Sample NAS24-08 was obtained from a depth of 15 cm in Pit 5 (Fig. 12). Sample NAS24-04 is a brown (10YR 5/3) medium sand (mean = 3.42 mm). It is a sand (99.2%) with trace silt (0.5%) and clay (0.3%). It is well sorted and symmetrically skewed with sub-angular grains. It contains 45% quartz, with 32% plagioclase feldspar, 8% potassium feldspar, 3% chlorite and 2% hematite and some heavy minerals. The sample was moist (3.37% H20 g/g). The sample is interpreted as eolian, as it is well-sorted with no coarse or fine sediment, although the grain surfaces show little signature of eolian transport, probably due to the short eolian transport distance and duration.

3.3.4. Pit 6 at HdEh-1

Pit 6 was located within HdEh-1 to obtain optical ages from within the occupation area and to examine the underlying stratigraphy (Fig. 14). Pit 6 was located within HdEh-1 on the fluvial-marine terrace. The pit was ~30 cm deep and consisted of two units. These units and the corresponding sediment samples are described as follows:

The surface is a coarse sand with a lag of pebbles and contains cobbles and boulders. The surface is exposed to intense eolian processes and, as such, the surface represents an erosion lag of sediment. Also at this location are artifacts, such as ground stone axes and chert stone tools, and fire-cracked rock features indicating the presence of an occupation site(s).

Unit 1 is a mottled brown coarse sand with a pebble layer. This unit represents the upper layer of fluvio-marine terrace sediments, noting that overlying sediments may have been eroded by eolian processes. This unit may correspond to Unit 2 in Pit 2. Sample NAS24-09A and sample NAS24-09B.

Unit 2 is a brown, medium to coarse sand with wavy horizontal bedding containing a silty layer. The unit represents fluvio-marine terrace sediments. This Unit may correspond to Unit 1 in Pit 2. Sample NAS24-10.

Figure 14. Photo of Pit 6 showing units and locations of sample NAS24-09A, NAS24-09B and NAS24-10 (by Stephen Wolfe).

NAS24-09A and NAD24-9B

Figure 15. Microscope image of NAS24-09A.

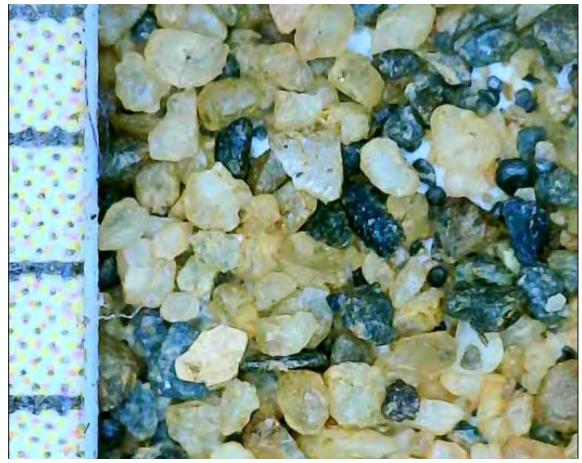


Figure 16. Microscope image of NAS24-09B.

Samples NAS24-09A and 09B were obtained from a depth of 6 cm in Pit 6 (Fig.14). Sample NAS24-09 is dark greyish brown (10YR 4/2) medium sand (mean = 3.02 mm). It is sandy (95.4%) with notable silt (3.7%) and clay 0.9%) and with considerable pebbles (11.4%). Quartz grains show considerable iron staining, it contains fines but without apparent silt or clay coatings on the darker mineral grains. It is moderately-well sorted, and very fine-skewed with angular grains. It contains 45% quartz, with 32% plagioclase feldspar , 5% potassium feldspar, 6% chlorite, 4% hematite, and small amounts of other minerals. The samples were moist (4.89% (NAS24-09A) 3.34% (NAS24-09B) H20 g/g). The sample is interpreted as fluvio-marine terrace deposits. The angular nature of sediments indicates that retain inheritance from a glacial source, with little reworking under glacio-fluvial processes. This incorporation of fine sediment is probably a result of soil-forming processes and the translocation of fine sediment downward into the sediment profile.

NAS24-10

Figure 17. Microscope image of NAS24-10.

Sample NAS24-10 was obtained from a depth of 28 cm in Pit 6 (Fig. 14). Sample NAS24-10 is brown (10YR 5/3) medium sand (mean = 3.34 mm). It is sandy (99.1%) with trace silt (0.5%) and clay 0.3%) and trace pebbles. It is relatively clean, but with some silt and clay coatings on the darker mineral grains. It is moderately-well sorted, and symmetrical with angular grains. It contains 50% quartz, with 34% plagioclase feldspar, 5% potassium feldspar, 3% chlorite and small amounts of other minerals. The sample was moist (3.36% H20 g/g). The sample is interpreted as fluvio-marine terrace deposits. The angular nature of sediments indicates that retain inheritance from a glacial source, with little reworking under glacio-fluvial processes.

3.4. Site Moose Lake

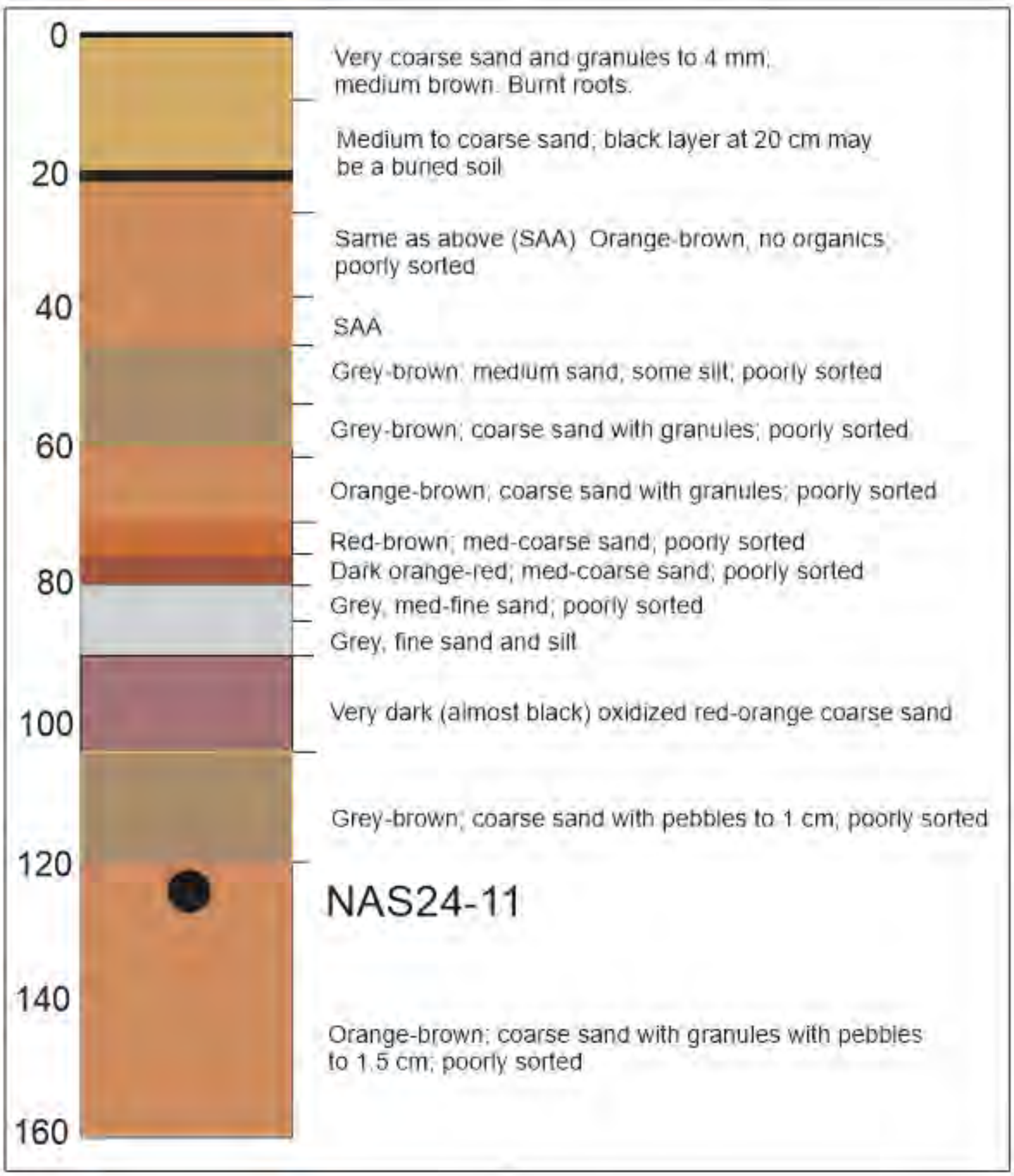


Figure 18. Sketch of core at Moose Lake with stratigraphic description and location of NAS24-11.

An auger core from a site at Moose Lake was excavated to examine the sedimentology and to obtain a sample (NAS24-11) for optical dating (Fig. 18). The auger hole was located ~ 20 m south of Moose Lake and ~ 1 – 1.5 m above the elevation of the lake. The hole was augered to a depth of 1.6 m.

NAS24-11

Figure 19. Microscope image of NAS24-11.

Sample NAS24-11 was obtained from a depth of 125 cm in the auger hole at Moose Lake (Fig. 18). Sample NAS24-11 is yellowish brown (10YR 5/4) coarse sand (mean = 5.41 mm). It is sandy (97.3%) with silt (2.0%), and clay 0.7%) and pebbles (2.1%). Silt and clay coatings on the mineral grains. It is moderately-well sorted, and fine-skewed with sub-rounded grains. It contains 49% quartz, with 36% plagioclase feldspar, 5% potassium feldspar, 3% chlorite, and small amounts of other minerals. The sample was moist (3.39% H20 g/g). The sample is interpreted as glacio-fluvial deposits. The sub-rounded nature of sediments and pebble components indicates transport in a fluvial regime from a glacial source. The fine sediment may be incorporated into the sediment, post-depositionally, through the translocation of sediment.

3.5. Site HdEh-2

Site HdEh-2 is located about 500 m south of site HdEh-1 on the same marine terrace. Figure 20 shows a photograph of a portion of the site depicting the lower marine terrace sediment with overlying sands constituting overbank and eolian sediments with a prominent oxidized buried soil horizon. Also noticeable is a large scattering of lithic debris, which may include fire-cracked rock. The distribution of this lithic debris suggests that it has originated from a level equivalent to the buried soil or immediately below it. Therefore, chronological ages pertaining to the soil horizon and units below it may be significant to understanding the time of human occupation.

Figure 20. Photo of site HdEh-2 (by Stephen Wolfe).

3.5.1. Pit 8 at HdEh-2

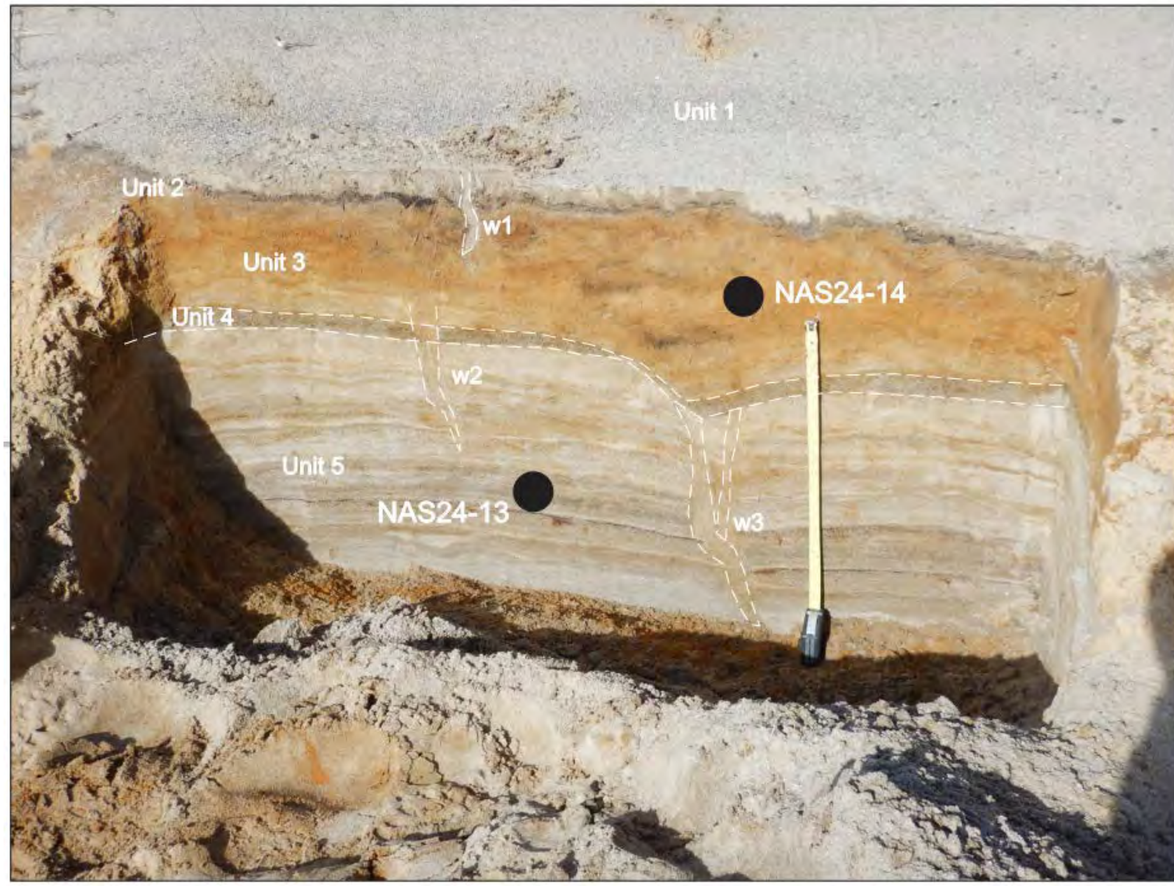


Figure 21. Photo of Pit 8 showing units and locations of samples NAS24-13 and NAS24-14 (by Stephen Wolfe).

Pit 8 was located within site HdEH-2 on the fluvial-marine terrace. The pit was ~ 70 cm deep and consisted of five units.

The surface is a coarse sand with lag of small pebbles. The surface is exposed to intense eolian processes. At this location there are artifacts including fire-cracked rocks, stone tools, and flaking debris.

Unit 1 is a grey medium sand with small pebbles on the surface. This unit represents modern eolian sediments. This unit may correspond to Unit 1 in Pit 2.

Unit 2 is a 5 cm-thick charcoal layer in medium sand. It represents the uppermost surface of Unit 3.

Unit 3 is a 20 to 25 cm thick orange-brown unit of medium sand with charcoal staining. The unit contains wavy, sub-horizontal layers. It is probably eolian, corresponding to Unit 2 in Pit 2. The unit is deformed due to subsidence from an underlying thermal contraction crack, resulting in downward displacement of sediment and fracturing. It is indicative of cold-climate periglacial processes. Note: this unit probably corresponds to the timing of human occupation in the area. Sample NAS24-14.

Unit 4 is a 3 cm layer of coarse sand between Units 3 and 5. It appears to represent the upper surface of Unit 5. It is eolian.

Unit 5 is > 30 cm thick layer of continuous, wavy, horizontally-bedded medium sand to fine sand with some silt. Some layers are more oxidized than others. It is an aggrading surface that appears to be eolian or shallow-water sediments. It may represent overbank deposits situated very close to the water level at that time. It corresponds to Unit 4 in Pit 2. Sample NAS24-13.

NAS24-13

Figure 22. Microscope image of NAS24-13.

Sample NAS24-13 was obtained from a depth of 50 cm in Pit 8 (Fig. 21). Sample NAS24-13 is a greyish brown (10YR 5/2) medium sand (mean = 3.09 mm). It is a sand (97.9%) with silt (1.5%) and clay (0.5%). It is moderately-well sorted and fine skewed with sub-angular to sub-rounded grains. It contains 46% quartz, with 36% plagioclase feldspar, 6% potassium feldspar, and small amounts of chlorite, hematite, and some heavy minerals. The sample was moist (3.24% H20 g/g). The sample is interpreted as overbank deposits, as it is moderately well-sorted with some fine sediment. As such is may represent a mixed component of eolian and floodplain deposits.

NAS24-14

Figure 23. Microscope image of NAS24-14.

Sample NAS24-14 was obtained from a depth of 25 cm in Pit 8 (Fig. 21). Sample NAS24-14 is a yellowish brown (10YR 5/4) medium sand (mean = 2.73 mm). It is a sand (96.1%) with silt (3.1%) and clay (0.8%) with trace pebbles (0.03%). It is moderately-well sorted and symmetrically skewed with sub-angular to sub-rounded grains. It contains 47% quartz, with 36% plagioclase feldspar, 7% potassium feldspar, and small amounts of chlorite, hematite (3%), and some heavy minerals. The sample was very moist (7.56% H20 g/g). The sample is interpreted as an aggrading soil layer in mixed eolian and overbank deposits. It is moderately well-sorted but with a high component of fine sediment coating mineral grains, which may be attributed to accumulation in a soil horizon. As such it may represent a mixed component of eolian and floodplain deposits with vegetation. This unit may correspond to the period of human occupation, noting the charcoal and surface cover of fire-cracked rock in the area, which may have come from this horizon.

3.5.2. Pit 9 at HdEh-2

Figure 24. Photo of Pit 9 (by Stephen Wolfe), showing a single unit of medium grey sand and locations of sample NAS24-12. Inset shows the relative locations of Pit 8 and Pit 9.

Pit 9 was located about 8 m east of Pit 8 and at about 50 cm lower elevation (Fig. 24). It is located below the surface of the marine terrace. It includes a single unit of medium, grey brown, well-sorted sand interpreted as fluvio-marine deposits reworked from a glacial source.

NAS24-12

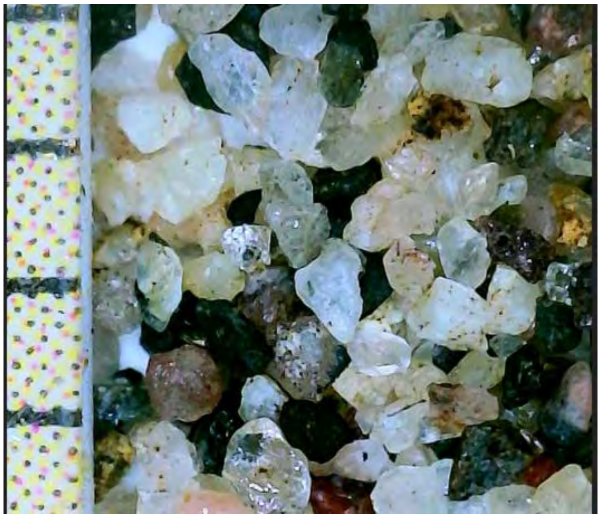


Figure 23. Microscope image of NAS24-12.

