Reflections on Early Holocene Chert Use in the Niagara Peninsula

by Robert I. MacDonald[1], Ronald F. Williamson[1], and Douglas Todd[1]

[1] Archaeological Services Inc.

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Abstract:

Early Paleo-Indians at the Mount Albion West site in Hamilton, Ontario, situated on the brow of the Niagara Escarpment on top of a local outcrop of Lockport-Goat Island Formation chert, chose not to use it in favour of Onondaga and Fossil Hill Formation cherts. A slightly later, more transient, Paleo-Indian site, situated a few kilometres to the east, has a significant presence of Selkirk and Haldimand chert, although it too exhibits a preference for Onondaga chert for the manufacture of formal tools. In contrast, Late Paleo-Indian Hi-Lo sites throughout the north shore watershed of Lake Erie show a preference for Haldimand chert across all tool categories. Later, in the Archaic period, regional populations seem to make increasing use of local toolstones such as Lockport-Goat Island Formation chert, although Onondaga chert remains popular, especially for formal tools. In this paper we reflect on the dynamics of toolstone acquisition and use by Early Holocene groups in the Niagara Peninsula and how these dynamics may have been influenced by constraints of the social and natural environment or more specifically by toolstone distribution, availability, knapping quality, durability, and aesthetics.

INTRODUCTION

SLIDE 1: TITLE

The 1996 discovery of the Mount Albion West site and its complete salvage excavation, completed in 2003, have provided the first significant glimpse of early Paleo-Indian life in the Niagara Peninsula.

SLIDE 2: OBLIQUE AERIAL

Perched at the brow of the Niagara Escarpment in the City of Hamilton, this Gainey phase site has yielded tantalizing clues regarding Aboriginal land-use, technology, and chert exploitation in this region at the end of the Pleistocene. In this paper we consider the results of our work at Mount Albion West, in the light of late Pleistocene and early Holocene paleoenvironmental and archaeological data from the Niagara region, with a particular focus on trends in chert exploitation.

PALEOENVIRONMENT

SLIDE 3: LAKE ONTARIO BATHYMETRY

Fundamental to our understanding of Paleo-Indian period land use in the Niagara region is the reconstruction of water levels in early lakes Ontario and Erie. In the Ontario basin, the postulated beginning of the Gainey phase, at about 11,500 radiocarbon years before present (BP), post-dates the recession of glacial Lake Iroquois which occurred before 11,800 BP. At approximately the time of the Gainey phase occupation of the site, around 11,400 BP, early Lake Ontario was about 100 m below the present level and had receded in the western basin to a distance of 20-25 km east of the present shoreline in Burlington Bay (Anderson and Lewis 1985; Coakley and Karrow 1994). The resulting expansion of the land base to the north and east of the site, between the modern strand and the paleo-shoreline, likely provided new and productive habitat for plants and animals and more opportunities for foraging for hunters, especially around wetlands left by lake recession (Nicholas 1994, 1998). Also during this low-water stage in the Ontario basin, through the radiocarbon millennium starting at 11,000 BP which encompasses the Younger Dryas cold event climate reversal (Haynes 1991), the physical and biotic landscape was in greater flux than at any other time during the post-glacial era, and this instability is thought to have resulted in extremely patchy ecological conditions (Dincauze 2007; Shott 2007). Together, these geological and climatic events created a complex landscape much different than today, much of which now lies hidden at the bottom of Lake Ontario. No doubt many important Paleo-Indian campsites lie there too.

SLIDE 4: POLLEN SPECTRUM

The regional vegetation during the occupation of the Mt. Albion West site is reflected in pollen spectra which indicate a spruce-dominated boreal woodland during early Paleo-Indian times, with some tamarack (*Larix* sp.) and cedar or juniper (*Thuja* sp. or *Juniperus* sp.) and a low and declining amount of shrubs and herbs, including grasses, sedges, and *Artemesia* (McAndrews 1981; 1994: 184; Yu 2000).

