Boreal Bias:
A Critique of CRM Testing Methodologies in Alberta's Boreal Forest

by

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Abstract

This project, conducted in partnership with Ermineskin Cree Nation through the Ermineskin Industrial Relations Department (EIRD), was undertaken to address biases present in Alberta Culture Resource Management (CRM) archaeology that skew the data and perpetuate the conception that boreal archaeological sites are generally small and ephemeral. A comprehensive analysis of archaeological sites in the study area identified site clusters – where two or more archaeological sites have been identified within 100m of each other – to determine whether these previously identified sites are isolated with clearly defined boundaries, or if they could be connected as part of a larger site area. To this end, subsurface testing was conducted on the untested terrain between the previously identified site boundaries (FgPw-37, FgPw-41, and FgPw-43) within site cluster FID1127. The site cluster is located on a large parabolic sand dune near the contemporary Tidewater Gas Plant in the foothills of west-central Alberta. The testing was designed to ascertain whether current CRM methodologies adequately identify cultural material and accurately reflect the special extent of known sites. Identification of cultural material between these known sites supports the theory that current CRM practices in the Alberta boreal forest are missing key archaeological material, and as a result, breaking up larger habitation areas into what appear to be small ephemeral sites. This is not an accurate reflection of past lifeways in this region. Because industrial expansion in the boreal forest shows no evidence of slowing down and archaeological material is not a renewable resource, CRM methodologies and regulations must be continually tested and updated. Failure to do so compromises archaeological resources and contributes to the erasure of Indigenous history in Alberta.

Preface

This thesis is an original work by Maegan Huber. No part of this thesis has been previously published.

Dedication

I dedicate this to my parents, Ross, and Janet Huber: For my dad, whose enthusiastic support always made me feel capable of the impossible, and for my mom who taught me that good enough is not enough unless it is my best. You have never doubted me, and as a result, I do not doubt myself. Thank you for all your love.

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Introduction

This project, conducted in partnership with Ermineskin Cree Nation, was undertaken to address some of the biases present in Alberta Culture Resource Management (CRM) archaeology that skew the data and perpetuate the conception that boreal archaeological sites are generally small and ephemeral. Seven years of CRM fieldwork suggests this is likely a result of testing methodologies and the nature of CRM archaeology in Alberta, rather than an accurate reflection of past lifeways in the boreal forest.

Alberta's boreal forest archaeology sites are commonly perceived to be small and ephemeral, the result of small highly mobile bands of 20-100 people spaced widely across the land, only coming together in greater numbers occasionally (Gibson 2005:2; Ives 1993:8). The acidic brunisolic soils found throughout the boreal forest quickly break down organic materials, leaving only lithic (stone) artifacts and occasional features such as fire hearths or pits for archaeologists to identify, which exacerbates the perception of ephemeral sites. Artifacts composed of bone and wood are few and far between. The minimal post-glacial depositional processes present in Alberta's Boreal Forest Zone (ABFZ) mean sites are not heavily stratified, with artifacts usually present only in the top 10-15 cm of mineral sediment, below the organic duff. Such shallow sediments are then vulnerable to any subsequent ground surface disturbance (Ives 1982:109-110; Ives 1985:1; Bereziuk et al. 2021:7; Gibson 2005:2). Restricted access and poor visibility make forest surveys difficult; thus, most archaeological sites have been identified along more easily accessible areas such as lakes and rivers (Gibson 2005:3).

Most archaeological sites identified in Alberta in the last 50 years have been located during CRM investigations conducted ahead of large-scale industrial development. However, CRM archaeologists are restricted by provincial legislation and requirements, industrial client timelines, project footprints, and budgets, as well as the political sentiments of the day. Additionally, there is also a distinct lack of consultation between Indigenous communities and CRM archaeologists in the province. These factors have contributed to creating biases that are skewing the data and ultimately our interpretations of the significance of the cultural landscape of the past.

To test the hypothesis that boreal archaeological sites are larger and more significant than they appear upon initial assessment, site clusters were identified where two or more archaeological sites have been identified within 100m of each other. This would determine whether these previously identified sites are isolated with clearly defined boundaries, or if they could be connected as part of a larger site area. Ground truthing was conducted at one of the identified site clusters located on a large parabolic dune in the Lower Foothills ecologic zone near the Tidewater Gas Plant. Subsurface testing was conducted in previously untested portions of the dune between sites FgPw-43, FgPw-37, and FgPw-41, which were identified in 2019 by CRM archaeologists conducting a Historic Resource Impact Assessment (HRIA) for a forestry client. The identification of cultural material between these known sites supports the theory that current CRM practices in Alberta are missing key archaeological material, and as a result, breaking up larger habitation areas into what appear to be small ephemeral sites. As industrial expansion in the boreal forest shows no evidence of slowing down and archaeological material is not a renewable resource, CRM methodologies and regulations must be continually tested and updated. Failure to do so compromises archaeological resources and contributes to the erasure of Indigenous history in Alberta.

Culture Resource Management in Alberta

Initial archaeological investigations conducted in Alberta were private, not government or industry initiatives. The Glenbow Foundation first became interested in archaeology sites in Alberta in 1955 and created its Department of Archaeology in 1957. This initiative was directed by Dr. Richard Forbis until 1969, when the department was closed. Its records and collections were subsequently transferred to the Department of Archaeology at the University of Calgary. At this point, there were no regulatory requirements for archaeologists to report on sites found or excavations carried out, leaving early archaeological reporting in Alberta highly variable, with some remaining unreported today. These archaeological studies were primarily research-oriented and funded by private foundations or public institutions (Lifeways of Canada Limited 2019).

In 1973, the Legislative Assembly of Alberta passed the Historical Resources Act (HRA), originally known as the Alberta Heritage Act, the province's first heritage legislation. In 1974, regulations to the HRA were passed pertaining to the protection, management, and disposition of "Heritage Resources" defined under the Act as "works of nature and of man, that are primarily of interest for their historical, cultural, scientific or aesthetic values including, but not limited to, historic, archaeological or natural sites or structures and heritage objects" (Alberta Heritage Act 1973:23-24). The same year, the Archaeological Survey of Alberta (ASA) was formed within the Department of Alberta

Culture to serve as the regulating body responsible for registering archaeological resources in the province. The ASA developed HRIA regulations and reporting guidelines following a "proponent pays" model, which was popular in the United States at that time (Klassen et al. 2009:205), meaning that the industries whose proposed projects threaten archaeological resources are required to pay for any necessary archaeological work.

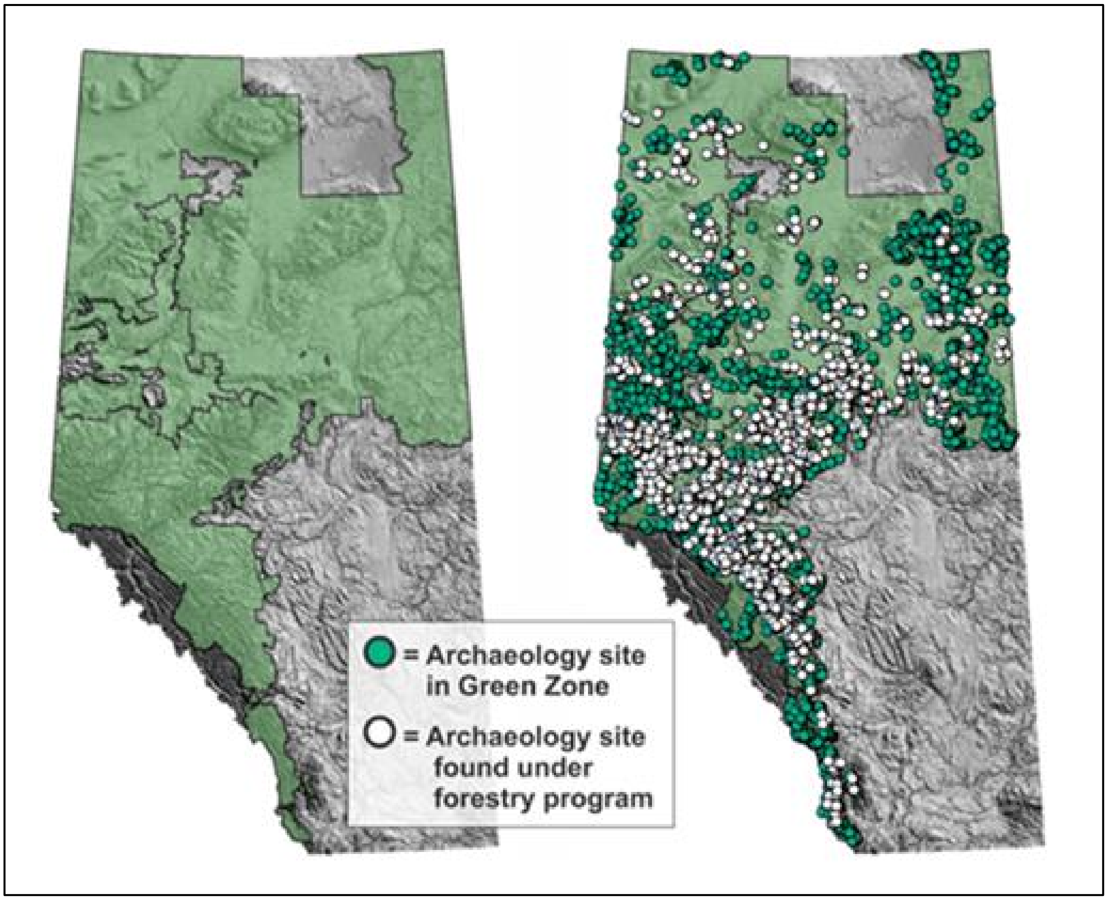
This led to the development of CRM consultants, a body of professional archaeologists who complete archaeological work for industry clients. The passage of the HRA and regulations pertaining to it drastically changed the nature of archaeology in Alberta. There was a shift away from research and academic archaeology towards professional applied archaeology, which is primarily undertaken on behalf of industry and the government (Lifeways 2019).

Since the enactment of the HRA in 1973 until 2021, the ASA has issued over 10,300 permits, resulting in the identification of over 42,000 archaeological sites in the province (Bereziuk et al. 2021:11). In the mid-1970s, the Government began issuing archaeological requirements to some developers, namely for mitigation prior to highway projects and pipeline construction. It was not until the late 1990s that the forestry sector in Alberta was integrated into historic resource management (Bereziuk et al., 2021:6-7). The ABFZ, also known as the "Green Zone," makes up almost 60% of the province, mostly in the northern half of Alberta and to the west along the foothills of the Rocky Mountains. From 2003-2020 (17 years of forestry compliance) 4,640 archaeological sites were identified through CRM forestry programs in the ABFZ, accounting for 42% of all sites recorded in this zone (Bereziuk et al. 2021:4-12; Figure 1).

These sites were identified through HRIAs conducted by CRM companies. HRIAs typically begin as a desktop assessment that evaluates the potential for cultural resources to be present based on the history of the region, the presence of known resources, and the type of terrain or landforms that will be impacted. In the case of forestry HRIAs, CRM consultants review and propose which harvest blocks should be assessed in the HRIA, often using predictive models which incorporate geographical, geological, hydrological, and other elements to assess archaeological potential in areas where archaeological sites have not yet been identified. Forestry developments are then added or removed during the ASA's review before fieldwork commences. In Alberta, cultural resources include paleontological, archaeological, historic, and Indigenous traditional land use sites (Alberta revised 2022). Cultural resources identified through HRIAs are then assigned a Historical Resource Value (HRV). These values are assigned to individual sites as well as larger Land Listings which are determined based on the sites within that area[1]. The HRV value of the land listing is updated every six months to incorporate newly identified resources.

[1] Consultants and regional archaeologists can recommend HRV 5 Land Listings for areas of perceived high potential where archaeological sites have not yet been identified. The inclusion of these HRV 5 areas in the Listing is at the discretion of the Minister.

Figure 1. ABFZ (left) Archaeology sites in the ABFZ (right). Bereziuk et al. 2021



Archaeological sites are assigned an HRV based on contents and interpretative potential. Sites identified through forestry programs are generally designated HRV 0, 3, or 4. HRV 0 is assigned when an archaeological site is considered insignificant, i.e., it is partially disturbed, is an isolated find, or has been fully mitigated; these sites do not legally need to be avoided. HRV 4 implies moderate significance requiring avoidance or further work. If the site is very significant, it may be designated HRV 3 and generally requires site avoidance (Bereziuk et al. 2021:17).

Table 1. Historic Resource Values and Their Meaning

HRV			
Archaeological Sites		Land Listings	
HRV 1	Provincial Historic Resource under *Historic Resource Act* or World Heritage Site	HRV 1	Provincial Historic Resource under Historic Resource Act or World Heritage Site
HRV 2	(Deactivated) Municipal Resource under *Historic Resource Act*	HRV 2	(Deactivated) Municipal Resource under *Historic Resource Act*
HRV 3	A known and significant resource that requires avoidance or further assessment	HRV 3	Contains a known and significant resource that will likely require avoidance or further assessment
HRV 4	Historic Resources that may require avoidance or further assessment	HRV 4	Historic Resource that may require avoidance or assessment
HRV 0	No avoidance or further work required	HRV 5	High potential to contain a Historic Resource.

Looking at the statistics for archaeological sites recorded under a forestry program in Alberta, approximately 43% are HRV 0, 57% are HRV 4 and only 0.3% are HRV 3 (Bereziuk et al. 2021:17). The designation of an HRV value is subjective and assigned on a case-by-case basis. CRM companies recommend HRV values to the government based on their HRIA results, but it is the ASA that officially designates the HRV of a site. As researchers, we must remember that the HRV system is only one tool used for assessing archaeological significance and future work. Each situation is evaluated on a case-by-case basis and even the presence of HRV 0 sites in the vicinity of a newly proposed project can trigger further archaeological work, such as requiring an HRIA (Personal Correspondence, Margarita de Guzman 2023).

HRV values are assigned based on the quantity and perceived quality of cultural material identified in the HRIA, as well as the perceived interpretive potential of the site. For example, the presence of multiple lithic flakes, tools, exotic lithic raw materials, organics such as calcined bone and Fire Broken Rock (FBR), or other archaeological features will be given a higher HRV value. Isolated finds, sites with only a few lithic flakes, or sites found in disturbed contexts are generally designated HRV 0. A common problem in CRM affecting HRV is the ability to locate sites in thick boreal vegetation. CRM archaeologists rely on surface inspection and subsurface testing methods to confirm the presence of material culture based on predictions made from potential modeling of specific landforms. As a result, places lacking in material archaeological evidence but rich in known cultural significance to Indigenous communities do not register as having "historical value" on the HRV scale (Thomas 2021:71-76). This structure fails to account for alternative heritage interpretations and does not value cultural landscapes, sacred sites, traditional trails, and other places that lack material culture proportionate to cultural meaning[2].

[2] Indigenous Heritage Section within the Historic Resource Branch is responsible for Traditional Use Sites in Alberta. The Indigenous Heritage Section is separate from the ASA and there is little overlap or communication between the two departments. This is a broader issue not addressed in this thesis.

These methodologies do not reflect the ways Indigenous peoples lived on and interacted with the land. At the most basic level, archaeological sites are simply fragmented pieces of a larger cultural landscape that served as the homeland of past peoples. Heavy industrial disturbance and the lack of consultation with Indigenous peoples, whose knowledge and memory would best preserve cultural landscapes and historic trails, have resulted in a very narrow view of heritage resources (McCormack 2017:113-114, 125). Archaeologists must be careful with the labels they assign to archaeological evidence since this has very real consequences for how the material culture is analyzed (Beaudoin 2016:8). In these ways, the HRV system perpetuates previous settler-colonial frameworks by prioritizing material evidence as the primary criterion for site preservation.

There is a distinct lack of Indigenous perspective in the HRV system. Thomas (2021:77) points out that in the instances when Indigenous perspectives are included in HRIAs, there is a caveat included in the reports:

> In evaluating the property, (CRM company name) has relied in good faith on information provided by other individuals noted in this report… (CRM company name) takes no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted. [Thomas 2021:77]

This serves to temper the perspective provided by the participating Indigenous representative(s) and implies mistrust of Traditional Knowledge in evaluating HRV (Thomas 2021:77).

While CRM is imperative for identifying and protecting archaeological resources in Alberta, it has its limitations. There are three distinct interests within the heritage management system of Alberta: government as the body that requires assessments, professional archaeologists as the "authority" on heritage artifacts, and industrial development as the largest driver of assessments. Thus, archaeology and heritage resource protection are implicitly tied to the expansion of Alberta's industrial development (McCormack 2017:126).

As mentioned, CRM archaeology in Alberta functions within a "proponent pays" system. Thus, CRM companies must meet the provincial government's standards, regulated by the ASA, but they are paid by industry clients. As a result, CRM archaeologists must bid on projects and work typically goes to the lowest bidder. They are limited by project footprints and budget restrictions; industry clients do not fund investigations or excavation in areas they do not directly intend to develop. Sites that likely extend outside development boundaries, where archaeologists are not allowed to dig, are often assigned an arbitrary boundary.

CRM archaeologists are also constricted by budgets, not just in funds directly used to excavate, but in terms of labour hours. They must optimize time and project resources to identify and protect as much as possible. Specific landforms are targeted for their potential to hold archaeological materials, typically those simultaneously at slightly higher elevations, dry, and near water. This leads to consistent testing of the perceived "highest potential" places to the detriment of slopes, low wetlands, hummocky terrain, and sediment traps that are often left untested (Woywitka and Michalchuk, 2021:88, 98).

The lack of identified sites in these more marginal areas does not prove a lack of past human activity in those areas. Instead, it provides us with a map of testing biases resulting from the natural, systemic pressures applied to CRM archaeological practice. Sometimes proponents will halt the archaeological testing of areas that are turning up large amounts of cultural resources because it is cheaper to move the development footprint than to pay for full archaeological remediation. This is especially prevalent when working with the forestry industry as proposed timber harvesting block locations and sizes can be altered without excess financial repercussions from prior infrastructure investment in a block. In such cases, archaeology is abandoned. While avoidance is the preferred form of mitigation, as these sites will be left in situ into the future, this abandonment of site-dense locations contributes to the current perception of small, ephemeral sites. Moreover, in areas of the province where there has been less industry and development, it often appears at first glance that there is less cultural significance because we see fewer archaeological sites present. This is not an indication that these areas were not used by past peoples, but rather a reflection of today's industrial land use.

This is in part a flaw created by site-focused maps. CRM archaeologists collect GPS tracks along with subsurface testing data (positive and negative) for all work completed. This data could be compiled to create regional archaeological maps which show previously identified sites as well as where previous archaeological investigations have been completed (e.g. negative subsurface test areas). This would allow archaeologists to clearly see testing biases in the region and understand more thoroughly which areas are low in archaeological material versus those that have simply not been investigated archaeologically (see Future Research and Recommendations).

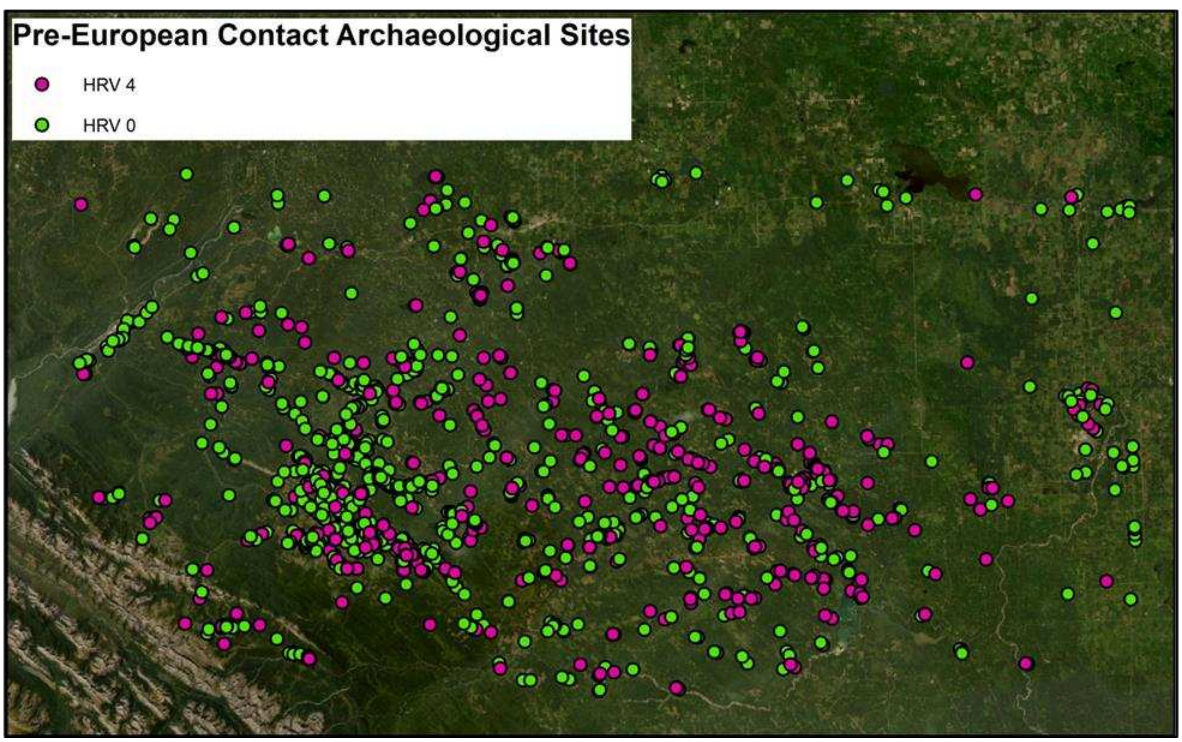
The “proponent pays” model has also created bias between different industries. In Alberta, oil and gas exploration and development is the primary cause of industrial disturbance in the boreal forest (Komers and Stanojevic 2013:2916). Ground surface disturbance created by infrastructure development, i.e., well pads, facilities, pipelines, etc., threatens the shallowly buried archaeological material commonly found in the ABFZ. For this reason, oil and gas developments are almost always subject to HRIA and followed up with Historic Resource Impact Mitigation (HRIM), most commonly including systematic excavation as well as detailed photography, and detailed mapping of sites and features to preserve as much data about the site as possible. Once the site has been mitigated, all that is left are the archaeological materials that were removed and the reports that encapsulate the special details, such as site configuration. There is no opportunity to go back and re-excavate a site. So, while mitigation is ultimately destructive, it also provides archaeologists with more site information and a better understanding of its significance than can be gained from an HRIA alone (Bereziuk et al., 2021:17). The large investment cost and forecasted profits associated with oil and gas projects make clients more willing to pay to have sites excavated and removed so that the project can continue, thus increasing the interpretive value for these sites.

Forestry, on the other hand, is considered minimally invasive, as trees are cut above the ground surface and the damage to buried resources is generally thought to be minimal. Therefore, HRIA is conducted to identify and avoid archaeological resources, but costly mitigation is extremely rare. Subsurface testing is geared toward allocating site boundaries for avoidance, not artifact recovery to learn about the site contents. Sites are usually marked for avoidance with a buffer around the site and forestry may proceed with harvesting if they avoid the archaeological sites by staying out of the flagged buffer zones; 30m buffers are the unwritten provincial standard. HRIA results based primarily on pedestrian survey and subsurface testing yield limited information; without HRIM, there is minimal interpretive value to these archaeological sites (Kristensen and Bereziuk, 2022:23; Bereziuk et al. 2021:17).

Figure 2. Site preparation methods employed by Alberta's forestry sector (Bereziuk et al., 2021: 8)

Theoretically, these sites are being avoided, meaning that further work can be conducted in the future to help us learn more about the past people who lived in these areas. However, many practices employed by forestry clients, including road building, skidding, rutting, log deck construction, and turnarounds, cause significant ground disturbance. Site preparation methods such as mounding, trenching, windrows, and drag scarification (Figure 2) are also employed to create sediment exposure after harvest and encourage softwood regrowth, leading to significant ground disturbance that can disturb and destroy archaeological resources. Thus, any unidentified cultural material missed by the HRIA will be destroyed or disturbed, limiting future research potential (Bereziuk et al. 2021:7; Gibson, 2005:3).

Figure 3. Pre-European Contact Archaeological sites in the study area by HRV value



A cursory evaluation of the archaeological site data provided by the ASA for our selected study area within a portion of Ermineskin Cree Nation's traditional territory makes it immediately obvious that there are a significant number of archaeological sites in the region (Figure 3). However, it appears that most of these sites are ephemeral archaeologically, based on their HRV 4 or HRV 0 designations. Looking at Figure 3, regardless of HRV values, there are a significant number of pre-European contact archaeological sites that have been identified within the larger study area. This project was conducted in partnership with the Ermineskin Cree Nation through the Ermineskin Industrial Relations Department (EIRD). The EIRD is in the process of conducting a cumulative effects study for their entire traditional territory, examining how all industry and development has affected their traditional lands, as well as the water, animals, and people that reside and depend on them. This project will contribute to the overall cumulative effects study by examining the CRM biases which have contributed to the current archaeological narrative of the region and affect the protection of cultural heritage within this portion of Ermineskin Cree Nations Traditional Territory. Looking at historical satellite images of the study area from 1984 (Figure 4) to 2022 (Figure 5), it is obvious how much large-scale industrial expansion has occurred throughout the territory. This process is only escalating in pace and archaeological resources are not renewable. It is imperative that CRM practices are continually updated to ensure that we are providing the maximum protection for archaeological resources.

Figure 4. Study area Google imagery from 1984, showing the extent of industrial expansion through the study area (Google Timelapse)

Figure 5. Study area Google imagery from 2022, showing the extent of Industrial expansion through the study area (Google Timelapse)

Most of the archaeological sites in the larger study area were identified through HRIAs conducted ahead of industrial deforestation programs. As such, we see mostly HRV 4 and HRV 0 sites. Research conducted by the ASA in 2022 (Kristensen and Bereziuk:1-24) compared the information found from sites identified through forestry HRIAs with the information gained after those same sites were later mitigated under oil and gas programs. Their conclusions indicate that forestry HRIA results have low interpretative value, sites are usually larger than the initial HRIA suggests, and more testing often revealed more work areas. Statistics rendered from this research show that for every piece of lithic debitage (n=1) identified in a forestry HRIA shovel test, there are approximately 50 more in the ground if that site was subjected to an HRIM excavation (Kristensen and Bereziuk, 2022: 22). These results are very relevant to this work and show that the initial assessment of boreal forest sites, which suggests they are primarily ephemeral, is a misinterpretation that is being reinforced by the CRM system and does not accurately reflect the true archaeological impact of our study area.

Testable hypotheses

Examination of CRM methodologies employed within the study area reveals that the current methods are inadequate to identify all cultural material and that current site boundaries do not accurately reflect the true special extent of archaeological sites within the region. Hypothesis testing, as outlined below, is employed as a method of statistical inferencing, which will be used to determine if the data collected sufficiently supports a particular hypothesis.

Null hypothesis

H_0= CRM methods are adequate to identify all sites in this regional context and accurately reflect the spatial extent of identified sites.

Alternate hypotheses

H_1= CRM methods are inadequate to identify all sites in this regional context and do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.

H_2=CRM methods are inadequate to identify all sites in this regional context but do accurately reflect the spatial extent of identified sites.

H_3=CRM methods are adequate to identify all sites in this regional context but do not accurately reflect the spatial extent of sites.

H_4= CRM methods do not accurately reflect the spatial extent of identified sites because they avoid places of perceived "low potential."

H_5=CRM methods do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.

H_6=CRM methods do not accurately reflect the spatial extent of identified sites because they both avoid places of perceived "low potential" and because they have arbitrary spatial boundaries.

Table 2. Marshall Table of Hypotheses and Their Expected Results

If…	**Then…**

CRM methods are adequate to identify all sites in this regional context and accurately reflect the spatial extent of identified sites	Additional testing at a higher density around known site boundaries and testing of perceived "low potential" areas would not produce more cultural material leading to the identification of new sites or the extension of current site boundaries
CRM methods are inadequate to identify all sites in this regional context but do accurately reflect the spatial extent of identified sites.	Additional testing at a higher density would produce cultural material leading to the identification of new sites, however, a higher density of testing around known sites would not produce more material culture and would not alter the spatial extent of the known site.
CRM methods are adequate to identify all sites in this regional context but do not accurately reflect the spatial extent of sites.	Additional testing at a higher density would not produce cultural material leading to the identification of new sites. However, a higher density of testing around known sites would produce more material culture and would alter the spatial extent of the known sites.
CRM methods do not accurately reflect the spatial extent of identified sites because they avoid places of perceived "low potential."	Additional testing in perceived "low potential" areas would produce cultural material near existing site boundaries, altering the spatial extent of known sites.
CRM methods do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.	Additional testing around known site boundaries would produce more cultural material and lead to the alteration of current arbitrary site boundaries.
CRM methods do not accurately reflect the spatial extent of identified sites because they both avoid places of	Additional testing of perceived "low potential" areas as well as a higher density of testing around known site boundaries

perceived "low potential" and because they have arbitrary spatial boundaries.	would produce more cultural material and lead to the identification of more sites as well as the alteration of current arbitrary site boundaries.

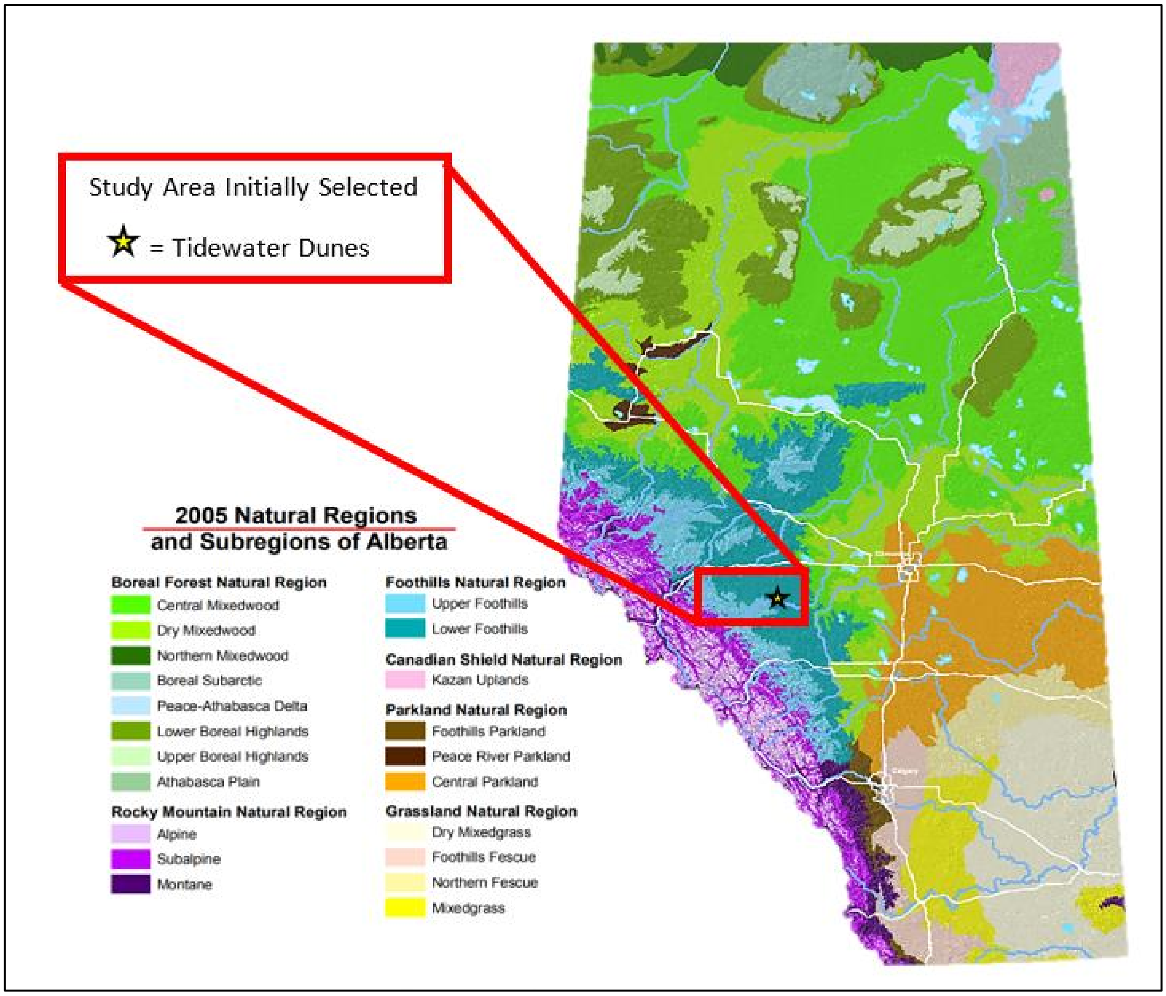
Geographic Background

Alberta Foothills Natural Region Background

Alberta is made up of six Natural Regions, with 21 subregions (Alberta Parks 2015:4). The study area selected for this project falls into the Foothills Natural Region, spanning the Upper and Lower Foothills Subregion and representing a transition between the Rocky Mountain and Boreal Forest Natural Regions. The study area covers a 17,773.58 km^2 area west of Edmonton, Alberta, spanning from the Yellowhead Highway in the north, east to Highway 22, and south to the Brazeau Dam (Figure 6). The Upper Foothills are dominated by bed-rock ridges near the Rockies, which transition into rolling terrain in the north and east of the Lower Foothills. In the north, the elevation is around 700 m, whereas in the south we see an elevation of up to 1700 m (Alberta Parks 2015:36-39).

Both the Upper and Lower Foothills subregions receive relatively high annual precipitation. At higher elevations, *Pinus contorta* (lodgepole pine) forest with well-developed feather moss ground cover is common. These *P. contorta* forests are considered a good marker of the Foothills Natural Region boundary with the Boreal Forest Natural Region, as they are scarce in the latter. In the lower elevations, we typically see mixed forests of *P. contorta*, *Populus tremuloides* (aspen), *Picea glauca* (white spruce), and *Populus balsamifera* (balsam poplar) with thick and diverse vegetation in the understory. Eighty rare vascular plant species are present in the Foothills Natural region, many of which are also found in the Rocky Mountain Natural Region. Water bodies are scarce in the foothills compared to other natural regions, accounting for one percent of the total area within the region. Wetlands are most common in the gentler terrain of the Lower Foothills and these wetland habitats in the southern and eastern parts of the natural region are more diverse with a rich variety of both flora and fauna (Alberta Parks 2015:36-39).

Figure 6. Natural Regions and Subregions of Alberta with project area identified (Alberta Parks 2015:5).



The varying topography of the Foothills Natural Region creates a wide range of habitat types, supporting a high diversity of animal and plant species. Typical plants and animals found within the Rocky Mountains and the Boreal Forest can be found in the transition zone of the Natural Foothills Region. These include *Cervus canadensis* (wapiti or elk) from the Rockies and *Pheucticus ludovicianus* (rose-breasted grosbeak), a boreal species. The foothills provide critical habitat for both *Rangifer tarandus caribou* subspecies boreal and mountain caribou, as well as *Ursus arctos horribilis* (grizzly bears) and *Gulo gulo* (wolverines). *Castor canadensis* (beavers) are abundant in wetland areas and create ideal habitats for other species such as *Bucephala islandica* (barrow's goldeneye trumpeter swans). Fish present in this region include *Prosopium williamsoni* (rocky mountain whitefish), *Salvelinus confluentus* (bull trout), *Thymallus arcticus* (arctic grayling), *Lota lota* (burbot), and *Catostomus commersoni* (white sucker) (Alberta Parks 2015:36-39).