Sample NAS24-12 was obtained from a depth of 25 cm in Pit 8. Sample NAS24-12 is a greyish brown (10YR 5/2) medium sand (mean = 4.36 mm). It is a sand (99.5%) with trace silt (0.3%) and clay (0.1%) and no pebbles. It is well sorted and symmetrically skewed with angular grains. It contains 50% quartz, with 36% plagioclase feldspar, 7% potassium feldspar, 3% chlorite, and some heavy minerals. The sample was very moist (2.48% H20 g/g) and is interpreted as fluvio-marine terrace deposits. The angular nature of sediments indicates that they retain inheritance from a glacial source, with little reworking under glacio-fluvial processes. The sample is equivalent sample NAS24-01 in Unit 7 of Pit 2.

3.5.3. Pit 10 at HdEh-2

Figure 24. Photo of Pit 10 (by Stephen Wolfe), showing a single unit of medium grey-brown sand in modern eolian (dune) deposits and location of sample NAS24-15.

NAS24-15

Figure 25. Microscope image of NAS24-15.

Sample NAS24-15 was obtained from a depth of 14 cm in Pit 10 (Fig. 24). Sample NAS24-15 is a greyish brown (10YR 5/2) medium sand (mean = 3.66 mm). It is a sand (98.5%) with some silt (1.3%) and clay (0.3%) and with trace pebbles (0.07%). It is moderately-well sorted and fine-skewed with angular to sub-angular grains. It contains 47% quartz, with 38% plagioclase feldspar, 6% potassium feldspar, small amounts of chlorite (2%), and some heavy minerals. The sample was very moist (3.79% H20 g/g). The sample is interpreted as modern eolian sediments. The absence of hematite may be the result of sorting and modification by eolian transport.

3.6. Supporting data and tables

3.6.1. Moisture content

Sediment samples were collected for each optical dating sample in order to obtain an "as-collected" field value of the moisture content. Samples were collected and placed in sealed vials. Moist samples were subsequently weighed, then dried at 105 °C for 12 hours and then re-weighed. The difference in mass represents the amount of water loss upon drying. Results are presented as a weight percent of the dry weight (i.e., mass water / mass dry sample as a percent). Results are shown in Table 1.

Table 1. As-collected moisture contents from sediment samples.

Sample	Moisture Content (%) dry weight
NAS24-01	3.49
NAS24-02	4.65
NAS24-03	3.72
NAS24-04	3.37
NAS24-05	4.08
NAS24-06	3.86
NAS24-07	3.20
NAS24-08	4.43
NAS24-09A	4.89
NAS24-09B	3.34
NAS24-10	3.36
NAS24-11	3.39
NAS24-12	2.48
NAS24-13	4.24
NAS24-14	7.56
NAS24-15	3.79

The as-collected moisture contents show considerable consistency among collected samples, with the exception of NAS24-14, which has a higher measure of moisture content (7.56%) than all others. The average moisture content, excluding NAS24-14, is 3.75% with a standard deviation (1σ) of 0.63%. The higher moisture content for NAS24-14 is probably anomalous, either being a temporary high at the time of collection, or an error. Therefore, the as-collected moisture content of all samples can be taken to be about 3.75 +/- 1.26 % at 2σ uncertainty.

3.6.2. Grain size and sediment characteristics

Grain size analysis was performed on the sediment samples to determine variation in size and distribution of the sediment in relation to their perceived environments of deposition. Grain size analyses were performed at the Geological Survey of Canada (GSC) Sedimentology Laboratory using a Retsch Technology Camsizer digital image analyzer for sand-sized particles (2000–63 µm) and a Beckman Coulter Counter LS13-320 digital image analyzer to determine the silt–clay fraction. Sample pretreatment involved washing through sieves of 2000 and 63 µm. The >2000 µm fraction was retained for bulk-weight measurement and the remaining separations retained for analysis of the respective size fractions. Samples were dispersed in a sodium hexametaphosphate solution, and the sand-sized fraction underwent ultrasonic dispersion (sonification) for 20 sec at 40% power level prior to analysis in the Camsizer to disaggregate grains. The particle-size distributions were assessed using the graphical statistical methods of Folk and Ward (1957).

Table 2 shows the grain size percent in different classes, reported as a weight percent. The sand size particles represent the < 2 mm to >63 µm fraction, the silt size particles represents the 63 to 4 µm fraction and the clay particles represent the < 4 µm fraction. Also shown is the grain texture (Folk and Ward, 1957) and the interpreted environment from field observations. All samples classify as medium sand, with the exception of NAS24-11, which classifies as coarse sand. This sample also has a significant pebble (i.e., > 2 mm) component of 11.4%. The sand component of all samples ranges from 95 to 98.5%.

Table 2. Grain size percent in different classes, reported as a weight percent.

Sample	Grain texture	Interpreted Environment	Pebble %	Sand %	Silt %	Clay %
NAS24-01	Medium Sand	Marine terrace	0.040	99.137	0.554	0.309
NAS24-02	Medium Sand	Beach	3.489	97.063	2.282	0.655
NAS24-03	Medium Sand	Shallow fluvio-marine	0.000	99.468	0.370	0.163
NAS24-04	Medium Sand	Overbank	0.000	99.213	0.538	0.249
NAS24-05	Medium Sand	Eolian	0.000	99.387	0.368	0.245
NAS24-06	Medium Sand	Marine terrace	0.013	99.329	0.442	0.229
NAS24-07	Medium Sand	Shallow fluvio-marine	2.057	99.352	0.347	0.301
NAS24-08	Medium Sand	Eolian	0.000	99.661	0.208	0.132
NAS24-09	Medium Sand	Shallow fluvio-marine	11.371	95.431	3.664	0.905
NAS24-10	Medium Sand	Shallow fluvio-marine	0.008	99.149	0.522	0.328
NAS24-11	Coarse Sand	Shallow fluvio-marine	2.115	97.290	2.032	0.678
NAS24-12	Medium Sand	Marine Terrace	0.000	99.533	0.333	0.133
NAS24-13	Medium Sand	Overbank	0.000	97.897	1.522	0.581
NAS24-14	Medium Sand	Overbank	0.025	96.061	3.131	0.808
NAS24-15	Medium Sand	Eolian	0.069	98.505	1.165	0.330
NAS24-02A	Medium Sand	Beach	3.660	95.083	3.589	1.327

Table 3 shows the descriptive sediment characteristics following the Folk and Ward (1957) method. The table includes descriptive sediment characteristics of the mean grain size, sorting and skewness. Most samples are moderately to well sorted, with the exception of one sample (NAS24-02A) which is poorly sorted. Samples are typically either symmetrically skewed or fine skewed, meaning that they are skewed towards the finer sized particles. The very-fine skewed nature of NAS24-09 may be ignored as it probably represents the skewness without the pebble-sized fraction included.

Table 4 provides the mean grain size of each sample as determined from Folk and Ward (1957) together with a visual characterization of the grain shape and dry Munsell colour.

Table 3. Descriptive sediment characteristics according to Folk and Ward (1957).

Sample	Interpreted Environment	Mean Texture	Sorting	Skewness
NAS24-01	Marine terrace	Medium Sand	Well	Symmetrical
NAS24-02	Beach	Medium Sand	Moderate	Fine skewed
NAS24-03	Shallow fluvio-marine	Medium Sand	Moderate	Symmetrical
NAS24-04	Overbank	Medium Sand	Well	Symmetrical
NAS24-05	Eolian	Medium Sand	Moderately-Well	Symmetrical
NAS24-06	Marine terrace	Medium Sand	Moderately-Well	Symmetrical
NAS24-07	Shallow fluvio-marine	Medium Sand	Moderately-Well	Symmetrical
NAS24-08	Eolian	Medium Sand	Well	Symmetrical
NAS24-09	Shallow fluvio-marine	Medium Sand	Moderately-Well	Very fine skewed
NAS24-10	Shallow fluvio-marine	Medium Sand	Moderately-Well	Symmetrical
NAS24-11	Shallow fluvio-marine	Coarse Sand	Moderately-Well	Fine skewed
NAS24-12	Marine Terrace	Medium Sand	Well	Symmetrical
NAS24-13	Overbank	Medium Sand	Moderately-Well	Fine Skewed
NAS24-14	Overbank	Medium Sand	Moderately-Well	Symmetrical
NAS24-15	Eolian	Medium Sand	Moderately-Well	Fine skewed
NAS24-02A	Beach	Medium Sand	Poorly	Fine skewed

Table 4. Visual grain shape, Munsell colour, and mean grain size.

Sample	Mean grain size (mm) Folk and Ward (1957)	Visual grain shape	Dry Munsell Colour
NAS24-01	3.57	Angular	10YR 5/2 Greyish brown
NAS24-02	2.76	Angular	10YR 4/2 Dark greyish brown
NAS24-02A	2.96		
NAS24-03	3.47	Sub-angular	10YR 5/2 Greyish brown
NAS24-04	3.42	Sub-angular	10YR 5/3 Brown
NAS24-05	4.13	Sub-rounded	10YR 5/3 Brown
NAS24-06	4.11	Sub-angular	10YR 5/2 Greyish brown
NAS24-07	3.64	Sub-angular	10YR 5/2 Greyish brown

NAS24-08	3.33	Angular	10YR 5/2 Greyish brown
NAS24-09A	3.02	Angular	10YR 4/2 Dark greyish brown
NAS24-09B		Sub-angular	10YR 4/2 Dark greyish brown
NAS24-10	3.34	Angular	10YR 5/3 Brown
NAS24-11	5.41	Sub-rounded	10YR 5/4 Yellowish brown
NAS24-12	4.36	Angular	10YR 5/2 Greyish brown
NAS24-13	3.09	Sub-angular to sub-rounded	10YR 5/2 Greyish brown
NAS24-14	2.73	Sub-angular to sub-rounded	10YR 5/4 Yellowish brown
NAS24-15	3.66	Angular to sub-angular	10YR 5/2 Greyish brown

3.6.3. Mineralogy

Particle mineralogy was determined on the sediment samples. Mineralogical analyses were performed at the GSC on micronized bulk sediment using a Bruker D* Advance Powder X-ray Diffractometer equipped with a Lynx-Eye detector, Co Kα radiation set at 35 kV and 40 mA. Mineralogical results were provided as weight percent (wt %) with detection a limit >1%.

The mineralogy of the sediment samples (Table 5) is dominated by quartz (40-50%), with a significant component of plagioclase feldspar (30-37%). Potassium feldspars comprise a small component (7-8%), and chlorite and pyroxene are found in lesser amounts ranging from 2 to 6 % and hematite typically occurs in trace amounts to 6% and magnetite from 0 to 5%. Dolomite and amphibole are found in even lower amounts ranging from trace to 2%. Combined amounts of muscovite and biotite make up a total of 2%. Other minerals, including calcite, garnet, and ilmenite, are rare and occur in mostly trace amounts.

Overall, there is no significant difference in the mineralogy of the samples, indicating that differing transport processes have not affected the mineralogical composition of the sediments. As well, the mineralogical composition is immature as quartz, although most abundant, is not very high. The mineralogical composition of the sediments may be largely inherited from the surrounding bedrock terrain, with glacial processes being mostly responsible for sediment production and fluvial, marine and eolian processes responsible for their sorting and size distribution.

Table 5. Mineralogy of samples collected for optical dating.

Sample	Qtz	Ms/Bt	Chl	Pl	Kfs	Am	Px	Cal	Dol	Sd	Grt	Epd	ilm	Mag	Hem	GoF
NAS24-01	42	2	4	37	8	1	2		1				tr	1	2	2.86
NAS24-02	40	2	5	32	6	2	3		1	1	tr			3	5	2.89
NAS24-03	46	2	4	33	4	2	3		1		tr			2	3	2.82
NAS24-04	45	2	3	32	8	2	3		2				tr	1	2	2.67
NAS24-05	46	1	4	35	6	1	2	tr	2					2	1	2.77
NAS24-06	45	2	4	37	5	tr	5		1		tr			1	tr	2.75
NAS24-07	44	2	5	36	5	1	4		1					tr	2	2.58
NAS24-08	49	2	3	33	7	tr	3		tr						3	2.88
NAS24-09	45	2	6	32	5	1	2		1		tr			2	4	2.95
NAS24-10	50	2	3	34	5	1	2		2						1	3.01
NAS24-11	49	2	3	36	5	1	2		1						1	2.66
NAS24-12	50	2	3	36	6	tr	2		tr		tr		tr	1		2.79
NAS24-13	46	2	2	36	6	1	2		1			1	tr	1	2	2.85
NAS24-14	47	2	2	36	7	1	3		1						1	2.99
NAS24-15	47	2	2	38	6	tr	2		tr				1	1	1	2.86
NAS24-02A	42	3	4	30	4	2	3	tr	1		tr		tr	5	6	3.03

3.7. Other observations and photographs

3.7.1. Eolian stratigraphy

A number of sections were excavated in order to document the stratigraphy associated with dune deposits. Photos of these sites are shown below (Fig. 26).

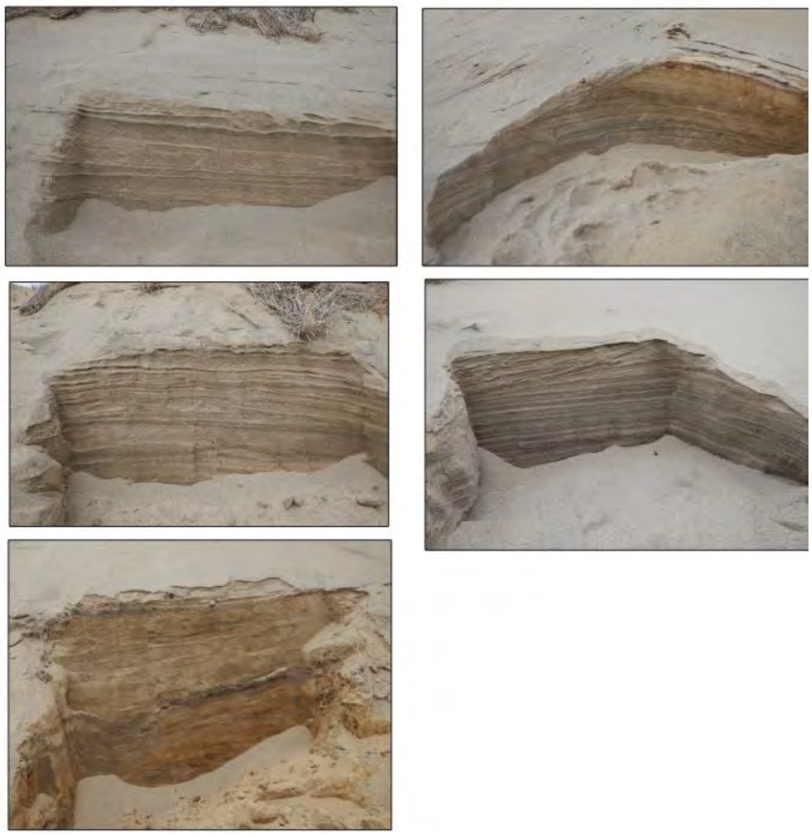


Figure 26. Examples of eolian stratification.

The sections excavated into eolian sediments reveal well-sorted medium sands ranging in colour from grey to orange-brown depending on the extent of oxidation. The stratigraphy is typically continuous thin layers of bedded sand, which may be horizontal or on an angle. These thin layers are typically parallel. There are no pebbles associated with these sands. Where the sediments are associated with vegetation, the layers tend to become more wavy and are more commonly oxidized to a brown or orange colour. In some cases layers of organic material are also observed in the sections.

3.7.2. Wind erosion

Examples of the extent of wind erosion on the marine terrace was evident from the extent of rock scouring of large boulders on the surface. The windward side of the boulders typically revealed fresh rock, with few signs of weather or surface vegetation. In contrast the protected (lee) side of these boulders where more weathered, had a surface cover of lichen, and plants grew at their base where they were sheltered from the wind (Fig. 27).

Figure 27. Examples of boulders on the marine terrace with a scoured windward facing side and a more weathered and vegetation cover lee side, where is was sheltered from the wind and erosion by blowing sand.

Other examples of the extent of wind erosion on the marine terrace are noticeable in the form of ventifacts (wind eroded cobbles and boulders) that have been re-shaped by blowing sand, and a persistent lag of gravel sediment on the surface. The gravel lag forms as fine sediment is blown away, leaving only the larger particles on the surface. Eventually, the larger particles cover the surface sufficiently to protect the underlying sediment from wind erosion. If the surface is disturbed, then wind erosion can start again on the underlying sediment.

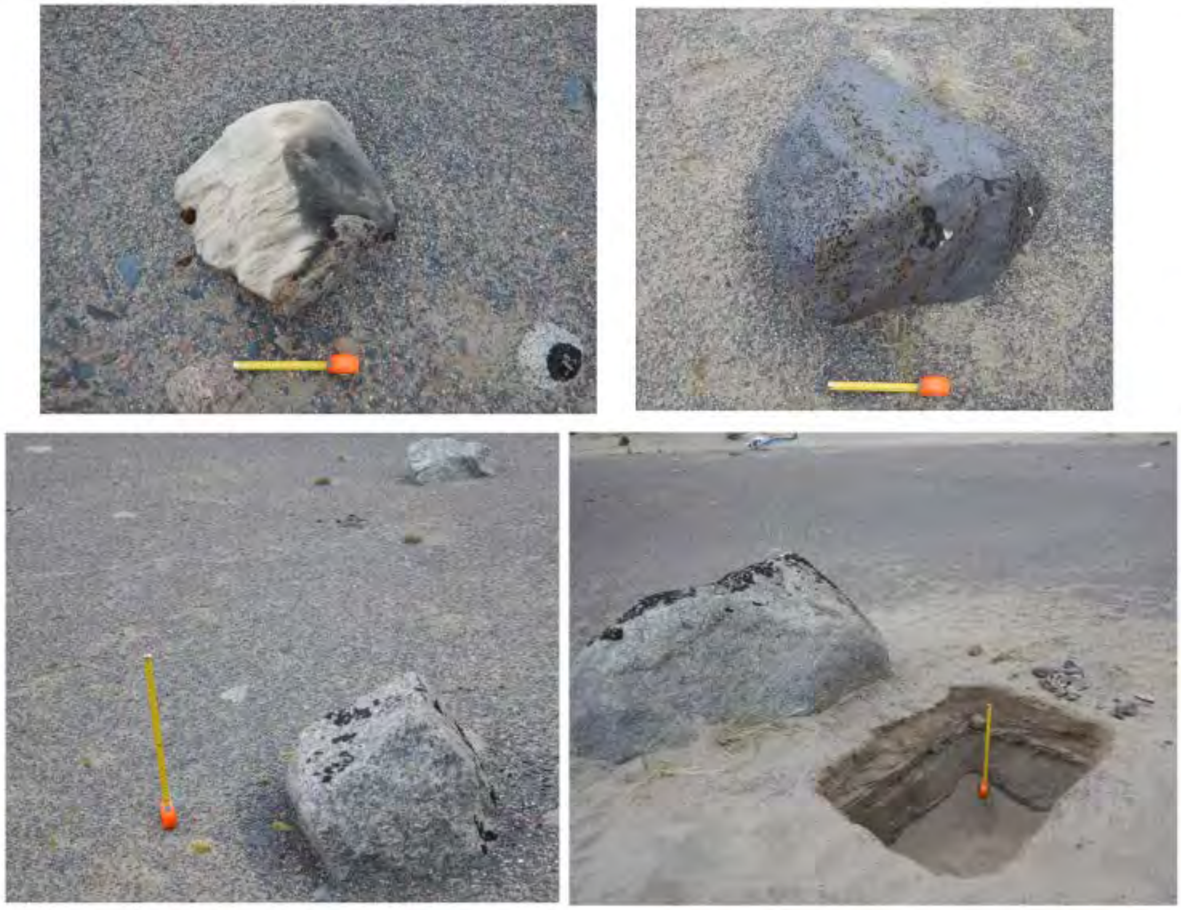


Figure 28. Examples of cobbles and boulders that have been eroded by the wind, forming ventifacts, together with the surrounding terrace surface with a protective cover of small pebbles forming a lag.