SLIDE 5: TRANSITION FROM SPRUCE PARKLAND TO SPRUCE FOREST

While the aforementioned patchiness of the landscape cannot be resolved by these pollen spectra, Muller's (1999) research shows the overall biotic flux at this time, with spruce pollen peaking between 12,000 and 11,500 BP and non-arboreal pollen dropping between 11,000 and 10,500 BP, indicating that the transition from open spruce parkland to closed pine forest was underway.

SLIDE 6: LAKES WAINFLEET AND TONAWANDA

In the Erie basin, Pengelly and Tinkler (2004) have presented compelling evidence to suggest that discharge into the upper Great Lakes from glacial Lake Agassiz raised glacial Lake Algonquin high enough to spill into the Erie basin between roughly 11,000 and 10,500 B.P. In so doing, Erie water levels seem to have risen approximately 10 metres above modern levels, transgressing the modern shoreline and creating Lake Wainfleet in the Niagara Peninsula and Lake Tonawanda in adjacent upper New York State. This scenario raises the possibility of early Paleo-Indian campsites situated along the strand of these vast, shallow lakes, or at the very least precludes the possibility that important sites now lie at the bottom of Lake Erie. It does, however, raise questions about the accessibility of Onondaga chert deposits. Pengelly and Tinkler (2004: 215) argue that these sources would have been inundated and unavailable to early Paleo-Indians, although outcrops in western New York State would have presented an alternative.

SLIDE 7: NIAGARA GEOLOGY CUT-AWAY

Von Bitter (2007:24-28) has countered this hypothesis, noting that several potential sources in the south-eastern Niagara peninsula would have been above the high water levels at this time and exposed by erosion along the advancing waterfront as it transgressed the dipslope of the chert-rich Onondaga Escarpment. He also points out that there are numerous inland outcrops in down-cut stream and river valleys from the Grand River valley westward (von Bitter 2007: 27).

SLIDE 8: ONONDAGA CHERT & EPI SITE LOCATIONS

EARLY PALEO-INDIAN SITES OF NIAGARA

The study of Early Paleo-Indian chert exploitation in the Niagara region is hampered by the paucity of known sites. The Ontario Archaeological Sites Database lists only a single fluted point site in Niagara, although testing of the Ward site by Ellis (1979) apparently cast doubt on the locality being more than an isolated find.

SLIDE 9: CROWFIELD POINT (AhGw-253)

Earlier this year, we added marginally to the database through the discovery of this Crowfield point approximately 3 kilometres east of Mt. Albion. In their 2004 article, Pengelly and Tinkler (2004:212) list twelve fluted points from Niagara, thanks largely to Pengelly's own survey work and the canvassing of local artifact collectors.

SLIDE 10: NIXON COLLECTION – ST. CATHARINES MUSEUM

Similar survey work in Niagara by Martin Cooper and Douglas Todd has yielded a few additional isolated specimens, again mostly in the hands of local artifact collectors.

SLIDE 11: ELLSWORTH COLLECTION – FORT ERIE

Brian Deller also reports a couple of isolated finds in Wentworth County in his 1988 dissertation.

SLIDE 12: THOMPSON COLLECTION - CAYUGA

Farther west, on the Grand River near Cayuga, two fluted points turned up in the collection of over 3000 points and other pre-contact tools amassed by Andrew Thompson in the late-nineteenth century (Williamson *et al*. 2002: 10-11).

SLIDE 13: ONONDAGA CHERT & EPI SITE LOCATIONS (AGAIN)

Finally, west of the Grand River in Haldimand County, Bud Parker and Bill Fox report fluted points in the Moerschfelder and Rainham Central School collections near Fisherville. The former apparently comes from the Bruce's Boulder site, an Onondaga chert quarry site with Fossil Hill Formation chert debitage (Fox, pers. comm.. 05NOV08), while the latter includes a fluted point of Upper Mercer chert (Parker, pers. comm. 04NOV08). Lorenz Bruechert (pers. comm. 29OCT08) also reports encountering a limited array of isolated fluted points across Haldimand County.