The Upper Foothills subregion has large swaths of coniferous forest (*P. contorta* in the south and mixed *P. contorta* and *Picea mariana* (black spruce) in the north) ideal for timber harvesting. The Lower Foothills subregion is the most diverse in terms of forest types and tree species. Depending on the slopes, exposure, and moisture content we see pure or mixed stands of *P. tremuloides*, *P. balsamifera*, *Betula papyrifera* (white birch), *P. contorta*, *P. mariana*, *P. glauca*, *Abies balsamea* (balsam fir or sweet pine), and *Larix laricina* (tamarack). This subregion contains some of the most productive timberlands in Alberta, resulting in intensive forest harvest programs throughout the subregion. Farming is mostly restricted to the eastern fringe of the Lower Foothills subregion, but cattle grazing occurs on natural range lands as well as disturbed or reclaimed areas in both the Upper and Lower Foothills subregions. Coal seams are present under much of the Foothills Natural Region, as a result, open-pit mines are located where the coal is close to the surface and the presence of coal-bed methane has resulted in intensive oil and gas exploration throughout the region (Alberta Parks 2015:36-39). The resulting seismic lines from this industrial expansion have created access for humans throughout the region and industrial interest in these resources drives most archaeological research conducted in the area.

The Lower Foothills subregion is dominated by glacial till deposits which are thinly deposited on steep slopes and are often capped with tertiary gravel deposits on higher elevation plateaus. In steep landscapes, there are often bedrock exposures (Whilloughby et al. 2018:2). Many soil types are found throughout the Lower Foothills subregion.

> There are significant inclusions of glaciofluvial sands and minor amounts of glaciolacustrine clays, mainly in the lower elevation plains. Orthic Gray Luvisolic soils dominate on the medium and fine textured materials of the uplands. They are accompanied by Brunisolic subgroups, particularly at higher elevations. Brunisolic Gray Luvisols and Dystric Brunisols are typical of sandy terrain, and Eutric Brunisols and Regosols are often associated with calcareous, recently deposited eolian and fluvial materials. Most upland soils in these materials are well to imperfectly drained, but there may be imperfectly to poorly drained Gleysolic soils and seepage in lower slope positions. The wetland organic deposits associated with poor to rich fens are mainly Mesisols … some Fibric Mesisols are associated with relatively uncommon bog vegetation. Orthic and Peaty Gleysols often occur adjacent to wetlands and are more common in the gently undulating areas [Whilloughby, et al. 2018:2].

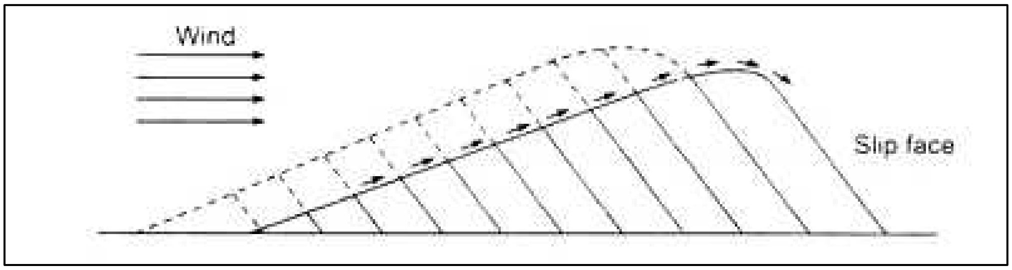
Understanding typical soil types present in the study area is important for interpreting the stratigraphy at archaeological sites in the region.

Dune Formation and Stabilization

The site cluster chosen for this project, FID1127 (FgPw-37, FgPw-43, and Fg-Pw-41), is located on the nose of a large parabolic sand dune within Ermineskin Cree Nation's traditional territory. FID1127 is located 2 km north of the Pembina River, and 2 km south-southwest of the contemporary Tidewater Gas Plant within a small dune field. For this project, this small area will be referred to as the Tidewater dune field. This dune field has not been investigated geologically; however, many of the stable dune fields throughout Alberta's boreal forest have undergone geological investigation (Wolfe and Lian 2021:1-16; Wolf et al. 2004:323-363; Munyikwa et al. 2011:407-422; Halfen et al. 2016:75-95).

From a geological perspective, sand dunes are accumulations of fine-grained sediments, sands, and silts, deposited by wind and gravity. The accumulations, or mounds, are created when windblown (eolian) sediments being blown across the ground encounter a solid object, such as rock or vegetation, which stops the forward motion of the sediments. The resulting mound of sediment enlarges the obstruction, and a dune begins to form (Figure 7; Ghrefat 2011:2). Many different variables such as grain size distribution, wind regime, vegetation, and surface moisture all affect eolian sand transport (Neuman and Scott, 1998:403-419; Iversen and Rasmussen, 1999: 723-731; Ghrefat 2001:2).

Figure 7. Cross section through a migrating dune. Sand grains are blown from the windward side and settle on the slip face. The dune is cross stratified to the slip face.

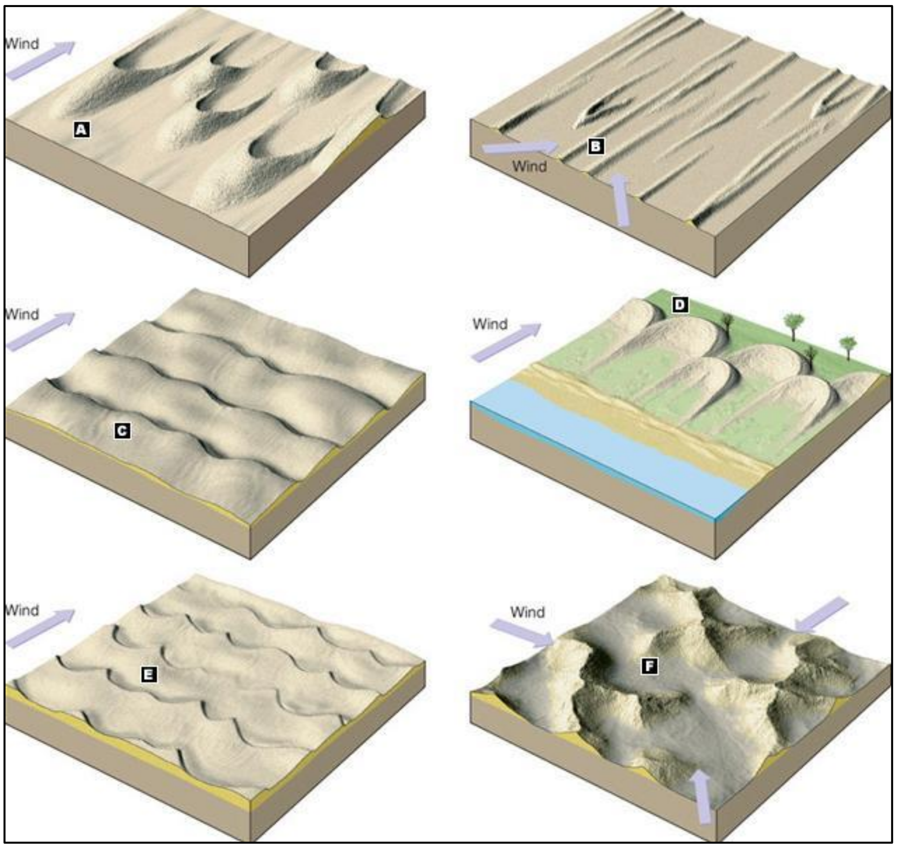


There are three required elements for the formation of sand dunes: 1) a source of dry sand, 2) a means to sort and transport the sand, and 3) a land area on which to deposit the sand with a general lack of vegetation (Hack 1941:243; Panas 2018:28-30). The amount of sand available as well as annual variation in wind direction dictate the size and shapes of dunes. Wind conditions have a strong influence on the shape of a dune field. Constant winds tend to form more evenly shaped dunes or long ridges, whereas irregular or changing wind directions result in irregular-shaped dunes (Ghrefat 2011:5).

Vegetation also plays a vital role in dune formation, activation, and stabilization. The physical presence of vegetation suppresses the movement of sand by trapping moving particles and reducing the velocity of the wind above the ground surface, which prevents more fine-grained particles from becoming airborne (Muhs and Wolfe 1999:188; Wolfe and Nickling 1993:50-52; 1997:8; Panas 2018:29). Vegetation also increases the presence of moisture within the dune feature by providing shade. Detritus from decaying plant matter increases the organic content of the soils, increasing their water retention capacity (Hudson 1994:193; Panas 2018:29). The presence of plant roots acts as a deterrent to erosional processes and activation of dunes even in areas where surface vegetation is minimal, such as in areas that have experienced fires or in drought conditions (Courtwright

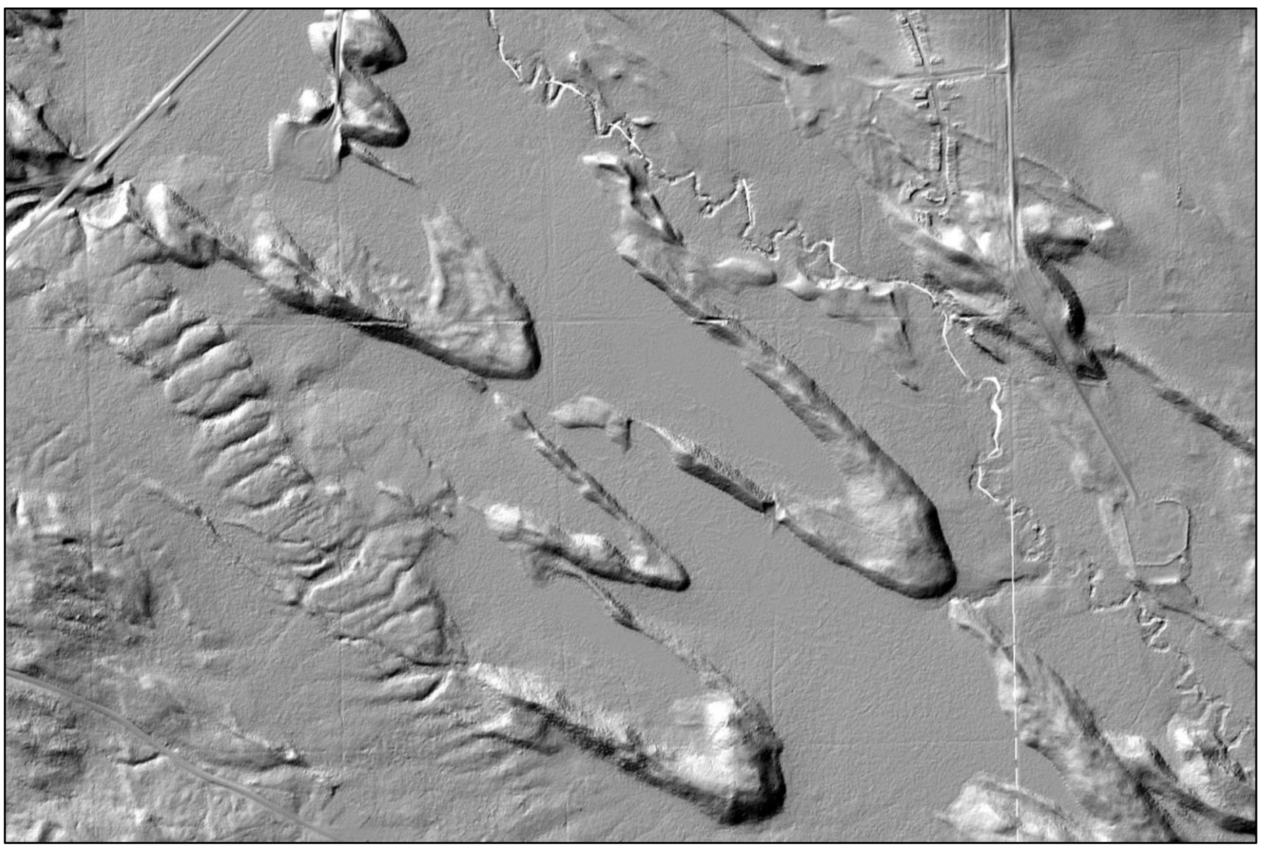
2023:17; Thomas and Redsteer 2016:401; Panas 2018:30). In these ways the presence of vegetation affects dune formation; some geomorphic features, such as parabolic dunes, require vegetation to form.

Figure 8. Sand dune types: barchan (A), longitudinal (B), transverse (C), parabolic (D), barchanoid (E), and star (F) (http://www.geo2all.com/vb/showthread.php?1684-geology-of-sand-dunes).



Parabolic dune formations make up most of the dune features in the Tidewater dune field. In general, these dunes are parabolic in shape, with the wings of the arch pointing upwind and the convex, "U" shaped, end downwind. They can form in areas of low to high sediment supply and are indicative of a semiarid or subhumid climate. These features originate when the edges of a transverse ridge, a straight dune with an axis that is normal to the prevailing winds, are anchored by vegetation. The curved parabolic dune shape is then formed as wind deflates the unvegetated central portion of the dune into a blowout and deposits the material downwind (Figure 8; Trenhaile 2016:410; Panas 2018:30-32). Parabolic dunes have been observed to occur in large groups, with all their axes parallel to the dune-forming wind (David 1971:25; Lemmen et al. 1998:30; Panas 2018:32-33). The Tidewater dune field is a perfect example of this phenomenon (Figure 9).

Figure 9. Tidewater parabolic dune features as revealed by 5m hillshade lidar imaging.



Site Background: Tidewater Dune Field

Geological investigations conducted on west-central Alberta dune fields provide a clear understanding of conditions that would have aided in the formation of the Tidewater dune field. During the Late Wisconsin Glacial Period, most of the now province of Alberta was covered by ice. Dune formation began between 15.6 and 13.5 Cal ka BP in an ice-proximal tundra setting as the Laurentide and Cordilleran ice sheets retreated (Figure 10; Wolfe et al. 2004:330). The associated meltwaters deposited glaciolacustrine and glaciofluvial outwash sediments (David, 1971:293-299; Muhs and Wolfe, 1999:187; Wolf et al. 2004:324). Strong winds, predominantly from the northwest, funneled along the ice margins in central Alberta, picking up the fine silts and sands, creating eolian dune formations (Figure 11; Wolfe et al. 2004:326, 332-333).

Figure 10. Ice sheet extent in North America at the last Glacial Maximum, ca. 22-20 ka ago (Munyikwa et al. 2017:148).

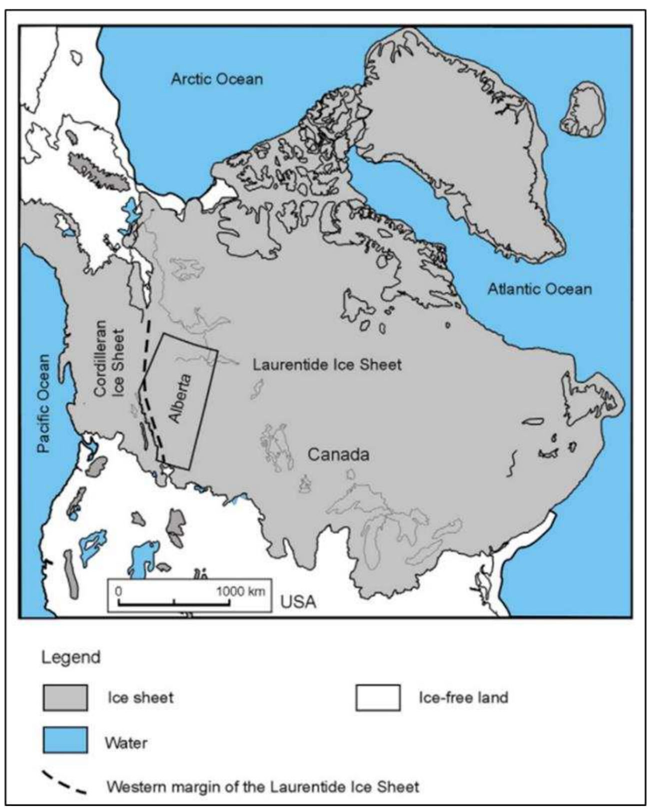
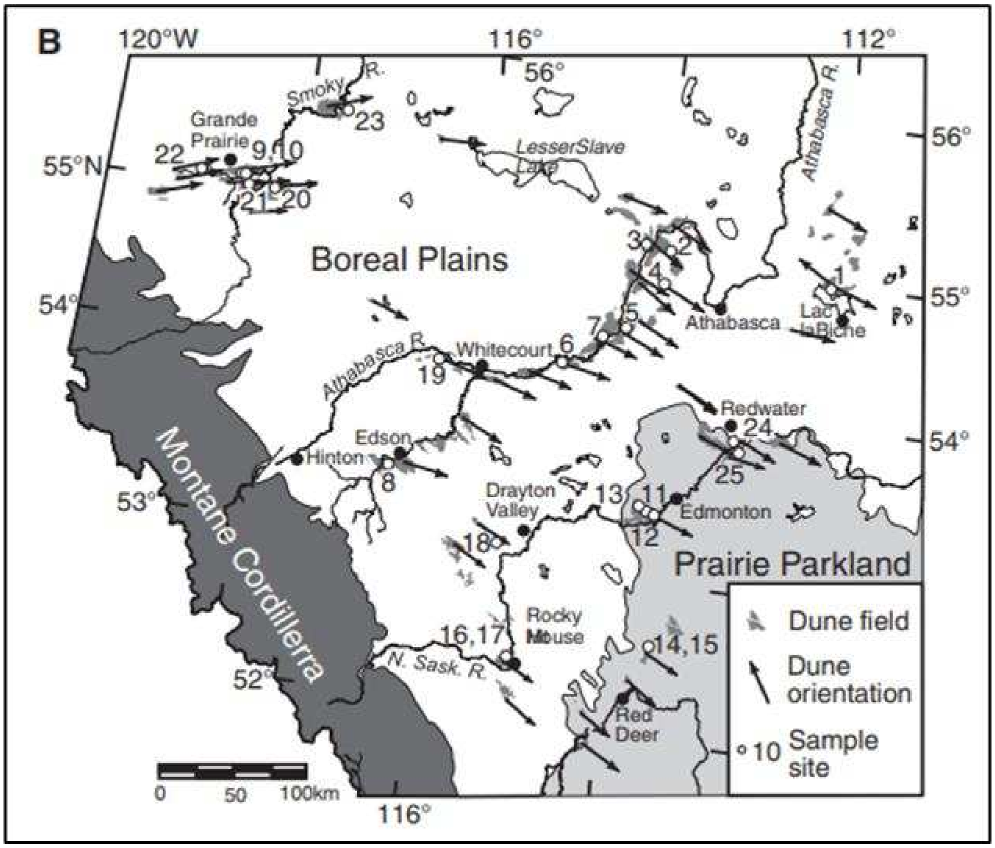


Figure 11. Central Alberta dune orientations (Wolfe et al. 2004:326).

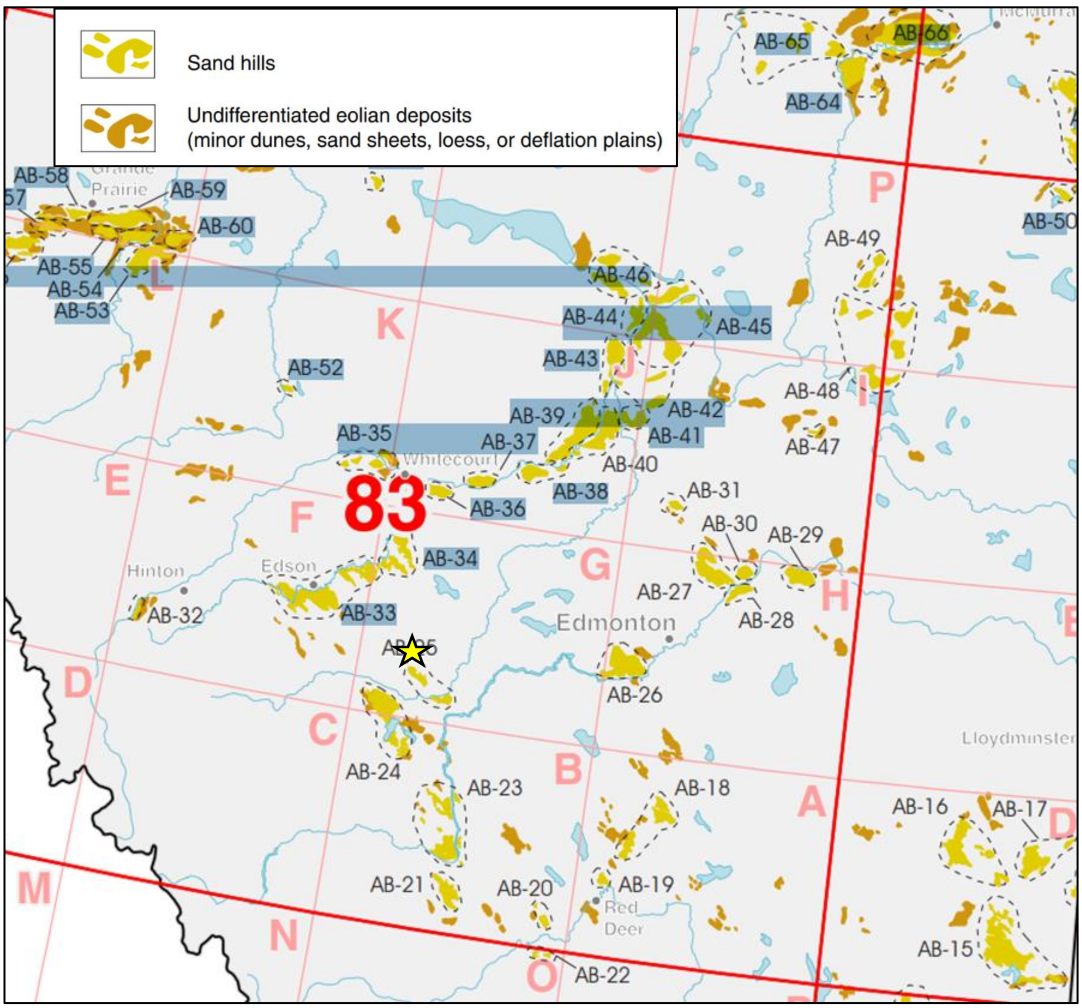


Wolfe et al. (2004:324) suggest that the individual boreal dune fields found in Alberta likely formed from single episodes of eolian activity, succeeded by stabilization as boreal forest vegetation covered the region between 13.0 and 9.0 Cal ka BP. Stabilization of these dune fields occurred in a time-transgressive manner from central Alberta to the northeast. Thus, the oldest dune fields are in the southwestern portion of the province, with progressively younger dune fields to the northeast. These isolated stable dune fields are still present today, and unlike their counterparts on the prairies, have seen little or no reactivation through the Holocene (Wolfe et al., 2004:324, 334).

Soil profiles on the Tidewater dunes are sorted silts and sands without any course fragments and clear eluviation, indicating that these are eolian Brunisols with an obvious

Ae (e=eluviation) horizon. This supports the age of the Tidewater dunes, as dunes that were more recent or had been reactivated would be indicated by Regosols, which are weakly developed and have not been stable long enough for the translocation of minerals to create clear horizons (The Canadian system of soil classification 1998:53-55, 117-119).

Figure 12. Sand hills and eolian deposits in west-central Alberta (Wolf, 2001). Yellow star indicating the location of the Tidewater dune field.



Research conducted by Wolfe et al. (2004) indicates the dune fields in west central Alberta stabilized between 15.9-12.2 ka Cal BP. The Tidewater dune field, which was not a part of this study, is located approximately 60 km west of the Lodgepole (AB-25) dune field (Figure 12). Optical dating measures the time elapsed since specific mineral grains were last exposed to sunlight, indicating the time since sediments were buried (Wolf et al. 2004:328). Optical dates gathered from the lodgepole dune field (AB-25) indicate an age of 14.1 +/- 1.8 ka. Similarly, the dune fields near Edson (AB-33 and AB-34) also recorded an age of 14.0 +/- 1.8 ka Cal BP (Wolf et al. 2004:330). The Tidewater dunes are slightly west of the Lodgepole dunes, indicating they may have stabilized slightly earlier, as they would have been farther from the retreating Laurentide ice sheet. Extrapolating from that data, it is safe to assume that the Tidewater dunes were stabilized by 12.2 ka Cal BP which is at the low end of uncertainty based on the optical dating (personal correspondence, Stephen Wolf, 2023). These ancient landforms have largely remained stable and forest-covered since stabilization, meaning what we see today is a good reflection of how the dunes would have looked to past peoples and cultural remains from human activity on the dunes will likely still be intact today.

Tidewater Dune Ecology

The Tidewater dunes are primarily parabolic sand dunes oriented east-southeast indicating winds were coming from a west-northwest direction (Figure 11). The dunes are prominent and distinct on the landscape, averaging 5-10 m in height (before forest cover; Photo 3) and stretching up to 1km long. Mature *P. contorta* (lodgepole pine) forests grow in the well-drained nutrient-poor silt and sand sediments that make up the dunes. The understory is open, with some immature *P. contorta* and *P. mariana* (black spruce). The ground cover vegetation is comprised of kinnikinnick, low-bush wild blueberry, soopolallie, hairy wild rye, labrador tea, bearberry, and bog cranberry (Photo 1 and Photo 2). On the tops of the dunes, the terrain varies from narrow ridges to wide knolls, and some marginally to gently sloped terrain. The margins are well-defined, sloping steeply down to low-lying wetland and *Sphagnum* muskeg (peatlands) terrain in the inter-dune spaces. The wetlands are characterized by peat accumulations up to 3m thick. *P. mariana* and *L. laricina* (tamarack) occur on the poorly drained margins of the wetlands with bog and fen understory species.

Photo 1. View southeast along the crest of the western dune arm.

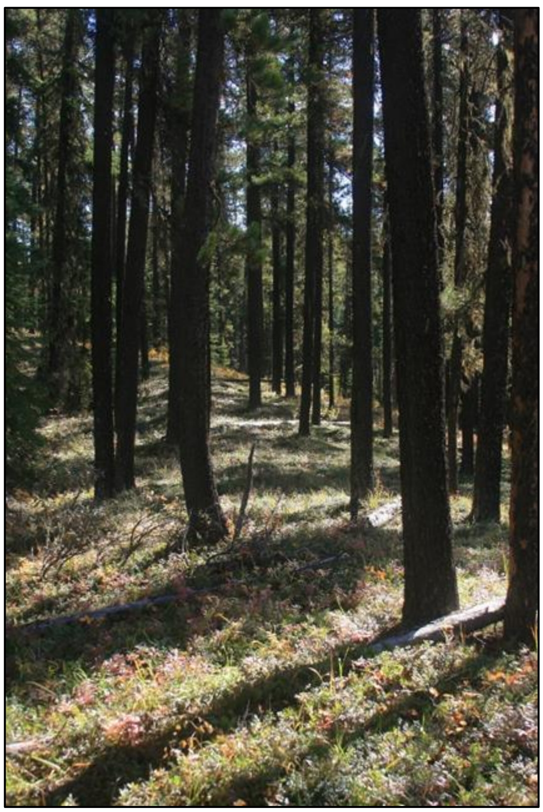
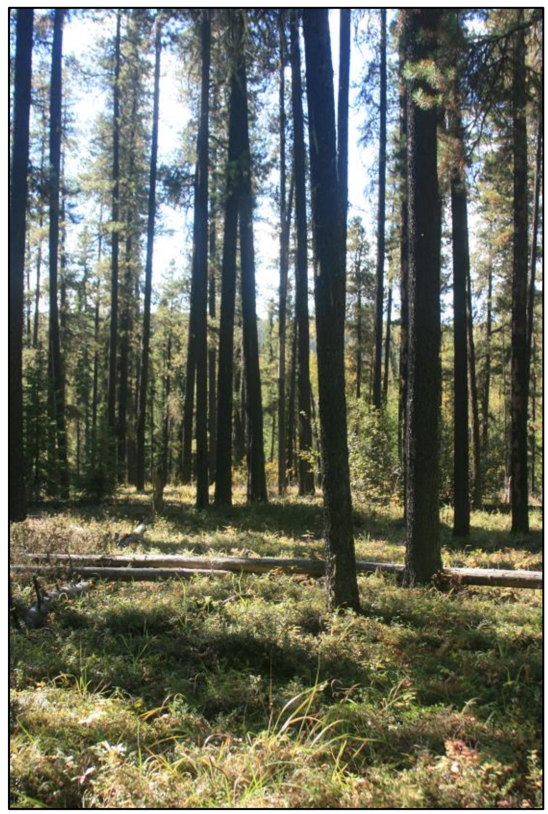


Photo 2. View southwest along the crest of the eastern dune arm.



The terrain between the dunes is low, wet muskeg with ponds and small creeks (Photo 4). This would have provided access to water as well as the unique flora and fauna that thrive in the wetlands. Waterfowl, moose, deer, beavers, and other fauna would have been drawn to these wetlands and the high dunes would have provided an ideal vantage point for hunters to survey for game and resources. The long, high dunes would also make it possible for people to easily navigate across the wetlands without wading through muskeg and water themselves. It is possible to walk for kilometers along the dune arms, traversing from one to the next. Ease of travel would have made these resource-rich areas even more attractive for past people (Personal correspondence, Grzegorz Kwiecien, 2023). It is also important to note that muskeg in western Canada developed in a time-transgressive manner from the northwest to the southeast, only reaching modern extents between 6,000 and 3,000 ^{14}C years BP. In the Alberta foothills, peatlands are known to have developed before 6000 ^{14}C years BP (Halsey et al. 1998:316-317). More research is needed to understand how the inter-dune spaces in dune fields might have looked and functioned for early occupants of the Tidewater dunes before the development of the peatlands.

Photo 3. View northwest along the eastern dune arm from the inter-dune wetland showing the dune's height (right side of photo).

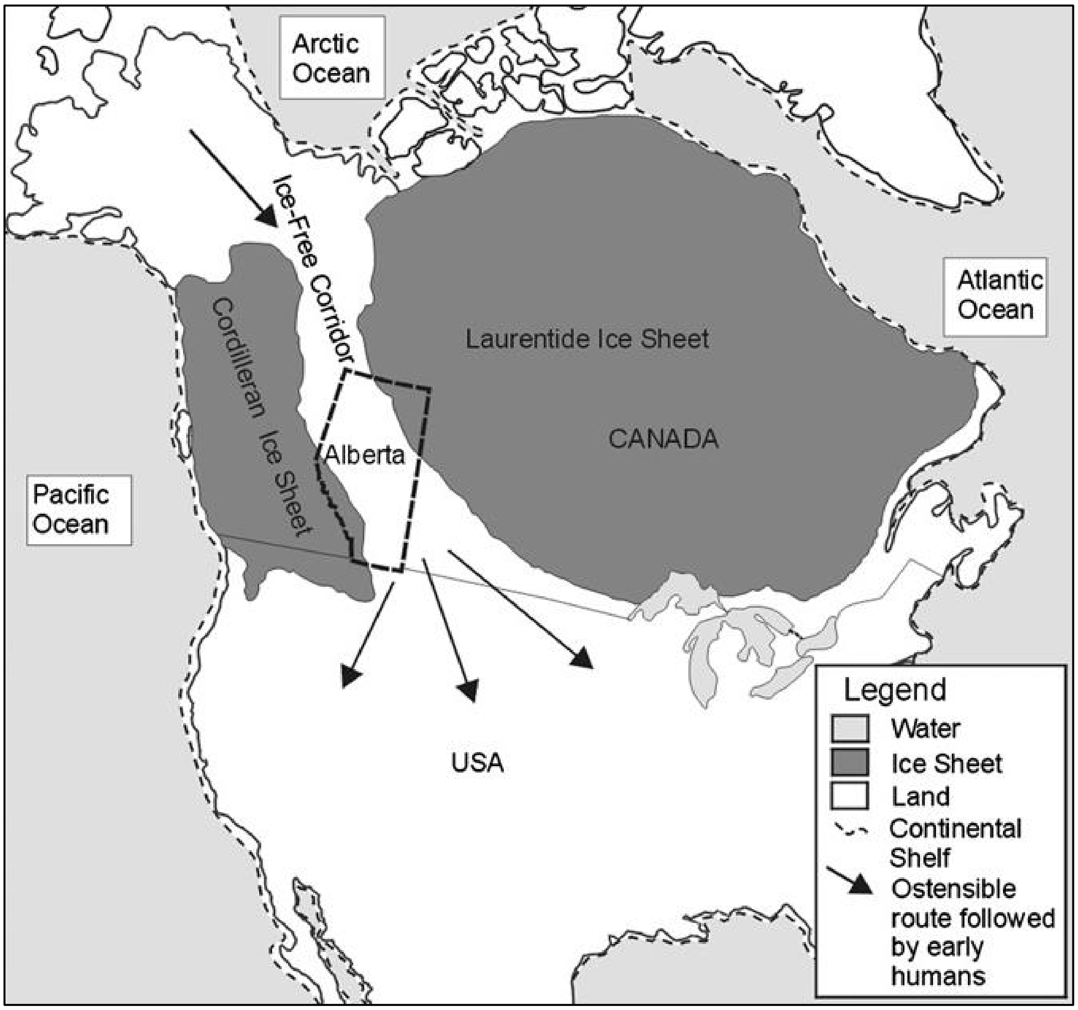
Photo 4. View west across the pond in an interdune wetland, showing muskeg vegetation and a raised parabolic dune feature in the background.

Cultural Background

History Of Regional Archaeology

Discussions of the first human occupation of the Americas is a topic of debate that is constantly evolving in American archaeology. How and when people first migrated to the Americas is a question that many archaeologists have asked. In North America, notions of an "Ice-Free Corridor" (IFC) between the retreating Cordilleran and Laurentide Ice Sheets during the terminal Pleistocene, creating a corridor from Northern Canada to Montana, have existed since the early 19th century and helped spur archaeological interest in the eastern slopes of the Rocky Mountains (Ives et al. 2013:149; Johnston 1933:11-45). During the 20th century, this deglaciation phenomenon became linked with the "Clovis first" paradigm of human ecological colonization, which asserts that the IFC was the route of travel for the earliest human settlers to what would become the Americas. However, in the later part of the 20th century, scholars recognized that the earliest archaeological sites in the Americas likely pre-dated the terminal Pleistocene IFC. The widely accepted model of the first migration of peoples into the Americas then turned toward the Pacific coast route and discussions of the IFC fell out of favor (Ives et al. 2013:149; Erlandson et al. 2011:28-37; Fladmark 1979:55-69; Jackson et al. 1997:195-198; Mandryk et al. 2001:301-314).

Figure 13. The conceptual 'ice-free corridor' of western Canada proposed to have been used by early migrants to reach the Americas during the Late Wisconsin Glacial Period (Wolfe et al. 2004:408).