3.7.3. Tiger Beetles

Tiger beetles (family *Cicindelidae*) are a species of beetle. They are commonly found in sandy areas and observed on sunny paths. A sub-species of tiger beetle was observed on the dunes in the vicinity of HdEh-1 (Fig. 29). The species may be *Cicindela limbata*. If so, it may be one of the most northerly observations of this species in Quebec.

Figure 29. Photograph of tiger beetle – possibly *Cicindela limbate*, observed on the sand dunes in the area.

3.8 Next Steps

Five samples have been submitted to the University of the Fraser Valley for optical dating. These represent samples from coring at Moose Lake (NAS24-11) and samples collected from site HdEh-2 (NAS24-12 to NAS24-15). Final age results from these samples are not expected until 2026. Once received, the ages obtained from these samples will be reported on and the context discussed. This will be provided in a follow-up report.

Acknowledgements

Funding for this research was made possible by Natural Resources Canada, through the Environmental Geoscience Program of the Geological Survey of Canada. This work is a contribution to the project entitled “A Geoenvironmental Inventory of Eolian Deposits in Eastern North America”.

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D | T. Gallo: HdEh-1 ground stone celt assemblage

HdEh-1 (NAP22-23)
Ground Stone Celt Assemblage

REPORT PREPARED FOR THE NASKAPI NATION OF KAWAWACHIKAMACH

June 29, 2024

Tiziana Gallo, Consulting archaeologist

Table of Contents

List of figures

List of tables

Introduction

The HdEh-1 (NAP22-23) site is located on a deflated terrace (100 m amsl) that borders the Caniapiscau River between the area of “Sandy Narrows” at the outlet of Cambrien Lake and Aapiitaamischuun (Shale Falls) (Figure 1). It was found during a summer of 2022 field survey initiated by the Naskapi Nation of Kawawachikamach. This survey was part of a larger and ongoing project that aims to highlight the Naskapi Nation’s deep relations to their traditional territory through archaeology, community consultation, and interviews (Denton and McCaffrey, 2023).

The site consists of a series of eight features aligned along a southwest-northeast axis by the edge of the terrace and defined by carpets of fire-cracked rocks. Inside and near most of these features were chipped stone tools and debitage, as well as a particularly high density of ground stone celts in various stages of manufacture and use. While this is an exceptionally rich site, the absence of diagnostic artifacts like projectile points and other datable materials complicates the identification of its chronological and cultural associations (Denton and McCaffrey, 2023).

This report focuses on the ground stone celt assemblage collected in 2022 on HdEh-1. This assemblage consists of 62 individual pieces, comprising celt blanks (n=3 fragments), celt roughouts (n=6 complete; n=19 fragments), celt preforms (n=1 complete; n=2 fragment), celts (n=2 complete, n=18 fragments) and reshaped celts (n=4 complete; n=7 fragments). A sample of the debitage found on HdEh-1 is presented and consists of 392 artifacts: complete flakes (n=223), distal (n=26), medial (n=8), and proximal (n=34) flake fragments, as well as chunks (n=2) and shatter (n=99). A worn cobble made of the same type of stone as the majority of the celts and a green chert ridged hammerstone likely used as a celt pecking tool are also discussed.

The location of the site on a sand dune, and the fact that all artifacts from the 2022 field season were surface finds adds a level of complexity to the interpretation of this ground stone celt assemblage. In many cases, surface traces that can inform about celt shaping and function are heavily weathered or obliterated by post-depositional conditions generated by the local dune environment. In particular, many stone surfaces exposed to sandblasting winds have become patinated through dissolution – a process affecting the topography and creating concave depressions that mimic pecking marks – and the redeposition of a thin silica gel layer creating a glossy surface (Howard, 2002). Fortunately, some of the ground stone artifacts whose faces were in direct contact with the ground were less exposed to these alterations, and traces from shaping, use and residue are occasionally preserved on their surface.

In the following pages, this assemblage is considered from a variety of perspectives to evaluate its informative potential despite the site’s post-depositional impacts on its traces. After a description of the types of stone selected for the manufacture of ground stone celts, these objects are presented according to their position in the *chaîne opératoire*[1], whether they are stone blanks, roughouts, debitage, preforms, complete celts, celt fragments, or reshaped celts. A discussion follows of the celts potential functions based on morphological traits and use-wear analyses conducted with a binocular microscope. Visible traces of residue are located in the figures and summarily described, as these can inform about use or depositional contexts. The next section considers the spatial distribution across the site's features of the documented celt *chaîne opératoire* steps, the celts morphological characteristics, and the thermally-altered pieces. Finally, the assemblage is compared to similar celts found on other sites to better understand the site inhabitants' potential relations to broader regional networks. The report concludes with recommendations for future research.

[1] The *chaîne opératoire* is a technological approach that seeks to reconstruct the different steps that were followed to shape artefacts and to situate them within their respective life stage: from raw material extraction to various manufacturing steps, use, recycling, and disposal. Considering how the artefacts from an assemblage are positioned within the *chaine operatoire* provides a broader understanding of the significance and/or function of a site (e.g., quarry site, workshop, domestic site) and allows us to address questions such as access to materials, technological traditions, and individual choices and skills (Boëda et al., 1990; Dobres, 2010; Inizan et al., 1995; Latour and Lemonier, 1994).

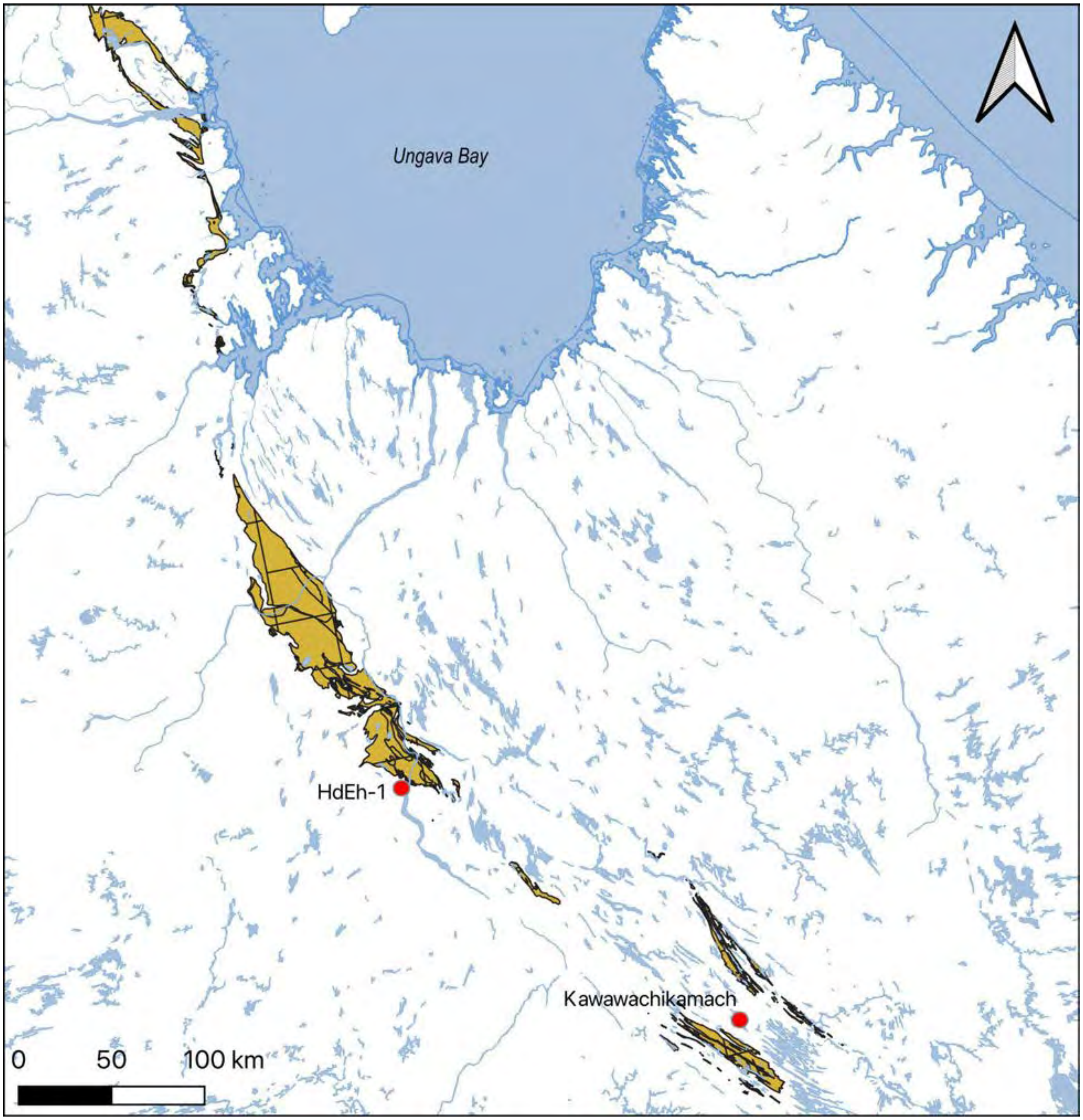

Figure 1. Location of site HdEh-1 site and the Menihek Formation

Raw materials

The celts and associated artifacts found on HdEh-1 are predominantly made of fine-grained laminated stones likely originating from the nearby Menihek Formation (Figure 1). This Paleoproterozoic geological formation of the Labrador Trough extends from the eastern shore of Ungava Bay to a few kilometres south of Kawawachikamach and comprises a variety of sedimentary stones like dolomites, siltstones and sandstones, pyroclastic stones like tuff, and their slightly metamorphosed versions (slate, phyllite, schist) (Bilodeau and Caron-Côté, 2018). These detrital stones were deposited in a "relatively deep basin under unstable tectonic conditions" (Dimroth, 1972, p. 198).

Macroscopically, the celts have a pale-medium grey to pale-medium green coloration. They are characterized by thin laminations and bands formed by successive depositional events and can thus be described as rhythmites (Figure 2.a-b) (MERN). These laminations are highly variable in thickness and are composed of muds and fine silts. In some celts, the different layers are well-defined, but in others, they are barely visible. Most of the celts have a massive texture and produced highly conchoïdal fractures (Figure 2.c), but a few are made of more foliated stones (Figure 2.d). While their slight differences might reflect variations in composition, sources and metamorphic contexts, these rhythmites all present abundant mineral dissolution cavities and voids (Figure 2.e-h). Combined with a greater hardness and resistance than what would normally be expected of siltstones, these voids and the highly conchoïdal nature of most of the assemblage seem to support Dressler's suggestion that some of the muds that gave shape to the Menihek Formation are likely of volcanic origin (1979, p. 49). As noted in the final section of this report, a better understanding of the stones that form this assemblage would require more in-depth analyses.

Despite the predominance of the grey-green rhythmites described above, a few celts on HdEh-1 are made of different types of stone. A fragmented celt (HdEh-1.68) is made of a similar stone but it is not laminated and has a slightly greater granulometry (Figure 2.i). One preform with what appears to be internal cleavage planes is possibly made of slate (Figure 2.d). A small celt roughout fragment (HdEh-1.1) has a bluer tint and a finer granulometry but like HdEh-1.68, it also shows the assemblage's typical cavities and voids (Figure 2.j). One complete roughout (HdEh-1.124) is made of a metamorphosed stone that resembles phyllite (Figure 2.k), while another one (HdEh-1.80) is made of a red siltstone with occasional white circular inclusions (Figure 2.l). A blank fragment and a few pieces of debitage are also made of the same material.

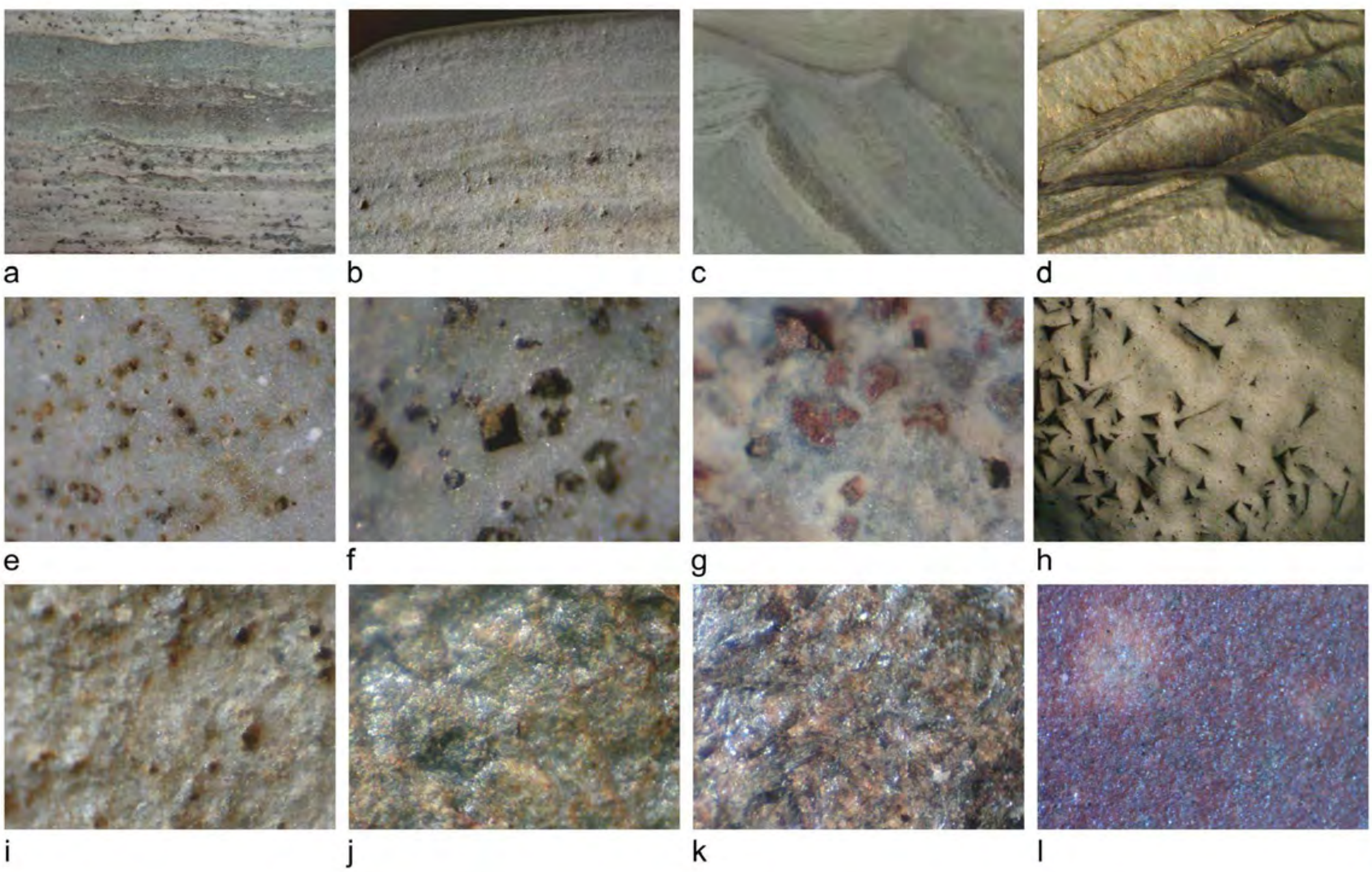

Figure 2. Microscopic images of celt stone types and characteristics
a) HdEh-1.144 X10; b) HdEh-1.113 X10; c) HdEh-1.92 X10; d) HdEh-1.75 X10; e) HdEh-1.159 X10; f) HdEh-1.144 X70; g) HdEh-1.144 X70; h) HdEh-1.92 X10; i) HdEh-1.68 X70; j) HdEh-1.1 X70; k) HdEh-1.124 X70; l) HdEh-1.80 X30

Chaîne opératoire

In the following sections, each artifact of the ground stone celt assemblage is presented according to its position in the *chaîne opératoire*, as specifically documented on the HdEh-1 site. This approach helps highlight the different steps at play in the manufacture of these celts, while also considering their potential provenance, different life stages, and relations to technological traditions (Boëda et al., 1990; Dobres, 2010; Inizan et al., 1995; Latour and Lemonier, 1994). Reconstructing the *chaîne opératoire* of ground stone celts requires the documentation of traces resulting from the superposition of techniques. For example, flake scars pecking marks and grinding striations – often represented as sequential steps in the making of ground stone celts – might appear in different orders, be absent, or be complemented by additional techniques like sawing, perforating and polishing. As mentioned in the introduction, on HdEh-1 these observations are complicated by the impacts on ground stone surfaces of the site's environmental conditions, which through the combined and prolonged actions of sand and wind, have smoothened and/or exfoliated many flake scars and ridges, pecking traces and grinding striations. In addition to complicating technological interpretations, these conditions greatly impact use-wear analyses as they obliterate most polishes and striations, and alter the attributes of scars. The *chaîne opératoire* proposed below is thus reconstructed through partial, or fragmentary, information. Nonetheless, it suggests a relatively consistent approach to ground stone celt manufacture on HdEh-1 and allows us to formulate dynamic intra and intersite comparisons.

The different steps involved in the manufacture of the ground stone celts found on HdEh-1 are described below and consist, in order, of blanks, roughouts, debitage, preforms, complete celts, fragmented celts, and reshaped and repurposed celts.

Blanks

The acquisition of a blank is the first step that comes into play when making a ground stone celt. The shapes, dimensions, and textural properties of blanks provide clues about the geological processes that contributed to their formation and allow to categorize them according to the kind of source from which they were acquired. These include blanks sourced at the outcrop (primary sources) or from glacial till or riverbeds where eroded outcrop material was transported (secondary sources) (Andrefsky Jr, 2005; Church, 1994).