Given such a small and diffuse sample, it is currently impossible to see any robust distributional pattern. Moreover, the majority of fluted point finds are isolated and contribute little to an investigation of land-use patterns beyond the knowledge that early Paleo-Indians were active on the landscape. Even the Late Paleo-Indian sites, of which there are substantially more, are rather thinly distributed across the region. The Mt. Albion West site thus offers the first important clues regarding early Paleo-Indian chert exploitation in the Niagara Peninsula.

<u>TOOLSTONE SOURCES</u>

SLIDE 14: CHERT SOURCES

Of the various toolstones available to the Mt. Albion Paleo-Indians, the closest was Goat Island Formation chert, also known as Lockport Formation chert or Ancaster chert. It occurs adjacent to the site at outcrops along the face of the Niagara Escarpment and within streambeds that have eroded through the relatively thin Quaternary overburden.

SLIDE 15: DAN LONG'S GAINEY POINT

Questions about the suitability of this chert for making fluted points prompted us to ask Mr. Dan Long to experiment with it. According to Mr. Long, it was not especially difficult to craft this Gainey point. Yet in spite of this and its proximity to Mt. Albion, our initial analysis identified only about 1 percent Goat Island chert in both the stone tool and debitage assemblages. Re-analysis of the relatively large number of tools for which the toolstone could not be easily identified is currently yielding additional specimens of this and other local cherts such as Haldimand.

SLIDE 16: NATURAL CHERT CHUNKS & SHATTER

We also now think that the debitage assemblage may somewhat under-represent Goat Island chert because the high quantities of natural shatter in the topsoil likely masked any cultural shatter. Yet this does not adequately explain the overwhelming disparity between the flakes and flake fragments of Goat Island in comparison with Onondaga and Fossil Hill. One possible explanation for this may be that knapping of Goat Island chert took place primarily at the outcrops, with only very limited finishing and retouching occurring at the campsite itself.

SLIDE 17: CHERT SOURCES (AGAIN)

The next closest toolstone is Onondaga chert, which occurs extensively along the north shore of Lake Erie within 35 to 40 kilometres of the Mt. Albion West site. Arguably the most abundantly occurring toolstone on pre-contact archaeological sites in the lower Great Lakes area, the popularity of Onondaga chert can be attributed to its wide availability and relatively high quality. This trend seems to begin early in the Niagara region, as Onondaga chert comprises some 91% of the Mt. Albion West debitage assemblage and around 50% of the stone tool assemblage.

SLIDE 18: MT. ALBION CHERT FREQUENCY PIE CHARTS

These frequencies are particularly interesting in light of those from the second-most common toolstone at Mt. Albion West, Fossil Hill Formation chert.

SLIDE 19: CHERT SOURCES (AGAIN)

Fossil Hill outcrops are only known from a very limited area in the Kolapore Uplands west of Collingwood, Ontario, approximately 150 kilometres north-northwest of Mt. Albion. Although limited in distribution, this white chert is of fairly high quality. In southern Ontario, Fossil Hill chert has gained a reputation as a hallmark of the early Paleo-Indian period, thanks in large part to its high frequencies on Parkhill complex sites such as Parkhill, Thedford II, and Fisher. At the latter site, situated approximately 28 kilometres east of the outcrops, Fossil Hill chert comprised 95% of the lithic assemblage.

SLIDE 20: MT. ALBION CHERT FREQUENCY PIE CHARTS (AGAIN)

At Mt. Albion West, Fossil Hill formation chert comprises about 8% of the debitage assemblage, but around 27% of the tool assemblage. This disparity suggests curation of Fossil Hill chert, and this hypothesis is supported by Dr. Peter Storck’s detailed analysis of the tool assemblage.