Ives et al. (2013:150-152) summarize the more recent studies conducted to establish a high-quality chronology for the corridor. They concluded that the Cordilleran Ice Sheet had begun to retreat by 12, 000-14,000 ^{14}C years BP (Carbon 14 years before present), creating a viable route from the Yukon to northeastern British Columbia and Northwestern Alberta by at least 11,200 ^{14}C years BP (Shapiro et al. 2004:1561-1565; Ives et al. 2013:151). The collective data from the Western Laurentide Ice Sheet margin analyzed by Ives and others (2013:152) suggests an advance of ice toward the Cordilleran Ice Sheet after 18,000 14C years BP, "culminating in a maximum by ca. 16,000 ^{14}C years BP. This advance represents the *only* period in which the region between the western LIS and CIS was not available during the Quaternary (Ives et al. 2013:152)." By 13,500 ^{14}C years PB the initial retreat of the western Laurentide Ice Sheet had taken place. Shrub tundra and grassland ecosystems were present in southern Alberta and Saskatchewan by 12,000 ^{14}C years BP, with herb tundra ecosystem present in the corridor, according to Dyke's (2005:211-62) biome reconstructions (Ives et al. 2013:152). The earliest replicated dates from northwestern Alberta and the Yukon prior to 11, 500 ^{14}C years BP show that the region was viable for grazing megafauna (bovids, equids, camelids, cervids, and felid predators). Early versions of the boreal forest took over the parkland boreal areas that were present in the center of the IFC at 10,000 ^{14}C years BP. This suggests that the IFC would have contained suitable environments for human populations a few hundred years before the dawn of the Clovis era (Ives et al. 2013:152).

The terminal-Pleistocene record of western Canada includes many dynamic geological processes, including outbursts from proglacial lakes, collapse of sediments after buried ice melted, significant eolian activity, etc., are factors that have potentially obscured or destroyed early archaeology sites. Some early Alberta sites survive, such as the St. Mary's Reservoir in southern Alberta, Lake Minnewanka in Banff National Park, and the Williston Reservoir in northeastern British Columbia. Figure 14 summarizes data from a scattering of dated sites in the corridor region as provided by Ives and others (2013:154).

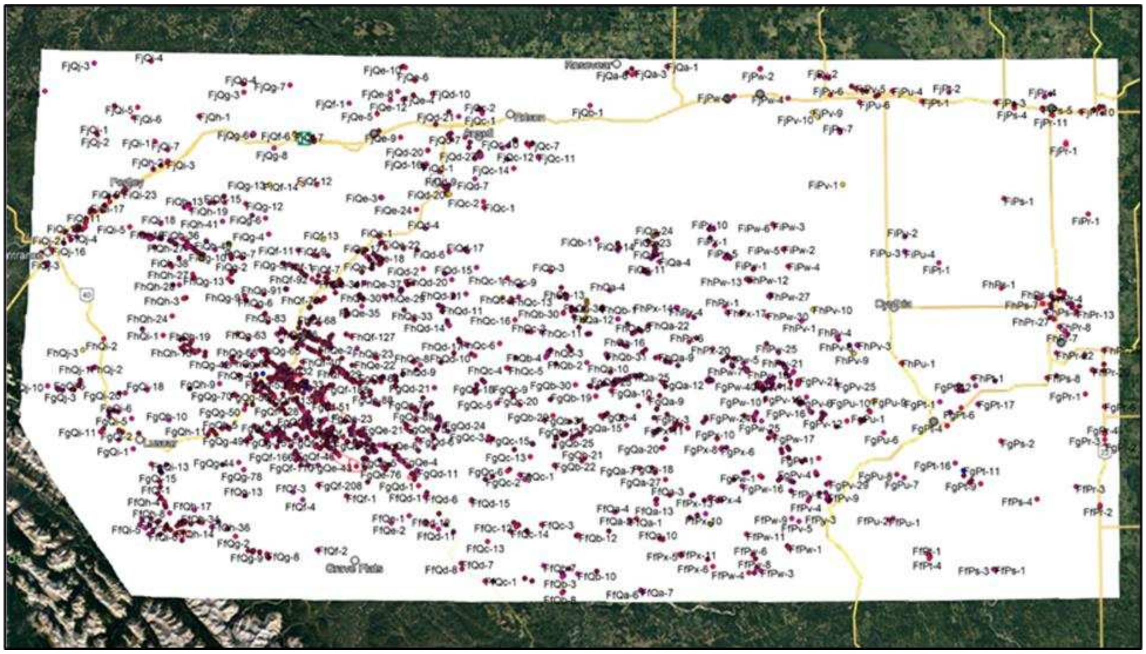
Figure 14. Archaeological sites in the IFC region (Ives et al. 2013:154).

Site	Date (^{14}C yr BP)	Associated artifacts	Comments	Sources
Bluefish Caves, Yukon	16 dates, 12,000–25,000	Pleistocene bones; microcore technology, burins, spalls	Indisputable lithic artifacts, Pleistocene bones possibly butchered and flaked	Morlan and Cinq-Mars (1982); Morlan (1989, 2003)
Little John, Yukon (KdVo-6)	Beta 182798 8890 ± 50 Beta 217279: 9530 ± 40 Beta 218235: 9550 ± 50 Beta-241522: 9580 ± 60 Beta 241525: 10000± 60 Beta-241523: 12020 ± 70	Chindadn points underlie micorcores and microblades; bison, caribou, deer, sheep, swan, and hare	Chindadn points not dated directly but underlie microblades; early date from Bison vertebra below cultural deposits	Easton et al. (2011)
Charlie Lake Cave, B.C. (HbRf-39)	CAMS-2129: 10,500 ± 80 CAMS-2137: 10,290 ± 100 SFU-378: 10,380 ± 160 SFU-300: 10,450 ± 150 CAMS-2134: 10,560 ± 80 SFU-454: 10,770 ± 120 Component 1; see Table 1.	Small basally thinned point, microblade core, articulated raven skeletons, bead	Bison and raven bones dated	Driver et al. (1996)
Vermilion Lakes, Alberta (153R, 502R)	RIDDL-215/6: 10,770 ± 170 RIDDL-85: 10,570 ± 150 RIDDL-70: 10,390 ± 140 RIDDL-318: 10,310 ± 230 RIDDL-79: 10,270 ± 100 RIDDL-282: 10,210 ± 130	No diagnostic points, possible microblade cores; sheep, deer, and caribou hunting	Dates on charred wood and bone collagen from Group 1, Component 9a, b; hearth and probable structure features	Fedje et al. (1995); Fedje (1996)
Minnewanka, Alberta (349R)	Complex dating situation (younger Dryas plateau) with seven surfaces dated to ca. 10,000-10,800 ^{14}C yr BP	Sheep hunting focus; a few Goshen-like points	Aeolian deposits with multiple occupation floors and associated hearths	Landals (2008)
Wally's Beach, Alberta (DhPg-8)	See Table 1: 10,980–11,350	Fluted and some Goshen points; some butchering implements directly associated with horse, camel	Horse and camelid hunting at stream crossing; deflated context, but butchered camelid and horses in situ, with associated tools	Kooyman et al. (2001, 2006, 2012)
Niska, Saskatchewan (DkNu-3)	TO-956: 10,880 ±70	Drill, steatite disc, high-quality lithic debitage (KRF, porcellanite)	Calcined bone fragments and hearth basin	Meyer and Liboiron (1990)
Anzick, Montana (24PA506)	B-163832: 11,040 ± 60 B-168967: 11,040 ± 40 B-163833: 10,780 ± 40 CAMS-80538 10,705 ± 35	Antler rods, bones from infant burial dated; 115 artifacts (large bifaces, point preforms and Clovis points)	Discrepant ages between rods and burial, but diagenetic change noted in infant bones.	Morrow and Fiedel (2006); Owsley and Hunt (2001)
Indian Creek, Montana (24BW626)	Beta-4619: 10,630 ± 280 Beta-13666: 10,980 ± 150	Clovis-like point, 7 channel flakes, bison, jackrabbit, marmot; scraper use wear indicative of hide preparation	Multiple loci, spring occupation(s) above Glacier Peak tephra; oldest date regarded as maximum age; Folsom characteristics of larger assemblage	Davis and Greiser (1992)

Regional Archaeological Background.

Most archaeological investigations within our study area are the result of CRM surveys conducted ahead of industrial expansion, all beginning in the 1970s. The results of these studies are primarily confined to the grey literature, little of which has been analyzed or published academically. For this project, I analyzed a sampling of past ASA permit reports from the study area to get a more detailed understanding of the history of archaeology in the region. Table 3 details some of the early archaeological work being conducted by CRM archaeologists in the study area during the 1970s and early 1980s.

Figure 15. The map represents archeological sites present in the study area as of January 2022.



In 1981 an HRIM (ASA permit 81-147) of six sites (FhQf-8 to 12, 13 and 25) was conducted near Robb, Alberta in response to the 1981 HRIA conducted for the Denison Rob Proposed Coal Project, which had identified 16 precontact archaeological sites (ARESCO Ltd. 1982:24-37). The results of those excavations are detailed here.

FhQf-8 is a small lithic workshop where 97 artifacts were collected, none of which were identifiable as to age or cultural affiliation.

Site FhQf-9 is thought to be an extension of FhQf-10, which it borders, and seems to have functioned as a campsite. A total of 79 lithic artifacts were collected from the site, including eight tools. Though no time-diagnostic materials were recovered at the site, it is presumably of the Middle Prehistoric period, given its spatial relation to FhQf-10.

Site FhQf-10 is a large campsite or workshop covering 3500m in area. A total of 5, 274 artifacts - were recovered, 96% of which were lithic debitage. The occupations of FhQf-10 are thought to date to 5000 years BP with McKean complex, Pelican Lake, and Besant materials represented (though not stratigraphically separable). After the artifact analysis, it was concluded that site activities through time included tool manufacture, meat and hide processing, wood and/or bone working, and perhaps the cutting or shredding of plant material.

At site FhQf-12 a total of 428 artifacts were retrieved from what appears to be a small campsite located on the east bank of the Embarras River. Also found at the site was a hearth area containing fragmented bone, charcoal and fire-broken rock (FBR).

Site FhQf -13 is located close to FhQf-12 and has been interpreted as a campsite with a single activity area centered around a hearth feature. Excavations recovered 1,123 lithic specimens and a quantity of bone (the total number of bone fragments was not counted). Interestingly, artifacts at this site indicated people may have conducted heat treatment on the lithic raw materials at this site.

Site FhQf-25 was discovered during the monitoring of a backhoe trench south of FhQf-10. The site is situated in a bog, next to a fen. Surface collection from the disturbed trench was undertaken followed by subsurface testing and excavation units. A total of 1,017 artifacts were recovered from the site. No dateable radio-carbon material was recovered, but the artifacts were discovered in relation with, but never below a thin lens of volcanic ash. It was concluded that this was likely St. Helens Y ash (2,980-3,500 BP) or less likely, Mazama ash (ca. 6,600 BP), suggesting the site possibly post-dates 6,600 years

BP, but more likely post-dates 3,500 years BP. Once discovered, these sites were fully remediated ahead of the opening of a large coal mine (ARESCO Ltd. 1982:39-145).

Table 3. A sampling of early archaeology projects conducted in the study area where site clusters were identified through this project.

Year	Project	Sites Identified	ASA Permit
1973	Archaeological Resource Inventory, Parks Project	2 precontact sites identified in study area	73-010
1976	HRIA Calgary Powers Transmission Lines 740L & 743L	8 pre-contact sites identified	76-076
1981	HRIA Denison Robb Proposed Coal Project	16 pre-contact sites identified	81-114
1981	HRIA Gulf foothills gas gathering system, shaw-mountain park segment	2 pre-contact sites identified	81-119
1981	HRIA Mcleod River Thermal Coal Project	19 pre-contact sites identified	81-127
1981	HRIA Mercoal Thermal Coal Project	28 prehistoric sites identified	81-128
1982	HRIA Esso Minerals Canada Limited Hinton East Coal Properties Test Pit Target Areas	1 site identified	82-126

These, among other CRM studies, demonstrate the intensity and duration of human activity on the region's landscape. CRM HRIAs and HRIMs have continued to be conducted throughout the study area ahead of industrial expansion projects, adding to the growing pile of grey literature that establishes the presence of past peoples in this region. Figure 15 (above) shows all the archaeological sites identified in the study area as of January 2022.

In 2009, significant archaeological material was identified at the Brazeau Reservoir, located in the southeastern portion of the study area. In 2013 RAM curators Bob Dawe and Jack Brink conducted an exploratory survey of the area and identified six sites, FfPv-1- 6 (Coleman 2016). Among their findings were six articulated mandibular Pleistocene horse teeth, which date to 12,700 Cal BP Near the teeth they identified several Paleoindian projectile points, including two fluted points, and a biface cache. Although the points and the horse teeth were not found in direct stratigraphic association, Brink et al. (2017:90) conclude that the fluted points are likely similar in age to the Pleistocene horse. These findings add to the growing body of literature indicating, at least the southern portion, of the Ice-Free Corridor, was open and inhabited by humans and animals by 13,000 BP (Brink et al. 2017:93).

The significance of these sites led to the creation of the Brazeau Reservoir Archaeological Survey Project, initiated in 2015 by the Strathcona Archaeological Society. Surveys were conducted from 2015-2018, leading to more site discoveries, as well as the recording and collection of more artifacts (Coleman 2016). Due to the substantial amounts of cultural material being recorded and collected only the 2015 and 2016 materials have been Catalogued to date. The 2017 and 2018 artifacts have yet to be catalogued and permit reports have not yet been submitted (As of spring 2022). Initial analysis of the projectile points by the permit-holding archaeologist indicates that these sites were occupied over a very deep span of time. The initial cultural phases believed to be represented in the Brazeau projectile points include Clovis, Agate Basin, Hell Gap, Oxbow, and Plains Corner-notch (Coleman 2016).

Construction on the Brazeau Hydroelectric Dam began in 1910 (Coleman 2016). It was completed and began operations in 1963 (Alberta 1995-2022), fundamentally changing the hydrology of the area. The dam was constructed at the confluence of the Elk and Brazeau Rivers. Restricting the flow of the rivers caused water levels west of the dam to rise, flooding back along the Brazeau and Elk River valleys to create the large reservoir seen today. What is now the shoreline of the reservoir was once the upper valley margins of these two river valleys. The topsoil and sediments along the upper valley margins were eroded away by the increased water volume.

Regulation of the dam, which provides hydroelectricity south to the city of Calgary, can cause abrupt changes in the water level inside the reservoir as water is released through the dam or when the flow is restricted or blocked entirely. For much of the year, the reservoir is full and there is little beach exposed, but at times, when the water level drops, large swaths of shoreline are exposed. Fluvial sediments flowing into the dam from Elk and Brazeau Rivers are continuously being deposited in the calmer waters of the reservoir. This sedimentation will slowly but continuously accumulate, reducing the storage-volume of the reservoir over time (Dargahi, 2012:619-625). It is along this ever-changing shoreline that the Brazeau archaeology sites have been identified. Due to the rising and falling water levels within the reservoir these sites are being covered and exposed annually. This changing hydrology is why the Brazeau sites were originally identified; changing water levels have eroded the surface sediments which once covered the sites. Every year new artifacts are exposed or re-buried as fluvial sediments are deposited in the reservoir, making the sites' visibility dynamic, thus making it difficult to capture the full extent of the archaeological remains that exist here. This seasonal erosion and re-sedimentation along the shore of the reservoir have undoubtedly affected the preservation and the stratigraphy of these sites. All artifacts recorded and collected by the Brazeau Reservoir Archaeological Survey Project were surface finds. It is clear from the number of sites and the breadth of artifacts identified along the upper valley margin of the Elk and Brazeau Rivers that it was an important area for past peoples and was used over a long period of time.

The Brazeau Dam sites, as well as the Robb sites mitigated in 1981, are examples of the dense archaeological record present in this area, both across the landscape and through time. These were heavily occupied areas used by past peoples since the late Pleistocene. These are just two examples of large archaeological sites in the study area that negate the narrative of small ephemeral sites. These relatively unknown sites are two of many large sites that have been identified through CRM, with the results buried in grey literature or yet to be studied (see Future Research and Recommendations).

In the early 2000s, a CRM company attempted to create a culture history for the Foothills region based on information compiled from the CRM data conducted in the area. The diagram (Figure 16) was included in early forestry reports prepared by Lifeways of Canada Limited. This, used in conjunction with the accepted Projectile Point Chronology for the Alberta Plains and Mountain Boreal Forest (Figure 17) can be used to help understand when archaeological sites were being used in the past even without the presence of datable material culture.

Figure 16. Culture history of central Alberta foothills (Lifeways of Canada Limited 2005:119)

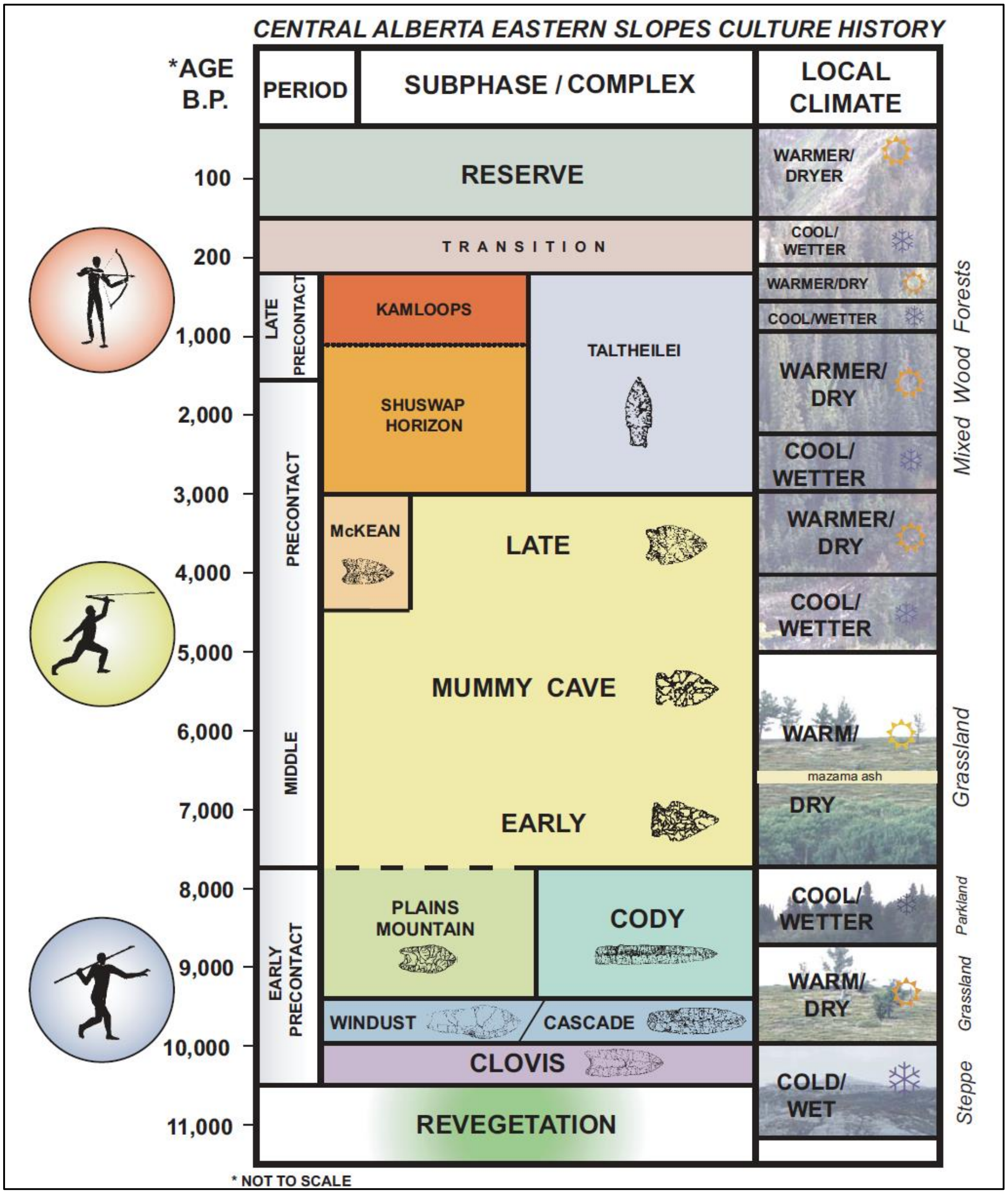
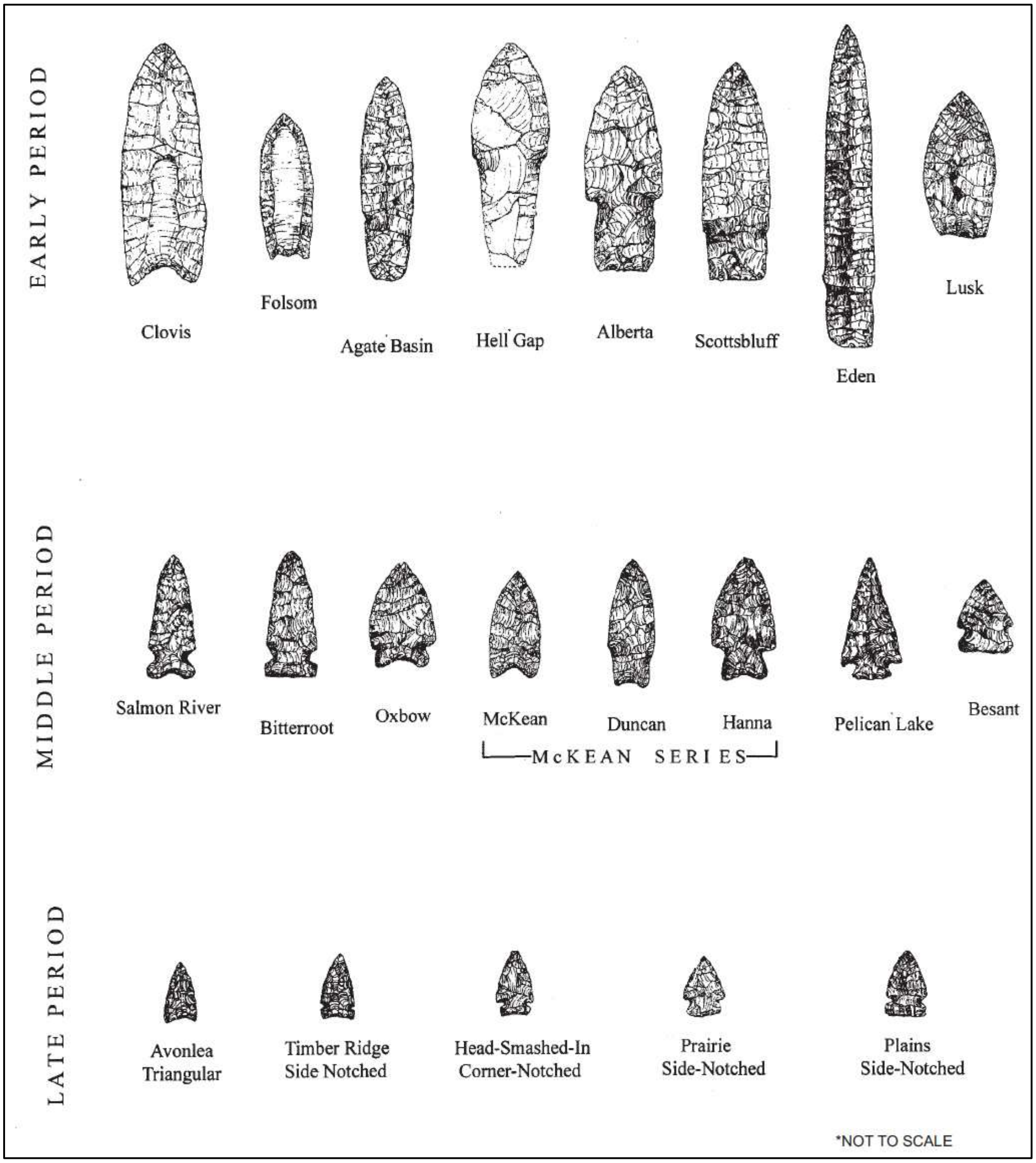


Figure 17. Alberta plains/mountain boreal forest projectile point chronology (Lifeways of Canada Limited 2005:118).



Alberta Lithic Raw Materials

Stone tools were an integral part of past lifeways and the physical remains left behind from that process make up most artifacts identified in boreal archaeological sites. Not all stones are suitable for making stone tools (knapping), the size and type of crystalline structure affect the workability of different lithic raw material types. Past peoples were proficient knappers, using both locally available and exotic raw materials, which they acquired through travel and trade networks from distant regions. In Alberta, many lithic raw materials were used to manufacture projectile points and other lithic tools including quartzite, chert, obsidian, sandstone, chalcedony, and basalt (Figure 18) (Bubel et al. 2012:22).

Quartzite is identified as an exceptionally hard, quartz-rich lithic material. Broken quartzite fractures through both grains and cement to form a conchoidal fracture surface (Howard 2005:708), making it a suitable material for producing stone tools. Quartzite is one of the most widely used materials in the creation of stone tools across the world (Ebright 1987:29). Quartzite is also the most abundant lithic raw material available in Alberta, transported from the Rocky Mountains to the west and the Canadian Shield to the east via the Cordilleran and Laurentide Ice sheets. Quartzite cobbles line the bottom of most major rivers and streams in Alberta, making it widely accessible for past peoples (Bubel et al., 2012:22).

Quartzite is created when quartz-rich sandstone is exposed to high heat and pressure, allowing it to be fractured through the quartz grains rather than around them. The resulting macro-crystalline structure gives the material a “sugary” appearance and a "gritty" texture. Quartzite comes in a variety of colours and qualities depending on the grain size of the quartz crystals (Bubel et al. 2012:22).

Quartzite is more difficult to knap than softer lithic materials; due to its macro-crystalline structure, the resulting tools are often not as finely made as those made from obsidian, chert, and chalcedony. However, skilled flintknappers often used quartzite to produce usable tools. Quartzite tools are durable and can withstand heavy use. This material was ideal for creating hammerstones, axeblades, and mauls (Bubel et al. 2012:22). Quartzite cobbles were also collected and heated and used for hearths, earth ovens, sweat lodges and boiling pits (Custer, 2017:281-282).

Chert is a sedimentary rock formed almost entirely of silica (SiO2), with a micro-crystalline structure. It is highly valued for stone tool manufacture because it is easy and predictable to knap and keeps a sharp edge. Chert comes in a variety of colours (blacks, greys, browns, greens, yellows, and whites) and may be translucent or opaque. Chert nodules often have small fossil inclusions, and they are recognizable due to their smooth appearance and waxy luster (Bubel et al. 2012:23, 24).

In Alberta, there are only a few local chert sources. Etherington chert, which comes from a quarry in the Crowsnest Pass, is a low-quality chert with internal fractures that make it difficult to knap. It comes in a variety of colours, from white to grey and purple and may be somewhat translucent. Pebble chert is a common opaque black waxy chert that is present in river and stream deposits throughout Alberta. This material is typically a higher-quality chert which is easy to knap, however, due to its small size it is not suitable for creating large tools (Bubel et al., 2012:23).

Figure 18. Common lithic raw materials identified in Alberta (Bubel et al. 2012:25).

Other types of locally available lithic raw materials used by past peoples in Alberta were petrified wood, basalts, siltstones, sandstones, and mudstones (such as Argalite found in southern Alberta and northern Montana, and Beaver River Sandstone from Quarry of the Ancestors in northeastern Alberta) (Bubel et al., 2012:24, 26).

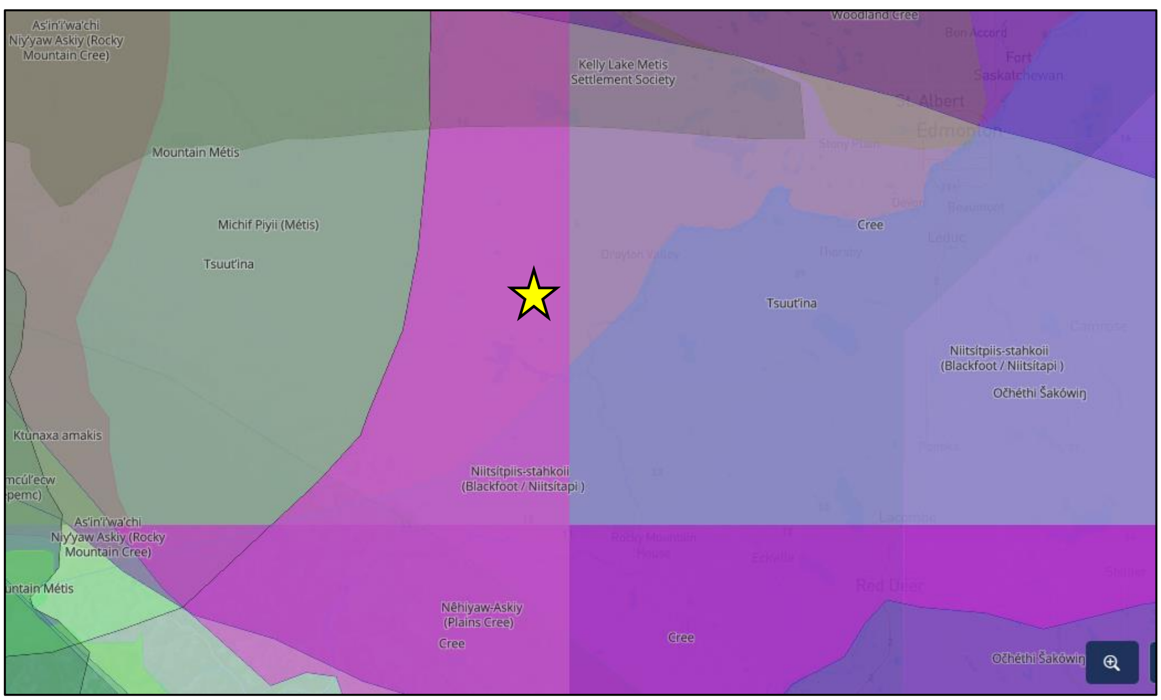
Exotic lithic raw material types were imported into Alberta for their physical properties which made them ideal for flintknapping. Most notable were Obsidian, Montana Cherts, Swan River Chert, and Chalcedony (Knife River Flint) (Bubel et al. 2012:23, 24).

Indigenous Regional History

The study area falls within Treaty 6 Territory, which extends through central Alberta and across Saskatchewan. Treaty 6 was signed by representatives of the Crown and Nehiyawak (Cree), Dene Suline (Chipewyan) and Nakota Sioux (Stoney) Nation leaders at Fort Carlton on August 23rd, 1876, and September 9th, 1876, at Fort Pitt. Many bands signed Adhesions to Treaty 6 from 1877 until as late as the 1950s. The people of O'Chiese First Nation near Rocky Mountain House, who signed an Adhesion in 1950 are of Saulteaux (Ojibwa, Anishinaabe) and Nehiyawak (Cree) ancestry (Alberta Teachers Association 2018). Sixteen distinct Nations make up the Confederacy of Treaty Six First Nations in Alberta: Alexander First Nation, Alexis Nakota Sioux Nation, Beaver Lake Cree Nation, Cold Lake First Nation, Enoch Cree Nation, Ermineskin Cree Nation, Frog Lake First Nation, Whitefish Lake First Nation #128, Heart Lake First Nation, Kehewin Cree Nation, Louis Bull Tribe, Montana First Nation, O-Chiese First Nation, Paul First Nation, Samson Cree Nation and Sun Child First Nation (Confederacy of Treaty 6 First Nations 2023).

Several First Nations communities have traditionally utilized the territory within the study area, including nations that are not members of the Confederacy of Treaty 6 First Nations. Figure 19 illustrates overlapping territories in the region according to information gathered by Native-Land.ca which indicates the study area falls into the traditional territories claimed by the Nêhiyaw-Askiy (Plains Cree), Îyãħé Nakón mąkóce (Stoney), Niitsítpiis-stahkoii (Blackfoot), Tsuut'ina, Michif Piyii (Métis), Mountain Métis, and As'in'i'wa'chi Niy'yaw Askiy (Rocky Mountain Cree).

Figure 19. Map illustrating overlapping traditional territories of Central Alberta's First Nation and Metis communities (Nativeland.ca). The yellow star indicates the location of field research conducted for this project.



The accepted historical view of the northwestern Plains indicates that the Blackfoot Confederacy made up of the Algonkian-speaking Siksika (Blackfoot Proper), Kainah (Blood) and Peigan (Peegan, Peekanow) were probably the first peoples to arrive on the northwestern Plains. The Athabaskan-speaking Tsuu T'ina likely split from the Northern Beaver before the arrival of Europeans and eventually joined the Blackfoot Confederacy. Collectively they are *Nitsitapii* (the people). Oral accounts of Elders define the borders of the *Nitsitapii* by significant geographic features: the North Saskatchewan River (*omaka-ty*) in the north, the Yellowstone River (*ponokasis-'ughty*) in the south, the Rocky Mountains (*mis-tõkis*) in the west, and the Great Sand Hills (*omaxi-spatchikway*) in the east (Panas, 2022:60-65). This territorial boundary is mirrored by those created by archaeological studies, where the Old Women's phase, is believed to represent the *Nitsitapii* (Oetelaar and Oetelaar 2006:376-381; Oetelaar and Oetelaar 2011:70-72).

The Gros Ventre (Atsina, possibly originally a division of the Arapaho to the south, also known as Fall Rapids Amerindians), an Algonkian-speaking people, were allies of the Blackfoot Confederacy to the west at the time of European contact (Grinell 1892:153, Panas 2018:66). The Gros Ventre can trace their origins to the Red River Valley in Manitoba and between 1700-1850 occupied territory in southwestern Saskatchewan. By 1850 the Gros Ventre were almost entirely displaced into northern Montana and North Dakota, today they reside on the Fort Belknap reservation in North Central Montana (Panas 2018:66).

The Shoshoni (Snake, Gens Du Serpent) were seasonal residents of the grasslands and plateau, and the first to acquire horses from their Comanche relatives to the south. The plains Ojibwa (Saulteaux, Bungi) are believed to have reached Saskatchewan by the late eighteenth century. Historical narratives place the Plains Cree as the most recent arrivals to the Northwestern Plains, originally from the eastern woodlands of Ontario and Manitoba, they migrated west with the expansion of the fur trade. When the Plains Cree first arrived on the plains, and into Alberta, is debated (Panas 2018:67-71).

The common narrative used to explain the presence of the Plains Cree in Western Canada can be found in *The Plains Cree* by David G. Mandelbaum (2001); an ethnographic, historical, and comparative study analyzing historical records to trace the development and movement of the Plains Cree since European contact. Mandelbaum (2001) indicates it was around Hudson's Bay that the Cree first encountered European traders and established a reliance on European goods. The expansion of the fur trade then took the Cree further west in their search for furs to trade. With access to European guns and ammunition, the Cree spread into the Canadian Park Belt of Saskatchewan and Alberta, driving the original inhabitants of that area before them (Gros Ventre and Blackfoot). Very quickly these Cree adapted to their new northern Plains environment, taking up bison hunting and establishing themselves as the Plains Cree. North of the Park Belt some groups of Cree pushing west kept predominantly to the forests, rarely coming south of the North Saskatchewan River; today these groups are known as the Western Wood Cree. (Mandelbaum, 2001: 45-46).