Blanks from primary sources can sometimes be recognized by the presence of flat surfaces consisting of joint or cleavage planes, or by a weathered face corresponding to the exposed outcrop surface. Primary sources tend to provide blanks that have a tabular, slab-like or block shape. Secondary sources such as riverbeds or glacial till often provide blanks in the form of cobbles and boulders (Pétrequin and Pétrequin, 1993). These are recognised by their rounded and weathered cortical surfaces. The latter can generally be distinguished from intentionally ground surfaces by the unevenness of their topography, the absence of patterned striations on smooth surfaces, and the development of neo-cortical surfaces caused by mechanical and chemical weathering (Fernandes et al., 2007). The impacts of transportation on a blank found in a secondary source are however dependent on many factors such as the distance travelled, the stone's textural properties, and other environmental and temporal factors. It is thus possible that a tabular blank detached from its outcrop and deposited at only a short distance would keep most of its original shape.

Three blank fragments are part of the assemblage (HdEh-1.100, HdEh-1.157, and HdEh-1.125). Two are made of laminated siltstone (HdEh-1.100 and HdEh-1.157) and are delimited by flat planes on their faces and at least one curved side. These blanks could come from medium-sized boulders such as those observed by archaeologists on the terrace where HdEh-1 is situated. The third blank fragment is a red shale slab with a highly weathered flat surface and rounded lateral cortical surfaces. Together, these three blank fragments suggest that after being eroded from their outcrop, they only travelled a short distance before being redeposited. Considering the proximity of HdEh-1 to potential sources and the presence of laminated siltstone erratics on the site, it is likely that some of the celts in this assemblage were made from stones sourced *in situ*. This would mean that the site itself was a secondary deposit from which people acquired celt blanks. Although not included in the celt blank category, the laminated siltstone cobble HdEh-1.3 could also have been sourced on HdEh-1.

In addition to these three blank fragments, surficial textures found on artifacts attributed to later steps can sometimes provide clues as to the nature of the blanks used. For example, the roughouts HdEh-1.118+122, .124 and .80 were all made from slabs likely procured at an outcrop (Figure 3.a-c). The use of a slab is also visible in preform HdEh-1.142, whose faces are delimited by flat planes aligned perfectly parallel to each other (Figure 8.a). Flat planes are also present on two reshaped celts, HdEh-1.70+73 and .76 (Figure 14.a-b), as well as on 52 pieces (or 13.26%) of the sampled debitage. On a smaller sample of the debitage (n=4, or 1%), the preserved cortical surfaces are curved, suggesting they were struck from a cobble or boulder. The cortical butt of the reshaped celt HdEh-1.71 is also curved (Figure 14.c). A celt's morphological characteristics can also provide information about the nature of the blank. This is the case for the only two celts considered "complete" in this assemblage: HdEh-1.66 and .67 (Figure 11). The curved lateral profiles of these two small celts show that they were made on flake blanks, possibly acquired among the site's larger debitage.

Overall, the people who made the celts found on site HdEh-1 appear to have adopted various sourcing strategies. This is reflected in the different types of blanks found on the site, and in the traces that suggest the use of distinct blanks on more advanced artefacts. For example, preserved cortical surfaces in the assemblage indicate that tabular blanks like slabs or blocks are predominant and suggest a preference for stone acquisition at the outcrop. Nonetheless, the three blank fragments described here more likely come from secondary sources, possibly the site itself. Furthermore, the selection of flake blanks for the two complete celts reveals the probable reuse of locally produced debitage.

Roughouts

Roughouts are blanks that were roughly modified to obtain an initial shape while, in the case of ground stone celts, preforms are more advanced and are ready for the following grinding/polishing step (Inizan et al., 1995). The difference between a roughout and a preform is contextual and depends on the *chaîne opératoire* employed within a specific assemblage. In the HdEh-1 assemblage, the roughouts are blanks that only present an initial shaping step: knapping.

Following debitage, roughouts represent the most abundant artifact type related to ground stone celts on HdEh-1 with 6 complete (Figure 3.b-c, f-i) and 19 fragmented pieces, 9 of the latter refitting to form 3 additional "complete" roughouts, for a total of 9 (Figure 3.a, d-e).

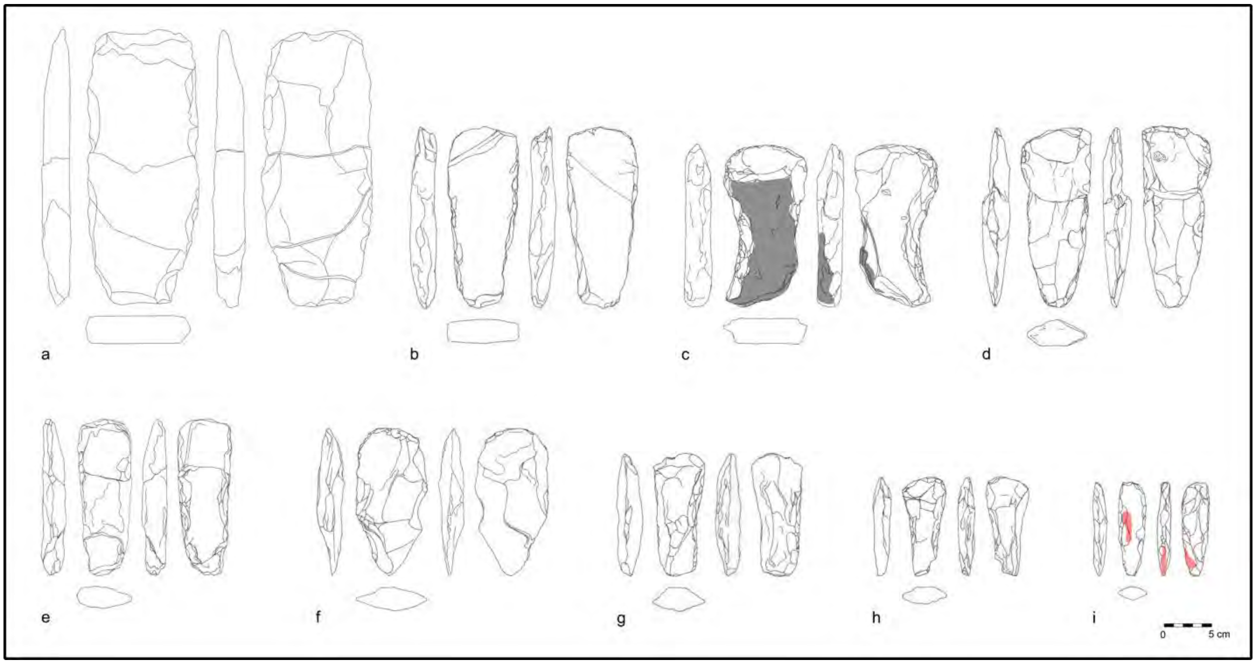

Figure 3. Roughouts
a) HdEh-1.118+122; b) HdEh-1.124; c) HdEh-1.80; d) HdEh-1.91+92; e) HdEh-1.90+93+104; f) HdEh-1.88; g) HdEh-1.105; h) HdEh-1.155; i) HdEh-1.97. Grey areas represent cortex, red areas represent residue.

Among the 9 complete roughouts in this assemblage, 7 are made of laminated siltstone, one is made of phyllite (HdEh-1.124, Figure 3.b), and another one is made of red siltstone (HdEh-1.80, (Figure 3.c). Their dimensions vary greatly, which could result from people on HdEh-1 having access to different stone sources or working with different types of blanks. It is also possible that the smaller roughouts (HdEh-1.105, .155 and .97, Figure 3.g-i) are repurposed celt fragments; however, no traces on their surface allow us to confirm this hypothesis. On the small roughout

HdEh-1.97 (Figure 3.i), brown specks of unidentified residue are superimposed on the weathered surface and thus result from post-depositional processes.

All 9 roughouts were shaped in a similar way, with bifacial knapping of both their sides and working edge and minimal knapping of their butt. At this step, the working edge is given its initial bevelled shape, either through a series of bifacial removals or with a larger and more covering flake to create a tranchet[2]. In addition to being present on the red roughout (HdEh-1.80, Figure 3.c), a stepped or hinged tranchet is also visible on two laminated siltstone roughouts: the very large and fragmented one (HdEh-1.118+122, Figure 3.a), and a medium-sized and fragmented roughout (HdEh-1.91+92, Figure 3.d). Interestingly, this latter roughout is fragmented at its mid-section and its fracture forms another hinged tranchet. This suggests that this particular step was a delicate one and that the force required to remove such a large flake put the integrity of the celt at risk.

As discussed in the previous section, the types of blanks used for some of these roughouts can be identified. In particular, the roughouts HdEh-1.118+122, .124, and .80 (Figure 3.a-c), have a biplanar cross-section (Table 1) with both faces delimited either by cleavage planes (HdEh-1.124), by fissile planes[3] (HdEh-1.118+122), or by a fissile plane and a flat cortical surface (HdEh-1.80). While this suggests that they are made on slabs acquired at the outcrop, the rounded cortex found on the red shale roughout's side hints at acquisition at a secondary source. In all three cases, the flat faces are preserved as bifacial knapping is limited to their periphery. This is also the case for the roughout consisting of the refitted fragments HdEh-1.90 .93 and .104 (Figure 3.e), although it has a bi-convex cross-section.

The five other celt roughouts have a diamond-shaped to pentagonal cross-section that was created through more invasive bifacial reduction, with flake scars reaching to (or close to) the center (Table 1). Altogether, these nine roughouts show three different types of profiles: 1) straight and splayed to moderately splayed sides, 2) one straight and one concave side, and 3) straight, parallel sides (Table 1). In lateral view, they have relatively symmetrical profiles, except for HdEh-1.90+93+104, .105 and .97 (Figure 3e, g and i). The incomplete nature of the roughouts, however, does not allow us to speculate on these unfinished celts intended functions.

The three complete celt roughouts composed of refit fragments (HdEh-1.118+122, .91+92 and .90+93+104, Figure 3.a, d-e) broke in three different ways. As mentioned earlier, roughout HdEh-1.91+92 appears to have fractured during the shaping process, likely following the failed realization of a tranchet. The fracture of roughout HdEh-1.90+93+104, however, could have

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[2] Tranchets are defined as straight working edges created by the removal of a large flake parallel to the working edge (Bordes 1968, p.248).

[3] Both cleavage and fissile planes are flat surfaces that can be exposed as stones fracture. Cleavage planes are found in low-grade metamorphic stones like slate and consist of "a regular set of parallel or subparallel closely spaced surfaces produced by deformation along which a rock body will ususally preferentially split (Bucher and Frey 2013, p.27). Fissile planes are found in fine-grained sedimentary stones like mudstone and appear as many "thin, paper-like laminations" (Potter et al. 2005, p.278).

resulted from accidental trampling, perhaps by a large animal: this is suggested by the fracture orientation of both the distal and the proximal ends in relation to the medial fragment. In the case of the exceptionally large roughout HdEh-1.118+122, its four refit pieces present smooth and concave fractures. These are characteristic of dry-cooled fire-cracked rocks and are referred to as expansion-fractured, i.e. "[…] rocks heated and cooled in a hearth, causing the outer portion of the rock to heat and expand faster than the relatively cooler interior" (Neubauer, 2018, p. 683).

Object ID	**Feature**	**Cross-section**	**Profile, face**	**Profile, lateral**
HdEh-1.118+122	f7	Bi-plano	Straight, parallel sides	Symmetrical
HdEh-1.124	f7	Bi-plano	Straight and moderately splayed sides	Symmetrical
HdEh-1.80	f4-f5 (or f7?) outlier	Bi-plano	One straight and one concave side	Symmetrical
HdEh-1.91+92	f8	Diamond/pentagonal	Straight and splayed sides	Symmetrical
HdEh-1.90+93+104	f8	Bi-convex	Straight and moderately splayed sides	Asymmetrical
HdEh-1.88	f8	Diamond/pentagonal	Straight and splayed sides	Symmetrical
HdEh-1.105	f8	Diamond/pentagonal	One straight and one concave side	Asymmetrical
HdEh-1.155	f4-f5	Diamond/pentagonal	One straight and one concave side	Symmetrical
HdEh-1.97	f8	Diamond/pentagonal	Straight and splayed sides	Asymmetrical

Table 1. Roughout morphological attributes

Among the 10 un-refitted roughout fragments, 3 can be more confidently attributed to proximal ends (HdEh-1.119, .1 and 103, Figure 4.d, f-g), and one to the distal end (HdEh-1. 126, Figure 4.a) of what would have been celts with straight and splayed to moderately splayed sides. The other fragments could be from either end and, like the previous, tend to have stepped fracture planes. The fragment HdEh-1.96 is a flake that was struck from the side of a roughout. All roughout fragments appear to have broken during manufacture, except for the thermally expansion-fractured butt fragment HdEh-1.103 (Ibid, p. 683).

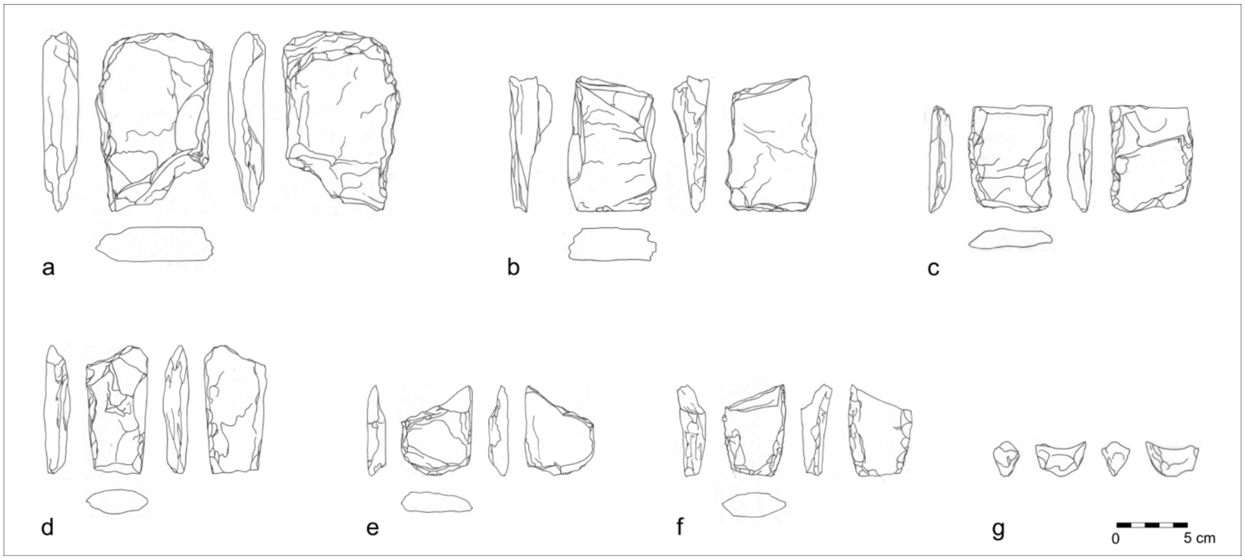

Figure 4. Roughout fragments
a) HdEh-1.126; b) HdEh-1.143; c) HdEh-1.94; d) HdEh-1.119; e) HdEh-1.166; f) HdEh-1.1; g) HdEh-1.103 (HdEh-1.96, .115, and .127 not illustrated)

Debitage

Only a sample of the debitage collected from HdEh-1 during the 2022 field season was analyzed for this report. This sample of 392 laminated siltstone artifacts consists of complete flakes (n=223) and distal (n=26), medial (n=8) and proximal (n=34) flake fragments, as well as shatter (n=101).

Attributes of complete flakes provide information about the nature of the celt-making activities that took place on HdEh-1. For example, the wide range of sizes and the presence of cortical surfaces on one-quarter of all complete flakes (n=57/223, or 25.56%) indicates that most, if not all, of the roughing out and preforming of the celts took place *in situ* (Table 5). While 9 of these cortical surfaces are curved and suggest the transformation of blanks in the form of cobbles or boulders, all other cortex is flat and points toward the transformation of tabular slabs or blocks.

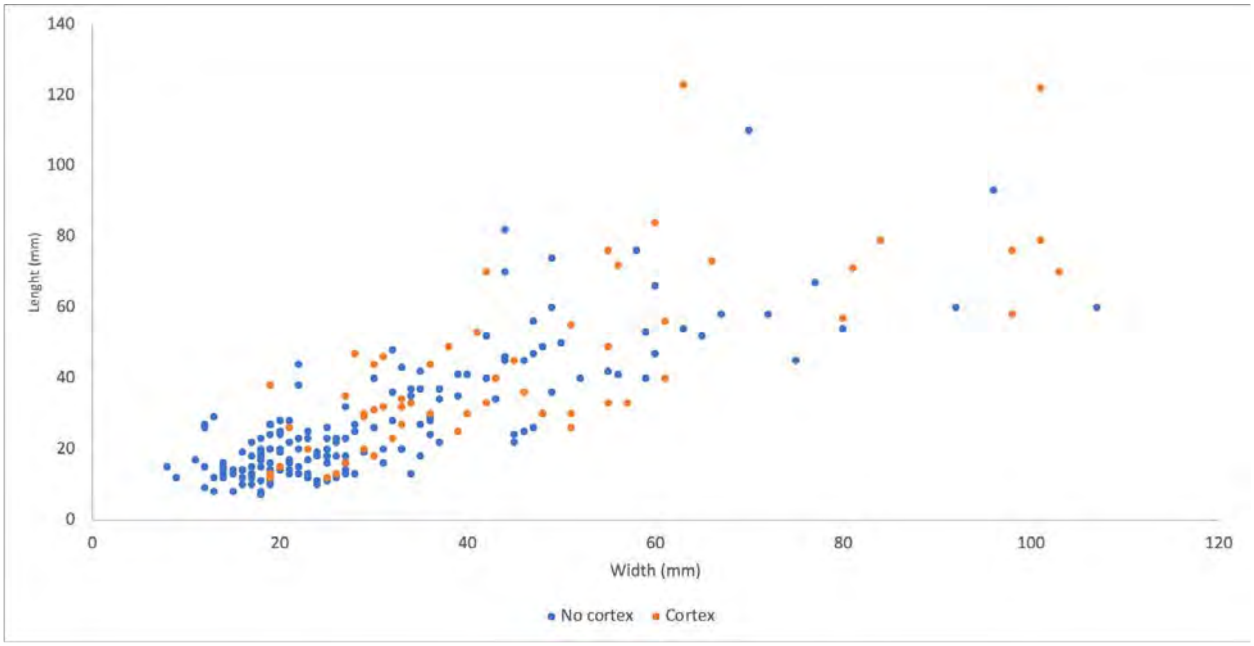

Figure 5. Size distribution of complete flakes with and without cortical surfaces

Percussion platforms on these complete flakes are predominated by facetted (n=67, 30.04%) and flat platforms (n=65, 29.25%) (Figure 6). These are followed by irregular (n=31, 13.9%), linear (n=25, 11.21%) and cortical (n=13, 5.83%) platforms. A smaller proportion of platforms are of the punctiform (n=8, 3.59%), torn (n=8, 3.59%), and “chapeau de gendarme” type (n=6, 2.69%). Flakes with facetted platforms are also known as biface thinning flakes (Andrefsky Jr, 2005, p. 123). Their wide range of sizes demonstrates the *in situ* transformation of bifaces of different sizes. In contrast, according to Andrefsky, flat striking platforms usually originate from the debitage of non-bifacial tools (2005, p. 95). The importance of both facetted and flat striking platforms, as well as of the other variations shown in Figure 6, might be explained by variations in the stones being transformed into celts: as discussed in the following pages, celt roughening and preforming strategies varied according to the selected blanks’ textural and morphological properties, debitage being either covering or limited to the celt’s periphery.