SLIDE 21: CHERT DEPLETION BY TOOL CATEGORY GRAPH

He notes that, whereas roughly half of the Onondaga chert tools are bifacial, only one-fifth of the Fossil Hill tools are bifacial. These ratios reverse as the sophistication of the tool decreases, with only a quarter of Onondaga chert being spontaneous or expedient tools while half of the Fossil Hill tools are expedient. He suggests that these trends may indicate that the Fossil Hill tools had been in the toolkit longer and were gradually being recycled, with broken and re-sharpened bifaces being turned into unifaces and unifaces turned into expedient tools. In contrast, relatively more bifacial tools of Onondaga chert were being discarded, likely due to their predominance in the toolkit as a result of the greater availability and probably more recent exploitation of Onondaga chert.

SLIDE 22: DAN LONG’S GAINEY POINT (AGAIN)

In his 2004 comparative analysis of the knappability of these three toolstones, Dan Long considered Onondaga chert to be the toughest, most consistent and predictable in fracture characteristics, and available in the largest pieces. He also described it as being relatively “forgiving” with respect to imprecise percussive blows that would have ruined specimens of more delicate material. All of these attributes would have been highly desirable to knappers of large, technically demanding, bifacial tools such as fluted points.

In contrast, Dan found Fossil Hill Formation chert to be highly variable, even within a given specimen, ranging from a tough and vitreous gray variant, through a slightly less vitreous but more predictable white variant, to a mixed variant of gray and white that had poor tensile strength and was crumbly when flaked. He also noted that Fossil Hill chert exhibits numerous vertical fractures within the rather thin beds, tending to limit the creation of the largest possible blanks to vertically oriented blocks. The resulting tendency of large fluted points to be oriented perpendicular to the bedding plane bands in the chert has been discussed by Roosa and Ellis (2000: 84-85). Given these attributes, Dan Long suggested that Fossil Hill chert may have been retained for its aesthetic value if more knappable cherts were readily available. Other researchers have noted that the white colour of the chert may have been an important attribute to early knappers.

The third toolstone, Goat Island Formation chert, was found to exhibit the lowest tensile strength of the three and was thus easiest to knap. The corollary of this, however, was its greater delicacy. It was also less vitreous, and its chalkiness resulted in more step fracturing. The largest limitation of Goat Island chert noted by Dan Long was the small, cubical nature of the source material, which severely limited the size of the bifaces that could be produced. Nevertheless, he thought that Paleo-Indian knappers would probably have used Goat Island chert to make fluted points in addition to more preferred materials (personal communication to Ron Williamson). The presence of a small but significant variety Goat Island chert tools, including bifacial preforms, suggests that the Mt. Albion West Paleo-Indians were using it at least for making unifacial or expedient tools if not fluted points. Moreover, such a ready source would have provided an opportunity for novice flintknappers to practice their craft without any worry of expending a valuable resource.

THE ARCHAEOLOGICAL EVIDENCE

SLIDE 23: EXCAVATION CREW

Following the initial reconnaissance survey and test excavations, salvage excavation of the Mt. Albion West site involved the hand excavation of 801 square metres of ploughzone. All topsoil was processed through 3 millimetre screen. The boundaries of artifact concentrations were defined by a threshold recovery rate of less than 10 pieces of Onondaga and/or Goat Island debitage per square metre, less than two artifacts or pieces of debitage of Fossil Hill chert, or the complete absence of artifacts. Four Early Paleo-Indian artifact concentrations plus a small dispersed group of surface discoveries were identified.

SLIDE 24: PREFORMS

A total of 319 complete or fragmentary stone tools, excluding channel flake fragments, was recovered. Twenty-eight artifacts were identified as bifacially worked preforms.

SLIDE 25: POINTS

One complete Gainey point and three basal Gainey point fragments were recovered, as well as eight fluted point fragments of undetermined type. Forty-two channel flakes were also recovered, including four bases and 38 midsection fragments.

SLIDE 26: SCRAPERS

Sixty complete and fragmentary end scrapers were recovered, as well as 7 side scrapers, 1 denticulate scraper fragment, 7 beaked scrapers, and various scraper fragments.

SLIDE 27: GRAVERS

The remainder of the tool assemblage consisted of 12 flake gravers,

SLIDE 28: COMBINATION TOOLS

7 combination tools, featuring various combinations of spokeshave, graving, scraping, and cutting elements, and 90 fragments of unidentified, unifacially worked tools.