According to Mandelbaum (2001:15-16), the first mention of the Cree in historical documents comes from the *Jesuit Relations* of 1640 where the Kiristinon[3] were mentioned by other Indigenous groups. The priests did not meet any Cree people until 1666-1667 when Father Allouez travelled to the tribe and observed that the Cree were a nomadic

[3] Kristineaux, Kiristinous, Kilistinous and Kilistinon are all variations of the Ojibwa name for the Cree people, where contemporary Cree is derived from.

people living along Hudson Bay with no fixed "abodes". The first fifty years of documented European history regarding the Cree indicates that they occupied territory between Lake Superior and Hudson Bay, as they do today (Mandelbaum 2001:17). Mandelbaum (2001:20) states that it would have been impossible for early priests and settlers to know of the lands beyond Hudson Bay, yet he states that "there is not the slightest evidence that the Cree had a westward extension".

According to Mandelbaum (2001: 28-29) "the fur trade is by far the most important single factor to be reckoned with in an outline of the life of the tribe" and that "by 1740 they (the Cree) have passed into a state of economic subservience". The Cree were specialists in fur trapping and had become dependent on the traders for European goods which had become necessities:

> Knives, forks, pots, spoons, and axes soon became indispensable to the native life[…] The Cree at once grasped the potentialities of the gun in defeating their enemies and in easing the rigors of the hunt[…] They soon had little use for the bow. Before long they became strongly addicted to whiskey and Brazilian tobacco. [Mandelbaum 2001:30]

The Cree were traditionally a nomadic hunting people spread over a large territory, this coupled with their proficiency with canoes made them ideal middlemen for European traders traveling inland. Armed with guns and following the fur trade inland, the Cree began their westward expansion and gained a foothold on the Plains (Mandelbaum 2001:30).

The Chevalier de la Verendrye was a Frenchman who penetrated deep into the Saskatchewan River Valley in the 1730s, he wanted to reach the "western sea" and secure a chain of forts from Nipigon to the Rockies to restore commerce for New France. Mandelbaum (2001:25-28) cites La Verendrye's journal entry of the "Cree of the Prairies" as the first authentic reference in literature indicating that the Cree were living in the plain's country south of the Saskatchewan River by 1730. Mandelbaum (2001:31) indicates this group was an example of the transition from forest to plains, stating that they "certainly lived upon the plains only a part of the year". Other evidence given by Mandelbaum (2001:31-32) for the western presence of Cree during this time was the account of David Thompson (approximately 1730) who met a man of Cree descent living among the Piegan in the foothills of the Rocky Mountains. The man had answered a call for aid against the "Snake" and remained with the Piegan eventually taking a Piegan wife. Mandelbaum (2001:31-33) inferred that the group to which the Cree man had originally belonged must have been in the lands well west of Lake Winnipeg for the Piegan to call on them for aid. He concludes that "the westernmost Cree were out on the plains about 1730, and yet were still familiar with the lakes and woodlands, probably shuttling in and out of the prairies, seasonally (Mandelbaum, 1979:33).

An alternative narrative is provided by Dale R. Russell (1991) in *Eighteenth Century Cree and their Neighbors.* Russell re-examines the hypothesis of a historic migration of the western Cree by examining historic documents. Russell (1991:10) points out that a lack of information regarding the interior during the onset of the fur trade was largely due to a lack of knowledge about the interior geography, the first maps not being available until after Anthony Henday's journey to central Alberta in 1754-1755. Henday's journal, recording his expedition, places groups of Cree and Assiniboine wintering in central Alberta near modern-day Red Deer and Edmonton as well as accompanying local groups (probably Blackfoot or Gros Ventre) on raids further to the southwest (Russell 1991:24). Russell (1991:24) points out that this is just 60 years after Mandelbaum insisted the Cree had no westward expansion from Lake Superior.

The second-oldest published journal of the west according to Russell (1991:24) is that of Mathew Cocking who overwintered with a Cree group between the Eagle Hills and lower South Saskatchewan in the winter of 1772/73. He noted that some groups of Cree and Assiniboine had left for the west in the fall, heading to Manito Lake and the Rockies for the winter. His account indicates that the Cree and Assiniboine were living between the North and South Saskatchewan Rivers, and they were allied with the Gros Ventre, Blackfoot Nation and the Sarcee (Russell 1991:24), the same people Mandelbaum (2001:35-37) indicates the Cree forcibly displaced during their westward invasion of the plains[4].

It is clear from both these sources that the Cree were present in the west by the mid-18th century when the first Europeans travelled inland from the Hudson Bay region. The primary source documents left by the Chevalier de la Verendrye, David Thompson, Anthony Henday, and Mathew Cocking make it very clear that Cree peoples were present on the northwestern plains as far west as Central Alberta, with knowledge west to the foothills of the Rocky Mountains between 1730-1773 (Mandelbaum 1979:33; Russell 1991:24). Journals written by Alexander Mackenzie record evidence of Cree raiding parties as far west as the Peace River Canyon near modern Hudson Hope in British Columbia (Russell 1991:36).

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[4] For a full accounting of Russell's critique of Mandelbaum see *The Eighteenth-Century Western Cree* Chapter 2 *David Mandelbaum: The Western Migration of the Cree* page16-27.

Archaeologically the introduction of European goods, likely brought west by the Cree and Assiniboine 50-100 years before Europeans reached Alberta, marks the beginning of the Protohistoric period in Alberta (Peck and Hudecek-Cuffe 2003:72-102). Research near Nipawin, in central Saskatchewan, has unearthed pottery sherds that may indicate the presence of Cree peoples within the Northern Plains during the Late Precontact period (Brink 1986:50-51; Meyer 1981:27; Syms 1977:108). This evidence indicates that the Cree were within Western Canada earlier than previously thought (Panas 2018:69).

Ermineskin Cree Nation in West-Central Alberta

Historical and ethnographic evidence supports oral histories which place the ancestors of the Ermineskin Cree Nation in Central Alberta and the foothills prior to and contemporaneous with early European exploration in the area. Territories regularly used and occupied by the ancestors of Ermineskin Cree Nations Citizens were vast, ranging across what would become the provinces of Alberta, Saskatchewan and Manitoba, as well as northwestern states such as Montana and North Dakota (Ermineskin, 2021:9). For the purposes of this research, we will focus on the presence of Ermineskin's ancestors in west central Alberta and the foothills, in the vicinity of our study area.

The Mountain Cree, so-called by Hudson Bay companies' governor-in-chief George Simpson, have lived in the Alberta foothills and the Rocky Mountains since at least the 1700s (Ermineskin, 2021:9). One of the primary use occupancy areas of the Mountain Cree was the Rocky Mountains and Alberta foothills from Grande Prairie-Grande Cache-Hinton in the north to Calgary and Pincher Creek in the South. The Mountain Cree over-wintered in the Rocky Mountains and foothills, taking advantage of the rich boreal landscape for fishing, hunting, and trapping. Furs were traded with Europeans at Fort Edmonton and Rocky Mountain House (Ermineskin, 2021: 9). One elder recalled:

> We were always in the eastern slopes; that was one of our main areas. It was a wintering area. It was, especially Jasper and Banff…once you enter those mountains in the Jasper area, it's like night and day. It might be cold and blowing, but once you enter in there, it's warm, and there's shelter. (Ermineskin, 2021:10)

In the spring the Mountain Cree would migrate east along the Red Deer, Battle, and North Saskatchewan Rivers onto the plains to gather, conduct ceremonies and hunt buffalo. In the fall, they would travel west along the Saskatchewan River to trade in Edmonton and occupy the Bear Hills and Peace Hills areas before returning to the mountains for the winter (Ermineskin, 2021:10; Dempsy, 2010:21; Hutchinson and Dempsey 1977:136-137 and 259-270). Cree bands were highly fluid, often breaking up and coming together for ceremonies or large hunts. The historical records and oral histories make it clear that the Mountain Cree were connected to the eastern Cree bands and leaders such as Big Bear, Sweetgrass, Poundmaker, Little Hunter, Kehiwin, and Pakan (Ermineskin, 2021; Dempsy, 1984:39, 43). The historical and ancestral connection between the Mountain Cree and Ermineskin Cree Nation is demonstrated by Louis Piche (Pesew/Pisu/Peechee). Son of a French-Canadian fur trader and his Cree wife, Piche joined the Mountain Cree in the 1820s, marrying the daughter of the Cree Chief (Ahenekew), Magdeline O'Piatastewis (Ermineskin, 2021:11; Johnson, 2017:23). Piche is known from historical documents as he guided David Thompson from Rocky Mountain House to Jasper and HBC Governor George Simpson from Edmonton to Washington state (Ermineskin, 2021:11: Simpson, 1847:73). Piche became Chief of the Mountain Cree in the 1830s. Piche and his wife O'Piatastewis had two sons, Alexis Piche (Bobtail) and Baptiste Piche (Ermineskin), both would go on to become chiefs and play critical roles in the founding of Ermineskin Cree Nation (Ermineskin, 2021:12).

After the death of Louis Piche in 1845, Bobtail became the Head Chief of the Mountain Cree and eventually commanded the largest band of Western Cree. Driven by poor trapping conditions and competition from other groups the Mountain Cree moved west toward the plains near Pigeon Lake. Despite Bobtail's initial boycott of treaty negotiations, the rapid decline of the buffalo and other wild game as well as the intensification of disease brought on by droves of Euro-Canadian Settlers was creating a desperate situation. In 1877, Bobtail adhered to Treaty Six at Blackfoot Crossing. A reserve was selected around the Bear Hills, near present-day Maskwacis, and divided to accommodate Bobtail's younger brother, Ermineskin. In 1885, Ermineskin had his reserve surveyed and was officially recognized as the first Chief of the Ermineskin Band by the Government of Canada in May of 1889 (Ermineskin, 2021:12).

Settlement on the reserve did not sever the connection between Ermineskin citizens and their traditional lands. Ermineskin citizens continue to travel, hunt, fish, and gather according to traditional customs for subsistence purposes across their traditional territory. In 1968 Chief Smallboy, maternal grandson of Alexis Piche (Bobtail) and over 100 of his followers left the reserve and established a camp on the Kootenay Plains, on the eastern slopes of the Rocky Mountains. This was done to pursue a traditional Cree lifestyle and preserve Cree culture and traditions, which was increasingly unviable on the reserve. In the early 1970s, the camp was relocated south of Grave Flats, where Smallboy Camp exists today. The ties between the camp and the reserve are strong, Camp residents remain citizens of Ermineskin Cree Nation and many residents of the Ermineskin Reserve 138 visit the camp regularly and have family and friends who live there. To this day camp residents are dedicated to the revitalization and preservation of the Cree culture and traditional practices, hunting, fishing, gathering plants for subsistence and medicinal purposes, and engaging in traditional ceremonies (Ermineskin, 2021:13).

This short history in no way represents the full complexity or territorial extent of Ermineskin Cree Nations' traditional territory or history. However, it does unequivocally establish the strong tie Ermineskin citizens have in west central Albertas' Rocky Mountains and Foothills regions.

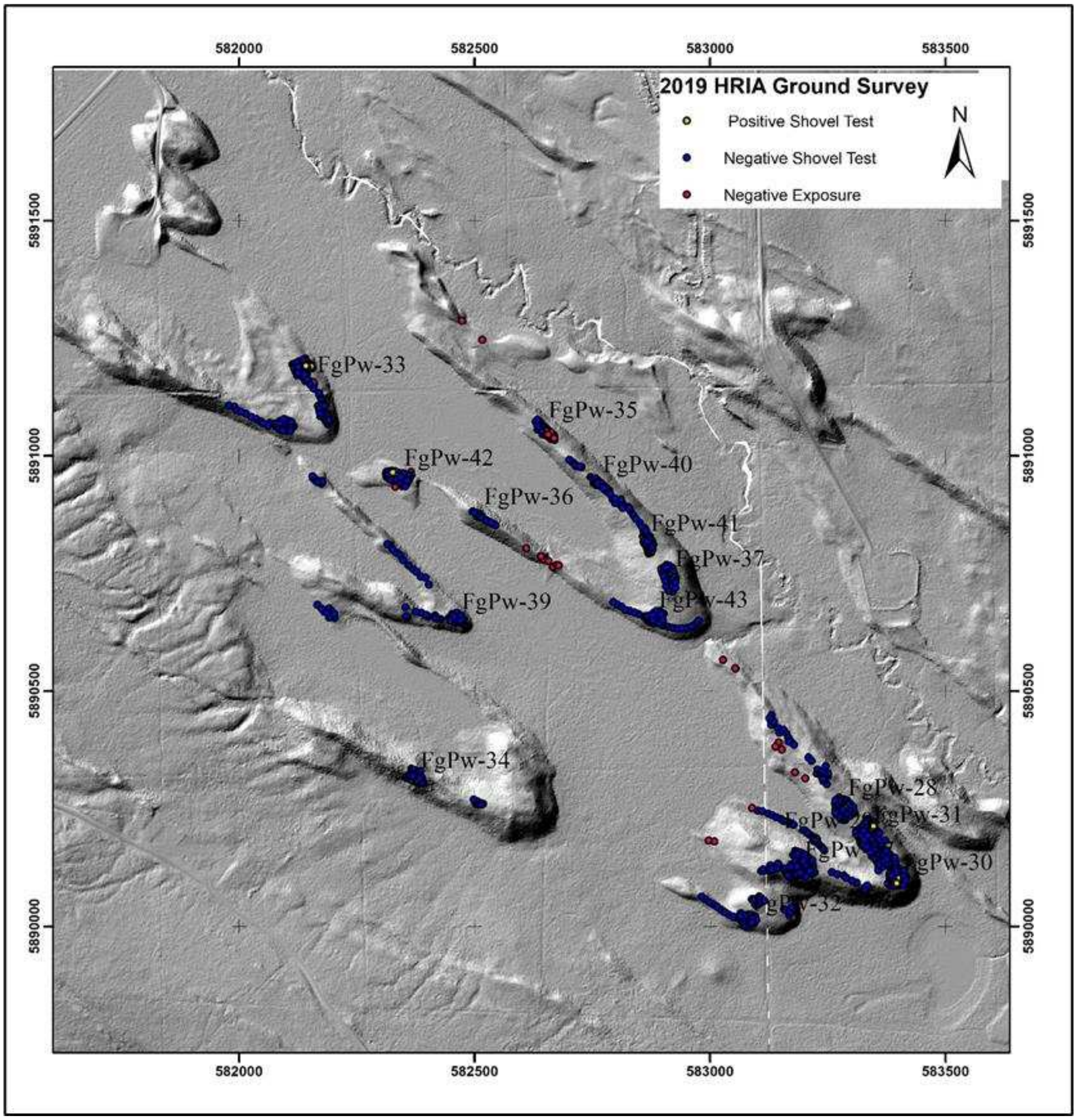
Site Specific Background: Tidewater Sand Dunes

Alberta Sand Dune Archaeology.

Although thousands of Precontact archaeological sites have been located within sand dune environments across Western Canada, comparatively little research has been conducted interpreting the role these areas played within larger regional cultural practices. More focus has been paid to sand dune occupation on the northern plains in both Saskatchewan and Manitoba, however very little attention has been paid to Alberta dune occupation, and even less to boreal sand dune environments (Panas 2018:91-99). Most data on sand dune archaeology in Alberta is contained in the grey literature, unpublished reports submitted to governments and industry clients in fulfilment of permit requirements. No attempt has yet been made to accumulate or analyze the data contained in the grey literature regarding sand dune archaeology in Alberta (See Future Research and Recommendations).

Where archaeological investigations have been conducted in boreal sand dune environments, subsurface testing has been limited to the upland ridges, with focus on the "highest potential" ridges and knolls; landforms that disperse sediment. Low-lying terrain such as sediment traps, slopes and interdune spaces are commonly left untested (Woywitka and Michaluk 2021:98), creating a testing bias. This testing bias is clear when looking at the subsurface testing conducted on the Tidewater dunes in during the 2019 HRIA (Figure 20). Subsurface testing was confined to the upland ridges and knolls of the dune features, no testing was conducted in the lowland portions of the dune field.

Figure 20. 2019 HRIA subsurface testing on the Tidewater sand dunes,



Indigenous Perspectives on Sand Dune Environments.

Panas' (2018:49-85) postgraduate dissertation synthesizes past work completed within sand dune environments on the Northern Plains to examine the environment, spiritual, and cultural roles that sand dunes played in the lifeways of Northern Plains

Indigenous groups during the middle and late precontact periods. The Tidewater dunes fall to the northwest of this study area, in a forested boreal environment but the Indigenous nations present on the northern plains during the middle and late precontact periods were also present in the foothill's region at this time, allowing us to use Panas' (2018:49-58) analysis as a potential indication of Indigenous perspectives on boreal dune environments. This research indicates that Indigenous people viewed and exploited dune environments differently than the environments that surround them.

Blackfoot oral history has many references to sand hills, they are viewed as areas where the spirits of the dead live as ghosts in a shadow land (Panas 2018:61; Grinnell 1920:44). Sand dunes are not only present on the physical landscape, but they also exist in the spiritual world (Panas 2018:62). There are numerous mentions of sand dunes in association with death and the afterlife (Grinnell 1920:127-128; Dempsy 1994:186-197; Jenish 1999:67-68, McClintock 1968:144-148) as well as an eyewitness account by Martin (1967:75-76) of Blackfoot burials in sand dunes around Gleichen, in Southern Alberta. The Blackfoot word for the geographic feature of sand hills or a desert (*ómahksspatsiko*) also means the hereafter, linguistically tying the concept of the afterlife to the sandhills (Frantz and Russell 1995:160; Panas 2018:60-65).

Sand dunes are also prominent features in early ethnohistoric accounts examining the afterlife of the Gros Ventre. Flannery (1957:8, 225-226) and Kroeber (1908:276) describe the "big sand" (*ba:snabe* or *basnable*) as the place where the spirits of the dead travel to (Panas 2018:66-67).

Among the Cree, sand dunes are not associated with the afterlife, but rather with "little people with no noses" (*memekwesiwak* or *memegweciwuk*). The *memekwesiwak* are supernatural beings; viewed as largely benign, they could act as spiritual helpers and grant powers. They were known to reside in sand dunes, rivers, and bodies of water (Panas 2018:67-71; Mandelbaum 2001:178-179). Modern accounts of sand dunes among the Cree indicate that medical skills and medicinal plant usage could be obtained through dreams from the *memekwesiwak* in exchange for gifts of tobacco, beads, brooches, and necklaces (Scribe 1997:4; Jensen et al. 1968; Dusenberry 1962:161; Panas 2018:71). Oral and written accounts also detail the use of sand dunes for subsistence purposes, as the sand dunes on the northern plains were used to create bison pounds, (Hind 1859:55-56, Mandelbaum 2001:52-57, Panas 2018:67-71).

Panas (2018:74) found no mention of sand dune environments in the ethnographic or historic accounts of the Assiniboine, which they recognize may be due to a lack of primary and secondary sources on Assiniboine culture.

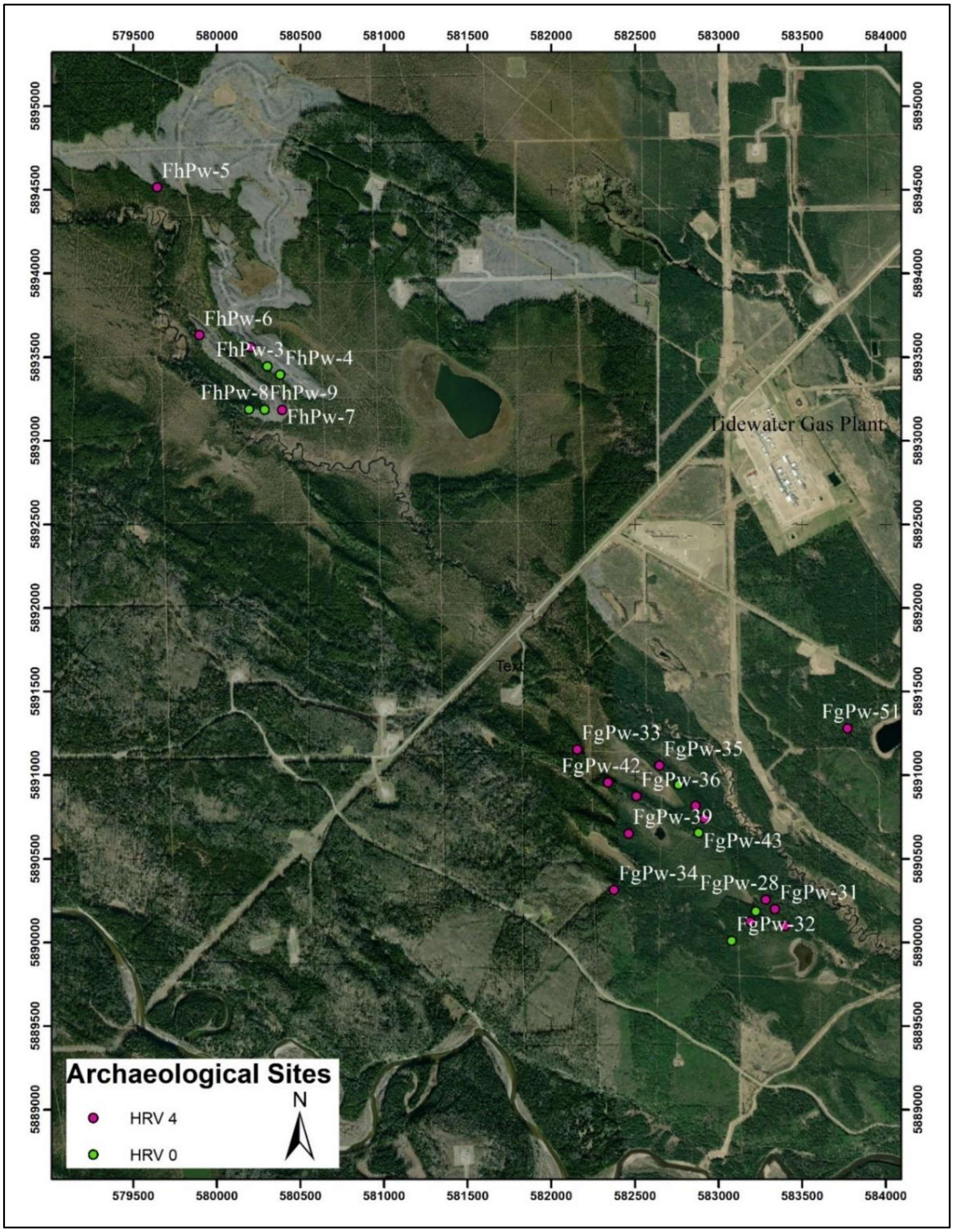
What Panas (2018:60-76) establishes is that sand dune environments, not only unique geologically, were also viewed differently than the surrounding landscape by Indigenous peoples during the middle and late pre-contact periods. These views likely stem from earlier beliefs and traditions. This supports what is typically seen archaeologically, that there is a different, more intensive, use pattern in sand dune environments, both on the plains and in forested environments, than is typical of the surrounding landscape. More intensive archaeological study of boreal forest sand dunes is needed to understand the trends that are beginning to appear in boreal forest sand dune environments (See Future Research and Recommendations).

Tidewater Dune Field Archaeology.

North of the Tidewater Road, a few dunes were investigated archaeologically in 2004 (Lifeways of Canada Limited 2005:50-56) under a forestry HRIA which resulted in the identification of eight (FhPw-2, FhPw-3, FhPw-4, FhPw-5, FhPw-6, FhPw-7, FhPw-8 and FhPw-9) prehistoric archaeological sites on three sand dune features (Figure 21). Four of these sites, FhPw-3, FhPw-4, Fh-Pw8 and Fh-Pw-9, are designated as HRV 0 sites. FhPw-3, FhPw-4 and FhPw-8 are lithic scatters <10 and FhPw-9 is an isolated find. FhPw-3 and FhPw-4 are less than 100 m apart and were identified as Site Cluster FID462 in our 2022 GIS analysis. The recorded site boundaries for FhPw-8, FhPw-9 and FhPw-7 (lithic scatter <10) are also separated by less than 100 m and were identified as another Site Cluster (FID706). No diagnostic tools were identified at any of the eight sites. No mention was made of sand dune features, the sites are described as being located on "ridges" (Lifeways 2005:50-56). However, based on analysis of topographic maps, world imagery, and field photos included in the 04-313 final report it is evident that these are large parabolic dune features, an extension of the Tidewater dune field to the south where our field research took place.

The dune formations south of the Tidewater Road were initially investigated in 2019 as a part of an HRIA (Circle CRM Group Inc. 2020) conducted ahead for industrial deforestation. During that investigation, 17 new archaeological sites were identified on five large parabolic dune features.

Figure 21. World imagery of the Tidewater dune field with the location of known archaeological sites identified (2022).



Theory

Community Engaged Archaeology and Indigenous Archaeology

The emergence the postprocessual archaeology in the 1980s was a distinct change from both the normative approach of cultural history and the scientific search for generalizations about human behaviour that defined processual archaeology of the previous decades. The relativistic and self-critical nature of postprocessual archaeology gave rise to interpretive, critical, structural, Marxist, feminist and Indigenous strategies as well as a recognition that archaeology was neither politically nor culturally neutral (Nicholas and Watkins, 2014:3779). Rather, "…the practice of archaeology…is embedded within a political and colonial system" (Beaudoin 2016:10). Archaeology was traditionally, and is still, used to understand the past from a Western scientific perspective and in colonial nations such as Canada, The United States, Australia, and New Zealand archaeology is a system of colonialism that has contributed to the marginalization of Indigenous communities (Van Alst and Gover 2023; Suprenant 2020).

Archaeologists have historically considered themselves authorities on the past and have engaged in "gatekeeping" and "safeguarding" of archaeological data and materials from Indigenous communities (Gupta et al. 2023:76; Deloria 1992:595). Every decision made by archaeologists, from what is studied, to which artifacts are collected or discarded, as well as what narratives are presented in museums, shapes our contemporary view of the past. In North America, these decisions have largely been made by settler archaeologists without the inclusion or consideration of Indigenous communities and traditional ways of knowing. Historic Preservation and other site protection efforts, such as CRM, rarely serve Indigenous peoples as the histories being protected, preserved, and commemorated situate only some people and events in the past. Often, with little or no correspondence to the memories or experiences Indigenous groups attach to the specific locales targeted by preservation activities (Carmichael et al. 1994:8-10; Deloria 1992:595-598; Joyce 2003:79-100; Smith 2006:133-132; Rubertone 2008:13-15). It is in these ways that archaeologists have dictated today's understanding of the past.

In Canada most archaeological research done focuses on Indigenous pasts; cultural material as well as ancestral remains were historically removed from the land and put into museums and other colonial institutions where they were displayed without the consent of descendant Indigenous communities and archaeological collaboration with Indigenous communities was rare (Supernant 2020). However, the development of postprocessual archaeology in the late 20th century, and pushback from Indigenous archaeologists and Indigenous communities, led to the development of Indigenous Archaeology as a theoretical framework. Some early Indigenous Archaeologists who began writing about and advocating for Indigenous Archaeology were Joe Watkins, Sonya Atalay, Dorothy Lippert, Desiree Martinez, Sven Haakanson Jr., Davina Two Bears, Eldon Yellowhorn, Michael Wilcox, and others (Van Alst and Gover, 2023:7). Indigenous Archaeology called for archaeologists to incorporate descendant Indigenous communities into their research, consider Indigenous world views, and encourage the incorporation of more Indigenous scholars into the field of archaeology (Van Alst and Gover, 2023:7; Watkins 2000:141-145, 2005:433-436; Nicholas and Andrew 1997:8-12).

During the 1980s and 1990s, archaeologists began working with and for Indigenous communities, *At a Crossroads: Archaeology and First Peoples in Canada* was published as a result of these collaborations and was the first in Canada to define Indigenous Archaeology as an approach (Nicholas and Andrew 1997; Supernant 2020). There is now a growing body of literature and a widespread recognition among professional archaeologists that Indigenous communities should be consulted before archaeological work is conducted on their traditional territory. Unfortunately, engagement remains uneven across the country, and it is still uncommon for Indigenous communities to have the right to refuse archaeological work or control the results (Supernaunt 2018:145). The 94 TRC Calls to Action established in 2015 emphasize the importance of teaching indigenous history and call on Canadians to help move us toward reconciliation. For archaeologists, this means changing the standards of practice. Currently, the lack of federal heritage legislation has had a direct impact on how Indigenous communities are consulted across different provinces and territories. Examination of research and legislation is required to create standards across the country which respond to the needs of Indigenous communities (Supernaunt 2018:146-148).

Indigenous archaeology does not reject the tenets of scientific inquiry, rather it combines Indigenous epistemology and the Cartesian empiricism of the West. Challenging the legacy of scientific colonialism and recognizing that there are different ways of knowing. Indigenous peoples often have fundamentally different conceptions of heritage. The Western dichotomies of time as linear and the belief in separate dimensions of people, the environment, natural and supernatural is not reflective of many Indigenous worldviews where time is often viewed as cyclical and the “real” and “supernatural” are not separate;

ancestral beings are part of this existence not in a separate "realm". This has substantial implications for CRM and heritage management and explains the importance of reburial, repatriation, and protection of cultural landscapes to Indigenous people (Nicholas and Watkins, 2014:3778-3779). Importantly, there is no pan-indigenous perspective as individual Indigenous nations have distinct values, histories, worldviews, and ontologies. Therefore, Indigenous archaeology must be conducted in collaboration with local Indigenous communities and viewed in relation to their distinct cultures and beliefs.

One of the pillars of Indigenous Archaeology, as argued by Sonya Atalay (2012:55), a prominent Indigenous Archaeologist, is the importance of collaborative work between archaeologists and Indigenous communities. Gonzalez (2016:533-549) and Silliman (2008:1-28) lay out a theoretical framework necessary for collaborative archaeological work.

1) Research design and the research questions should be developed with the community the archaeologist is working with.

2) The community should be involved in all stages of the research including survey and excavation.

3) Open communication should be maintained throughout the project.

4) The results need to be disseminated to the community in a digestible and accessible manner. Not only published for other academic scholars.

This is the theoretical framework that has been put into practice in this research project. Research design and development of this project were created in partnership with the EIRD team to help address issues of archaeological site designation within a portion of Ermineskin Cree Nations' traditional territory that affect site preservation and perpetuate the idea of small ephemeral sites. Ermineskin EIRD is currently conducting a cumulative effects study to assess the total impact that industry (forestry, mining, oil and gas, etc.) has had on their traditional lands. This project will contribute to that larger study. This project also criticizes the lack of consultation and relationships between Indigenous communities and CRM archaeologists in Alberta, a multi-faceted problem that has a direct impact on Indigenous communities and heritage management practices. In this way, the project was designed with and for Ermineskin Cree Nation.

The EIRD team, made up of Ermineskin citizens and Elders, has been involved in all stages of the research and was heavily involved in site selection, site reconnaissance and ground survey (See Methods Chapter). The EIRD team provided equipment (trucks, ATVs and UTVs, chainsaw, bear protection, etc.) as well as covered the cost for their team and the above equipment to make this research possible. Following the completion of field research in 2022, updates were provided throughout the writing process and in October 2023 I presented the contents of the thesis to the EIRD team, and a collaborative meeting was held to assess content and ensure that this project was accurately representing the project and addressing the needs of the community.

History of CRM "Salvage" Archaeology

Population growth, coupled with rapidly expanding technologies of the late 19th and early 20th century created an era of unprecedented industrial development throughout the world which exposed and threatened the physical remnants of the past. J.O. Brew

(1961:2) described “this thoughtless despoliation as a crime against civilization”. In 1907 systematic archaeological surveys and excavations were conducted in Egypt along a 250-mile stretch in the Valley of Nubia which would be flooded due to the decision to increase the height of the Aswan dam. Funding was provided by the Egyptian government and work was directed by a Harvard University Professor, G. A. Reisner. Systematic archaeological study and excavation were again conducted between 1929-1931 after the decision was made to raise the height of the dam again, resulting in flooding which would extend to the border of Sudan (Brew 1961:2-3).

Following the formalized salvage archaeology operations in Egypt, many similar programs began to take place internationally ahead of large land development programs. After the Second World War, the Inter-Agency Archaeological Salvage Program of the United States Government was formed to address archaeological concerns in the US (Brew 1961:3). Canada was also seeing a rise in GDP growth with the baby boom and increased immigration from Europe after the Second World War. The export value of natural resources such as pulp paper, iron ore, and non-ferrous metals was on the rise, coupled with the discovery and development of Alberta’s oil patch after 1947. Infrastructure development to support Canada’s economic growth resulted in significant land-altering development that threatened Canada’s Archaeological remains (Dent 2016:17-18, Green 2000:234).

In Manitoba, Ontario and British Columbia provincial advisory boards were created to memorialize historic sites and buildings; some of these boards eventually began the work of identifying and preserving them as well (Apland 1993:7-24; Dent 2012:21-34; Dent 2016:18). Archaeological and Historic Sites Protection Acts (AHSPA) (Ontario, R.S.O. 1953 c. 4; British Columbia, R.S.B.C. 1960 c. 15) were significant pieces of heritage legislation adopted in Ontario and British Columbia respectively that prompted the development of these advisory boards to preserve the archaeological record (Dent 2016:18). As cultural heritage is defined as a natural resource in Canada, it was left in the hands of provincial and territorial authorities to manage, and without federal heritage legislation or administration, it resulted in a "patchwork of inconsistent practices" (Dent 2012:31) across the country. The archaeological community felt these standards were not adequate and called for more formal government-regulated archaeological standards and legislation (Apland 1993:7-24; Dawson et al. 1971:6-9; Noble 1977:4-6; Savage 1972:3; Dent 2012:21-49, 2016:17-20).

In the 1970s and 1980s, many provinces began integrating archaeology into government bureaucracy, giving heritage legislation official enforcement weight, and providing field resources for guaranteed salvage archaeology operations. This created a need for professional archaeologists leading to the emergence of the first archaeological consulting firm in Ontario in the mid-1970s. Across the country, the 1970s-1990s saw the emergence of privatized, commercial salvage/rescue archaeology, known commonly as Cultural Resource Management (CRM; Dent 2016:20-21). See Chapter 1 Introduction for a more detailed history of CRM in Alberta. Today, CRM archaeology represents 80-90% of the archaeological community and work practiced in Canada (La Salle and Hutchings 2012:8; Ferris 2007:78-99; Dent 2016:28).