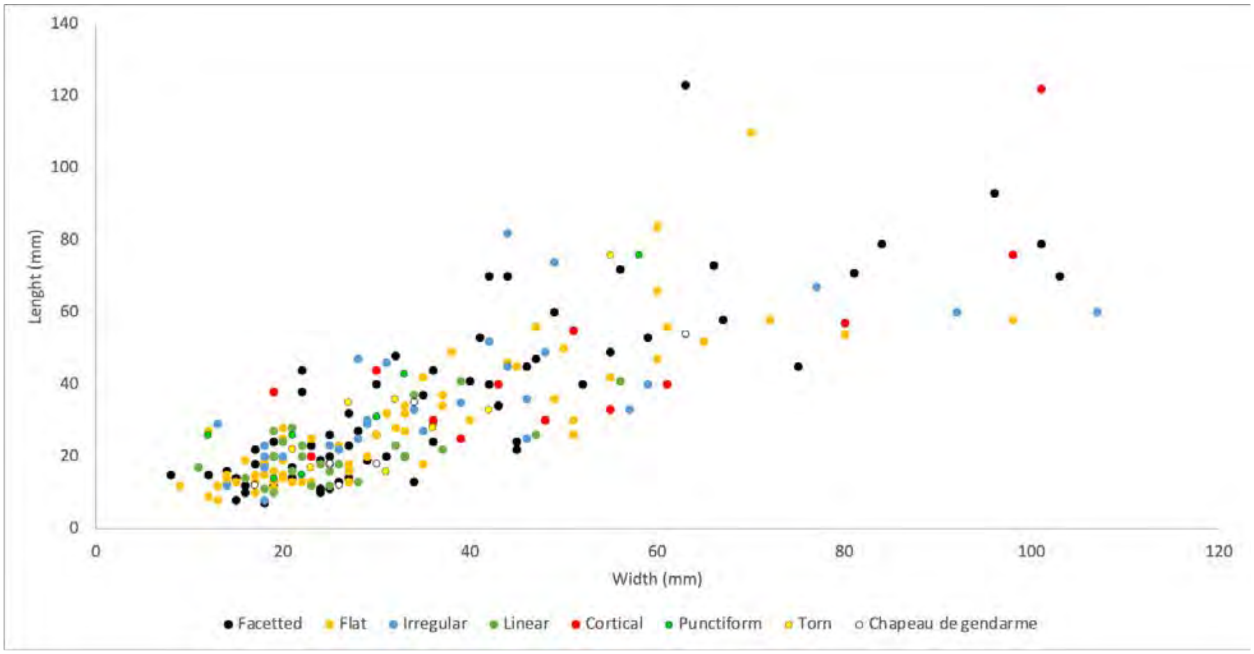

Figure 6. Size distribution of complete flakes according to percussion platform type

The complete flakes also have a variety of distal terminations, with feathered (n=124, 55.6%) and hinged terminations predominating (n=44, 19.73%) (Figure 7). These are followed by stepped and snapped (each: n=24, 10.76%), straight (n=5, 2.24%) and overshot terminations (n=2, 0.89%). These proportions demonstrate both the highly conchoidal nature of the laminated siltstone and some of the challenges that flaking this stone type would have entailed. While hinge fractures tend to be attributed to lower-skilled knappers (Nichols and Allstadt, 1978), this stone's textural properties would have made them more difficult to prevent: despite a relative homogeneity within superimposed bedding layers, their different textures and the often fissile nature of the transition from one bedding plane to another make this stone heterogeneous, with directional properties impacting fracture paths (Cotterell and Kamminga, 1987). In addition to the intermittent fissility of this stone, its many microvoids might have also caused more hinged and stepped flakes (Ibid, p.678).

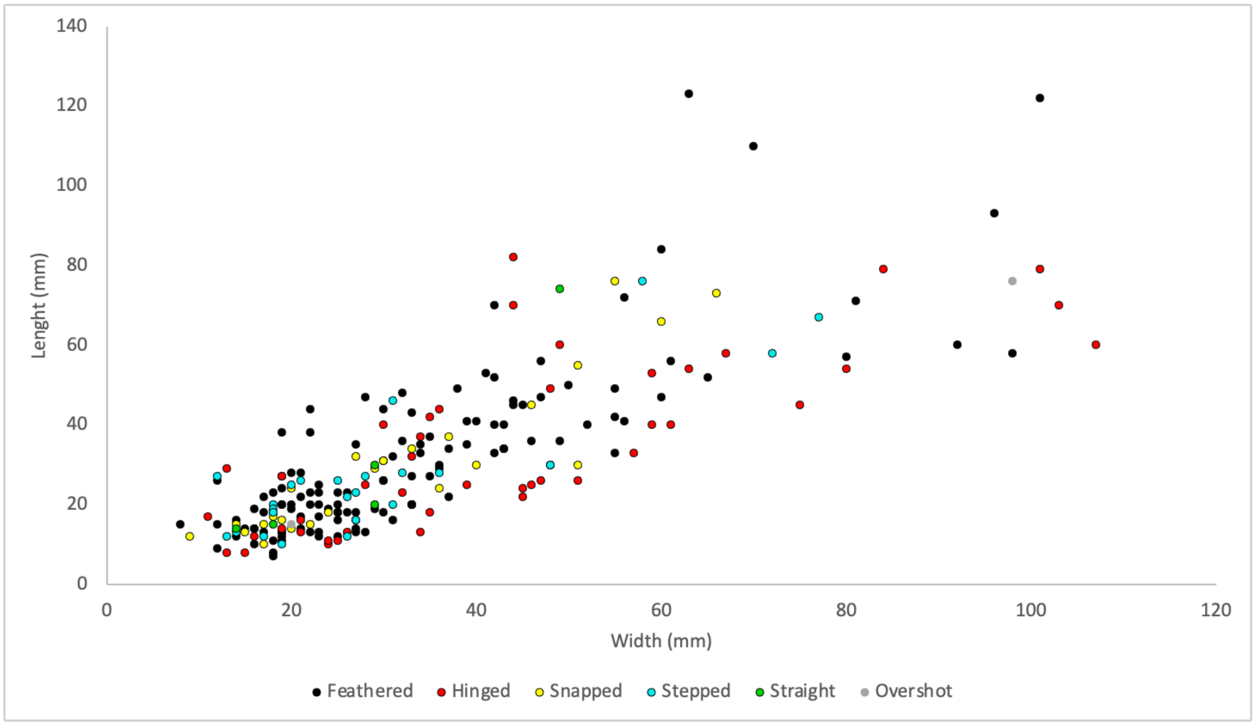

Figure 7. Size distribution of complete flakes according to termination type

The presence of a well-defined lip on 169 of all complete flakes (75,78%) and the accompanying absent to diffuse bulb (n=111, or 65.68% of flakes with lips) are possible indicators of soft-hammer percussion (Andrefsky Jr, 2005, p. 118; Inizan et al., 1995, p. 150). However, the complete flakes that do not have a lip (n=49, 21.97%) also have a higher proportion of absent to diffuse bulbs (n=38, 77.55% of flakes without lips), which suggests that the specific properties of the worked siltstone have an impact on the characteristics of its flake attributes.

Preforms

While the roughouts found on HdEh-1 are differentiated from blanks by their knapped sides and ends, celts categorized as preforms underwent an additional shaping step, pecking. Figure 9 shows the difference between pecked surfaces and a surface altered by the site's local conditions involving sand and wind. The pecked surfaces (Figure 9.a-b) are characterized by smaller, more densely packed and better-defined craters often presenting clean ridges compared to the rounder and wavier ridges of weathered surfaces (Figure 9.c). In some cases, both patterns are superimposed, making pecking marks more difficult to identify (Figure 9.b).

There are only two preforms in the assemblage, HdEh-1.142 and .75 (Figure 8). In both cases, the celts' lateral portions were pecked to level the ridges created by bifacial knapping. On HdEh-1.142, pecking traces are also visible on one face of the distal portion, where they helped shape the celt's bevel. Both preforms have straight and splayed sides, but their cross-sections are bi-convex (HdEh-1.142) and bi-plano (HdEh-1.75) (Table 2). From a lateral perspective, HdEh-1.142's profile can be described as symmetrical, although ulterior grinding steps could have made it more asymmetrical.

The textural properties of both preforms might have motivated the use of pecking as an intermediary technique between knapping and grinding. Indeed, both preforms have developed cleavage planes. On HdEh-1.142, these are represented as the cortical surfaces that delimit both faces of what was a slab blank[4]. On HdEh-1.75, cleavage planes are revealed by the distal fracture, which might have been caused by an earlier attempt to create a tranchet. Due to the fissile texture, however, the tranchet attempt resulted instead in a large stepped fracture. Unlike roughouts with a more conchoidal fracture, HdEh-1.142's bevel was prepared through a series of smaller bifacial flake removals.

The ridged hammerstone HdEh-1.106 is worth mentioning here. It is likely the tool that was used to peck the surface of the celt preforms described in this section, as well as some of the fragmented and reshaped celts. This tool is made of a green translucent chert that was first knapped into a disc shape and then used as a hammerstone. The crushed and fissured ridges of its circumference attest to its use as a ridged hammerstone (or pecking stone) (Figure 10).

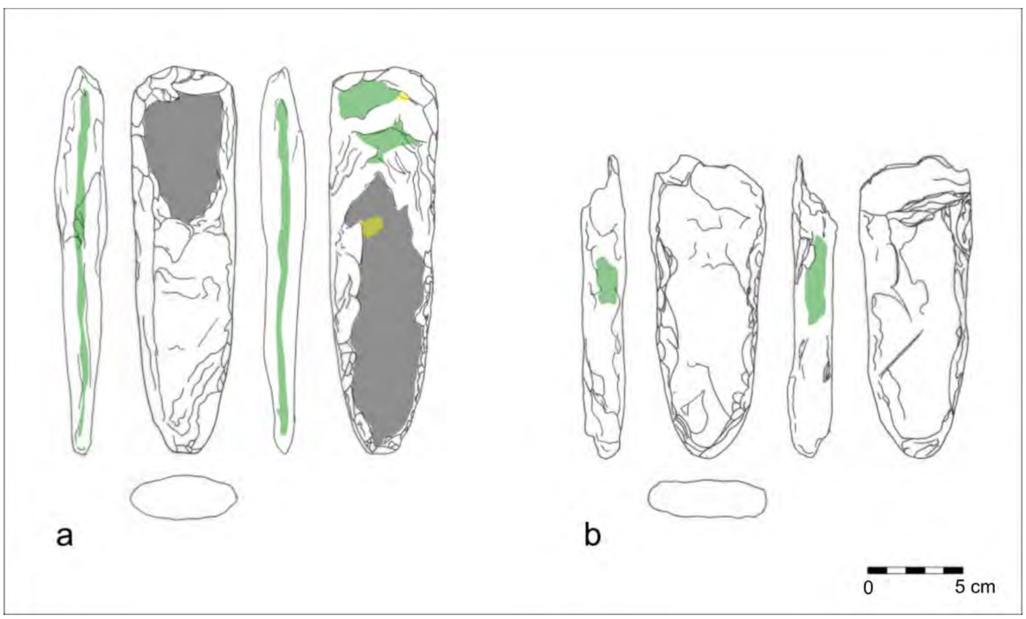

Figure 8. Preforms
a) HdEh-1.142; b)HdEh-1.75. Grey areas represent cortex, green represents pecking traces, and yellow represents grinding traces.

[4] Although grinding traces are visible on a very small portion of this artefact's ventral cortical surface (Figure 8.a), it is nonetheless categorized as a preform: the grinding did not significantly alter the shape of the celt and could have been meant to test the material.

Figure 9. Microscopic images of celt preform surfaces
a) HdEh-1.142 X10; b) HdEh-1.75 X10; c) HdEh-1.69 X10

Object ID	Feature	Cross-section	Profile, face	Profile, lateral
HdEh-1.142	f7	Bi-convex	Straight and splayed sides	Symmetrical
HdEh-1.75	f8	Bi-plano	Straight and splayed sides	Symmetrical

Table 2. Preform morphological attributes

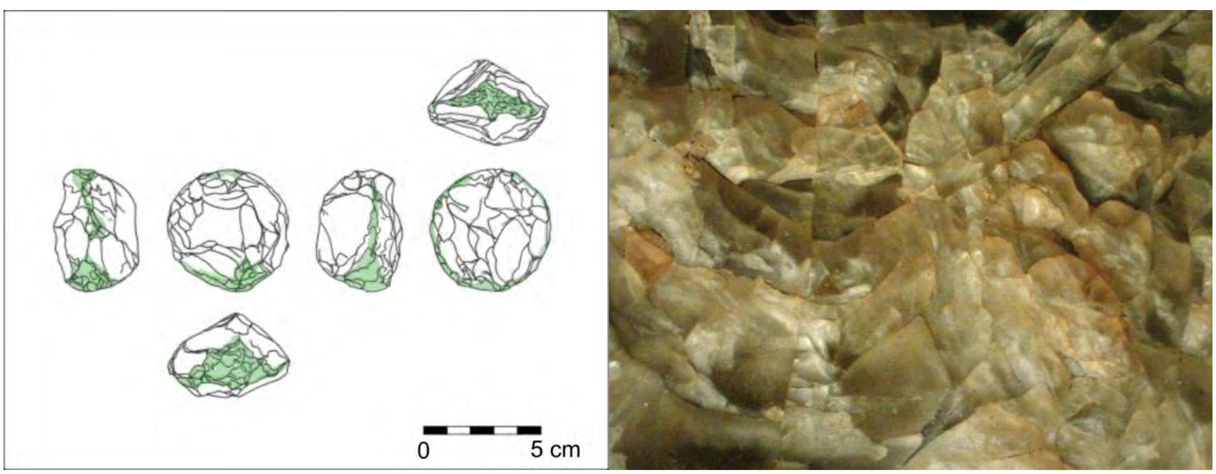

Figure 10. Ridged hammerstone HdEh-1.106 and microscopic image of crushed surface (x10)
Green areas represent ridged areas crushed from their use as pecking surfaces.

Complete celts

Only two artifacts in the current assemblage can be described as complete celts (HdEh-1.66 and .67, Figure 11). This implies that compared to preforms, they have undergone an additional step: grinding. Grinding can be present anywhere on a celts body, but it is the grinding of a functional bevel that makes a celt usable as an edged tool. Unfortunately, the surface of both these celts is too eroded to allow grinding traces to be visible, except for some very faint striations on the working edge of HdEh-1.67. Nonetheless, the levelled surface of these celts' working edge and their well-defined bevels indicate that their current morphology was obtained through grinding.

Interesting features of these celts include their small size and the curved lateral profile that they inherited from their flake blanks (the celts' butts correspond to the flake blanks' percussion platform). Both have a profile defined by straight and splayed to moderately splayed sides, curved and symmetrical working edges, and their lateral profile is asymmetrical (Table 3). However, celt HdEh-1.66 has a triangular cross-section while the smaller celt HdEh-1.67 has a bi-convex cross-section.

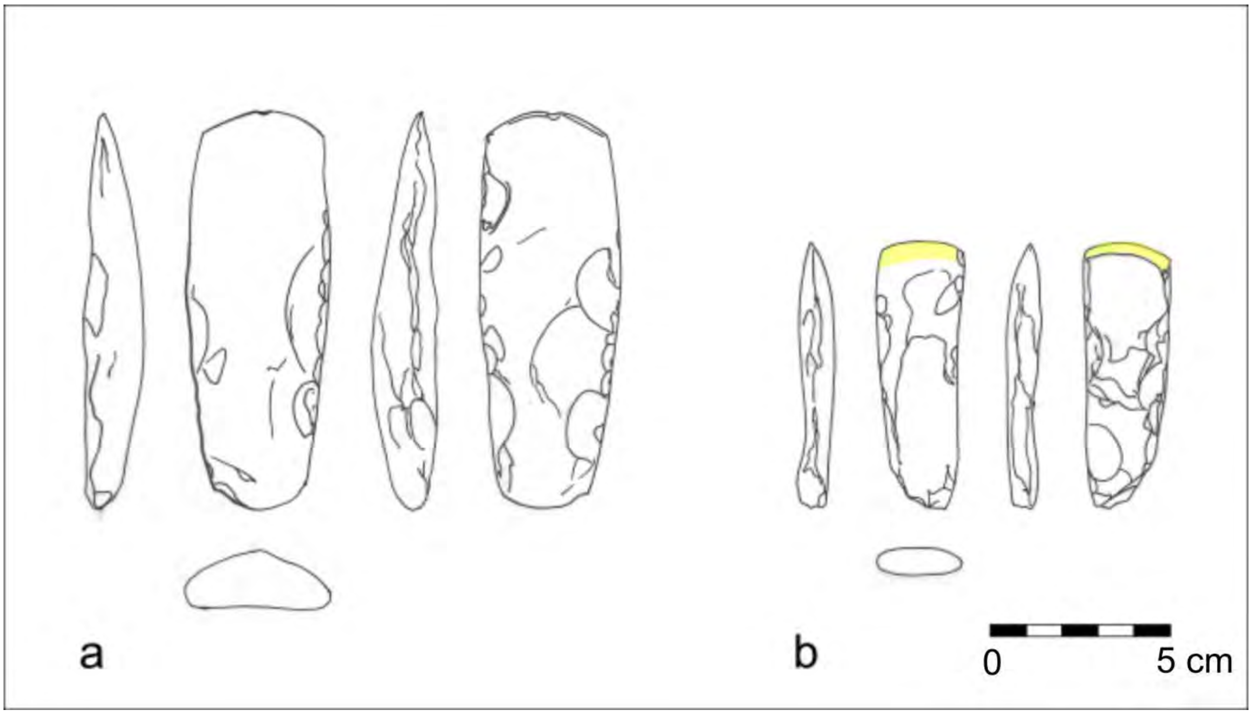

Figure 11. Complete celts
a) HdEh-1.66; b) HdEh-1.67. Yellow areas represent grinding traces.