SLIDE 29: DEBITAGE PIE GRAPH

In addition to tools and tool fragments, 9,907 pieces of debitage were recovered. Approximately 71% consisted of flake fragments and shatter. Of the complete flakes, the distribution was strongly skewed towards the late end of the lithic reduction continuum. Biface retouch flakes constituted the most common type at 11%, followed by late stage biface thinning flakes at 9% and early stage biface thinning flakes at 7%. Flakes attributed to primary reduction accounted for less than 1% of the assemblage, and various types of cores were similarly rare. The predominance of biface thinning flakes in the debitage assemblage suggests that chert was likely brought to the site as large flake blanks and preforms where they were refined into a variety of bifacial and unifacial tools including the production of some fluted points. The majority of the Fossil Hill chert debitage may have been derived from the re-sharpening and re-working of stone tools that were originally manufactured elsewhere.

SLIDE 30: TOOL AND TOOLSTONE CONTOUR MAP

Of the four principal artifact concentrations at Mt. Albion West, Area A consisted of a diffuse scatter of 48 tools and tool fragments distributed over an area of 153 m^2. It is notable in that the six preforms recovered there represent all four of the reduction stages defined for the analysis. In addition, this area produced two Goat Island chert preforms, both representing early stages of reduction.

Area B was a fairly dense concentration of 174 Paleo-Indian tools, tool fragments, and channel flake fragments occurring over an area of 240 m^2. These occur within a spatially discrete concentration of Fossil Hill debitage showing four centres of peak density. Area B produced nearly half of the preforms, 5 of the 10 fluted biface fragments, all 4 of the channel flake bases, and all but one of the 42 channel flake mid-section fragments from the site, suggesting that fluted biface production was an important activity in this area. It also yielded 27 of the 39 end scrapers from the site, suggesting that Area B was generally an area of greater activity, either in duration or intensity, or both.

Area C was a diffuse scatter of 17 Paleo-Indian tools over an area of 104 m^2 that appeared to be physically separated from Area B. Area D was a diffuse scatter of 19 Paleo-Indian tools/tool fragments over an area of 117 m^2 that appeared to be spatially distinct from the tools in Area C. Areas C and D are noteworthy primary for the 2 preforms and 2 fragments of fluted bifaces that each area produced.

While we can conclude that Gainey complex Early Paleo-Indians used all areas of Mt. Albion West, pending further analysis, we cannot currently say when or how these areas may have been used relative to one another.