Figure 22. Percentage of consulting vs. research permits issued by province from 1970s to 2014 (Jalbert 2019:148)

Province	Research	Consulting
Alberta	6%	94%
Saskatchewan	7%	93%
Ontario	7%	93%
Québec	10%	90%
Nova Scotia	11%	89%
Newfoundland and Labrador	41%	59%

The old rhetoric in archaeology is that CRM for-profit archaeology is a sub-standard practice compared to academic or research-driven archaeology. This is a false narrative. Research-driven archaeology is not infallible and is also subject to bias, such as the researcher's interests, motives, experiences, and bias. The necessity for funding, which is often granted through academic institutions or federally funded grant programs, also creates a political bias as not all applications are approved. One of the largest backers of archaeological research projects in Canada is the Social Sciences and Humanities Research Council (SSHRC), a "federal research funding agency that promotes and supports research and training in the humanities and social sciences" (Government of Canada, 2023). Often, the political and social circumstances of the time influence which projects receive funding. Many research permits are also being completed by graduate students, like me, who are learning how to conduct archaeological research. Whereas many professional CRM archaeologists have decades of experience in the field.

The advantage of research-driven archaeological projects is that they are not constrained by the same factors as CRM archaeology. There are no project footprints or client budgets, and the time constraints are far less demanding. Where CRM archaeologists will complete and report on numerous projects a year, I have dedicated 2 years of academic research to this one archaeological investigation. This project brings to light many of the biases of Alberta's CRM system in the hope that many of these biases can be addressed, thus improving future CRM archaeology in Alberta (See Future Research and Recommendations).

The State of Indigenous Consultation and Inclusion in Alberta CRM:

Cultural heritage resources recognized in Canada are predominantly archaeological sites and material remains left behind by Indigenous peoples, with some historical sites and material remains of early European settlers (Ferris and Dent 2020:31-56). The management and protection of these resources are left in the hands of provincial governments. To this day, there is no federal legislation in Canada that addresses heritage conservation. Therefore, the criteria for conducting archaeological heritage investigations, preserving, and protecting heritage resources, as well as the very definition of what constitutes a "Heritage Resource" differs between the provinces and territories (Dent 2016:22). The degree of recognition and inclusion of Indigenous peoples in heritage management is also different in each legislative sphere. Looking at the heritage legislation in the province of Alberta there is an alarming lack of consultation with local First Nations and Metis communities in archaeological investigations. In Alberta the heritage management system is formed around three distinct interests, that of the government as a regulating body, professional archaeologists as the authority on heritage artifacts and sites, and industrial development as the driver of heritage assessments (see Introduction: CRM in Alberta).

In Canada, Aboriginal and Treaty Rights are protected by s. 35 of the *Constitution* (Canadian Charter of Rights and Freedoms 1982) as such, the Crown has a fiduciary duty to Indigenous peoples. The disregard for Indigenous rights and the lack of consultation by the Crown and Industry in Canada led to several key court cases regarding the infringement of Aboriginal rights, beginning with *Sparrow* (S.C.C., 1990) followed by *Delgamuukw* (S.C.C. 1997) (Natcher 2001:113-122). In September 2000 the Government of Alberta Released *The Government of Alberta's Aboriginal Policy Framework* setting out the basic structure for policies to address "Aboriginal" issues in the province (Calahasen, 2000). In 2005 *The Government of Alberta's First Nations Consultation Policy on Land Management and Resource Development* (Government of Alberta 2005) was released defining the role and responsibilities of all parties. In 2013, *The Government of Alberta Policy on Consultation with First Nations on Land and Resource Management* (Gov of Alberta 2013) came out and the Aboriginal Consultation Office (ACO) was created to oversee the provinces' role in consultation. The Policy came into force on July 28, 2014, with the release of *The Government of Alberta's Guidelines on Consultation with First Nations on Land and Natural Resource Management* (Gov of Alberta, 2014). Similarly, in the fall of 2015 Alberta's Métis Settlements consultation policy, *The Government of Alberta's Policy on Consultation with Metis Settlements on Land and Natural Resource Management* (Gov of Alberta, 2015), 2015 was approved by Cabinet. The Policy came into force in April 2016 with the release of *The Government of Alberta's Guidelines on*

Consultation with Metis Settlements on Land and Natural Resource Management, 2016 (Gov of Alberta 2016(a)). In 2019 *The Government of Alberta's Proponent Guide to First Nations and Metis Settlements Consultation Procedures* was released to provide direction to industry proponents to meet the administrative requirements needed to satisfy the Crown's duty to consult and provide "information and direction for all … stages of the consultation process" (Gov of Alberta, 2019:3).

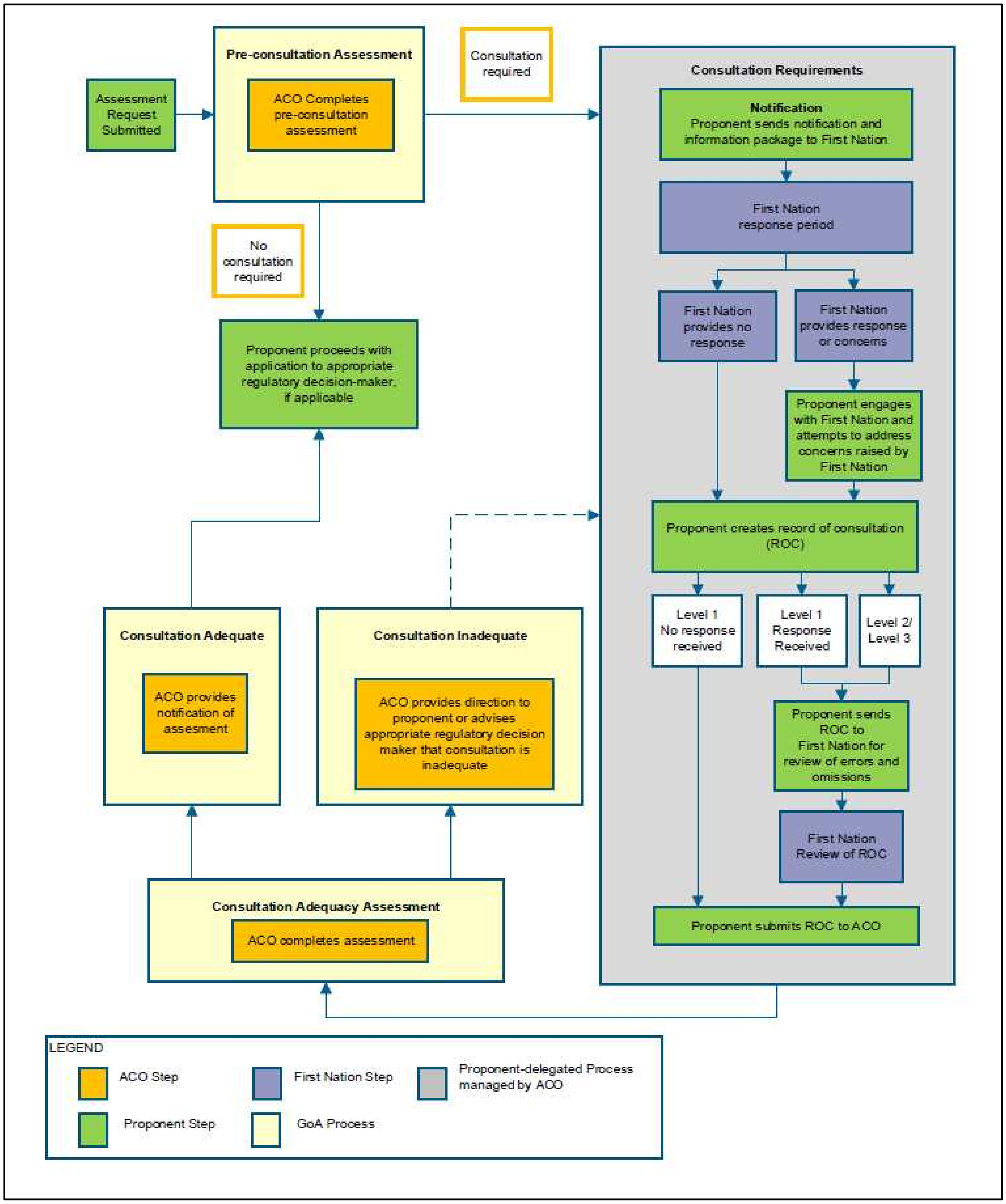
Alberta's consultation system, managed by the ACO, requires industry proponents to consult with First Nations and Metis communities after conducting their Environment Impact Assessment (EIA). Most First Nations and Metis communities have established departments within their offices to deal with the hundreds of applications they receive each year. These consultation offices review EIAs and participate in traditional land use assessments and research (Baker and Westman 2018:146). The onus is therefore put on Indigenous communities to respond to the ACO, on timelines of 15 to 20 days (Gov of Alberta 2014:11-13) if they have concerns with proposed industry developments. Many communities do not have the capacity to adequately respond to every notice within the allowed timeframes, meaning that communities are forced to prioritize what they respond to (Baker and Westman, 2018:146).

The Alberta 2005 policy acknowledges Treaty Rights as protected under the constitution and defines the roles and responsibilities of all parties regarding consultation with First Nations in the province (Alberta, 2005:2). The Policy states that "Alberta will manage the consultation process" (Alberta, 2005:4). Industry project proponents are expected to "consult with and consider the views of First Nations… incorporate traditional use data when planning…[and] avoid or mitigate infringement of *First Nations Rights and*

Traditional Uses" (Alberta, 2005:5-6). Under the Policy, First Nations are expected to "clearly identify which *Rights and Traditional Uses* may be infringed… provide alternative solutions or approaches… initiate sessions to increase awareness of the First Nations *Rights and Traditional Uses*" (Alberta, 2005:6-7). This consultation system, developed by Alberta, takes the Crown's fiduciary duty to consult and transfers it to the industry proponent. It also places a large burden on Indigenous communities that are expected to take on the work of teaching and informing both the province and the industry proponents of their rights, share traditional knowledge, provide alternate solutions or approaches, and work with industry and the province "in good faith" (Alberta, 2005:1-7; Baker and Westman, 2018:146).

Alberta's consultation system was not developed with or for Indigenous communities. Instead, it is focused on the expedition of the consultation process for industry proponents. Several guidelines (mentioned above) have been developed and published by the ACO for Industry proponents which provide an overview of the steps to follow in the consultation process (Figure 23). However, there is no guideline for Indigenous Nations to help them navigate the system or ensure that their concerns are being adequately addressed, nor is there an ACO liaison dedicated to assisting Indigenous Nations through the consultation process.

Figure 23. ACO consultation process flowchart (Government of Alberta 2014 (2019 Amendment: Section 3 (c)):2).



Outside of Traditional Land Use studies, which are included under the *Heritage Resources Act*, consultation between professional consulting archaeologists and Indigenous communities in Alberta is not required. Thus, relationships between Indigenous communities and CRM companies are rare. In most cases, local First Nations and Metis communities are not informed about archaeological findings or allowed to evaluate them. In many instances, Indigenous communities may be unaware that these investigations are taking place, and they are unable to obtain the results without following the Historic Resource Management Branch's complicated processes. A summary of HRIAs and HRIMs conducted by CRM archaeologists are included in the EIA final report industry proponents are required to conduct. Therefore, it is the proponent that controls the information about their project's anticipated impacts on heritage. This summary is often not integrated with Traditional Land Use studies or Indigenous testimony and knowledge (McCormack 2017:115).

The lack of Indigenous inclusion in the heritage management system in Alberta goes against the commitments made by both the federal and provincial governments to implement the principles of the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP). Article 12 of UNDRIP states that "Indigenous peoples have […] the right to maintain, protect, and have access in privacy to their religious and cultural sites; the right to the use and control of their ceremonial objects; and the right to the repatriation of their human remains" (United Nations (General Assembly) 2007: 6).

The *Statement of Principles for Ethical Conduct Pertaining to Aboriginal Peoples* released by the Canadian Archaeological Association (2022) states that CAA members will abide by the following principles regarding consultation:

1. To recognize the cultural and spiritual links between Aboriginal peoples and the archaeological record.
2. To acknowledge that Aboriginal people have a fundamental interest in the protection and management of the archaeological record, its interpretation and presentation.
3. To recognize and respect the role of Aboriginal communities in matters relating to their heritage.
4. To negotiate and respect protocols, developed in consultation with Aboriginal communities, relating to the conduct of archaeological activities dealing with Aboriginal culture. [Canadian Archaeological Association 2022]

While it is not a requirement for Canadian archaeologists to join the CAA or adhere to their code of conduct, it establishes a best practice for the industry. There is no mandatory professional association in Canada, or within the province of Alberta to oversee and enforce best practices (See Future Research and Recommendations). The lack of consultation between CRM archaeologists and Indigenous communities in Alberta stands in opposition to the above-mentioned ethical code of conduct.

Some other archaeological codes of ethics in Canada also speak to consultation in varying degrees (McCormack 2017:115-118). In the case of Alberta, The Archaeological Society of Alberta does include "Engaging with First Nations, Metis and Inuit" in their mission statement. However, neither the Association of Consulting Archaeologists (2022) nor the Archaeological Society of Alberta (2022) has a code of ethics or conduct pertaining to indigenous engagement or consultation[5].

Heritage management in Alberta operates in an industry-driven legislative system that values material artifacts above all else and fails to adequately identify and protect places of cultural significance that do not produce quantities of material remains. First Nations belief systems, unlike Western religious notions, are intrinsically tied to geographic locations (Sundstrom 2003:260). There is a spiritual relationship that exists between First Nation individuals and the natural world which is based upon personal revelations and interpretations associated with specific geographic locations (Deloria 2003:66-67). Sacred sites, although considered distinct, are not divorced from the surrounding landscape, they remain part of the larger cultural landscape (Sundstrom 2003:259). The nature of the proponent pays CRM system constrains professional archaeologists to project footprints and rarely gives them the ability to assess the larger cultural landscape. Sacred sites are also difficult to identify within the archaeological record as the range of objects left at sacred sites is large, and includes arrowheads, pipes, knives, coins, beads, bracelets, pendants, shells, elk teeth, etc. Other items, such as hides, tobacco, and cloth, would deteriorate, and as such rarely survive in the archaeological record. These types of artifacts can also be identified at non-sacred sites throughout the province, therefore the best way to identify sacred sites is in a social context through ethnography and oral history, which can be found today in the knowledge and memory of Indigenous people (Sundstrom 2003:284-285; McCormack 2017:113; Panas 2018:20-22).

[5] Neither of these associations are mandatory for provincial archaeologists to join.

Unfortunately, Alberta's Indigenous peoples are largely overlooked in the heritage legislation of the province. Subsequent policies implemented by the province regarding consultation with First Nations and Metis settlements fail to create a requirement for consultation on HRIAs and communities are only able to review the archaeological work done after the submission of EIAs by industry proponents. This system of consultation places the onus firmly on the shoulders of Indigenous communities. The lack of consultation between professional archaeologists and Indigenous communities is in opposition to the commitments made by the federal and provincial governments to uphold the principles of UNDRIP and to the ethical conduct principles laid out by the Canadian Archaeological Association. It is clear from this short review that the legislation of heritage management in Alberta is an ideal, however, the current system does not uphold the authority or interests of Indigenous peoples in cultural heritage management. The main goal of the current HRIA system appears to expedite the approval of resource industries rather than effectively protect heritage resources and the interests of Indigenous communities (McCormack 2017:128).

My first-hand experience working in CRM reflects this same general disregard for Indigenous engagement within CRM archaeology in the province. While most professional archaeologists agree on the importance of incorporating Indigenous perspectives into archaeological research in a general sense, it is not a requirement for CRM companies as consultation is handled by industry through the ACO- divorcing archaeologists from the equation, while giving them the false sense of assurance that consultation has been adequately addressed previously. From the Industry proponents' perspective, they have completed all required Indigenous consultation through the ACO and, therefore will not pay for further consultation between CRM companies and Indigenous communities. The only way to effectively create a dialogue between CRM archaeologists and Indigenous communities in Alberta would be to restructure the current system and make Indigenous consultation and inclusion mandatory in the HRIA/HRIM processes (see Future Research and Recommendations).

Methods

Descendant Community Partnership

It is my intention with this project to show how descendant community collaboration can benefit CRM-scale archaeological investigations. I have been fortunate, in my short career, to work on several community-based archaeological projects where we worked closely with Indigenous community members; this is atypical in Alberta CRM, where Indigenous participation and collaboration is rare. Including contemporary Indigenous perspectives in archaeology is imperative for understanding the lives of their ancestors who inhabited these lands, producing the material culture we, as archaeologists, are tasked with investigating and preserving. This section outlines the methods employed to create this archaeological project in partnership with Ermineskin Cree Nations EIRD team.

The first step to operationalize that intent was to find a community interested in such collaboration. Knowing I intended to work in the Alberta Boreal Forest Zone, I reached out to several Nations who are known to have past populations in the region: Enoch Cree Nation, Alexis Nakota Sioux Nation, Sunchild First Nation, Samson Cree Nation, Paul First Nation, O-Chiese First Nation, Ermineskin Cree Nation, Louis Bull Tribe, and Montana First Nation.

In February of 2022 I had a phone call with Carol Wildcat from the Ermineskin Cree Nation EIRD office, she said they would like to meet me and get to know each other more.

The following meetings with Carol Wildcat and her team resulted in relationship building which eventually led to the creation and execution of this project.

I came to them with a working understanding of CRM archaeological practices in Alberta's boreal forest and some basic ideas for research projects that might be able to address some of the shortfalls that I had identified working in CRM. Carol Wildcat and Danny Bellerose, along with Clara Wildcat, Ermineskin Cree Nation archaeologist, and Elder Delora Smallboy were all present during our initial meetings. Their enthusiasm and guidance shaped the direction of the project.

In May 2022, a week was spent south of Edson with Ermineskin Elders Delora Smallboy, Jack Mackinaw, Alfred Morin, and the late Larry (Lawrence) Cutarm as well as EIRD team members, Danny Bellerose, Clara Wildcat, Sam Wildcat, Ben Wildcat, Alfred Morin Jr., and Calvin Rowan. The EIRD team was visiting planned forestry blocks laid out by West Fraser- Edson Forest Products. Throughout the week I was able to learn from everyone, especially Elders Jack, Alfred, Larry, and Delora about Ermineskin's traditional territory and their use of the land in the past and the present. I also learned a great deal from Clara Wildcat, as both an archaeologist and a citizen of the Ermineskin Cree Nation, her insight and teachings were particularly meaningful to me and this project. It was a great week of relationship-building and learning on my part.

After our time in the field, we reconvened at Maskwacis throughout the summer to develop our research project. We were able to narrow our site selection using Geographic Information System (GIS) data provided by the ASA.

Site Selection/GIS

Initial site data provided by the ASA in 2022 for a portion of Ermineskin Cree Nations Traditional Territory revealed 1,674 archaeological sites. Of these, 8 were designated HRV 3, 693 were HRV 4, 937 sites were HRV 0, and 36 sites were still pending. The data was analyzed using Geographical Information Systems, specifically Esri mapping software ArcGIS, ArcMap 10.8.2. See the GIS data flowchart (Figure 25) for the steps taken to analyze data and create maps in ArcGIS.

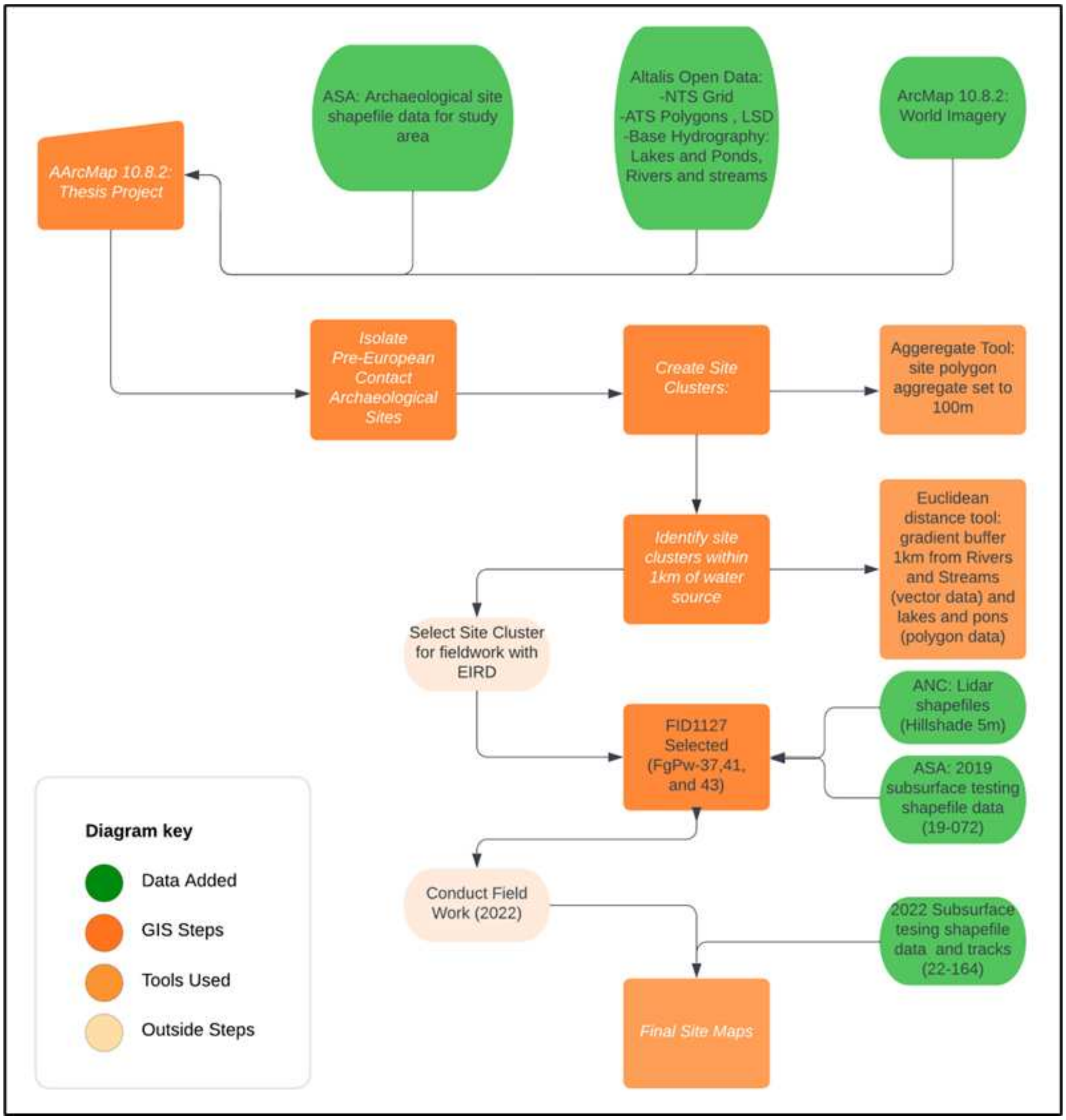
The first step was to isolate pre-European contact sites from historic archaeological sites; for this research, the focus is on pre-contact Indigenous archaeology. After removing historical sites (Figure 24), 1,373 pre-contact archaeological sites were left, 536 of which were designated HRV 4 and the remaining 837 were designated HRV 0.

Figure 24. Steps taken to isolate prehistoric sites on ArcMap.

Archaeology Site Points -> Right Click Properties -> Definition Query -> Query Builder "Site Class" Like "%prehistoric%" AND "%Prehistoric%" -> Verify= Okay

Next, proximal sites that could potentially represent a larger site area were identified. Using the Aggregate Tool, it was possible to set a distance for the site point or site polygons and it would select the sites that were within a set distance from each other. The polygon aggregate was used as the polygons represent the site boundary, whereas the site points are set from the center of the site polygons. The Site Polygon Aggregate was set at 100m, meaning that any site boundaries within 100m of each other would be grouped into a cluster; 61 site clusters were identified throughout the larger study area using this method.

Figure 25. GIS data flowchart illustrating the steps taken to complete this project.



The ASA currently requires that archaeological features or artifacts recorded less than 100m from each other, on the same landform, be grouped into one large site (Government of Alberta, 2023:3). However, CRM tends to have a narrow view of "landform" as they justify changes in slope as a reason to stop testing. Research conducted by Woywitka and Michalchuk (2021:88-99) used geomorphon-based terrain classification to assess the topographic setting of archaeological survey points in the boreal forest of Alberta. Their findings confirm that archaeologists have not representatively sampled the full suite of landform elements in the boreal forest, the current sampling strategies bias the archaeological record to shallow difficult to interpret sites on sediment-dispersing landforms, such as summits, ridges, shoulders and spurs. Low terrain areas, which hold potential for deeply stratified archaeological sites, and sediment traps such as foot slopes, hollows, and depressions, are underrepresented in current CRM testing strategies. The current sampling strategies do not incorporate or account for Indigenous cultural landscapes that extend beyond specific geomorphic terrain classifications.

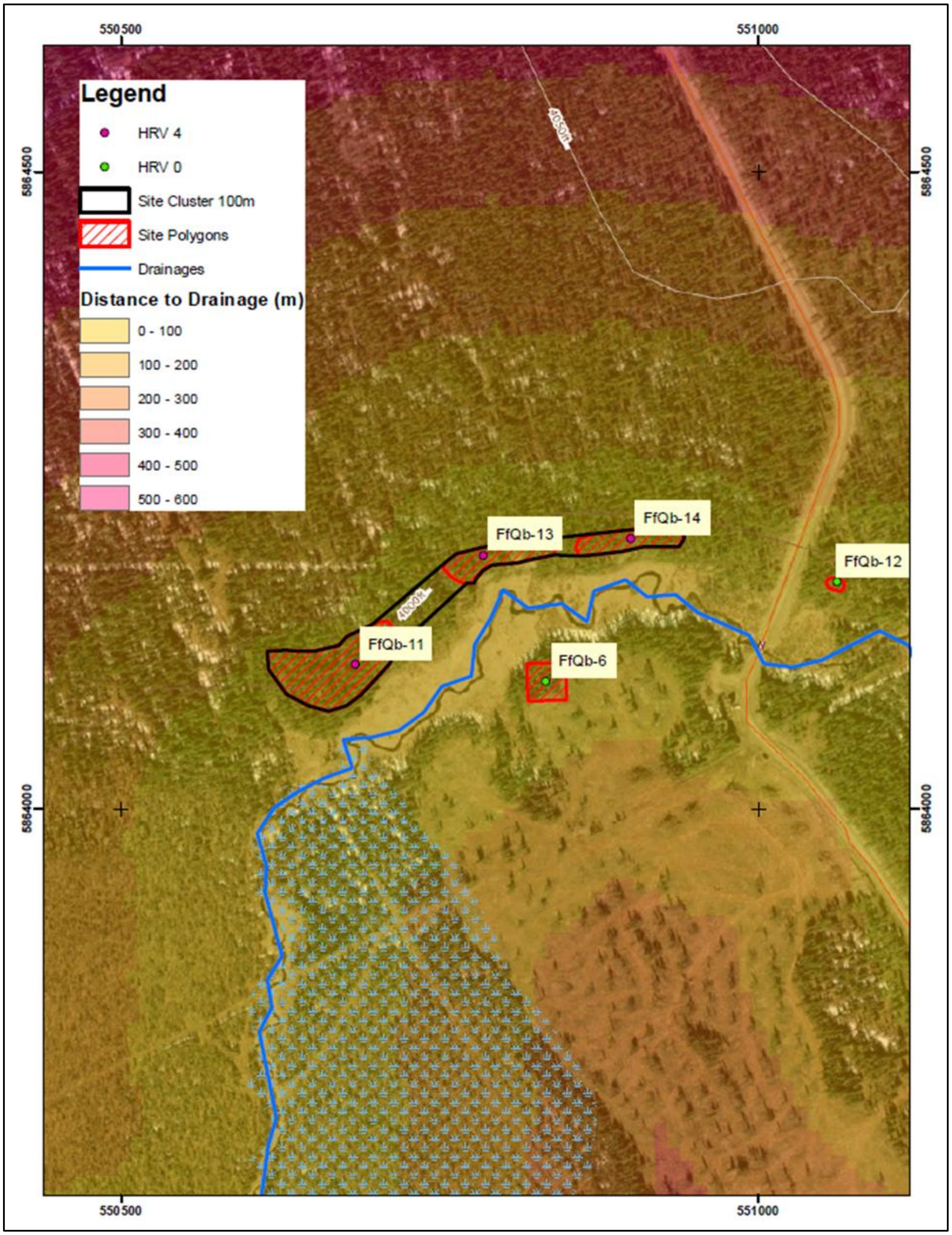
The Arc Map Euclidean distance tool was then used to create a rainbow gradient buffer set at 1 km (each 100 m is a different colour) from Rivers and Streams (vector data) and the lakes and ponds (polygon data), narrowing down the clusters to only those within 1 km of a water source. When looking at the clusters on Arc Map it was very clear how far from water sources each site was (Figure 26).

To understand the context of the individual sites in the clusters the final permit reports were requested from the ASA for all the sites identified within the 61 site clusters[6]. The final report for ASA permit 19-072 was initially not available, however, special permission was granted to view the draft copies of the final report for my thesis work. The finalized report was made available in the winter of 2023 and has been referenced in this work.

[6] Of the 68 permit reports requested, 16 were not available because the permits had not yet been submitted, the reference numbers referred to a non-permit reference or they referred to a university thesis, so the government did not have a final report to share.

With access to the reports, it was possible to understand the conditions under which the sites had been identified and the methods used to establish site sizes. This narrowed down the options as some of the sites had been previously mitigated, were found in disturbed settings (e.g. on previously existing roads) or sites within a cluster were found on distinctly different landforms.

Figure 26. Site cluster FID22 shows site cluster polygons and the Euclidean distance rainbow gradient.



With this additional information, potential site clusters were reduced from 61 to 12. These 12 site clusters had the potential to represent larger site areas as the sites were on the same landforms with less than 100 m between the known site boundaries. Maps of each of the 12 site clusters were created and presented to the EIRD team in a collaborative meeting. Two of the site clusters were in the Tidewater dune field, where there was a high density of sites on large parabolic dune features, this made these site clusters stand out and the EIRD team was very interested in exploring the sites on the dunes. Two backup clusters were also identified in case our field reconnaissance found that the dunes had been previously harvested.

After the selection of these clusters, a representative of Alberta Newsprint Company (ANC), the forestry proponent who was planning to harvest the dunes, was contacted as they had the HRIA completed in 2019. ANC provided lidar Shapefiles for the Tidewater dunes and communicated that some of the dunes had been previously harvested and the rest were scheduled for harvest in the winter of 2023. They were open to further research being conducted on the dunes prior to harvest. Using the lidar data provided it was possible to see the landscape relief and it was clear that these large dunes were individual landforms, peppered with archaeological sites.

Subsurface testing shapefile data was then requested from the ASA for the 2019 HRIA, providing the locations of subsurface tests conducted on the landforms in 2019 (accounting for the 5-8m error in GPS data). The data provided also indicated which tests were positive (contained cultural material) and those that were negative (no cultural material identified).

Site Specific

The dune formations south of the Tidewater Road were initially investigated in 2019 as a part of an HRIA (Circle 2020) conducted ahead for industrial deforestation. Seventeen new archaeological sites were identified on five large parabolic dune features. Testing strategies used in 2019 included:

> Pedestrian reconnaissance of the target areas, along with subsurface testing where landforms and vegetation reveal a moderate to high potential for deposition and/or the identification of buried, intact cultural material. Eroded profiles and any upturned soils were also examined for evidence of historic resources. Areas with archaeological potential received judgmental subsurface testing... Shovel test areas were selected based on target areas identified during pre-field research …as well as in-field professional judgment; project areas that were not shovel tested were deemed in the field to be of limited potential, i.e., previously disturbed to depths below the mineral soil, poorly-drained, poorly-defined, featureless or sloping.
>
> Shovel tests, which were strictly limited to project boundaries, were approximately 40 cm by 40 cm. There were no areas where deep testing was required in order to reach the depth of glacial deposits. Tests were excavated to basal sediments, at an average depth of 30 cm below the surface (cmbs). Shovel tests were generally conducted at 5 to 10 m intervals with a minimum of two staggered or parallel rows of tests. Sediment removed from shovel tests were screened through ¼” mesh and observed for cultural material, before

being returned, as best as possible, to their original state. [Circle CRM Group Inc. 2020:32-33]

Positive shovel tests, yielding cultural material, were delineated to 15 m at 5 m spacing, to determine the site size. Site buffers were then flagged off around the sites at 20-30 m from the positive shovel tests. These sites were flagged for avoidance and the shapefiles were reported to the Archaeological Survey as well as to the forestry client. Harvest was approved with the stipulation that the flagged buffer zones were avoided (Circle 2020).

In September 2022, representatives from Ermineskin Cree Nation and I revisited the dunes to see what state the archaeological sites were in, as we had identified two potential site clusters on the dunes that could be appropriate for further fieldwork. Our site revisit revealed that three of the five dunes investigated in 2019 had since undergone harvest. It was very easy to identify the archaeological sites, as the only tree patches remaining on the harvested dunes were those within the flagged archaeological site buffers. The rest of the dunes had been completely stripped of trees. The forestry client had also built their logging roads along the tops of the dunes, where it is high and dry (Photo 5). This road development is hugely destructive and has stripped all the surface vegetation from the tops of the dunes, leaving the fine silt and sand exposed to the elements, which may lead to the reactivation of these ancient dune formations.

Photo 5. Logging road built along the crest of a large parabolic sand dune feature in the Tidewater dune field, 2022.

The two dunes that were still intact were the dunes where we had identified site clusters. We assessed both locations, and neither had been previously harvested. Looking at the subsurface testing data for Location 1, site cluster FID1127 (Figure 27), it was clear that there were untested areas between the three identified site boundaries (FgPw-41, FgPw-47, and FgPw-43) which were ideal for testing the hypothesis that CRM testing strategies were biased and missing relevant data. Location 2, site cluster FID464 (Figure 28) was composed of five previously identified sites on the nose of a large parabolic sand dune. Some of these sites were identified on the top of the dune and some were identified on a lower bench. The terrain between the known site boundaries was more sloped and there had been more testing between the known site boundaries than there was at FID1127. The EIRD team believed the abundance of edible and medicinal plants at FID1127, as well as the general look of the landform, made it an ideal spot for their ancestors to utilize. For this reason, as well as its accessibility, we chose this site cluster (FID1127) to conduct field research.

Site Cluster FID1127 includes known archaeological sites FgPw-41, FgPw-37, and FgPw-43. These extant archaeology sites were identified by CRM consultants in 2019 near the nose of a large parabolic dune; site boundaries were less than 100 m from each other (GIS cluster data). FgPw-43 was a small HRV 0 site identified on the narrow, lower western arm of the dune. Two positive shovel tests revealed two pieces of lithic debitage. Northeast of this small site, a second larger site FgPw-37 was identified on a high knoll on the eastern arm of the dune. The terrain between the two sites is marginally to moderately sloped and was not tested during the 2019 HRIA. There was approximately 50 m of untested terrain between the two known site boundaries.

FgPw-37 is an HRV 4 site comprised of 13 pieces of lithic debitage and one lithic tool, a scraper, identified from four positive shovel tests. North of this high point on the eastern dune arm the terrain slopes marginally down into a small saddle before rising slightly into a second knoll. The third site, FgPw-41 was identified on this smaller northern knoll top. FgPw-41 is an HRV 4 site comprised of five pieces of lithic debitage and a quartzite biface tool identified from three positive shovel tests. There was approximately 45 m of untested terrain between FgPw-37 and FgPw-41. It was the untested space between these known sites, which were less than 100 m apart, that this research was interested in. I hypothesized these untested areas would reveal more cultural material, indicating these sites are connected or possibly represent a larger site area than was shown through the initial HRIA.