Object ID	Feature	Cross-section	Profile, face	Profile, lateral
HdEh-1.66	f2	Triangular	Straight and moderately splayed sides	Symmetrical
HdEh-1.67	f3	Bi-convex	Straight and moderately splayed sides	Symmetrical

Table 3. Complete celts morphological attributes

Fragmented celts

The HdEh-1 assemblage comprises a total of 21 fragmented celts. Three of these fractured celts are well-preserved distal fragments with a curved and symmetrical working edge, and a symmetrical lateral profile (HdEh-1.68, .102 and .113, Figure 12). Like the complete celts, their surfaces either show traces of grinding or present morphological evidence that they reached a functional state (Figure 13).

The longest fragmented celt, HdEh-1.68, has straight and moderately splayed sides with a hexagonal cross-section (Figure 12.a, Table 4). It is almost complete but a large fracture of its proximal end would have made it difficult to use in its current state. This celt is made of a similar stone type to that of the rest of the celt assemblage, but it differs slightly as it is not laminated and has a slightly coarser granulometry. If knapping was used as an initial shaping step, all traces were erased by the elaborate pecking of the entire surface. Although this celt's body would have also been ground into shape, grinding traces are only visible on its distal portion. As this celt appears to have fractured from use, its function and the resulting traces are discussed in the "use-wear" section of this report.

The two other fragmented celts are more highly worn from their post-depositional context (wind-sand) and few traces of manufacture are preserved on their surface. HdEh-1.102, which consists of a refitted celt mid-section and its distal end, has straight and splayed sides with a bi-convex cross-section (Table 4). The distal end has preserved pecking traces and a small overlying ground area on which brown specks of unidentified residue are visible.

A small portion of the distal end HdEh-1.113 also has preserved grinding traces. Both HdEh-1.102 and .113 are expansion-fractured, which is characteristic of dry-cooled fire-cracked rocks (Neubauer, 2018, p. 683).

The other celt fragments (not illustrated), include two celt bit corners (HdEh-1.162 and .163). While celt bit corner HdEh-1.162 might have been detached from a celt while it was being used, bit corner HdEh-1.163 refits with the reshaped celt HdEh-1.149+179 (Figure 14.e) and was likely produced during this reshaping event. In addition to seven fragments associated with unidentified celt portions, eight fragments come from lateral portions, which suggests they were intentionally detached from celts during a reshaping process.

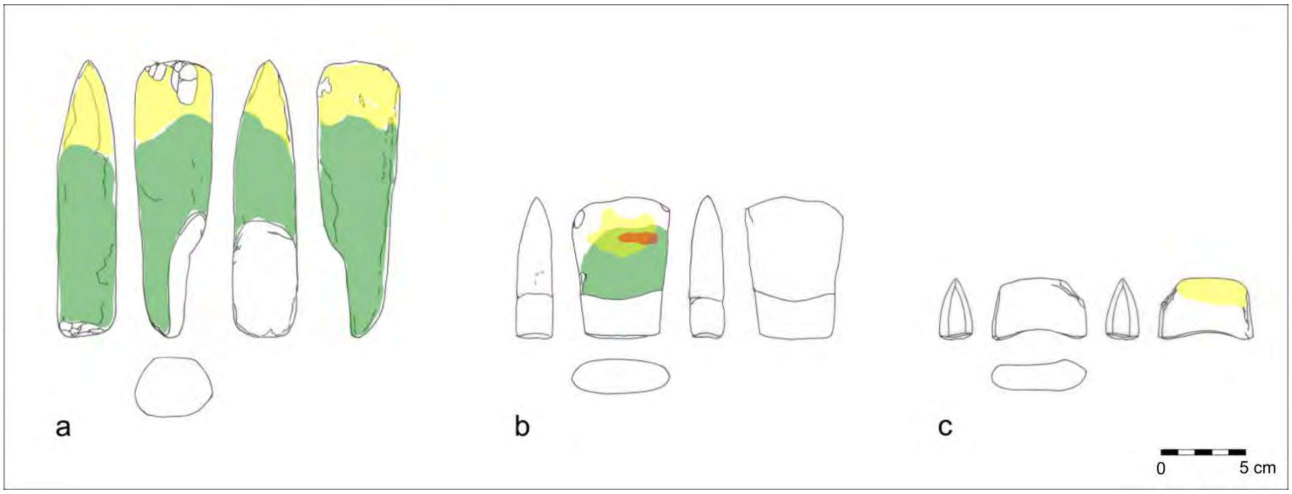

Figure 12. Fragmented celts
a) HdEh-1.68 ; b) HdEh-1.102; c) HdEh-1.113. Green represents pecking traces, yellow grinding striations and red is residue.

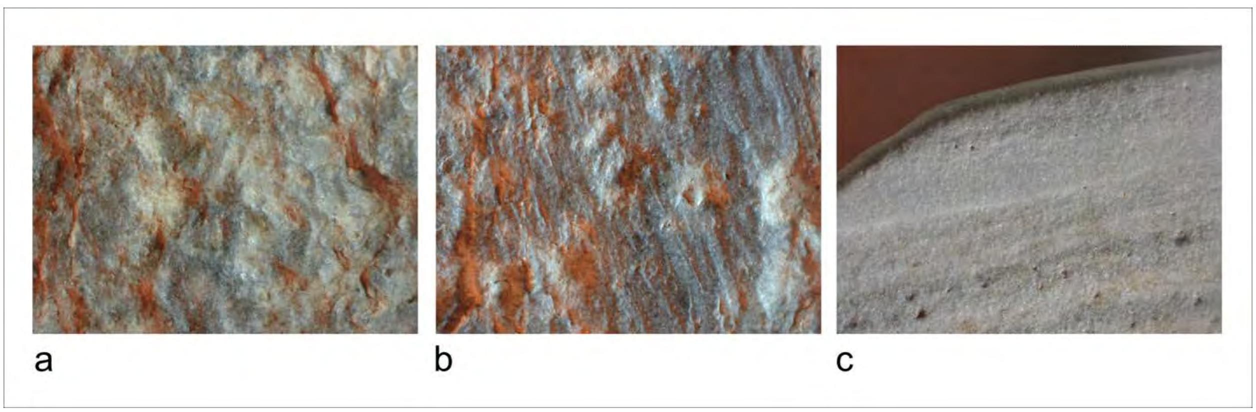

Figure 13. Microscopic images of fragmented celt surfaces
a) HdEh-1.102, spot 1 X10; b) HdEh-1.102, spot 5 X10; c) HdEh-1.113 X10

Object ID	Feature	Cross-section	Profile, face	Profile, lateral
HdEh-1.68	**f4**-f5	Hexagonal	Straight and moderately splayed sides	Symmetrical
HdEh-1.102	f8	Bi-convex	Straight and splayed sides	Symmetrical
HdEh-1.113	f8	Bi-convex?	Undetermined	Symmetrical

Table 4. Fragmented celts morphological attributes

Reshaped and repurposed celts

Eight celts made of laminated siltstone are grouped here under the category "reshaped celts" (HdEh-1.70+73, .76, .71, .72, .149+179, .95, .69+160, and .74, Figure 14, Table 5). This category includes all celts reshaped after reaching a functional stage and most likely breaking during use.

The functional history of these celts is often difficult to interpret because of site HdEh-1's environmental context and post-depositional impacts on the celts' surficial traces.

In particular, the largest reshaped celt HdEh-1.70+73 presents a complicated set of traces. It consists of refitted proximal and medial-distal ends of a celt with straight and moderately splayed sides and a diamond/pentagonal cross-section. Its fragments are separated by a hinged fracture that appears to have occurred when the celt was a preform. This is suggested by the pecked left side of the proximal fragment. On the medial-distal fragment, a portion of the dorsal surface reveals grinding striations, suggesting that this portion of the celt might have eventually been completed and used, or reached an advanced preform stage (the removal of more distally ground areas of the working edge prevents this distinction from being made). However, the eventual reshaping of the celt is revealed by the fact that the ground portion is crosscut by more recent bifacial retouch of the working edge and sides. The first few millimeters of the stone's surface is whitened and potlids are visible on the dorsal ridge, which is consistent with heat alteration (Deal, 2012). On the dorsal left portion of the celt, flake scars from bifacial knapping crosscut the heat-altered dorsal surface and removed all traces of earlier pecking.

The working edge of four other celts was reshaped following the occurrence of distal wear and/or fractures that further prevented their use (HdEh-1.76, .71, .72, and .149+179, Figure 14.b-e). All present residual knapping, pecking and grinding traces. Their reshaped working edge can be distinguished from those fractured through use because no portion of the original bevel remains and the celts could therefore not have been used in their current state. Furthermore, the successive removal of flakes along the broken edges indicates that these were intentionally produced in an effort to redefine bevel angles. The longest of these reshaped celts, HdEh-1.76, has an asymmetrical lateral profile and a plano-convex cross-section with the ventral face and right side delimited by the blank's flat planes. The three other reshaped celts have a bi-convex cross-section and a relatively symmetrical lateral profile. While celt HdEh-1.71 has an intact cortical butt, HdEh-1.72 and 149+179 are missing their proximal end. On both HdEh-1.71 and .72, patches of brown to grey residue are present along one side.

The smallest celt HdEh-1.95 has a plano-convex cross-section and a relatively symmetrical lateral profile. Its working edge would no longer have been functional as a cutting tool, but its fractures on both ends and the rounded aspect of its bevel suggest that it was repurposed as a bipolar hammer. Unfortunately, due to its surface being heavily worn from wind and sand exposure, this interpretation remains tentative.

The two other reshaped celts have a bi-convex cross-section and come from thinner blanks or celt fragments. HdEh-1.74 was struck from the side of a celt (as suggested by the grinding striations visible on its left dorsal area) and bilaterally retouched on its ventral face. It is unclear if this reshaped celt had a functional working edge, of which only a portion remains, or if the celt remained unfinished. Specks of brown residue are distributed along both sides and on the butt of this reshaped celt. In the case of HdEh-1.69+160, it is not possible to determine if it came from a larger celt or if it was made from a thin slab. Nonetheless, it is categorized as "reshaped" due to the extensive damage visible on its working edge and the full obliteration of its bevel.

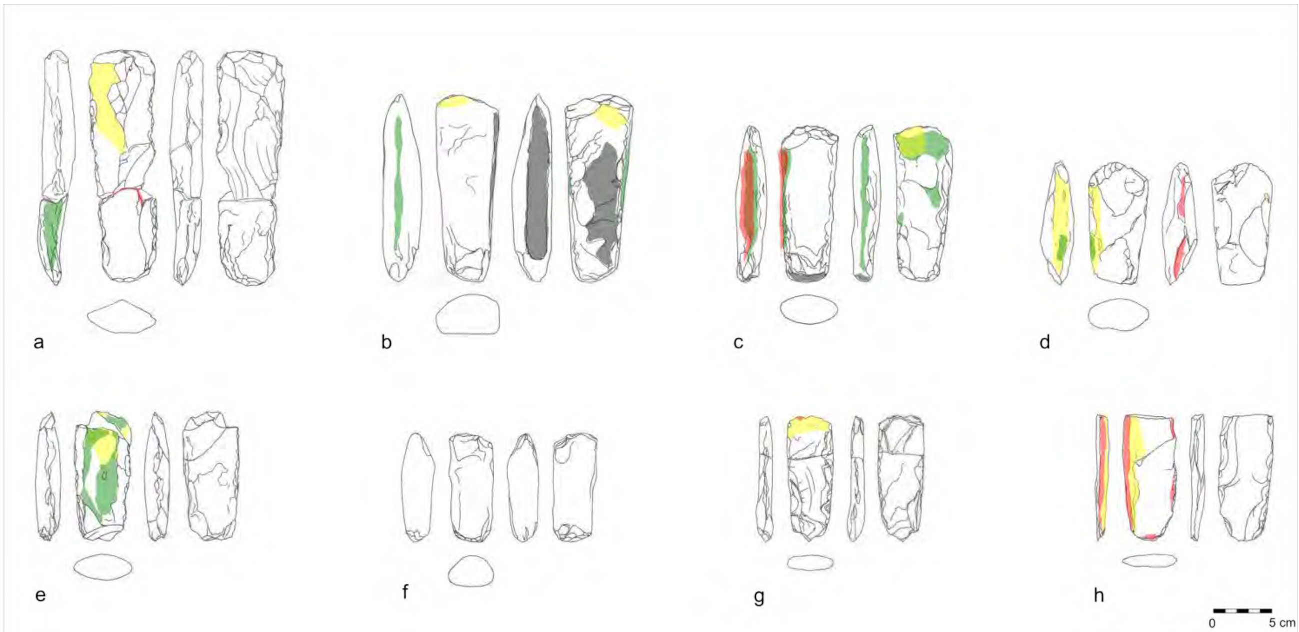

Figure 14. Reshaped celts
a) HdEh-1.70+73 ; b) HdEh-1.76; c) HdEh-1.71; d) HdEh-1.72; e) HdEh-1.149+179; f) HdEh-1.95; g) HdEh-1.69+160; h) HdEh-1.74. Grey areas represent cortex, green represents pecking traces, yellow grinding striations and red is residue.

Object ID	**Feature**	**Cross-section**	**Profile, face**	**Profile, lateral**
HdEh-1.70+73	**f4**-f5	Diamond/pentagonal	Straight and moderately splayed sides	Symmetrical
HdEh-1.76	f8	Plano-convex	Straight and moderately splayed sides	Asymmetrical
HdEh-1.71	**f4**-f5	Bi-convex	Straight and moderately splayed sides	Symmetrical
HdEh-1.72	**f4**-f5	Bi-convex	Straight and moderately splayed sides	Symmetrical
HdEh-1.149+179	f4-f5	Bi-convex	Straight and moderately splayed sides	Asymmetrical
HdEh-1.95	f8	Plano-convex	Straight and moderately splayed sides	Symmetrical
HdEh-1.69+160	f4-f5	Bi-convex	Straight and moderately splayed sides	Symmetrical
HdEh-1.74	f4-**f5**	Bi-convex	Straight and moderately splayed sides	Symmetrical

Table 5. Reshaped celts morphological attributes

Celt functions

Definitions of axes, adzes, and chisels are usually based on morphology and assume hafting methods and functions. Axes are expected to have a symmetrical lateral profile, are hafted with a shaft oriented parallel to their working edge and are used in thrown longitudinal percussion. On the contrary, adzes are expected to have an asymmetrical lateral profile, are hafted with their working edge perpendicular to the shaft, and are used in thrown transversal percussion (Leroi-Gourhan, 2004; Semenov, 1964). Chisels tend to be distinguished from axes and adzes based on their smaller size, parallel sides, and lack of evidence of a haft (Pétrequin and Pétrequin, 1993). They are used with percussion driven with a hammer (Leroi-Gourhan, 2004). While these categories are not inaccurate, celts often stand at the junction between different tool types (Adams, 2014). For example, some of the celts that Semenov (1964) identified as adzes through use-wear had a symmetrical profile. Furthermore, tools described as axes, adzes or chisels can be hafted differently throughout their use-lives or even used un-hafted (Pétrequin and Pétrequin, 2012; Pétrequin et al., 2012). Dimensional criteria are also problematic, for example, very long chisel blades are known from Neolithic contexts in Valais, Switzerland (Pétrequin et al., 2012).

Throughout this report, the term “celt” is used to refer to any kind of ground stone tool with a bevelled distal working edge. More precisely, it follows Kapches’(1979, p. 65) definition of celts as covering “a class of ground stone implements that includes the functional and morphological types of artifacts known variously as adzes, axes, gouges, chisels, etc.”. This term prevents the attribution of function based on morphological attributes alone and leaves room for celt shapes and functions to be impacted by different factors such as stone and blank properties, hafting type, life stage and cultural context. As highlighted by Semenov (1964), it is only through use-wear analysis that the function(s) of a celt can be identified.

As most celts found on HdEh-1 are at the roughout or preform stage, it is not possible to identify their intended function. Although some have a lateral profile tending more towards symmetry or asymmetry, the shape of their bevel would likely change after being ground. Unfortunately, the detection of use-wear on the site’s complete and reshaped celts is complicated by the post-depositional effects of the site’s environment, where wind and sand combined to smoothen exposed surfaces and erase most traces. Striations with distinct orientations and distributions are the principal traces that allow us to distinguish an axe from an adze: these are absent across the assemblage. The few preserved striations are either too faint and partial to properly describe or are attributed to grinding rather than to use.

The site’s only two complete celts (HdEh-1.66 and .67, Figure 11) were found in features 2 and 3 respectively and, in both cases their surface is too patinated for use-wear to be apparent. Nonetheless, on HdEh-1.66, a slight change in angle 1 mm below the bit’s bevel could be from (re)sharpening or could suggest, as does a scar centred on the dorsal bit, that it was used (Figure 16.a). On HdEh-1.67, very faint perpendicular striations are visible on both faces of the bit, but it is unclear if these are from shaping or use (Figure 16.b). While HdEh-1.66 might have been used in a manner similar to an adze (this is suggested by its asymmetrical lateral profile and the single flake scar located on its dorsal bit), it could have also been used as a scraper or a small chisel, or perhaps as a flesher tool (*miihchiihkun*). These are also potential functions for the smaller celt HdEh-1.67.

The three fragmented celts (Figure 12) can be assigned a more specific function. On HdEd-1.68, the lateral profile is symmetrical but the celt was not used with thrown longitudinal percussion as would an axe (Leroi-Gourhan, 2004). This is evidenced by the preservation of a relatively symmetrical bit, whereas the bit of an axe will tend to become lop-sided (Semenov, 1964, p. 129). While it is possible that this celt was at some point used as an adze, the group of fluted scars on one face of the bit suggest that it was last used as a wedge. Keeley (1980, p. 41) notes that "if the implement is deeply embedded in the wood, long "fluting" flakes can be removed, with their point of origin on the working edge" and that "generally, the damage scars are shallow, with a tendency to terminate in a "step"", like those on HdEd-1.68's bit. This celt's bipolar percussive use as a wedge left its butt battered and fractured. Microscopic hafting wear does not appear to have been preserved on its surface, but a slight narrowing of the celt 7.5 cm below the bit suggests the poll was contained in a haft when it fractured. The morphological characteristics of the two thermally fragmented celt distals found in feature 8, HdEh-1.102 and .113 suggest they were used as axes: they both have a symmetrical lateral profile and their bit is slightly lop-sided from use. A small section of the axe HdEh-1.102's dorsal face retains pecking traces superimposed with grinding striations, but use-wear on the bit is too eroded to observe (Figure 16.c-d). Some striations are preserved close to the bit of the axe HdEh-1.113 but these are too faint and partial to characterize (Figure 16.e).

While many of the eight reshaped/repurposed celts (Figure 14) were likely used before entering this stage, their lack of preserved use-wear complicates their functional identification. The celt HdEh-1.76, also found in feature 8, has a clearly asymmetrical lateral profile and a flat ventral plane, which could qualify it as an adze. However, it is unclear if this celt was ever used: striations are preserved below its broken bit but these are highly weathered (Figure 16.f). Considering its morphological resemblance to gouges found in the Northeast, it is possible that this celt is a gouge preform on which a channel remains to be formed, and that its bit was reshaped during the manufacturing process.

Based on lateral symmetry alone, the celts HdEh-1.71, .72, and .149+179 appear to have been used as axes. However, the reshaping of their bit obliterated any use-wear that could allow us to verify this. Pecking traces and grinding striations are sometimes preserved along their sides and body, away from the bit, and the latter appear relatively fresh (vs. smoothened from handling or the addition of a haft) (Figure 16.g-j). As mentioned previously, the crushed working edge and the bipolar wear observed on the heavily worn and patinated celt HdEh-1.95 suggest that it was repurposed as a bipolar hammer. The small reshaped celt fragment HdEh-1.69+160 presents possible use-derived striations on the preserved portion of its ground working edge (Figure 16.k-l). While the partial and weathered nature of the striations makes these difficult to distinguish from grinding traces, the presence of dark patches of unidentified residue on the bit supports the hypothesis that this celt was used before being reshaped.

HdEh-1.3 is a curved object that resembles a celt blank but does not appear to be directly related to the manufacture of ground stone celts. Yet, it is discussed here because it is made of the same laminated siltstone as the majority of this assemblage and has a highly worn surface. Wear is concentrated on this tool's curved face (shown as the dorsal in Figure 15), while its opposite face appears to have been retouched to facilitate the grip and shows a high concentration of red residue. Unlike the celts described in this report, this tool has well-preserved use-wear consisting of very bright, smooth and rounded polish reaching into deeper areas of the dorsal surface (Figure 17.a-h). The striations that run across the same surface are long and continuous, and have varied widths, depths and orientations (Figure 17.a-c). The majority are oriented parallel or slightly oblique left and right in relation to the tool's long axis, with a smaller quantity running at angles sub-perpendicular to that axis. Like the polish, the striations follow and reach over the tool's curved edges, suggesting that the material being worked was soft and well-lubricated (Figure 17.e). Together, these traces are consistent with those that tend to form on hide-working tools (Adams, 1988, 1989; Keeley, 1980; Keeley and Newcomer, 1977; Masclans et al., 2017). While the hide and the siltstone would not have contributed abrasive particles causing the striations, it is possible that these were created from grains of sand introduced from the site's context or from the red material (ochre?) whose residues are found on both faces of the tool (Figure 17.c-d, i-l).

Oblique bands of bright polish are macroscopically visible on half of the tool's dorsal surface but are difficult to see under the binocular (represented as blue bands in Figure 15). These bands appear to be related to striations that run perpendicular to the tool's long axis and circle it around its sides, suggesting that the tool was wrapped in that area at some point after having been used (Figure 17.f-h).

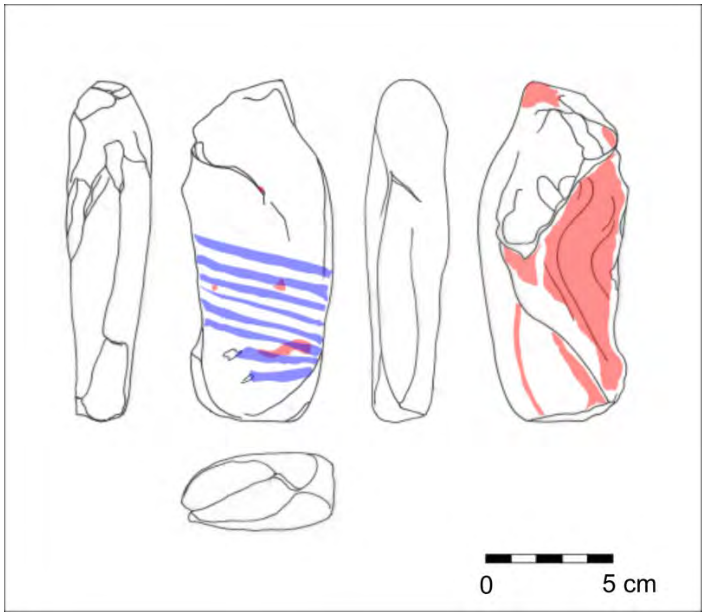

Figure 15. Possible hide processing tool (HdEh-1.3)
Blue represents bands of polish, red is residue

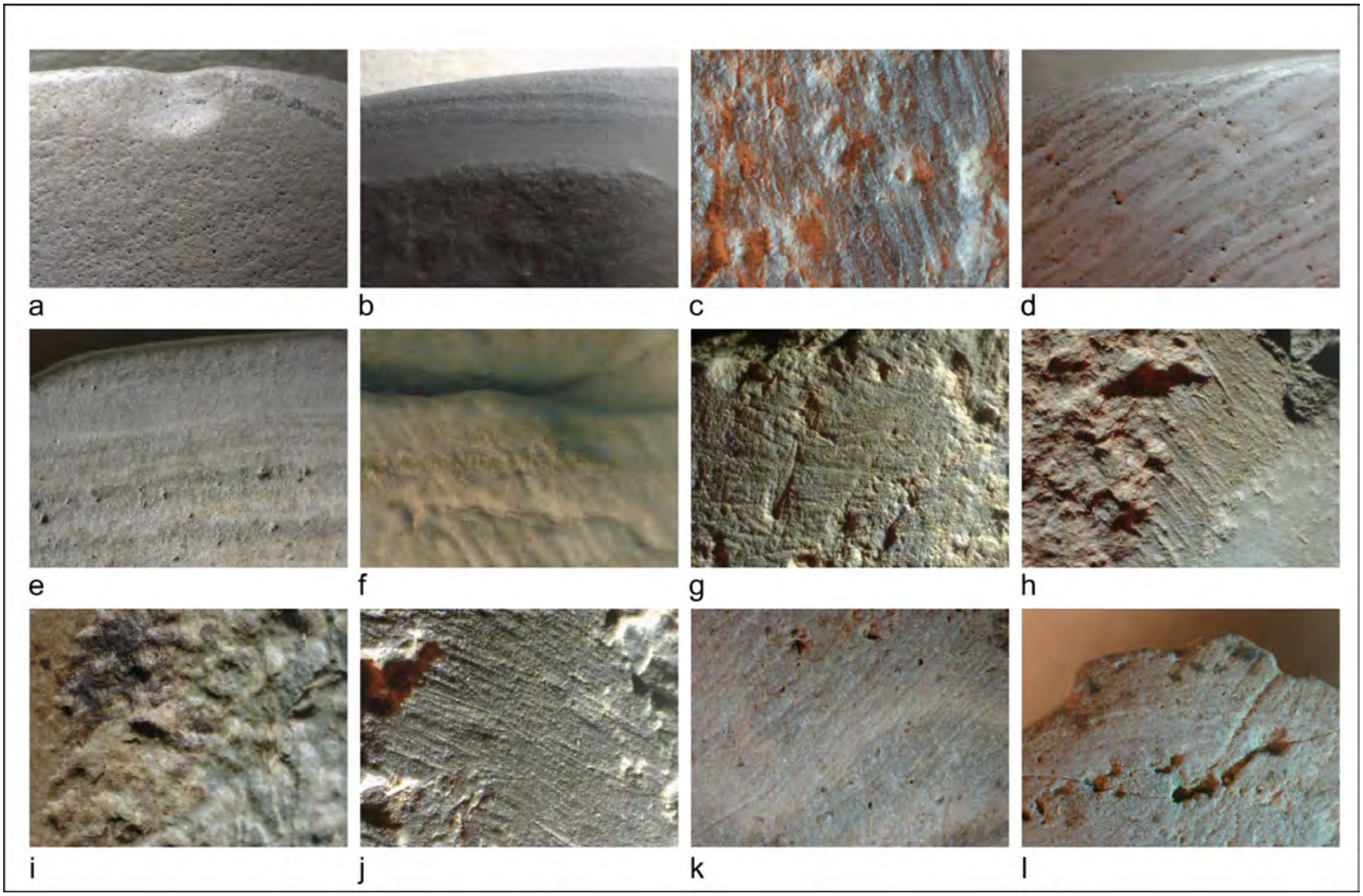

Figure 16. Microscopic images of worn celt surfaces
a) HdEh-1.66 X10; b) HdEh-1.67 X10; c) HdEh-1.102 X10; d) HdEh-1.102, X10; e) HdEh-1.113 X10; f) HdEh-1.76 X10; g) HdEh-1.71 X10; h) HdEh-1.72 X10; i) HdEh-1.72 X10; j) HdEh-1.149 X10; k) HdEh-1.69 X10; l) HdEh-1.69 X10

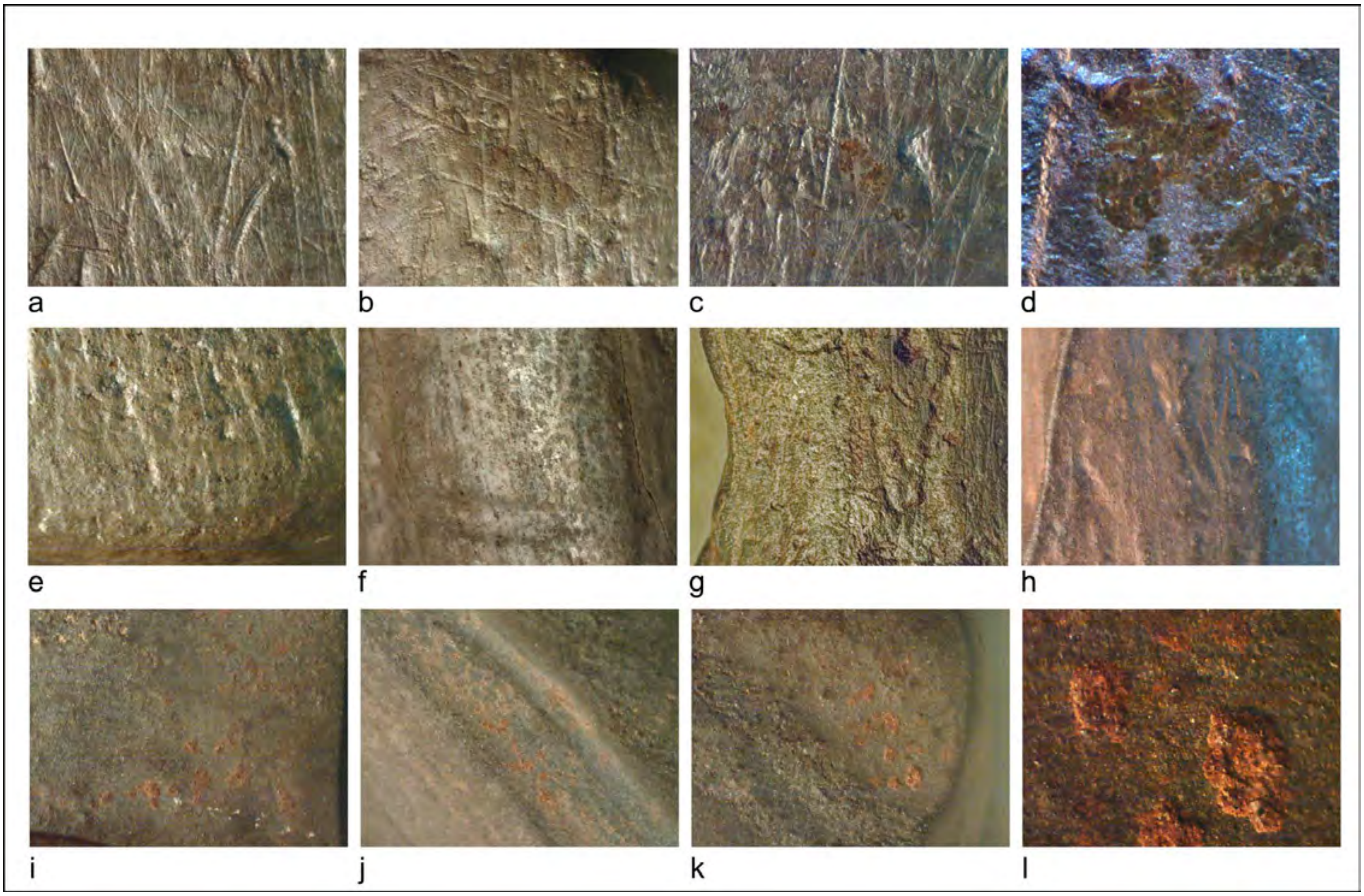

Figure 17. Microscopic images of possible hide-softener HdEh-1.3
a) spot 3, X10; b) spot 7, X10; c) spot 20, X10; d) spot 20, X50; e) spot 1, X10; f) spot 12, X10; g) spot 14, X10; h) spot 16, X10; i) spot 19, X10; j) spot 18, X10; k) spot 17, X10; l) spot 17, X50

Spatial distributions

Considering the spatial distribution of the celts' production steps across the site allows us to observe certain patterns and groupings. When possible, to better capture the dynamics of the site's occupation, the f4-f5 conjoined lobes are considered separately according to an arbitrary division.

Figure 18 suggests that the distinct steps of the celts' *chaîne opératoire* were divided across the site's features. Blank fragments and complete celt roughouts are distributed across f8, f7 and f5. However, the concentration of siltstone debitage products in f4+f5 shows that the initial shaping of roughouts was conducted in this sector of the site. Roughouts then appear to have been passed down to individuals occupying the site's southwestern features, f7 and f8. It is in these two features that the pecking of celt roughouts into preforms would have taken place, an interpretation supported by the ridged hammerstone's presence in f8 (HdEh-1.106) and by the many celt roughout fragments possibly fractured from pecking in f8 and f7. The two reshaped/repurposed celts found in f8 also appear to have reached a stage related to pecking: the possible gouge preform with a reshaped bit could have been transferred to f8 for its occupants to peck its channel, and the small celt with traces of bipolar percussion might have been used as a pecking tool, like a ridged hammerstone (see e.g., Pétrequin and Pétrequin 1993, p.229). The two fragmented celts found in f8 differ from those of f4-f5 as their breakage was thermally induced. Interestingly, the very large roughout found in f7 was also thermally fractured.

The absence of complete celts in f4-f5 contrasts with its abundance of celt fragments and reshaped celts, both complete and fragmented. Considering the occupants of f4+f5's apparent siltstone debitage "specialization", they also appear to have taken charge of reshaping celts that had reached the end of their functional life in a particular form, possibly then repeating the transfer to f7 and f8 for pecking. The celt fragments found inside f4+f5 are not the result of accidental breakage from use inside these features as none of them are characteristic of such breakage[5]. Future work on HdEh-1 might reveal the presence of use-derived fragments in f4-f5 and support the intensive use of ground stone celts in this feature. However, it is also possible that celts were used intensively in a different location and only brought to f4-f5 to be reshaped afterwards.

The fact that the only two complete celts (i.e., unfractured celts that could be used in their current state) were found in the northeastern features of the site, f2 and f3, and as the only objects in these features that are associated with the celts' *chaîne opératoire*[6], suggests that the people who occupied this area did not directly participate in celt manufacture. It is interesting to consider the delicate nature of these two celts –likely made from celt-shaping by-products – and their possible use as fleshing tools (*miihchiihkun*) alongside the nearby presence (between f1 and f2) of the worn siltstone curved object (HdEh-1.3) whose function appears related to hide-working. Whether the northeastern section of the site was occupied simultaneously or after the southwestern portion (f8,

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[5] Flakes on which the striking platform corresponds to a celt's bevelled working edge are typical, as well as large snapped-off portions of celt distal and proximal ends.

[6] Except for one flake shatter of grey siltstone and one of red siltstone in f2.

f7 and f4-f5), the activities that took place in both sections differ greatly and might reflect a gendered and/or functional division of the space.

Figure 19 allows us to visualize the distribution of celts according to their morphological traits, i.e., cross-sections and face profiles. The abundance of cross-section and profile shape combinations (n=12) shows that celt-making was a relatively flexible process for HdEh-1's occupants and that these combinations might reflect more the artisans' adjustment to the properties of each stone blank than an adherence to strict cultural typological norms. Nonetheless, the presence of some distributional patterns does suggest slightly different approaches to celt manufacture in each feature. The most striking pattern concerns cross-sections: there is a greater abundance of diamond/pentagonal cross-sections in f8 and a greater abundance of bi-convex and bi-plano cross-sections in the f7-f5-f4 group. Regarding profiles, celts with straight and splayed sides are more common in f8 while those with moderately splayed sides are more common in f4-f5. The concentration of celts with bi-plano cross-sections in the southwestern sector of the site is related to a greater diversity of stone types and their tabular texture, including possible slate preform (HdEh-1.75) in f8, a very large siltstone (HdEh-1.118+122) and a phyllite roughout in f7 (HdEh-1.124), and a red siltstone roughout in the f7-f5-f4 outlier (HdEh-1.80). In and around f7 in particular, the co-occurrence of these different stone types with the very large and thermally fractured siltstone roughout suggests that the people who created this feature had good access to siltstone and access other celt raw materials.

Figure 20 shows the distribution of thermally-altered celts found in features f8, f7 and f5+f4. The greatest concentration of heat-altered celts is in f8. This includes the two dry-cooled expansion-fractured celt distal (or working) ends and a roughout proximal end that, like the large roughout in f7, appear to have been placed in a fire. The other thermally-altered celts in this feature are not as heavily impacted and their exposure to fire did not lead them to break.

The thermally-altered celt roughout fragments in f7 consist of the large refit roughout with dry-cooled expansion fractures, and two other roughout fragments. One of these was found close to the large roughout, in the northwestern part of f7, but was not as deeply impacted by its exposure to heat.

Across f5 and f4, two pairs of reshaped celt fragments that were exposed to a high source of heat refit together, as does another heat-altered fragment with a non-altered piece. These might have been thrown in (or close to) a fire, along with a blank fragment, after being rejected. However, the presence of a complete and heat-altered, reshaped celt in f4 does not seem to fit this interpretation, as the bevel of its distal end could still have been ground to prolong the celt's use-life.