Figure 27. Location 1 site cluster FID1127, 2019 subsurface testing data.

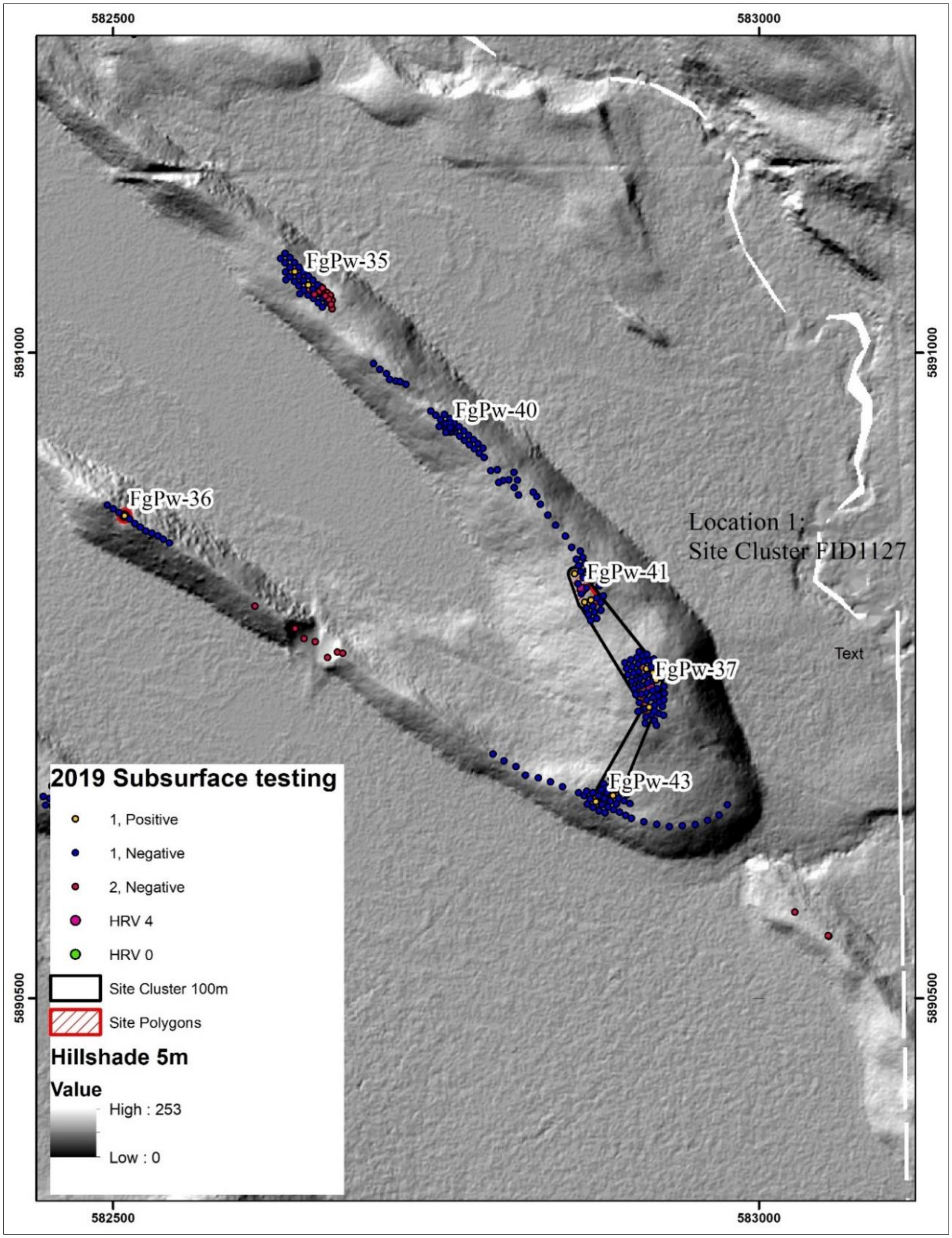
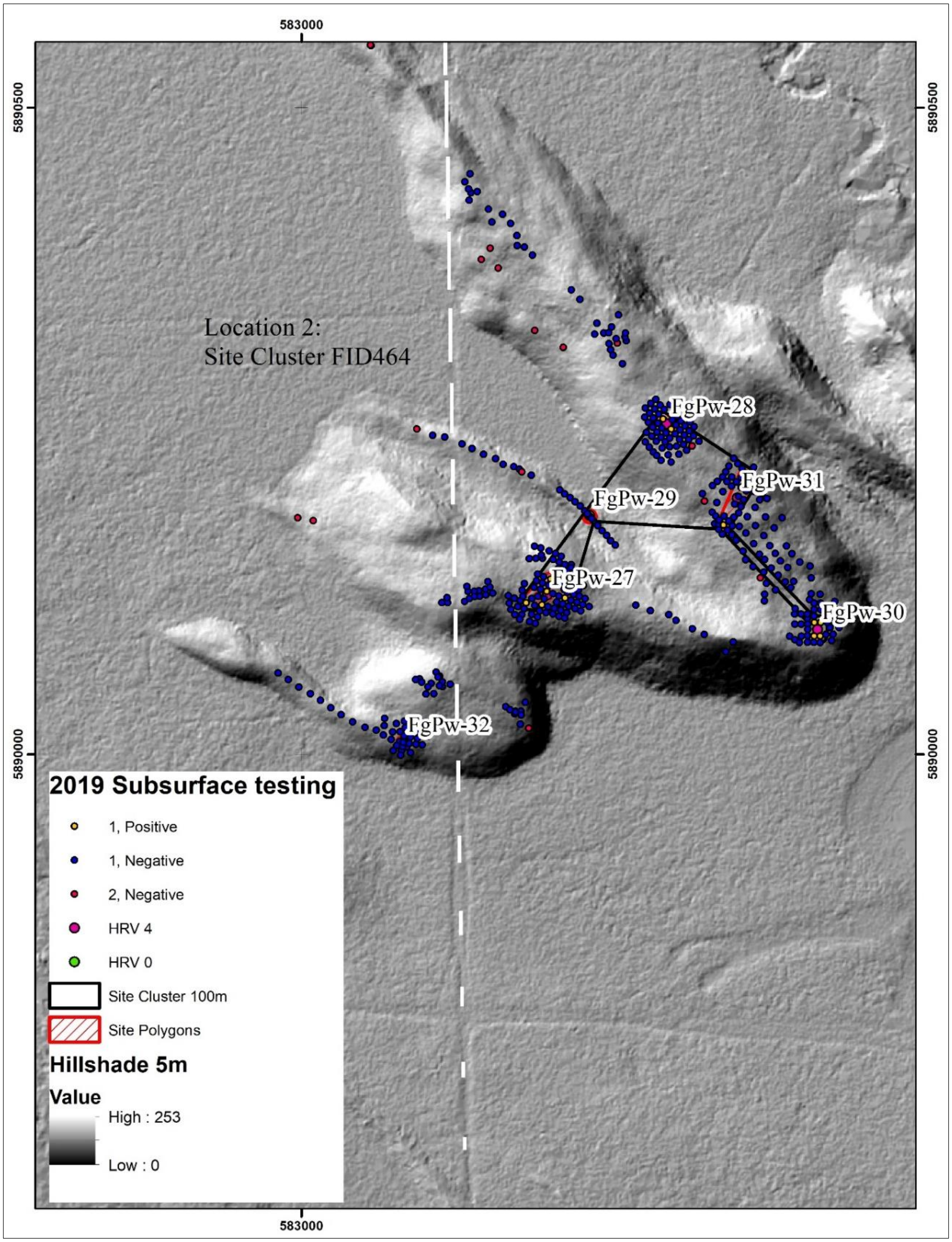


Figure 28. Location 2 site cluster FID464, 2019 subsurface testing data.



Fieldwork Plan

Fieldwork was carried out from October 1-4, 2022, with EIRD team members (Danny Bellerose, Clara Wildcat, Sam Wildcat, Ben Wildcat and Elders Alfred Morin, and Bruce Lee), UofA student volunteers (Avery Frank, Mailys Paccoud, Megan Beiraugle), UofA professor (Dr. Maggie Spivey-Faulkner), and volunteers (Garrette Faulkner and Kalista Sherbaniuk). The initial strategy was to place subsurface tests along a 2 m grid between the site boundaries. Upon arrival at the site location, it was apparent that would be too intensive for the scope of the project. After a discussion of best practices, it was concluded that 5 m interval testing along two transects between the site boundaries of FgPw-37 and FgPw-43 (the original 30m buffer flagging from 2019 was still intact, we used flagged buffers as our markers) would be a good initial test and the strategy could be adjusted as needed. The 5 m interval testing strategy produced positive results with the identification of subsurface cultural material and, thus, was not modified further. 5 m interval transects were used for the entirety of the project, with the addition of some judgmental slope testing on the nose of the dune.

Photo 6. Ermineskin EIRD team conducting subsurface testing at FID 1127 (Top Left) Clara Wildcat, (Top Right) Alfred Morin, (Bottom left to right) Alfred Morin, Danny Bellerose, Maegan Huber, and Bruce Lee.

Transects were laid out using a long line measuring tape with pin flags marking each 5 m interval, excavation of subsurface tests was limited to one transect at a time. Subsurface tests were consistent with CRM standards of 40X40 cm square tests and were excavated by hand with shovels to compact sediments, averaging 30-60 cm below ground surface (bgs). Due to the stable nature of the Tidewater dunes cultural material would likely be located at, or just below the ground surface. Stable boreal dunes in this region have seen little to no reactivation since they stabilized approximately 12.2ka BP (Stephen Wolf, personal correspondence 2023), thus the artifacts would not have shifted through the sediments unless there was bioturbation from animals and insects, the materials were initially deposited below the ground surface (e.g. in a pit) or there was some other ground disturbance since the artifacts were deposited. The identification of artifacts directly below the duff at the ground surface or in the first 0-20 cm bgs from Ermineskin 01, Ermineskin 02, and FgPw-41, PgPw-43, and FgPw-37 all support this theory[7]. All material removed from the subsurface tests was screened through 6 mm (or smaller) mesh screens onto tarps. Positive shovel tests, producing archaeological materials or features were left open to be recorded, one negative subsurface test in each transect was also recorded as an example of the typical stratigraphy. Negative subsurface tests were filled back in after completion whereas positive tests were left open until the end of the fieldwork. Pin flag markers for each test location remained in the ground until the completion of the fieldwork.

There was no need to delineate around the positive subsurface tests to establish site size, as these testing locations are already between known and delineated sites. The results indicated that excavation units were not required to answer the research question (see Results).

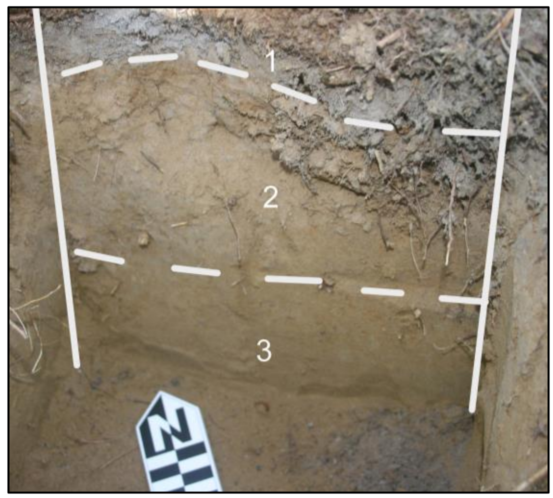
[7] One secondary decortication quartzite flake was identified at 50-60 cm bgs in ST011P at Ermineskin 01. This was the only artifact identified in ST011P, the flake probably fell out of the wall higher up.

Location 1: Between FgPw-37 and FgPw-43.

Transect 1 was laid out in a straight line north-northeast to south-southwest between FgPw-37 and FgPw-43 (). The transect proceeded up a moderate slope on the northwest portion of the landform, near the inside of the parabola. Subsurface tests were conducted at 5 m intervals for 35 m with a total of seven subsurface test pits.

Photo 7. View north-northeast along Transect 1.

Photo 8. ST002 Profile, NE wall.



<u>ST 002 Profile:</u> NE wall

0-4cm bgs- light grey silty sand

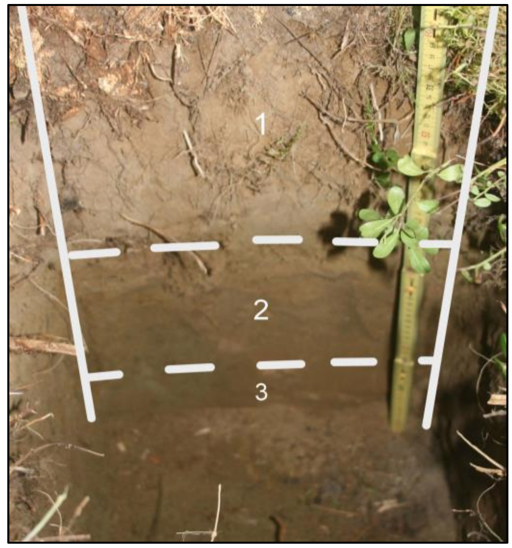
4-18 cm bgs- loose dark yellowish brown (10YR 4/4) silty sand

18-33 cm bgs- compact dark yellowish brown (10YR 4/4) sand

Transect 2 was laid out in a straight line from northwest to southeast running parallel between the site boundaries of FgPw-37 and FgPw-43 (Photo 10. View northwest along transect 2.). This transect runs between the inner and outer edge of the parabola, as close to the center of the landform as we could manage. The transect began at the southeastern edge of the landform. Transect 2 is nearly perpendicular to transect 1. Subsurface tests were conducted at 5 m intervals for 90 m with a total of 18 subsurface tests.

Photo 9. View northwest along transect 2.

Photo 10. ST011P Profile, NE wall.



<u>ST 011P Profile:</u> SE wall

0-26 cm bgs- dark yellowish brown (10YR 4/4) silty sand

26-45 cm bgs- light olive brown (2.5Y 5/6) sand

45-60 cm bgs- dark yellowish

Judgmental slope testing was conducted southeast of Transect 2 on the southeastern nose of the dune. Locations for the tests were selected based on the varying grades and aspects of the slope. A total of three subsurface tests were conducted on the southeastern slope of the dune nose (Photo 11).

Transect 5 was added at location 1 at the end of the project to address the lack of testing across the southeastern portion of the dune nose. Transect 5 is a straight line running south-southwest to north-northeast, perpendicular to Transect 2 (Photo 13). The transect begins 5 m south of ST015P in Transect 2. Subsurface tests were conducted at 5 m intervals for 30 m with a total of six subsurface test pits.

Photo 11. View northeast showing the slope of the dune nose.

Photo 12. View southwest along Transect 5.

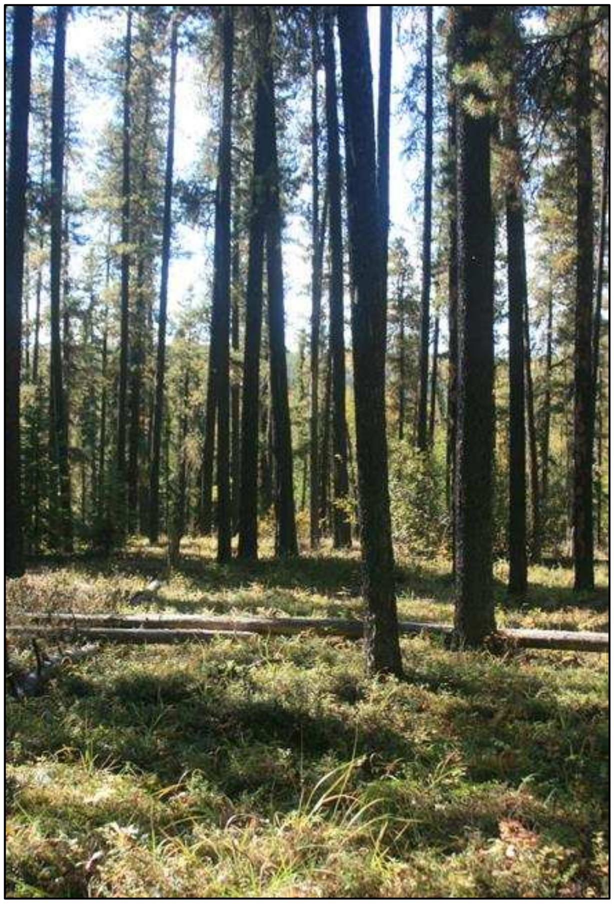
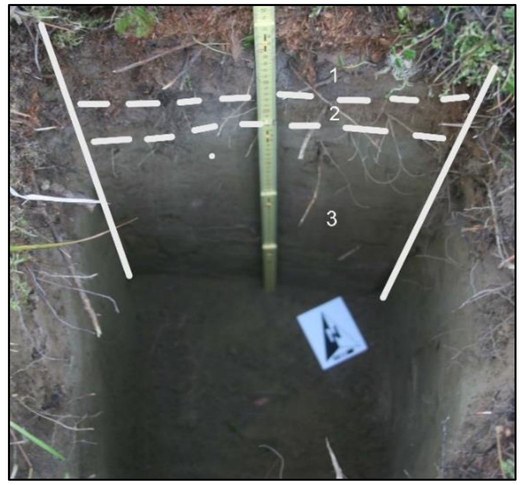


Photo 13. ST046P, NE wall.



<u>ST 046P Profile:</u> NE Wall

0-8 cm bgs- grey (10YR 6/1) silty sand

8-13 cm bgs- yellowish brown (10YR 5/4) silty sand

13-60 cm bgs- dark yellowish brown (10YR 4/6) sand

Location 2: Between FgPw-37 and FgPw-41.

Transect 3 was laid out in a straight line north to south between FgPw-37 and FgPw-41 along the top of the dune ridge (Photo 15). Subsurface tests were conducted at 5 m intervals for 35 m with a total of eight Tests.

Photo 14. View north along Transect 3.

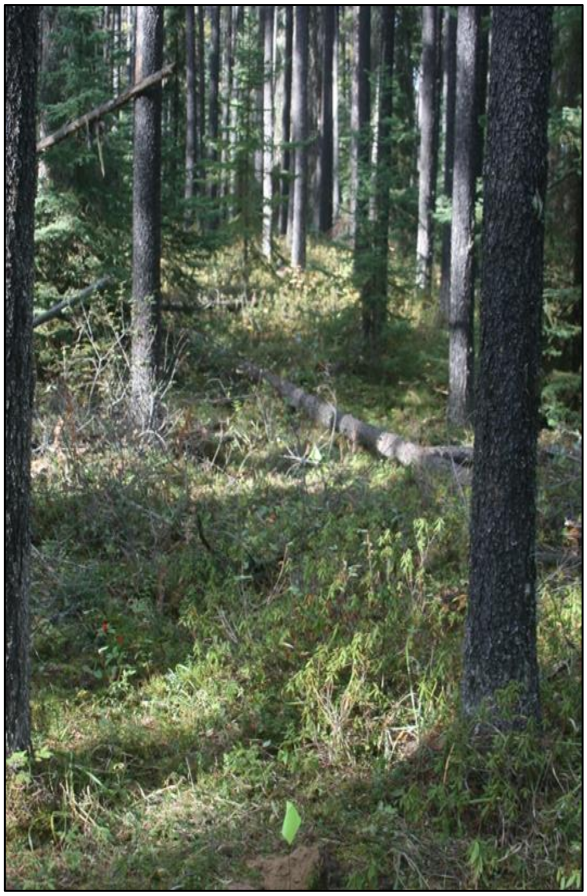
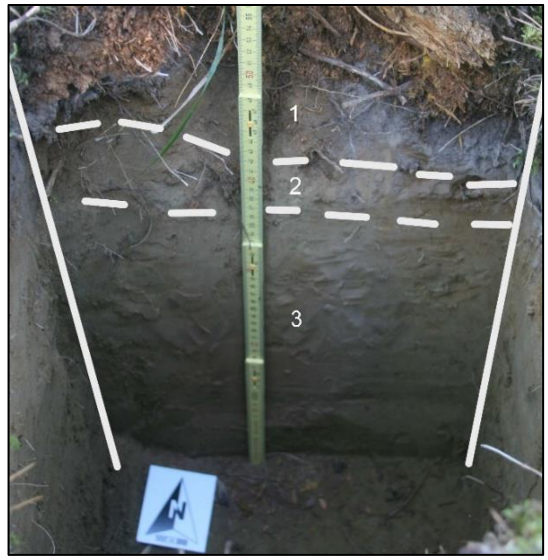


Photo 15. ST032P Profile, N wall.



<u>ST 032P Profile</u>: N Wall

0-8 cm bgs- gray (10YR 6/1) silty sand

8-13 cm bgs- yellowish brown (10YR 5/6) silty sand

13-50 cm bgs- dark yellowish brown

Transect 4 was laid out in a straight line west-southwest to east-northeast across the top of the dune ridge parallel to the site boundaries of FgPw-37 and Fg-Pw-41 (Photo 16). Transect four is closer to the site boundary of FgPw-41, as it was placed in the natural swale between the two known sites which are located on the highest knolls of the eastern dune arm. It is nearly perpendicular to Transect 3. Subsurface tests were conducted at 5 m intervals for 40 m with a total of nine tests.

Photo 16. View west along Transect 4.

Photo 17. ST039 Profile, E wall.

<u>ST 039 Profile:</u> E wall

0-2 cm bgs- gray (10YR 6/1) silty sand

2-58 cm bgs- dark yellowish brown (10YR 3/4) sand

Lab Methods

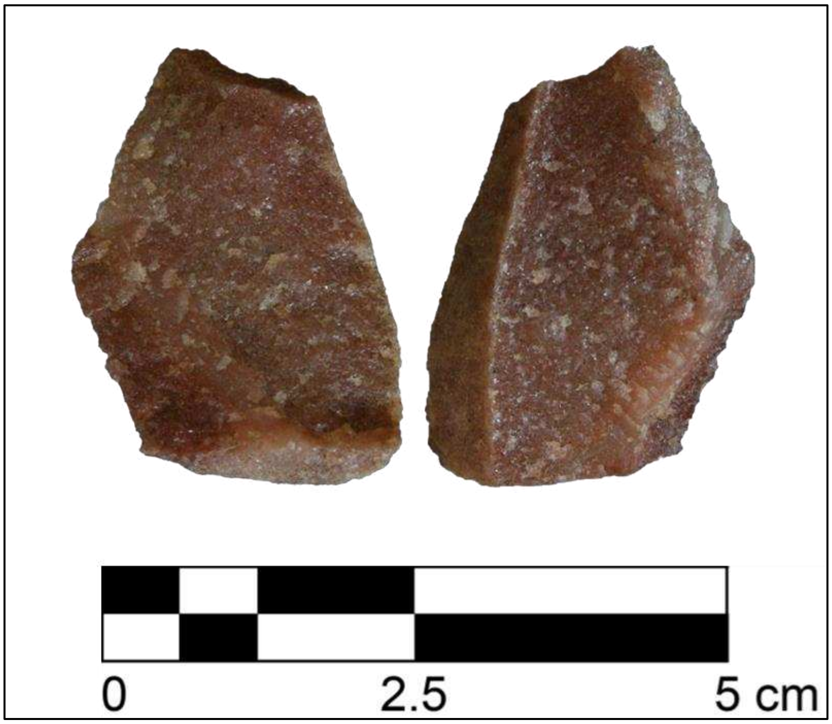
Field investigations resulted in the identification of 24 lithic artifacts and four charcoal samples which were collected and brought to the University of Alberta anthropology department for analysis. There were no tools in the assemblage that we believed would reveal more information with a residue analysis, therefore all 24 lithics were washed in water and lightly scrubbed with a toothbrush to remove the encrusting soil and residue. The lithics were then laid out on a paper towel to dry thoroughly before being placed in museum-approved plastic bags and tagged with an artifact label.

Each artifact was weighed (g) and measured with calipers (mm), length, width, and thickness were recorded in the artifact Catalogue (Table 4, Table 5, and Table 6). Each artifact was then inspected visually and analyzed in depth using a DinoCapture 2.0 camera for magnification. The artifact Catalogue was based on the model provided by the RAM for artifact submission, in fulfillment of the student research permit requirements. Lastly, each artifact was photographed digitally with a Canon Rebel XT EOS Camera DC 8.1v in a lightbox, photos were taken of the ventral and dorsal surfaces of each lithic artifact and at least one edge.

A total of four charcoal samples were collected in the field. One sample was taken from the Ermineskin 01, two samples were taken from Transect 2 and one sample was taken from Transect 3. All the samples were collected at the ground surface, just below the duff, or were burnt roots collected from below the ground surface and are likely the result of a natural forest fire(s) at the site in the past. None of the charcoal identified was associated with a human-made feature (e.g. hearth, boiling pit, etc.). As such, dating of the charcoal would probably not provide dates associated with the cultural material identified at the sites and for the cost, it was concluded that this would not further the research.

There were also 27 lithic artifacts identified and collected in the 2019 HRIA investigations at FgPw-43, FgPw-41, and FgPw-37. The Permit 19-072 (Circle 2020:558-559, 566-567, 572) report provided artifact catalogues for each site. The reports were analyzed for data about the other artifacts identified at the sites. Permission was also granted to view and photograph the artifacts from these three sites stored at the RAM repository in Acheson, Alberta. I travelled to the repository on March 21, 2023, and viewed the artifacts from FgPw-43, FgPw-41, and FgPw-37 that were collected in 2019. At that time, digital photos of each artifact were taken using a Canon Rebel XT EOS Camera DC 8.1v. Photos of both the proximal and ventral surfaces were taken for each artifact.

Photo 18. Artifact FgPw-37:14 (collected in 2019) as an example of artifact photos taken at the RAM in 2023.

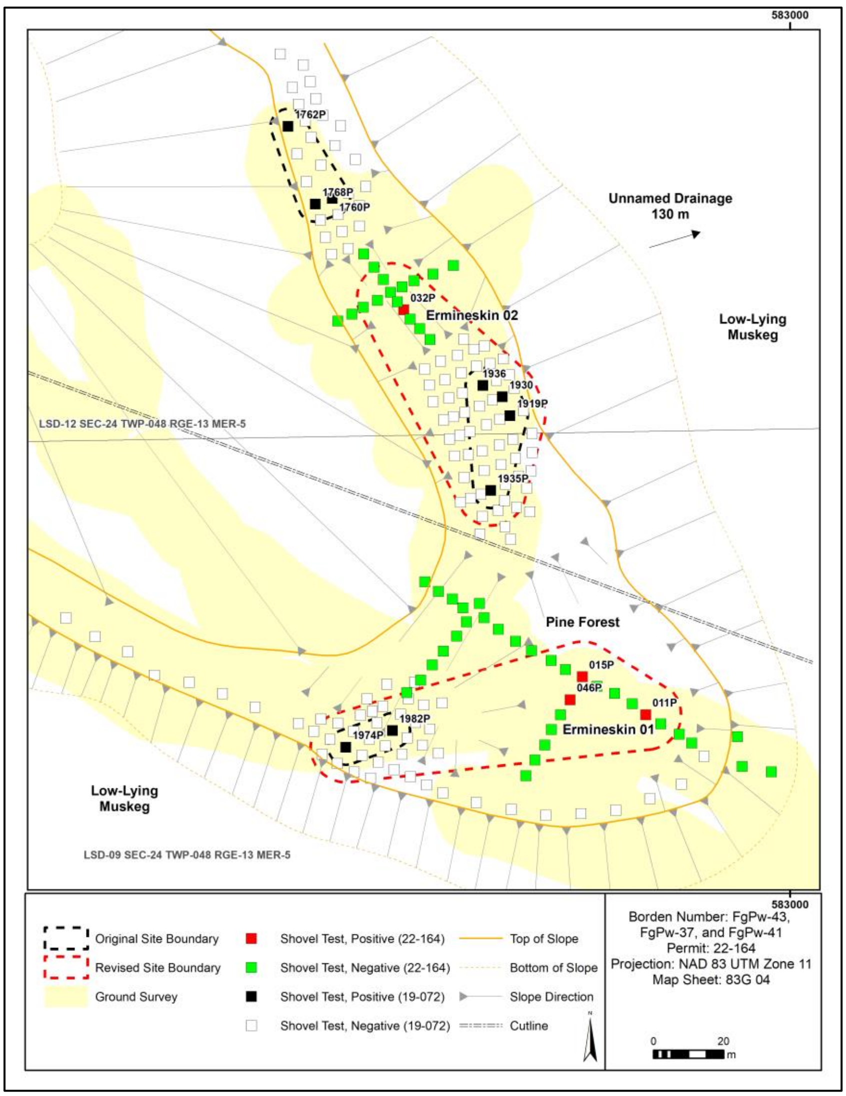


Results

Field Results

2022 subsurface testing along five transects identified two new site areas, Ermineskin 01 (between FgPw-37 and FgPw-43) and Ermineskin 02 (between FgPw-37 and FgPw-41; Figure 29).

Figure 29. FgPw-43, FgPW-37, and FgPw-41 subsurface testing 2019 and 2022.

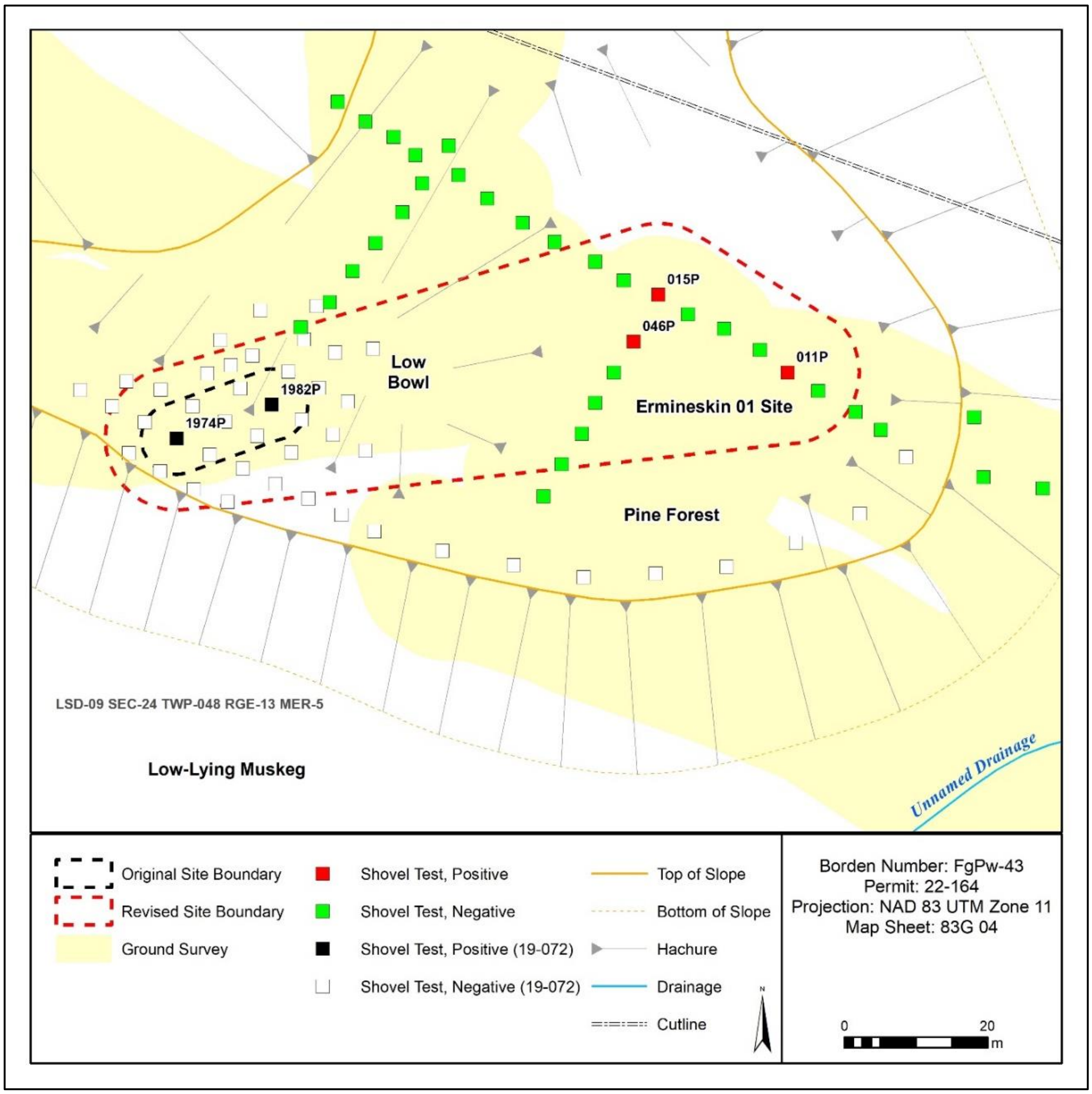


Location 1: Ermineskin 01.

In Transect 1 <10 pieces of carbonized wood were identified in shovel tests ST001 and ST002, initially, they were assumed to be modern pieces that had dropped in from the moss layer above the topsoil. In Transect 2 we found much denser concentrations of carbonized wood in ST020 (57 pieces) and ST018 (32 pieces); in ST020 the concentration was at 20cm bgs (below ground surface) and in ST018 the concentration was at 10cm bgs. Near the end of day one, ST015P produced lithic material; the site was named Ermineskin 01. Artifacts were in the mineral sediment directly below the duff; FBR was identified first, then lithic debitage (5 quartzite flakes and 1 chert flake). ST011P in Transect 2 also produced lithic materials on the second day of subsurface testing. On the fourth and final day of fieldwork, lithic material was identified in ST046P of Transect 5, 5 m SSW of ST015P. These three positives, ST015P, 011P, and 046P make up Ermineskin 01 which is located between FgPw-37 and FgPw-43.

There is approximately 50 m between Ermineskin 01 and FgPw-43 to the ESE. FgPw-37 is only 60 m further to the NNW. Ermineskin 01 could be an extension of either site or proof that all three are spatially connected. Sheila Macdonald, Archaeological Information Coordinator at the ASA, explained that for data management purposes all the sites would not be formally merged. However, the administrative boundaries for existing sites could be altered to incorporate the newly identified cultural material. Ermineskin 01 is marginally closer to FgPw-43 and separated from FgPw-37 by a moderate slope, thus, it was determined that the site boundary for FgPw-43 would be extended to include Ermineskin 01. The site form for FgPw-43 was amended to reflect the new changes and submitted to the ASA. Figure 30 is a site map that shows the subsurface testing strategy employed in 2019 and the subsurface survey conducted for this project in 2022. Site boundary alterations are displayed as well.

Figure 30. FgPw-43 combined with Ermineskin 01.

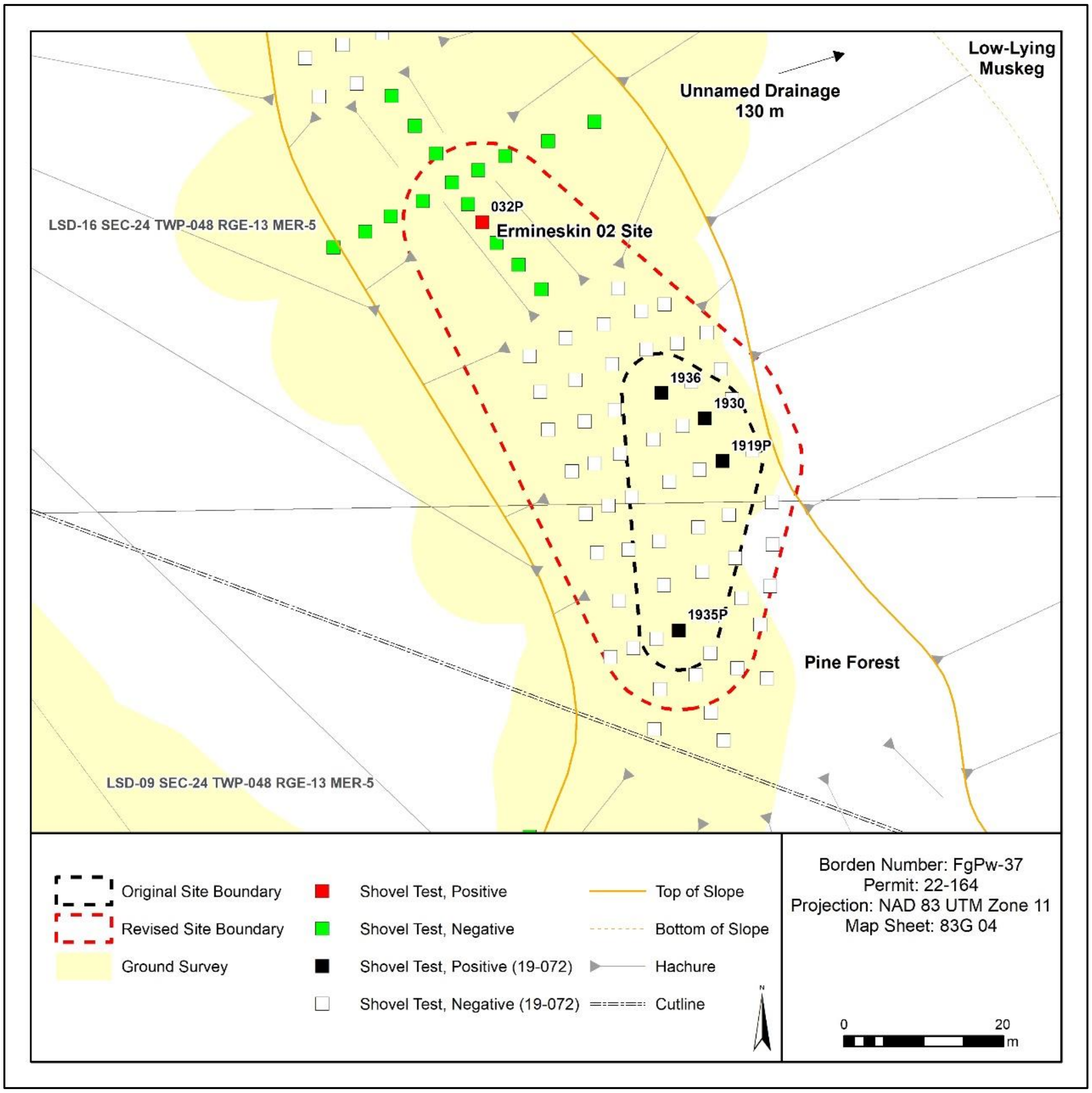


Location 2: Ermineskin 02.

During the excavation of shovel tests in Transect 3 two pieces of lithic debitage (Swan River chert) were identified in ST032P; making up Ermineskin 02. A large, carbonized wood deposit was also noted just under the duff, above the ground surface, in ST034. The feature was recorded, and a sample was taken. Carbonized wood was also identified above the ground surface in ST036; no sample was taken. These are likely the result of previous wildfires and not related to past human occupation of the site. Ermineskin 02 is located on the top of the dune ridge between Fg-Pw-37 and Fg-Pw41. No positive shovel tests were identified in Transect 4.

Ermineskin 02 is located 30 m north northwest of FgPw-37 and 38 m west southwest of FgPw-41. As in the case of Ermineskin 01, an argument could be made that all three sites should be recorded as one large site. For data management purposes, Ermineskin 02 was incorporated into FgPw-37, which is marginally closer than FgPw-41. The presence of the positive on gently sloping northwest-facing terrain was also considered a factor as the artifacts could have fallen from the elevated terrain to the south (Sheila Macdonald Personal Correspondence 2023). The site form for FgPw-37 was amended to reflect the new changes and submitted to the ASA. Figure 31 is a site map that shows the subsurface testing strategy employed in 2019 and the subsurface survey conducted for this project in 2022. Site boundary alterations are displayed as well.

Figure 31. FgPw-37, 2019 subsurface testing strategy and 2022 subsurface survey.



It is important to note that despite this somewhat arbitrary decision made for ease of data management at the ASA, all five sites - FgPw-43, FgPw-37, FgPw-41, Ermineskin 01, and Ermineskin 02 - represent a more extensive occupation than initially thought and show complex land use by past peoples on this dune. Had these positive subsurface tests been identified in 2019, they would likely have been recorded as one large site because they are less than 100 m apart and on the same landform.

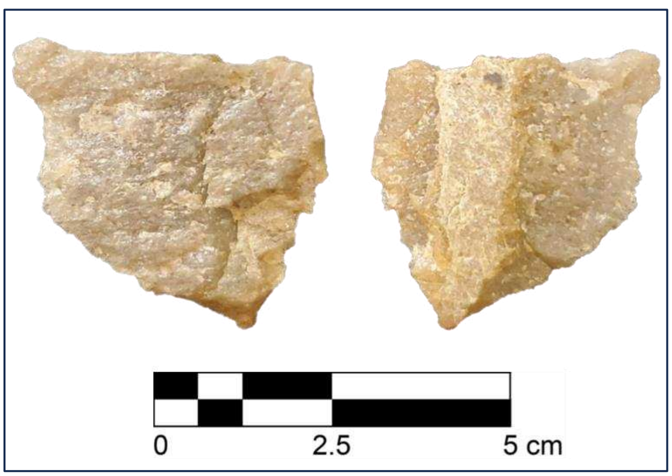
Lab Results

Lithic Analysis: Interpretation.

Quartzite

Ten pieces of quartzite lithic debitage were identified in two of three positive tests (ST 011P and ST 015P) at Ermineskin 01. The only artifact identified from ST011P is the distal portion of a large secondary decortication flake (FgPw-43:03) recovered from 50-60 cm bgs. The material is a dark grey coarse-grained quartzite. Two flake scars are evident on the dorsal surface leaving less than 50% cortex between the two scars. The cortex is smooth and rounded, consistent with a quartzite river cobble rounded by fluvial processes (Photo 19). Quartzite cobbles of varying qualities are readily available in the nearby river valleys.

Photo 19. Artifact FgPw-43:03.



The nine remaining pieces of quartzite debitage were recovered from ST 015P. Artifacts FgPw-43: 11 and 13 are two small pieces of dark pink-red medium-grained quartzite shatter

Photo 20 and Photo 21). Both artifacts were identified between 10-20 cm bgs. The pink-red colour could be the result of heat treatment applied to the material before knapping to improve workability, although visual changes are less evident in coarser-grained siliceous materials such as quartzite (Domanski 2007:159). Cortex is present on the dorsal surface of both pieces consistent with fluvial rounding.

Photo 20. Artifact FgPw-43:11.

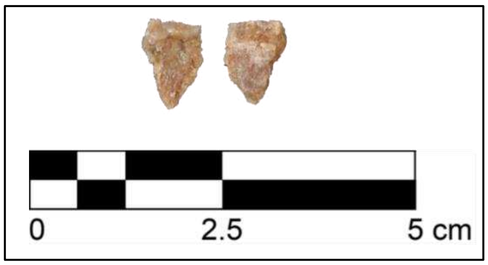
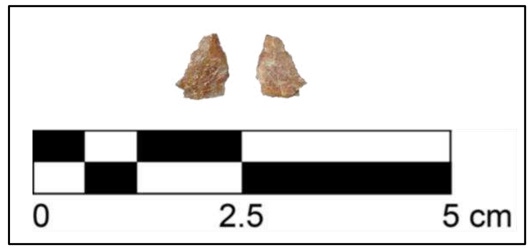


Photo 21. Artifact FgPw-43:13.



Artifacts FgPw-43:04, 05, 06, 07, 08, 10, and 14 are made of a grey–light grey medium-grained quartzite material with flecks of dark/black material included in the matrix. Artifact FgPw-43:04 is a utilized flake fragment, with evidence of small sharpening flakes being removed along one edge. FgPw-43:05, 06, 07, 08, 10 and 14 are all small flake fragments without obvious flake features. Artifact FgPw-43:14 is the only flake fragment with cortex present on the dorsal surface. The cortex is smooth and rounded, consistent with fluvial rounding. There is extensive pink coloring on the dorsal surface, possibly the result of the material being heat-treated to improve workability. All these artifacts were identified in ST 015P at a depth of 0-5 cm bgs, apart from FgPw-43:10 which was identified at a depth of 10-20 cm bgs.

Photo 22. Artifact FgPw-43:04.

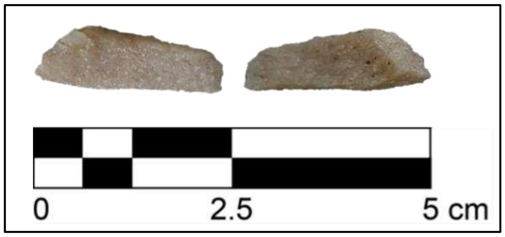


Photo 23. Artifact FgPw-43:05.

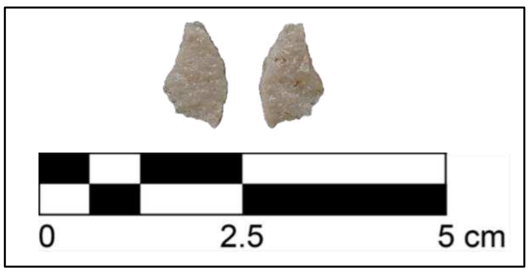


Photo 24. Artifact FgPw-43:06.

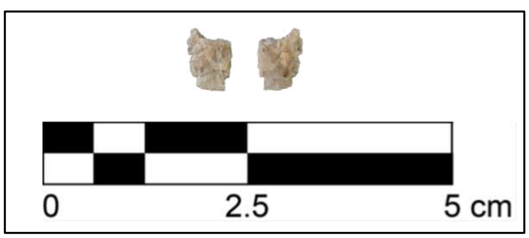


Photo 25. Artifact FgPw-43:07.

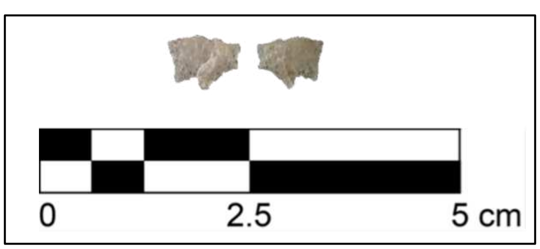


Photo 26. Artifact FgPw-43:08.

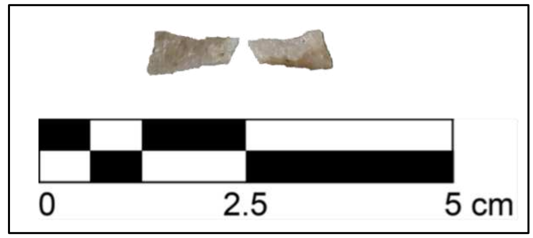


Photo 27. Artifact FgPw-43:10.

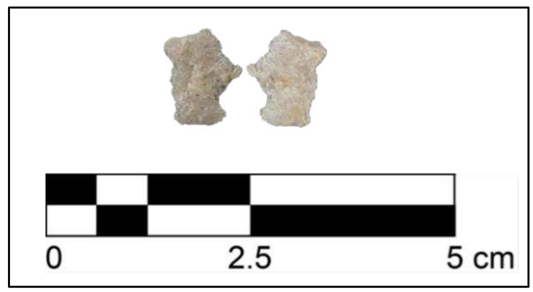
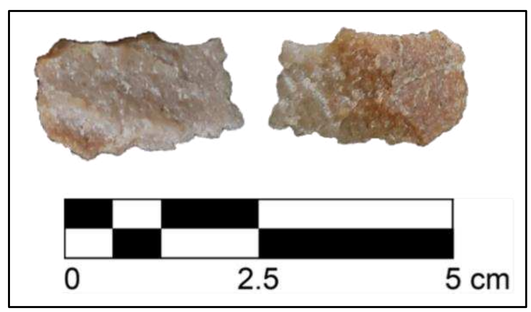


Photo 28. Artifact FgPw-43:14.

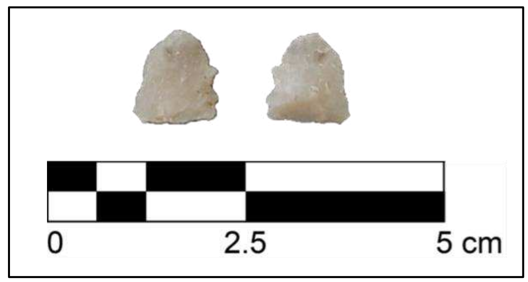


Chert

The last two pieces of lithic debitage (FgPw-43:9 and 12) identified at Ermineskin 01 from ST015P are made of chert material. Both artifacts were retrieved from a depth of 0-5 cm bgs. Artifact FgPw-43:09 is a small modelled dark grey chert flake fragment. Artifact FgPw-43:12 is a light grey-cream-colored chert. Various types of cherts can be found locally in the form of cobbles along rivers and creeks in the vicinity.

Photo 29. Artifact FgPw-43:09.

Photo 30. Artifact FgPw-43:12.



Lithic analysis of artifacts FgPw-37:17 and 18 identified in ST 032P at Ermineskin 02 revealed that both pieces of lithic debitage were made from Swan River chert (SRC) material. SRC is quartz bonded with chalcedony. The material type was identified due to its high density of irregular porous spaces called "vugs" and crystal growths that occur throughout the matrix (Ahler 1977:136; Low 1996:168). Photo 15 (below) is a Dino-Lite capture image of artifact 024, a platform-bearing pressure-thinning flake identified at Ermineskin 02. In this image, you can see the vugs and crystal growths in the matrix.

Photo 31. Artifact FgPw-37:17.

Photo 32. Artifact FgPw-37:18.

Photo 33. Artifact 24, an example of Swan River chert vugs and crystal growths.

SRC lithic material is found predominantly in southwest-central Manitoba. However glacial deposits of SRC can be found across southern Saskatchewan, in southeastern Alberta, northern Montana and north to northeastern North Dakota as a result of the movement of the Laurentide Ice Sheet (Low 1996:168). Low (1996:167) states that occurrences of SRC tools and debitage identified on the plains are overwhelmingly heat treated as this enhances the workability of this otherwise hard-to-fracture material. The colour of SRC ranges from "cream white through to medium grey, pink to rust, pale yellow to deep orange" (Leonoff 1970:12), Low (1996:165) notes that heat treatment is generally responsible for the whites/greys to reds.

The two pieces of SRC debitage (023 and 024) identified at Ermineskin 02 are cream-light grey in appearance, evidence that the material has likely undergone thermal alteration to make it easier to knap. Both artifacts made of this material are pressure-thinning flakes, indicating tools were being made from SRC at the Tidewater dunes. As this is not a local lithic material found in the foothills, we must assume the people utilizing these sites either travelled to or from the southeast or traded with groups occupying territory where SRC material is naturally found.

Fire Broken Rock

Fire Broken Rock (FBR), also called Fire Cracked Rock (FCR), is a type of artifact commonly identified in Alberta archaeological sites. FBR is typically quartzite or granite, fist-sized stones that were repeatedly heated and cooled, causing the stones to fracture or sometimes explode. Repeated heat cycling can cause the material to degrade and become crumbly. FBR is often pinkish or reddish due to the iron in the material oxidizing during the heating and cooling process (Hamza 2022).

FBR is often evidence of boiling pits, a method of heating stones and placing them in wide, shallow, water-filled pits, lined with animal hides to cook food. In Alberta, the identification of FBR at an archaeological site is used to classify campsites, as there is evidence of food processing (Hamza 2022). Rocks were also heated in hearths, earth ovens and sweat lodges, all of which can create FBR. Experimental studies have found that fracture attributes of FBR can be correlated with specific past uses of heated stone when applied to FBR assemblages if the assemblage comes from a controlled archaeological context and includes at least 50 FBR (Custer, 2017:281-282). The FBR identified at Ermineskin 01 was not identified in a controlled context, nor is their quantity enough to determine the specific past use.

Nine pieces of FBR were identified at the Ermineskin 01 from two of three positive tests (ST 015P and ST 046P). All nine artifacts are quartzite, but three separate quartzite materials were identified, likely representing three separate cobbles fractured through heat cycling. Cortex is present on samples from all three material types, showing us that these cobbles were smooth and rounded due to fluvial or glacial fluvial processes.

Quartzite Material Type A: FBR 06 and 07 were both identified in ST 015P from 0-5 cm bgs and are the same material type, crumbled quartzite showing evidence of intense heat cycling. Both artifacts are dark grey/pink in colour with large quartz crystals. A smooth rounded cortex surface is visible on portions of 06 and 07, indicating the original stone was a rounded river cobble, and that both pieces are likely from the same original cobble.

Photo 34. FBR 06.

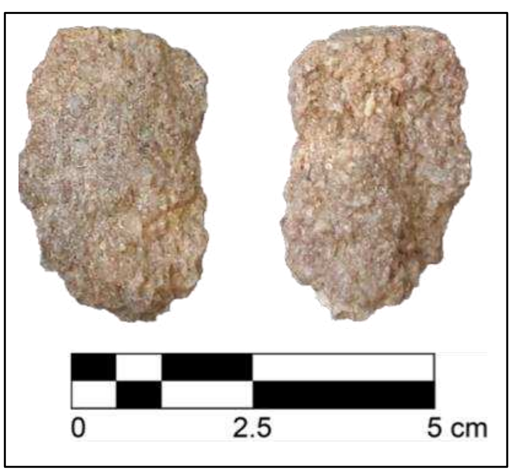
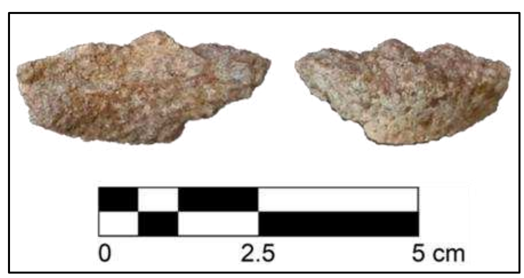


Photo 35. FBR 07.



Quartzite Material Type B: The remaining five pieces of FBR (03, 04, 05, 08, and 09) identified in ST 015P are also the same material type, and likely pieces of the same cobble. This material is a light grey course-grained quartzite with large quartz crystals. Three (04, 05, and 08) of the FBR pieces still retain bits of the original cortex of the rock, which is smooth and slightly rounded, indicating this was probably once a rounded river cobble. The remaining two pieces (03 and 09) do not have any cortex left.

Photo 36. FBR 03.

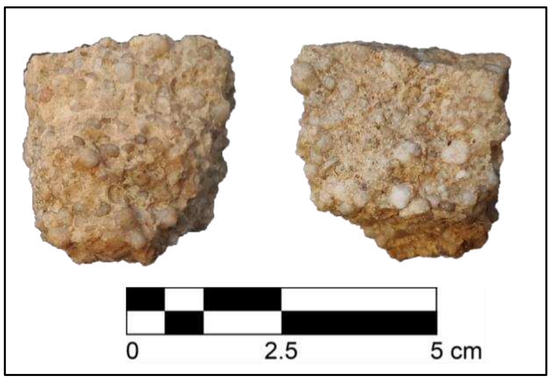


Photo 37. FBR 04.

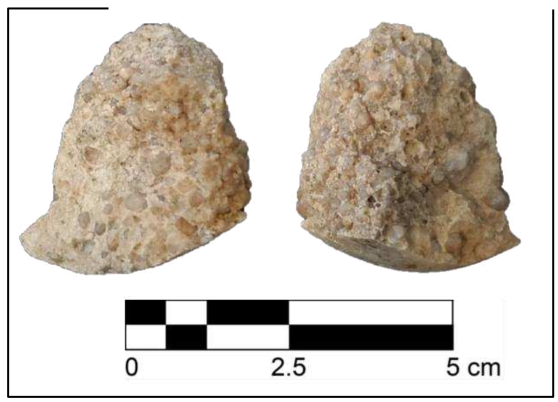


Photo 39. FBR 05.

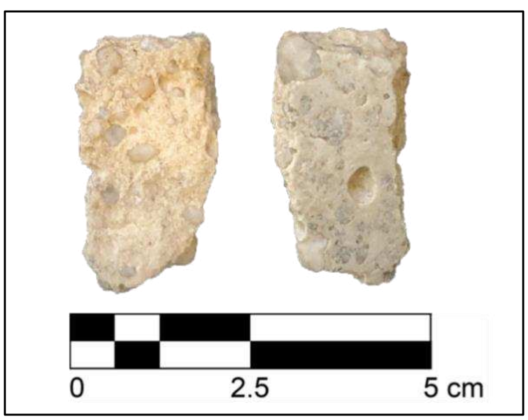


Photo 38. FBR 08.

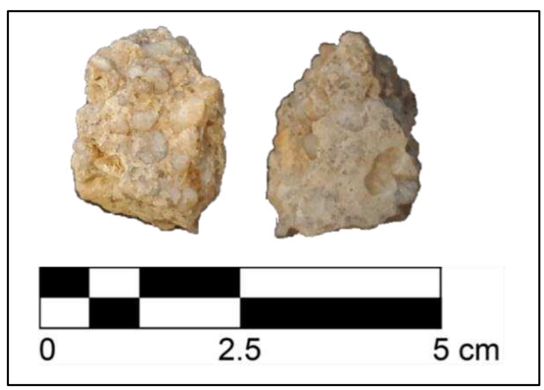
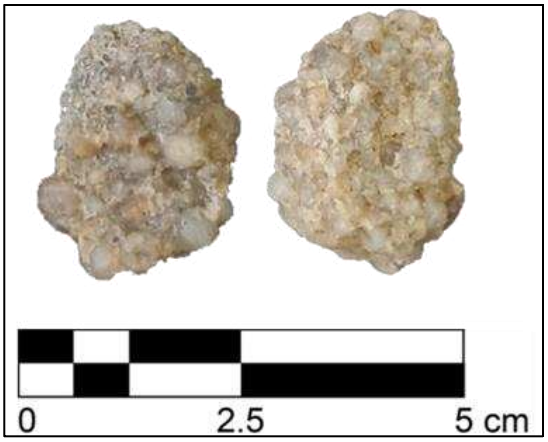


Photo 40. FBR 09.



Quartzite Material Type C: Two pieces of FBR (01 and 02) were recovered from ST 046P at a depth of 0-5 cm bgs. Both pieces are angular and blocky, light grey/pink in color and made from a fine-grained quartzite with some large quartz crystal inclusions. They are likely from pieces that shattered off the same original cobble. Fragment 02 is large with smooth, rounded cortex visible on most of one side of the rock; 01 does not have any cortex present. Evidence suggests this was a rounded river cobble before it was fractured by heat cycling.

Photo 41. FBR 01.

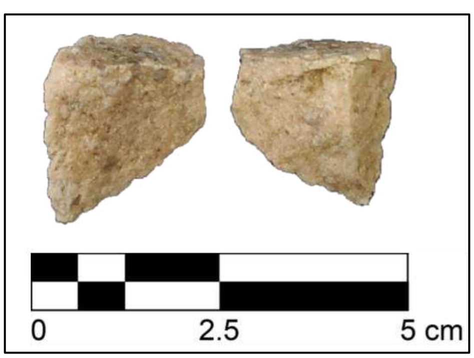
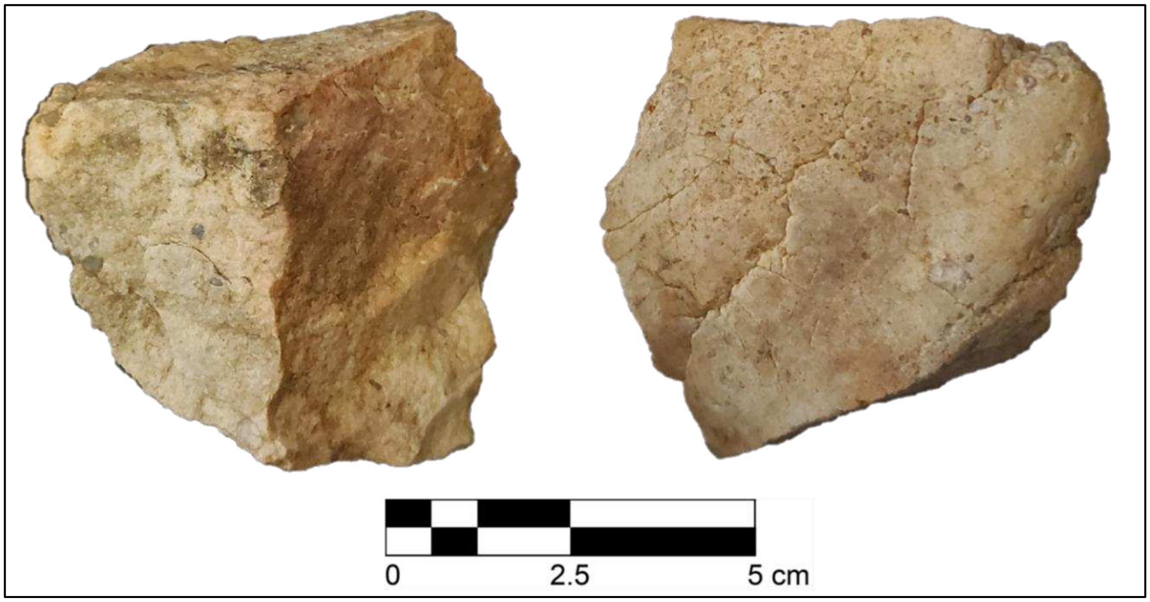


Photo 42. FBR 02.



All three material types identified are quartzite, show evidence of smooth, rounded cortex, and display characteristics typical of FBR. For these reasons, these nine pieces likely represent three separate quartzite cobbles fractured due to heat cycling associated with boiling pits, sweat lodges, or a hearth. No features were identified in this investigation. River cobbles are not naturally found on the top of a sand dune; therefore, they must have been transported to the site intentionally.

Charcoal Analysis.

Charcoal was identified in eight of 51 shovel tests conducted across the study area. Small amounts of carbonized wood were noted in ST 01 and 02, these were small pieces believed to have fallen into the tests from the moss above the ground surface. Transect 2 revealed more substantial carbonized wood deposits in ST 18 and 20 and a burnt root was identified at 10 cm bgs in ST 016. Samples were taken from ST 18 at 10 cm bgs and from ST 020 at 20 cm bgs. A small sample of charcoal was also collected from ST 15P at the

Ermineskin 01 from 0-5 cm bgs, this is likely the result of charcoal falling into the test from the moss layer above the ground surface. In Transect 3 near the Ermineskin 02 large, carbonized wood deposits were identified in ST 034 and 036. In both cases the deposit was noted to be sitting above the ground surface of the test, making it likely that these deposits are the result of a wildfire event post-deposition of the Ermineskin 02 lithic materials. A sample was taken from ST 034.

None of the carbonized wood identified in the subsurface tests was associated with distinguishable features (e.g. hearth), there was strong evidence of past forest fires which would have resulted in carbonized wood debris on the ground surface and in deposits below the ground surface where the fire travelled into the roots of trees, leaving behind carbonized wood. For this reason, no dating was done for the carbonized wood samples as they are likely younger than the artifacts identified at the sites and would not significantly improve our understanding of the sites.

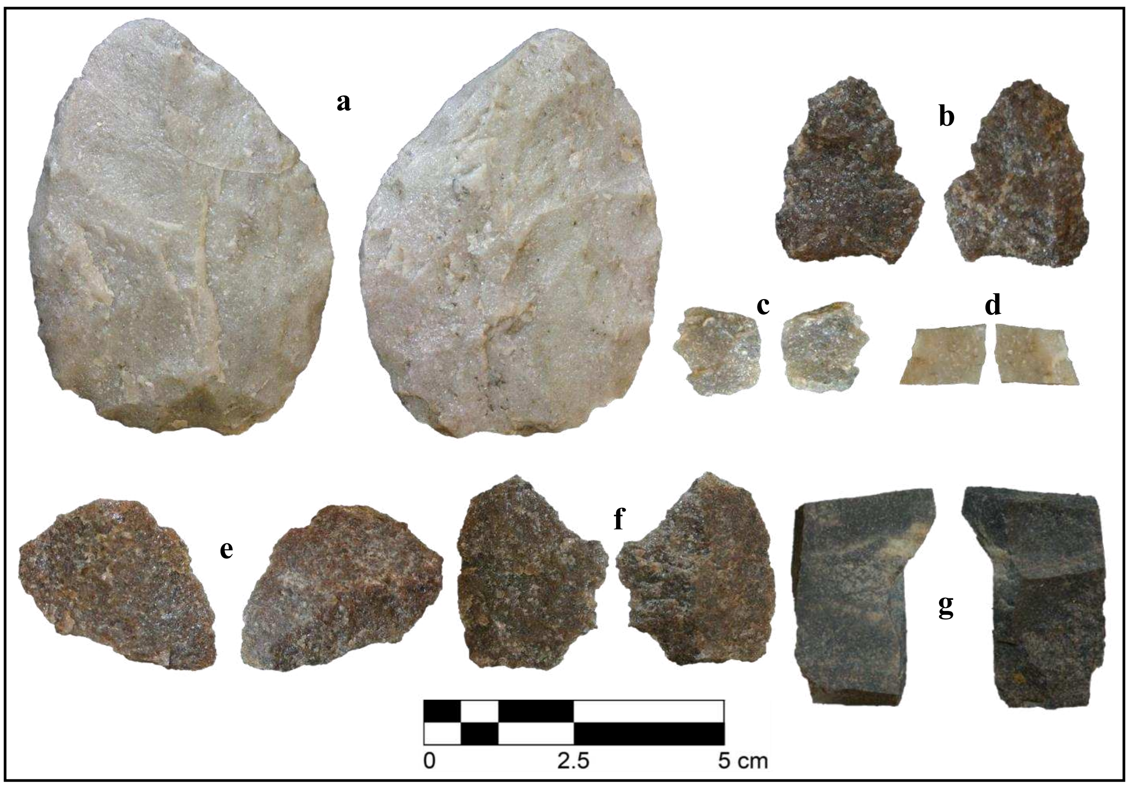
2019 Results Comparison

After completing the field research and the lab analysis of cultural material collected for this project, I compared the results to the cultural material identified at FgPw-37, FgPw-43, and FgPw-41. Results from the 2019 CRM investigations for each site are as follows:

FgPw-41

Site FgPw-41 was designated based on the identification of five pieces of lithic debitage and one lithic tool from 3 of 30 subsurface tests (ST 1760P, 1762P and 1768P) conducted during a forestry HRIA (ASA Permit No. 19-072) in 2019. Debitage consisted of three quartzite platform-bearing flakes, one quartzite flake fragment, one quartzite retouch/resharpening flake, and one piece of mudstone block shatter. The tool is a quartzite biface measuring 109.81 mm in length, 76.7 mm in width, and 16.31 mm in thickness (Circle 2020:378-381, 556-567).

Figure 32. FgPw-41 2019 artifact photos; (a) FgPw-41:06, (b) FgPw-41:02, (c) FgPw-41:01, (d) FgPw-41:05, (e and f) FgPw-41: 3 and FgPw-41:4, (g) FgPw-41:07.



My analysis of the artifacts at the RAM in March 2023 indicated that artifacts 2, 3 & 4 are manufactured from the same material, a coarse-grained dark grey quartzite. Artifact 1 is also a dark grey quartzite but finer-grained, likely a different raw material. Artifact 6 light beige-white quartzite for the tool, possibly salt and pepper quartzite.

Artifact 5, a light pinky grey fine-grained quartzite, is different than the tool. Therefore, four separate raw materials are likely being represented among these lithics.

FgPw-37

Site FgPw-37 was identified as a lithic scatter consisting of 15 pieces of lithic debitage and one scraper recovered from four of 61 tests (1936P, 1935P, 1930P, 1919P). Lithic debitage is composed of seven quartzite platform-bearing flakes, one quartzite primary decortication flake, six quartzite flake fragments, and one piece of quartzite shatter. One broken mudstone thumbnail scraper was also recovered. The scraper measures 12.55 mm in length, 21.85 mm in width, and 3.93 mm in thickness (Circle 2020:362-365, 558-559).

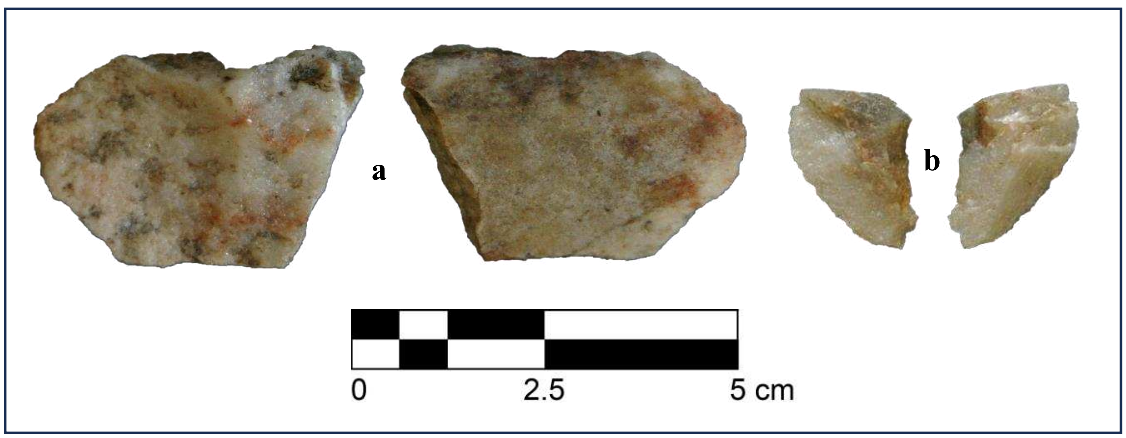
All 15 pieces of lithic debitage identified in the 2019 HRIA are created from local quartzite materials in various colours and textures from white, grey, pink, brown to red. The three pieces of lithic debitage described as being red were identified as being heat treated (see FgPw-37 artifact catalogue below). The thumbnail scraper is made of a grey mudstone material, also available locally.

Figure 33. FgPw-37 Artifacts identified in 2019 (ASA permit 19-072); (a and b) FgPw-37:1-2,(c) FgPw-37:3, (d) FgPw-37:4, (e) FgPw-37:5, (f and i) FgPw-37:10-11, (g) FgPw-37:6, (h) FgPw-37:7, (j) FgPw-37:8, (k) FgPw-37:13, (l) FgPw-37:12, (m) FgPw-37:15, (n) FgPw-37:14, (o) FgPw-37:16, (p) FgPw-37:9.