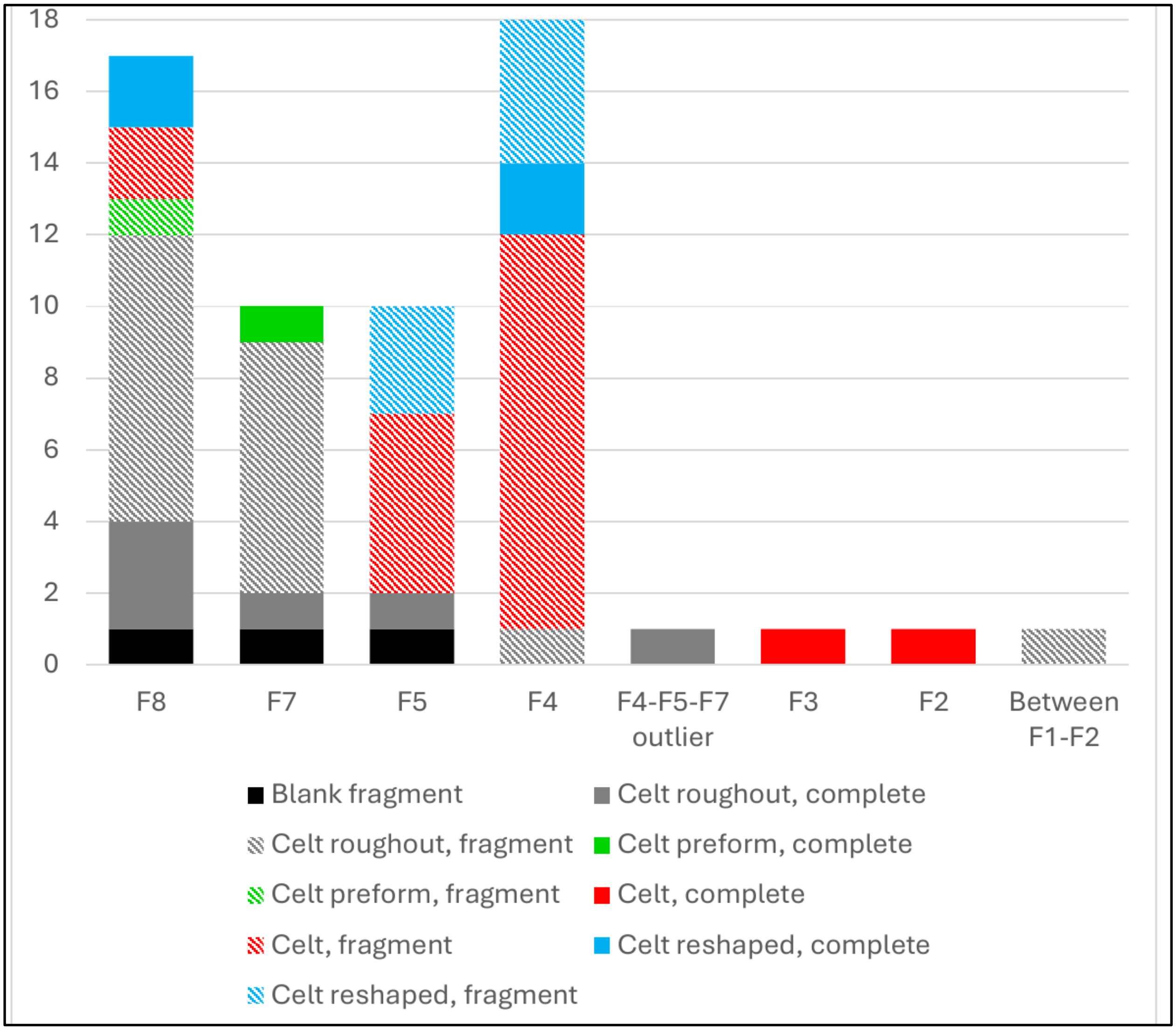

Figure 18. Distribution of celts according to their step in the *chaîne opératoire*
Note: Three celt fragments from either f4 or f5 are not included in this graph.

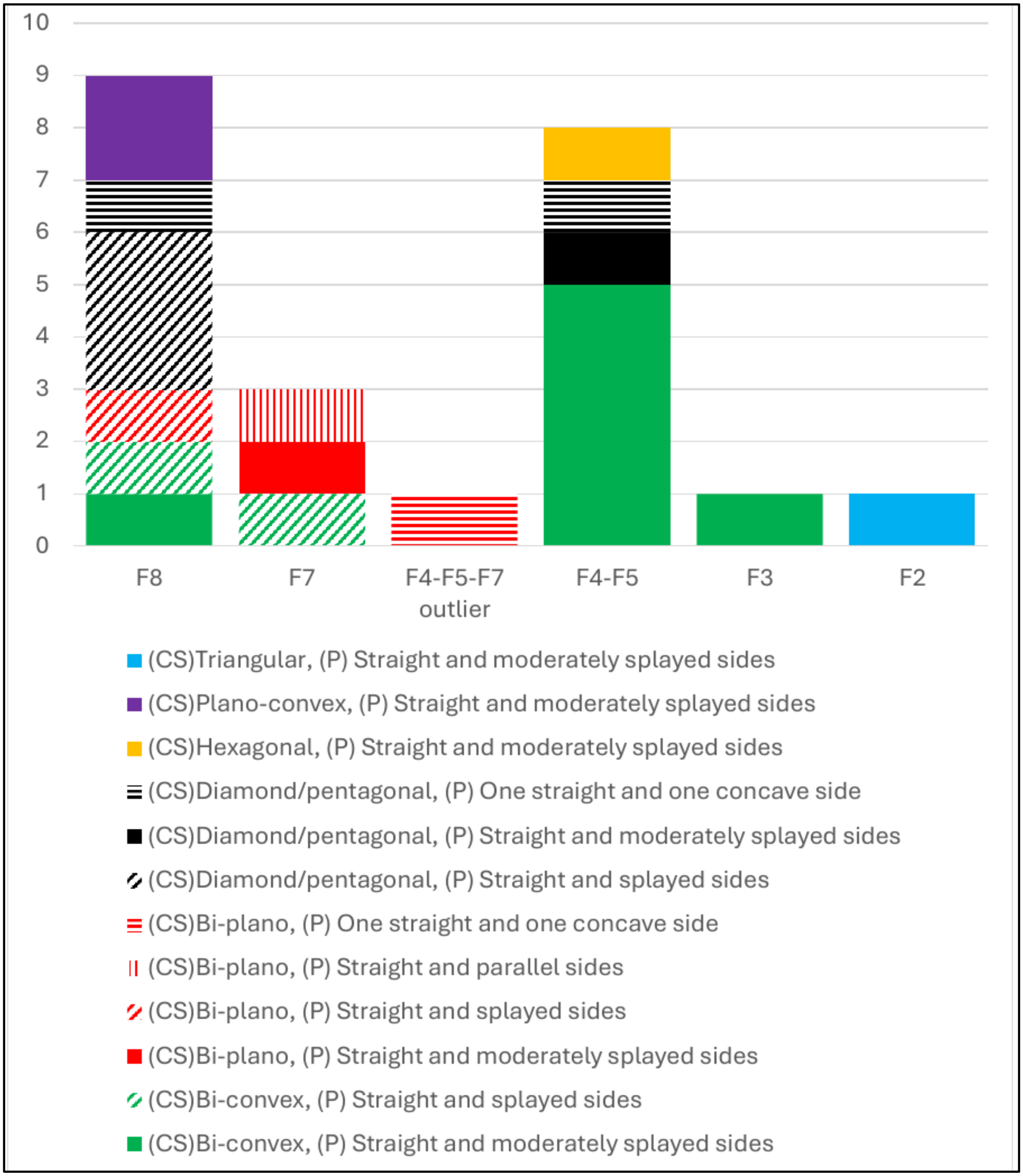

Figure 19. Distribution of celts according to their cross-section (CS) and profile (P)
Note: This graph only includes the celts whose cross-sections and profiles are observable (i.e. the roughouts, preforms, complete and fragmented celts, and reshaped celts listed in Tables 1-5).

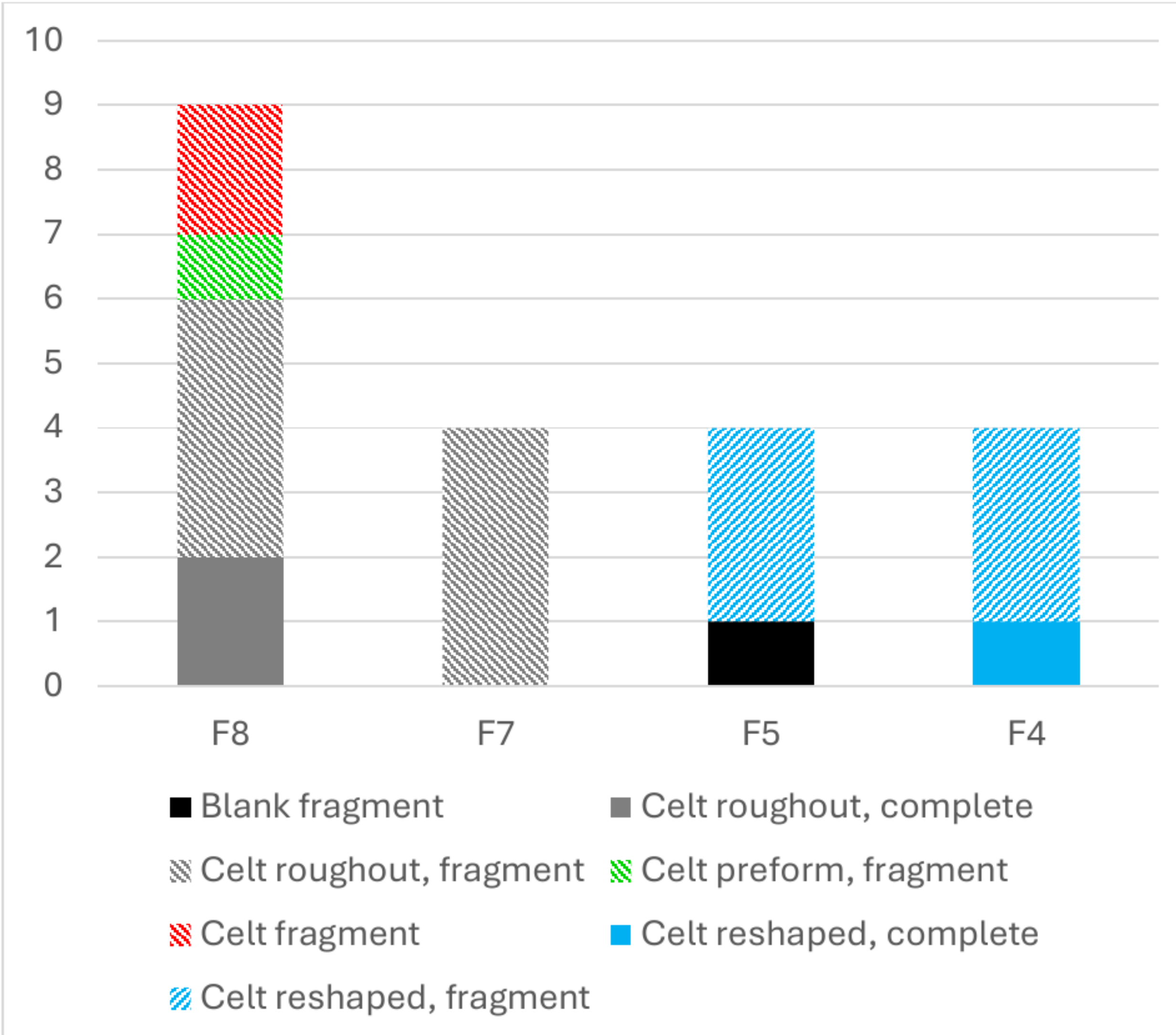

Figure 20. Distribution of thermally-altered celts

Comparative artifacts/sites

The comparison of the HdEh-1 ground stone celt assemblage with celts found in the far Northeast is complicated by the current lack of detailed reporting of this artifact category. Another particular challenge to intra-site comparisons also rests on archaeologists' inconsistent use of geological terminology. Without proper petrographic descriptions, it is impossible to know if celts are made of slate – a term often used to describe ground stone objects made of fine-grained stones – or if they are made of argillite, siltstone, fine-grained sandstone, or a fine-grained pyroclastic stone like tuff (Burke, 2003, p. 199). These differences not only limit comparisons based on specific types of stones and their possible sources, but they also have textural implications on celt *chaînes opératoires*, afforded function(s) and recycling potentials (Gallo, 2017, 2022).

Despite these caveats, similarities in materials and shapes between celts found on HdEh-1 and other sites in Québec, Labrador and the Maritime Peninsula reveal shared traditions around celts made of pale greenish to grey fine-grained stones and with straight sides that are either moderately or highly splayed (like most celts on HdEh-1), or parallel.

Ground stone celts with parallel sides are absent from HdEh-1. Nonetheless, the materials used to make such shaped celts in Newfoundland and Labrador resemble the siltstones used on HdEh-1. On the Rumbolt site (DgBh-1) along the Humber River in Newfoundland, eleven finely ground double-ended gouge-adzes and one double-ended adze with hexagonal cross-sections were found in a cache. These vary in length between 10 to 40 cm and are made of a "banded, grey limestone that has weathered to a pale tan colour" (Lacroix, 2014, p. 164). In the Strait of Belle Isle, celts of similar shape but rougher finish and made of stones described as limestone or dolomite, green volcanic tuff, and friable grey stone were found on the Pinware Hill (EjBe-10), Arrowhead mine (EjBe-16), and Juniper (EjBe-15) sites (McGhee and Tuck, 1975). While Pinware Hill would be the earliest known archaeological site in Labrador at ca. 9000-8000 BP, the Arrowhead mine site is dated to ca. 7200-7000 BP and Tuck and McGhee suggest a 6000-5000 BP range for the Juniper site (despite a radiocarbon date of 3970±45) (Fitzhugh, 1978; McGhee & Tuck, 1975; Rankin, 2008; Schwarz, 2010; Tuck and McGhee, 1975).

Celts with straight splayed sides and bi-convex cross-sections are more common on HdEh-1. In the Gulf of Maine, celts and gouges with splayed sides were found among an Early Archaic cremation burial of the Morrill Point Mound (CB103), estimated to date to ca. 8500-8000 BP (Robinson, 2006). On the Rivière Sainte-Marguerite (DbEl-10b) along the Saguenay Fjord, groups of the Maritime and/or Laurentian Tradition made and used celts with splayed sides and bi-plano or bi-convex cross-sections sometime between 8000 and 3000 BP, and with some lithic materials resembling those used on HdEh-1, including slate, shale and a tuff macroscopically described as siltstone (Gallo, 2016).

Closer to HdEh-1, in the Strait of Belle Isle, McGhee and Tuck found celts with straight splayed sides and bi-convex cross-sections on the Fowler, Forteau Point (EiBf-2) and Pinware W-5 (EjBe-12) sites. These celts are described as made of eroded volcanic tuff on Fowler, and as greenish silicified slate on Pinware W-5 (McGhee and Tuck, 1975). Fowler is dated to 6855±115 BP. but Forteau Point might have had a later occupation ca. 4000-3000 BP. based on similarities with Port au Choix objects (Fitzhugh, 1978, p. 72; Tuck and McGhee, 1975, p. 86).

Splayed celts with shaping patterns most similar to those found on HdEh-1 were found on sites of the Naksak Complex in the Nain-Okak region: Koliktalik 1 (HdCg-2), Ballybrack Mound 2 (HeCi-II), Evilik 7 (HeCg-10), Adlatok 1 (GiCc-2) and Natsatuk 1 (HdCg-1) (Fitzhugh, 1978). Fitzhugh (Ibid, 84) describes some of these celts as made of slate and mentions the use of siltstone in Naksak assemblages. An image of a celt from the Ballybrack Mound 2 site, dated to 7065±70 BP, even hints at the presence of laminations in the stone. Among the few Naksak dated sites, two pits on site Koliktalik 1 delivered radiocarbon dates of 6135±95 BP and 6010±65 BP (Fitzhugh, 1978, 2006). According to Fitzhugh, the Naksak Complex is an Early Maritime Archaic manifestation that predates the Sandy Cove Complex (1978, p. 72).

Ground stone celts and gouges are also common on sites of the Sandy Cove (ca. 6000-4000 BP) and Rattler's Bight Complexes (4000-3700 BP), but few are described or illustrated, which limits comparisons. On the Easter settlement site (EjBd-1) possibly occupied ca. 5000 BP, a knapped and pecked celt preform with straight splayed sides and a possible diamond cross-section resembles HdEh-1.70+73 and is made of a very fine-grained light-coloured stone (McGhee and Tuck, 1975, p.217). A finely ground small splayed celt of a similar material but less angular cross-section was also found on this site (Tuck and McGhee, 1975, p. 85). One smoothly ground but fragmented celt found on Rattler's Bight 1 has splayed sides a possibly bi-convex cross-section, and is made of a pale fine-grained stone (Fitzhugh, 1978, p.71).

Ground stone celts from different sites located in the far Northeast and dated to between 9000-3000 BP compare morphologically – and perhaps materially – to those found on HdEh-1. While this points to a longlasting tradition of making ground stone celts in the region, the current state of knowledge and limited documentation surrounding this object category limits how precisely HdEh-1's assemblage can be situated in relation to the complexes and sites described above. Nonetheless, as one of the very few North American sites with evidence of celt manufacture and maintenance, HdEh-1 is uniquely positioned in terms of its potential contribution to a better understanding of ground stone celt technologies in the far Northeast.

Recommendations

This section offers recommendations for future research on HdEh-1. The first recommendation concerns the intersite comparisons discussed above: as preliminary observations based mostly on the literature, these remain hypothetical and should be verified in person. This would allow us to compare more of these celts' morphological attributes and to verify material correspondences. To better characterize HdEh-1's laminated siltstone assemblage, petrographic analyses could be conducted on a few samples of shattered or incomplete flakes. This would provide a better understanding of the stone and its properties. This would also provide a reference sample that could be compared with similar materials found on other sites.

It would be helpful to revisit assemblages associated with the Kaskak, Sandy Cove and Rattler's Bight Complexes in Labrador. In particular, Fitzhugh's list of trends that appear with the Rattler's Bight Complex includes an "Increasing standardization of lithic material used for specific implement types: Ramah chert for points and bi-faces, soapstone for plummets, a single type of slate for the ground stone industry" (1978, p.70). Comparing this "single type of slate" with the HdEh-1 assemblage could help to identify the site's affiliation.

A visit to potential sources in the Menihek Formation would allow us to verify the degree of variability of laminations and textures within the same outcrop and to evaluate the possibility of sourcing different-looking blanks from the same area. A survey of the HdEh-1 site itself could focus on the presence and particularities of local secondary deposits that could have been sourced for blanks. As it is still unclear where the grinding of HdEh-1's celt assemblage took place (on the site or elsewhere?), this survey should also pay particular attention to large stones that could have been used as grinding stones. These might be made of abrasive stones, but the abundance of sand on the site might have allowed less abrasive stones to be used for this purpose. Considering the site's location alongside a waterway and the importance of water during grinding steps, grinding stones might be located closer to the water's edge.

The spatial distribution of distinct steps, shapes, materials and alterations found within this celt assemblage provides a dynamic perspective on the site's occupation and use. This would certainly be enhanced by a similar distribution analysis of the chert stone assemblage.

Finally, an analysis of the residue observed on a small portion of the celts could improve our understanding of the activities conducted on this site.

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