FgPw-43

Site FgPw-43 was identified as a lithic scatter consisting of two pieces of lithic debitage recovered from two of 41 subsurface tests (1974P, 1982P). Lithic debitage consists of one quartzite primary decortication flake and one quartzite platform-bearing flake. Both pieces of lithic debitage identified in 2019 were Catalogued as white quartzite materials. It was noted that the primary decortication flake (FgPw-43:1) had pink inclusions (Circle 2020:386-389, 572). My re-analysis of these artifacts in 2023 indicates that these flakes were likely derived from different cores. Indicating two material types being used at this site, both are locally available quartzite.

Figure 34. FgPw-43 Artifacts identified in 2019; (a) FgPw-43:1, (b) FgPw-43:2.



Findings

The SRC identified in 2022 remains the only example of a non-local lithic raw material. Quartzite makes up most of the lithic material, with two examples of mudstones; all raw materials are locally available in the form of river cobbles. This indicates that people utilizing this area in the past were primarily using the raw materials available to them locally. This is common for the area, as exotic raw materials are less common than local lithic sources in Alberta boreal forest sites.

Quirks (what really happened)

The initial methods document submitted to the Archaeological Survey of Alberta as a part of the research permit application stated that intensive subsurface testing would be conducted at 2-3 m intervals, in a grid pattern across the top of the landform between the established site boundaries. Upon arrival at the site on October 1, 2022, to conduct fieldwork it became obvious this subsurface testing strategy was too fine for the scope of this project. There was too much untested space between the known site boundaries of FgPw-43, Fgpw-37, and FgpW-41 to place tests in a grid every 2-3 m. After further analysis and discussion, it was decided that transects comprised of 5 m spacing between subsurface tests would be sufficient to test our hypothesis that there were indeed artifacts in the untested sections between the known site boundaries. A permit amendment was then submitted to reflect the altered testing methodology which was accepted by the ASA.

Our research permit also allowed us to conduct 0-5 m^2 of excavation in 1x1 m units as we deemed necessary based on the results of the ground survey. However, it was decided that it was not necessary to conduct any excavations for this research as the hypothesis was proven with the subsurface testing. Future research at the site, including excavations, would be very beneficial in helping us to understand more about the site (See Future Research and Recommendations).

The methods document also stated all sediments would be screened through 6 mm mesh. The Archaeology department at the University of Alberta provided the field equipment; mesh hand screens (6 mm), and large standing screens (3 mm) were available. We took a selection of screens to determine which would prove most useful at the site. In general, we used 6 mm mesh hand screens for most of the subsurface tests as the large standing screens were awkward to transport across the sites. However, once we had identified cultural material in a test, we used the 3 mm mesh standing screens for the positive tests to optimize the recovery of micro-debitage.

Our methods also stated that a representative soil profile with a photo would be recorded for each shovel test area (each transect) and a photo would be taken of each positive shovel test. Soil profile photos were taken, however, unfamiliarity with the borrowed equipment and a failure to upload and check the photos before the end of fieldwork resulted in some blurry profile photos. The camera was not properly adjusted to account for the changing depth within a shovel test, something that was not noticeable until the photos were viewed on a computer. It is for this reason that some photos present in this report are not in focus, diminishing their usability. As such, markups have been added to the profile photos to delineate the stratigraphic breaks that are less visible in the blurry photos.

Table 4. FgPw-43 Lithic Debitage Artifact Catalogue (2023)

Permit: 22-164		Borden #: FgPw-43				Artifact Catalogue: Lithic Debitage					Recorded By: M. Huber 12/19/2023		
Catalogue Number	**Count**	**Weight (g)**	**Length (mm)**	**Width (mm)**	**Thickness (mm)**	**Description**	**Portion**	**% Cortex**	**Raw Material**	**Colour**	**Depth (CMBS)**	**SI_Name**	**Comments**
3	1	7.51	30.67	33.55	7.19	Secondary Decortication Flake	Distal Portion	<50%	Quartzite	Grey	50-60	ST 011P	
4	1	1.04	28.09	9.34	4.2	Utilized Flake Fragment		0	Quartzite	Grey	0-5	ST 015P	Pressure flaking along one edge
5	1	0.24	12.71	7.44	2.76	Flake Fragment			Quartzite	Grey	0-5	ST 015P	
6	1	0.05	7.76	5.48	1.71	Flake Fragment		0	Quartzite	Grey	0-5	ST 015P	
7	1	0.04	7.47	5.28	1.54	Flake Fragment		0	Quartzite	Grey	0-5	ST 015P	
8	1	0.13	9.34	4.61	2.63	Flake Fragment		0	Quartzite	Grey	0-5	ST 015P	
9	1	0.03	2.85	2.78	1.68	Flake Fragment		0	Chert	Dark Grey	0-5	ST 015P	
10	1	0.1	10.67	8.87	1.35	Flake Fragment		0	Quartzite	Grey	10-20	ST 015P	
11	1	0.15	9.91	7.3	2.78	Shatter		50-100%	Quartzite	Pink/Red	10-20	ST 015P	Heat
12	1	0.07	8.44	7.41	1.47	Pressure Thinning, Platform Bearing Flake	Complete	0	Chert	Light Grey	10-20	ST 015P	Heat
13	1	0.13	8.99	5.83	2.24	Shatter		50-100%	Quartzite	Pink/Red	10-20	ST 015P	Heat
14	1	1.23	22.14	12.72	3.96	Flake Fragment	Distal Portion	<50%	Quartzite	Pink/Grey	10-20	ST 015P	Heat

Table 5. FgPw-37 Lithic Debitage Artifact Catalogue (2023).

Permit: 22-164		**Borden #: FgPw-37**				**Artifact Catalogue: Lithic Debitage**					**Recorded by: M. Huber 12/19/2022**		
Catalogue Number	**Count**	**Weight (g)**	**Length (mm)**	**Width (mm)**	**Thickness (mm)**	**Description**	**Portion/Integrity**	**% Cortex**	**Raw Material**	**Colour**	**Depth (CMBS)**	**SI_Name**	**Comments**
17	1	0.09	9.03	8.81	1.23	Flake Fragment-Pressure thinning flake	Distal portion	0	Swan River chert	Cream	10-20	ST 032P	Heated
18	1	0.21	13.86	8.71	1.6	Pressure thinning, platform bearing flake	Proximal Portion	0	Swan River chert	Cream	10-20	ST032P	Heated

Table 6. FgPw-43 Fire Broken Rock Artifact Catalogue (2023).

Permit: 22-164		**Borden #: FgPw-43**			**Artifact Catalogue: Fire Broken Rock**						**Recorded by: M. Huber 12/19/2022**		
Catalogue Number	**Count**	**Weight (g)**	**Length (mm)**	**Width (mm)**	**Thickness (mm)**	**Description**	**Portion/Integrity**	**% Cortex**	**Raw Material**	**Colour**	**Depth (CMBS)**	**SI_Name**	**Comments**
01	1	4.51	22.85	21.31	10.46	FBR	N/A	0	Quartzite (C)	Light grey/ pink	0-5	ST 046P	
02	1	209.8	75.34	74.44	39.03	FBR	N/A	50-100%	Quartzite (C)	Light Grey/Pink	0-5	ST 046P	
03	1	26.07	40.31	30.78	19.67	FBR	N/A	0	Quartzite (B)		10-20	ST 015P	
04	1	36.64	40.91	38.52	21.85	FBR	N/A	<50%	Quartzite (B)	Light grey	0-5	ST 015P	
05	1	7.37	31.49	15.79	10.55	FBR	N/A	50-100%	Quartzite (B)		0-5	ST 015P	
06	1	11.5	37.33	25.98	11.67	FBR	N/A	<50%	Quartzite (A)		0-5	ST 015P	
07	1	5.59	37.3	15.98	9.36	FBR	N/A	<50%	Quartzite (A)		0-5	ST 015P	
08	1	4.01	19.75	15.26	11.02	FBR	N/A	50-100%	Quartzite (B)		0-5	ST 015P	
09	1	1.96	17.71	13.53	7.53	FBR	N/A	0	Quartzite (B)		0-5	ST 015P	

Interpretation

Implications for Alberta CRM

This project brought to light many of the biases present in CRM archaeology in Alberta. The most pressing is the lack of Indigenous inclusion and consultation at the CRM level. The current system, managed by the ACO, transfers the Crown's fiduciary duty to consult with First Nations and Metis to industry proponents, divorcing CRM archaeologists from the consultation process. CRM archaeologists in the province rarely work with or for Indigenous communities as the current Indigenous consultation system in the province is built to expedite the consultation process for the benefit of the industry proponent, it was not designed with or for Indigenous Nations. Nor does it currently support what is considered ethical best practices in archaeology, where indigenous inclusion and collaboration are considered essential. In Alberta 80-90% of archaeological work completed is CRM archaeology, meaning the vast majority is not benefitting from or incorporating Indigenous lived experiences, oral histories, traditional ways of knowing, or considering how sites fit in the broader cultural landscape. Instead, CRM is reinforcing the colonial nature of archaeology to the detriment of contemporary descendant communities.

Without the efforts and participation of the Ermineskin Cree Nations EIRD team, this project would not have been possible. The EIRD team was fundamental in project development, execution, and interpretation. The EIRD supplied equipment, such as trucks, trailers, ATVs and UTVs to facilitate site visits and shuttle archaeological equipment for the fieldwork portion of the trip. Ermineskin Cree Nation EIRD team members, citizens and Elders participated in the excavation of shovel tests and identification of artifacts. Working with the EIRD team was both a pleasure and a privilege which greatly improved the feasibility of fieldwork and created a greater consideration for the broader cultural implications associated with heritage management which are often overlooked in Alberta CRM when descendant Indigenous communities are not involved. Identification, protection, and interpretation of archaeological resources greatly influence the understood narrative of the past, having a substantial impact on living descendant communities who continue to live on, and care for, their traditional territories.

Tidewater Dune Field

The scope of this project limited testing to only one (FID 1127) of the 12 site clusters identified as having a high potential of representing a larger site area. Four of these site clusters were situated in the Tidewater dune field on large parabolic dune features, two (FID1127, FID464) on yet unharvested dunes, and two (FID 462, FID706) on dunes that have been previously harvested. In the case of site clusters FID462 and FID706, previous harvesting between the site boundaries may have disturbed any archaeological material missed in the initial HRIA, making them poor candidates for fieldwork.

The 2004 HRIA on three dune features north of the Tidewater Road identified eight archaeological sites on three large parabolic dune features (Lifeways 2005). The 2019 HRIA identified 17 archaeological sites on five large parabolic dune features south of the Tidewater Road (Circle 2020), for a total of 25 archaeological sites on eight large dune features from within the larger Tidewater dune field. This represents a unique, site-dense area within the larger study area. Examination of the CRM permit report submitted for both the 2004 and 2019 HRIA reveals that subsurface testing was limited to the highest and flattest portions of the ridges. No testing was conducted along the bases of the dunes, on the slopes of these landforms, or in the interdune spaces, restricting our knowledge to the utilization of the tops of the dunes. As we have previously established, archaeological sites are not separated from the wider cultural landscape and indigenous peoples did not utilize the landscape based on our narrow definitions of landform. Therefore, it is highly probable that there is more cultural material in the untested portions of the landscape. Research by Woywitka and Froese (2020:217-230) indicates that portions of landforms where sediments accumulate are consistently undertested in boreal settings. Sites identified in sediment traps would likely produce more deeply stratified sites that would greatly aid our temporal understanding of the utilization of these sites. Whereas the tops of eolian dune features, which are currently being targeted by CRM subsurface surveys, are sediment-shedding areas. Thus, the shallowly stratified sites that are predominantly identified are what should be expected in these areas. This is a clear testing bias that could be altering our current understanding of boreal archaeological sites.

Several large dune features within the Tidewater dune field have not been selected for harvest and have yet to undergo archaeological investigation. It is likely based on these findings, that an HRIA would reveal more archaeological sites on these features as well. While these stable, forested dune features are not uncommon in the Alberta Boreal Forest Zone they are restricted to small dune fields and are not typical of the overall terrain. These dunes are unique both geologically and archaeologically. Unfortunately, this is also what makes them extremely attractive to the forestry industry. Mixed-wood forests of *P. tremuloides*, *P. balsamifera*, *B. papyrifera*, *P. contorta*, *P. mariana*, *P. glauca*, *A. balsamea*, and *L. laricina* are common in the Lower Foothills Region around the Tidewater dune field. However, the well-drained silty-sand sediments of the dunes that make them attractive campsite locations also make them ideal for *P. contorta*, which is very lucrative in the forestry industry.

Forestry is generally considered minimally invasive since the trees are being cut above the ground surface and removed with minimal ground disturbance, however, this does not account for road building and site preparation practices which are incredibly destructive. Building roads to access and remove the timber requires bulldozing of the ground surface to create a smooth graded road surface, wide flat landings are required to process and deck the timber. These landings must be large enough to allow logging trucks to maneuver. After the timber is harvested and hauled away the ground then needs to be prepared for re-planting. These site preparations can include mounding, trenching, windrows, and drag scarification, all of which cause significant ground disturbance and threaten buried archaeological resources (Bereziuk et al. 2021:7; Gibson, 2005:3). This intensive ground disturbance and removal of the surface vegetation in such loose eolian sediments increases evaporation, limiting the moisture-retaining ability of the dunes, and allowing the dry sediments to be reactivated by wind. The lack of buried roots due to bulldozing activities makes to dunes unstable and increases erosional and activation activities.

Our initial site visit in September 2022 revealed that three of the five dune features investigated in 2019 had already been harvested. Roads had been built along the ridges of the dunes where it was high and dry, which makes sense from an engineering perspective. While the site buffers flagged in 2019 had been respected and tree patches were avoided around the identified sites, any cultural material that may have been missed along the tops of the dunes has since been completely bulldozed away. Road building has removed the surface vegetation that has been stabilizing the dunes for the last 12,000-plus years. Large cut banks are evidence of the amount of destruction that has been inflicted on these ancient landforms. Huge amounts of loose sand and silt are now exposed to the elements, being reactivated, and eroded by wind and rain, irreparably altering these landforms.

Photo 43. View east of an exposed cut bank created by road-building activities on a large dune feature in the Tidewater dune field.

Photo 44. View south of a forestry road built along the crest of a dune arm in the Tidewater dune field.

Timber harvesting on these fragile dune features is extremely destructive and threatens both unidentified and identified cultural material. Despite a 30 m buffer of standing timber around the identified site boundaries, it is possible that reactivation and erosion of the dunes could continue to act upon them and threaten the archaeology within the buffered zone. The removal of the standing timber leaves these small remaining tree patches vulnerable to the wind, creating a high potential for the trees to be blown over. As roots are ripped out of the ground, the shallowly buried archaeological material will be thrown out of situ, limiting the ability of future archaeological interpretation.

The perceived low impact of forestry practices, which is not a reflection of the industry's true impact on buried cultural materials, is a problem throughout the province where HRIAs are being conducted for forestry clients. Biases and failure of CRM methodologies to adequately identify and protect archaeological material, as seen in this study, as well as the lack of greater protective measures for site-dense areas on behalf of the ASA, make Alberta archaeologists complacent in the erasure of Indigenous history.

Site Specific: FID1127

The results of this research show there are lithic artifacts in the untested portion of the sand dune between the known site boundaries of FgPw-37, FgPw-41, and FgPw-43. The gently to moderately sloped terrain was left untested, focusing on the highest and flattest portions of the dunes, a common CRM testing bias (Woywitka and Michalchuk, 2021:88-99; Woywitka and Froese, 2020:224, 229-230). The problem with focusing only on the perceived "highest potential" areas is that our "models" become a self-fulfilling prophecy and perceived "low potential" areas are continually left untested.

The ASA's standard is that positive shovel tests within 100 m of each other are recorded as a single site, exceptions provided in the *Alberta Archaeological Site Reporting Guide* are (Alberta 2022:16):

> 1) Features or artifacts (that) are located on separate landforms that have pronounced topographic differences (e.g., the top and bottom of a cliff or opposite sides of a deep ravine)
>
> 2) Features or artifacts located on opposite sides of major water bodies.

In the case of the 2019 survey, breaks in slopes were used as a way of defining a change in "landform" as there was less than 100 m between FgPw-37, FgPw-41, and FgPw-43. Had the artifacts from Ermineskin 01 and 02 been identified in the 2019 HRIA, the entire nose of the dune encompassing FgPw-37, FgPw-41, and FgPw-43 would have been recorded as one site and received a singular Borden number. Instead of the record amending that mistake by recording this whole area as one site, FgPw-37, FgPW-41, and FgPw-43 will continue to be portrayed as three separate sites rather than one large habitation area. This is done for the sake of a paperwork legacy; however, it perpetuates the notion of small ephemeral sites which is detrimental to our understanding of the landscape as it would have been utilized by Indigenous peoples. The only change in the official records resulting from this fieldwork is that FgPw-43 will be updated from an HRV 0 to an HRV 4 designation. This arbitrary separation of sites based on "landforms" and distance does not accurately reflect how past peoples understood, used, and moved across the landscape.

None of the sites identified in 2019 or in our 2022 fieldwork were heavily stratified. The sites are scatters of lithic materials with some tools (FgPw-37, FgPw-41) and some FBR (Ermineskin 01). The shallow poorly stratified lithic scatters and "campsites" (deemed as such due to the presence of FBR) identified on the Tidewater dunes are typical of our current understanding of boreal forest archaeology sites (Ives 1981:109; 1985:1). However, working under the understanding that the large dune features making up the Tidewater dune field stabilized by 12.2 ka Cal BP and have not seen significant reactivation since (See Geological Background Chapter), it makes sense that the archaeological sites present on the crest of the dunes would not be deeply buried or heavily stratified as there has been little soil deposition since the dunes stabilized. These sites potentially represent multiple occupations of the dunes over a long period; however, the lack of deeply stratified assemblages, diagnostic tools or dateable organic materials makes any temporal interpretation speculative at best.

Evidence of humans and animals inhabiting the southern portion of the IFC as early as 13, 000 Cal BP is present at Brazeau Reservoir, where a Pleistocene horse mandible was found in close approximation to Paleoindian fluted points. The teeth dated to 12,700 Cal B.P. (Bink et al. 2017:79-96). Further, evidence of camel and horse hunting as early as 13,277–13,464 Cal BP was recovered at the Walley's Beach site in southern Alberta where fluted points were found near horse and camel kills (Ives et al. 2019:144; Devièse et al., 2018:175-176; Grayson and Meltzer, 2015:186-187; Waters et al., 2015:4266). This early evidence of humans and animals occupying the IFC suggests past peoples have been using the larger study area around the Tidewater dunes from stabilization until the present and there is potential to find evidence of Alberta's earliest human inhabitants in the study area and potentially within the Tidewater dune field.

Most of the lithic materials identified were made from local quartzite cobbles with some local or regionally available mudstone and chert. The presence of Swan River Chert lithic raw materials at Ermineskin 02 suggests there is a southeastern connection. SRC lithic material is found predominantly in southwest-central Manitoba. However, glacial deposits of SRC can be found across southern Saskatchewan, in southeastern Alberta, Northern Montana and north/northeastern North Dakota because of the movement of the Laurentide Ice Sheet (Low 1996:168). SRC was the only lithic raw material identified that was not locally available, indicating the people occupying the dunes were predominantly utilizing lithic raw materials that were readily available locally and were less concerned with exotic raw material types.

Future Research and Recommendations

Provincial Indigenous Consultation and Participation

The largest problem identified in Alberta CRM is the need for inclusion and consultation between CRM archaeologists and Indigenous descendant communities. Changes are required at a government level to support this. There needs to be a requirement for consultation within the HRIA process making it possible to include indigenous participants within field crews, without the financial burden being put solely on the CRM companies or Indigenous communities. Looking to neighbouring provinces and territories, where this is already standard practice, could provide Alberta with options for how best to implement these changes.[8]

Here I propose several suggestions for next steps that could be employed by provincial CRM archaeologists to help facilitate relationship-building with Indigenous descendant communities and incorporate indigenous consultation into current CRM archaeological practices.

1) The Association of Consulting Archaeologists could extend invitations to Indigenous Communities for upcoming meetings, creating a space for dialogue between Indigenous communities and professional archaeologists to take place. Providing information about the CRM system to community representatives would

[8] A full breakdown of provincial and territorial Indigenous inclusion within CRM is outside the scope of this thesis project.

allow both parties clarity on what is currently being done and why. This could allow for more open communication regarding concerns from both sides and allow for strategic planning to help address gaps in the current system.

2) Many communities are unaware that it is possible to receive information regarding the archaeological resources identified within their traditional territory. The Archaeological Survey of Alberta needs to provide clear instructions for Indigenous communities seeking this information and assign a designated representative to be the liaison between Indigenous communities and the ASA. The current system is "gatekeeping" archaeological data and making it difficult for Indigenous communities to access.
3) CRM companies wishing to build relationships with descendant communities, especially those who do annual work in specific areas of the province, should reach out to communities before the advent of fieldwork. A simple introduction explaining who the company is and what kinds of work they typically do in the region is a good starting point for a positive relationship. Waiting to interact with a community until something is wanted or needed from them reduces communication to an extractive practice that will not facilitate lasting relationships.
4) Public archaeology presentations could also be offered to interested communities where archaeologists transparently communicate their understanding of relevant cultural regions. This sharing of knowledge would not only benefit the community but may spark interest from community members to seek an education in archaeology, and eventually pursue a career, which in turn would benefit the CRM community.

5) Some grants, scholarships and co-op opportunities currently exist to support Indigenous youth who wish to study archaeology or anthropology academically. Many of these programs are underutilized due to a lack of awareness about their existence. More communication with Indigenous communities is needed to bring awareness to the resources that currently exist, and more opportunities of this nature are needed.
6) At this point, there is no professional association in the province which is mandatory for provincial archaeologists to join. Therefore, it is difficult to implement standards of practice and push for larger provincial change. A unified body of provincial CRM archaeologists would hold more weight and be able to effect greater change over provincial standards and practices.

These are just some suggestions that could be implemented by CRM archaeologists in the province to help facilitate more Indigenous inclusion into provincial archaeological practice within the current consultation system.

Site Boundary Designations

The results of this study suggest that current CRM sampling strategies and the way the ASA defines site boundaries should be updated regarding site clusters. This research was limited by the scope of a master's thesis project, therefore only one of the 61 site clusters identified in our initial GIS survey was subjected to further subsurface testing during this project. While this is a small sample size, it does show the potential for a broader study. Many of the clusters have been previously harvested, and the space between the known site boundaries is now disturbed. However, where site clusters are identified in the future, the ASA could adopt testing requirements which ensure CRM archaeologists are at least minimally testing (such as transects) in low or medium potential areas around an identified site, particularly when there is perceived lower potential between two or more known sites. This would help ensure that larger habitation areas are not being broken up into small separate sites simply because perceived areas of low potential are left untested. Preconceived notions of ideal vs. poor potential need to be reevaluated so that a larger suite of landform types are subjected to subsurface testing in the future.

The assignment of arbitrary site boundaries to archaeological sites which do not consider the larger cultural landscape are currently breaking up large habitation areas into small separate sites. This is a problem that likely extends outside of the boreal forest and impacts archaeological sites throughout the province. While I understand data management is a complicated process requiring standardized practices for site recording, the arbitrary 100 m rule is not reflective of past lifeways. A more flexible system needs to be adopted by the province which would allow site-dense areas to be recorded more broadly without breaking them up into little sites, especially as we know cultural material is inevitably missed in initial HRIA assessments.

Testing biases and perceived "low potential"

One potential way to help address the testing biases identified through this study could be through the addition of spatial data (GPS tracks and subsurface testing waypoints collected by past archaeological investigations) to predictive models and adaptive management plans. The ASA already requires CRM companies to submit spatial data including their tracks and both positive and negative shovel test locations along with site data. If this data were made available to CRM companies at the desktop assessment stage, regional maps could be created which are not focused solely on the presence or absence of archaeological sites but also incorporate the spatial data from previous archaeological investigations conducted in the vicinity. This would allow archaeologists to see testing biases in the region, making it obvious which areas or specific landforms are consistently left untested, or alternately areas that are being over-tested but not producing cultural material. In this way, CRM archaeologists would have a better picture of the broader cultural landscape around their project footprint and could actively and strategically work to address testing biases by targeting some of the perceived low-potential areas which have not received adequate attention in the past. On a cautionary note, these maps could be used as a justification for conducting less testing in areas where there have been previous surveys or subsurface testing programs. The purpose of these maps would be to help archaeologists understand the regional testing biases and hopefully try to fill those gaps, not as a justification to do less fieldwork. Testing Methods and requirements have changed over time, it should not be assumed that previous work was done to current standards.

Alternate options for forestry programs to preserve site integrity

One factor highlighted through this research is the true ground disturbance that is created by forestry proponents, which threatens archaeological resources. It is important to understand that any cultural material missed in the initial HRIA due to testing biases or arbitrary site designation practices, is likely to be destroyed or disturbed. This is even more of a problem in site-dense areas such as the Tidewater dunes, which currently do not receive additional protection from the ASA. Here I would like to propose a potential solution. At this point the standard practice is to avoid known sites by leaving site buffers, the remaining timber may be removed if the timber standing within the buffered zones is left undisturbed. Unfortunately, by removing the surrounding timber, the standing trees are left unprotected and are often blown over by wind in the coming years. When this happens, the roots are ripped out of the ground and the archaeological material culture is disturbed anyway, limiting future research potential.

If the goal is to protect the buried resources, while allowing timber harvesting to continue, I propose the following potential solution. Under the current system, archaeological assessment usually takes place after the block layout has already been completed. If CRM archaeologists can work with forestry proponents to complete HRIAs before timber cruising and block layout take place, identified sites could be incorporated into current forestry management practices without any additional cost to the clients. For example, sites could be incorporated into Wildlife Tree Patches or Riparian Management Areas, both of which forestry proponents are already required to create. In this way, the sites get protected in larger wind-resistant tree patches and the client is not left with additional avoidance zones created by arbitrary site buffers. Small sites could also be converted into machine-free zones, which are harvestable zones where motorized equipment cannot be used. The ASA could stipulate a minimum trunk height to ensure that the trees were being harvested above the ground surface (e.g. 2 feet). Converting site buffers to machine-free zones would allow the forestry client to harvest the timber without any ground disturbance, preserving site integrity. These solutions require negotiation with forestry proponents, however, they could be employed to better preserve archaeological sites for the future, while simultaneously allowing timber harvesting to continue, a solution many forestry proponents would probably support.

Future recommendations for the Tidewater dune field

A comprehensive study of Alberta boreal dune archaeological sites incorporating all the grey literature collected from CRM investigations is needed to understand human activity on these unique landforms, that appear to have a disproportionately high density of known archaeological sites. More research is also needed at the Tidewater dunes to address many of the questions that were outside the scope of this project.

This research highlights how CRM methodologies are arbitrarily breaking up the cultural landscape by focusing heavily on the "high potential" portions of landforms. In the case of the Tidewater dunes, these large eolian features are massive singular landforms that should not be artificially divided due to the presence of an area with a moderately different slope. The utilization of changes in "landform" used in CRM to justify stopping testing or breaking up sites results in under-sampling and is not reflective of the Indigenous utilization which may not be bound to our interpretation of what an "ideal" campsite location/landform should be. Thus, the findings of this project and the previous HRIA surveys conducted on the dunes, do not reflect the true extent of cultural material that may have been left behind by the past inhabitants of this landscape.

The identification of cultural material in these untested areas within the identified site cluster supports our hypothesis that the CRM testing strategy used at this site cluster did not account for the cultural material present in the "sloped" areas of the dune. During the 2022 fieldwork, newly identified positive subsurface tests were not delineated nor were excavation units opened at the site. Both practices could be utilized in the future to gain a better archaeological understanding of the cultural materials identified within the site cluster. CRM testing methodologies are biased toward testing on upland ridges, which are the highest, driest, and flattest portions of landforms (Woywitka and Froese, 2020:225-226). These areas have been targeted as this is the perceived most ideal spot for habitation structures, however, that precludes other desirable features or activities that did not require as much level, dryness. More testing is needed in the perceived "moderate" potential landforms and landform elements, including on slopes, at the base of slopes, and in sediment traps.

Future research conducted within boreal dune fields could tell us a lot more about how past peoples used these unique landforms. More intensive testing is needed along the top of the entirety of the dunes, on the dune slopes, at the base of the dunes, and in the inter-dune spaces which have thus far remained untested. Today the inter-dune spaces are low and wet, typically covered in muskeg, however, there is little understanding of how these interdune spaces may have looked before the development of the muskeg. Archaeology sites identified in dunes on the northwestern plains show that interdune spaces were often used as natural bison pounds, kill sites, processing areas and campsites

(Panas 2018:162-167). It is possible that boreal inter-dune spaces were used in similar ways, future research is needed to test these theories.

Archaeological excavation at some of the larger dune sites would also provide a great deal of information that is not possible to get from shovel testing alone. Excavation almost always results in the identification of more cultural material including diagnostic tools which, if identified, could allow archaeologists to comment on the relative timeframe of site occupation. Future mitigation of the Tidewater dunes archaeological sites would likely reveal more work areas, larger site boundaries, and possibly diagnostic tools (Kristensen and Bereziuk, 2022:19), which could tell us more about the sites and the people who created them. As previously stated, research conducted by Kristensen and Bereziuk (2022:22) suggested that for every 1 artifact identified under a forestry program, 50 more are in the ground should those sites be mitigated. A total of 22 pieces of lithic debitage were identified between FgPw-37, FgPw-41, and FgPw-43 in 2019, plus 14 pieces of lithic debitage identified at Ermineskin 01 and 02 in 2022. Making a total of 36 pieces of lithic debitage at site cluster FID1127. Two tools, one scraper and one biface, were also identified in 2019. If we extrapolate from the data provided by Kristenson and Bereziuk (2022), that means there could be upwards of 1,800 pieces of lithic debitage still in the ground at site cluster FID 1127. The identification and analysis of more lithic materials could change our understanding of lithic material preference at the site, reveal more about space utilization and activity areas, and provide better interpretation and understanding of the site.

Optically stimulated luminescence (OSL) dating has been used by geologists to understand the formation and stabilization chronology of boreal forest dunes. Formal OSL dates on the Tidewater dunes could provide a more concrete understanding of their geological history. Portable OSL has also been employed by Western Heritage, an Alberta CRM company, to understand stratigraphy and provide relative dates for cultural material within the same site at other boreal forest locations. Taking POSL samples directly from the stratigraphy at sites where there are no obvious stratigraphical breaks can provide more data that allows for a better understanding of the stratigraphy that may not be visible to the naked eye. This tool can help archaeologists understand relative dates within a site and can provide information about different occupations at the same location (Gilliland et al. 2015). POSL relative dating could be employed at the Tidewater dune sites, as well as in other boreal sites with poor organic preservation, slow sediment accumulation, disturbed sediments, or a lack of dateable artifacts (such as lithic debitage) to help understand more about site formation processes and occupation timelines.

Conclusion

The results of this research indicate that the current CRM testing methods employed in the study area are inadequate, the assignment of arbitrary site boundaries and lack of testing in perceived "low potential" areas is artificially breaking up the cultural landscape into small sites which do not reflect the true spatial extent of the archaeological material culture. Hypothesis testing (outlined below) was conducted based on the data gathered through this project, the results support this conclusion.

Null hypothesis

H_0= CRM methods are adequate to identify all sites in this regional context and accurately reflect the spatial extent of identified sites.

"This Null hypothesis is falsified."

Alternate hypotheses

H_1= CRM methods are inadequate to identify all sites in this regional context and do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.

"This alternate hypothesis is neither falsified nor verified. This is because testing was limited to site clusters, therefore, all material culture identified altered site boundaries but did not indicate new sites."

H_2=CRM methods are inadequate to identify all sites in this regional context but do accurately reflect the spatial extent of identified sites.

"This alternate hypothesis is neither falsified nor verified. This is because testing was limited to site clusters, therefore, all material culture identified altered site boundaries but did not indicate new sites."

H_3=CRM methods are adequate to identify all sites in this regional context but do not accurately reflect the spatial extent of sites.

"This alternate hypothesis is neither falsified nor verified. This is because testing was limited to site clusters, therefore, all material culture identified altered site boundaries but did not indicate new sites."

H_4=CRM methods do not accurately reflect the spatial extent of identified sites because they avoid places of perceived "low potential".

"This alternate hypothesis is verified."

H_5=CRM methods do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.

"This alternate hypothesis is verified."

H_6=CRM methods do not accurately reflect the spatial extent of sites because they both avoid places of perceived "low potential" and because they have arbitrary spatial boundaries.

"This alternate hypothesis is verified."

Table 7. Marshall table of hypotheses expected outcomes, and the results.

If…	**Then…**	**Results**
CRM methods are adequate to identify all sites in this regional context and accurately reflect the spatial extent of identified sites.	Additional testing at a higher density around known site boundaries and testing of perceived "low potential" areas would not produce more cultural material leading to the identification of new sites or the extension of current site boundaries.	Did not Find
CRM methods are inadequate to identify all sites in this regional context but do accurately reflect the spatial extent of identified sites.	Additional testing at a higher density would produce cultural material leading to the identification of new sites, however, a higher density of testing around known sites would not produce more material culture and would not alter the spatial extent of the known site.	Did Not Find

CRM methods are adequate to identify all sites in this regional context but do not accurately reflect the spatial extent of sites.	Additional testing at a higher density would not produce cultural material leading to the identification of new sites, however, a higher density of testing around known sites would produce more material culture and would alter the spatial extent of the known sites.	Did not find
CRM methods do not accurately reflect the spatial extent of identified sites because they avoid places of perceived "low potential".	Additional testing in perceived "low potential" areas would produce cultural material near existing site boundaries, altering the spatial extent of known sites.	Did Find
CRM methods do not accurately reflect the spatial extent of identified sites because they have arbitrary spatial boundaries.	Additional testing around known site boundaries would produce more cultural material and lead to the identification of more sites as well as the alteration of current arbitrary site boundaries.	Did Find
CRM methods do not accurately reflect the spatial extent of sites because they both avoid places of perceived "low potential" and because they have arbitrary spatial boundaries.	Additional testing of perceived "low potential" areas as well as a higher density of testing around known site boundaries would produce more cultural material and lead to the identification of more sites as well as the alteration of current arbitrary site boundaries.	Did Find

The identification of cultural material in the untested spaces between previously identified archaeological sites FgPw-37, FgPw-41 and FgPw-43 in site cluster FID1127 indicate that the current testing methodologies employed by CRM archaeologists in this region do not accurately reflect the true spatial extent of the cultural material present. As a result, large habitation areas are being artificially divided into small, seemingly ephemeral sites. This misrepresentation of data is perpetuating a false narrative that is not an accurate reflection of past lifeways in this region. This project identifies the need for CRM methodologies and regulations to be tested and updated often. Failure to address these biases threatens non-renewable archaeological resources and contributes to the erasure of Indigenous history in Alberta.

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