CONCLUSIONS

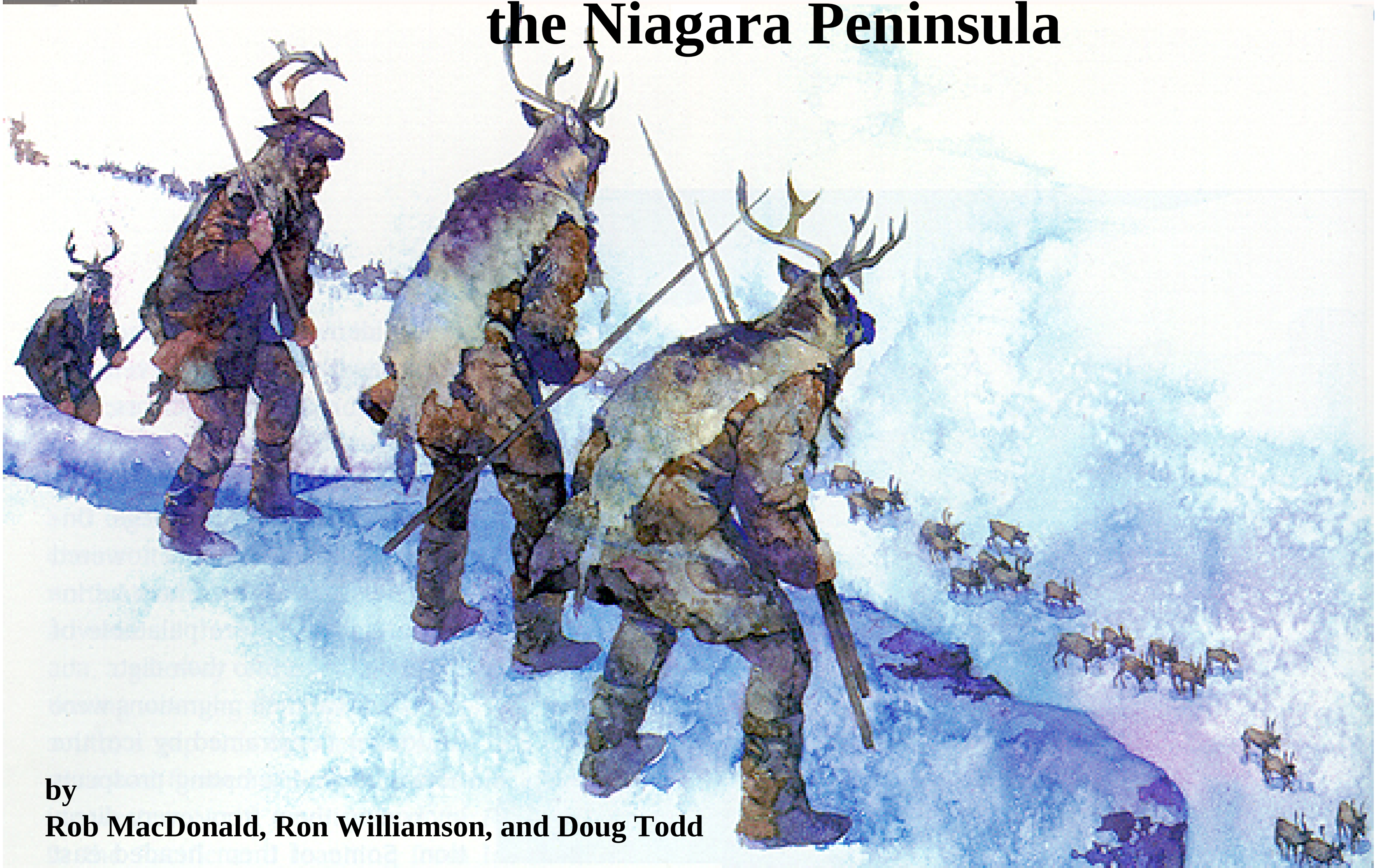
SLIDE 31: OBLIQUE AERIAL OF MT. ALBION AND RED HILL VALLEY

In conclusion, the Mt. Albion West site has opened a small but very important window into the Gainey complex occupation of the Niagara peninsula, thereby significantly expanding our understanding of Early Paleo-Indian lifeways in the lower Great Lakes area. As we often see with important pre-contact Aboriginal settlements, the Mt. Albion site location offered more than one advantage. One of these was its proximity to a toolstone source. Although perhaps not the preferred raw material, neither was it without utility, and one could imagine the rationale for its exploitation to run along the lines of “a Goat Island preform in the hand is worth two Onondaga preforms in the bush.” Another important factor that likely influenced this choice of campsite was no doubt the site’s strategic location at the brow of the Niagara Escarpment immediately adjacent to the Red Hill Creek re-entrant valley, one of the few access points between the Lake Ontario and Lake Erie basins. During the Late Pleistocene, this location would have been nearly equidistant from the strands of early Lakes Ontario and Erie, and may have been an important transfer node for game such as caribou moving between these areas. The pattern of chert exploitation revealed at Mt. Albion suggests considerable band mobility, with significant use of both Onondaga and Fossil Hill Formation cherts. However, in contrast with other Early Paleo-Indian groups in south-western and south-central Ontario which seem to focus almost exclusively on Fossil Hill chert, this band seems to have made greater use of regionally available cherts, especially Onondaga, but also Goat Island and Haldimand chert. Yet to be determined is whether this pattern of chert exploitation reflects a band that had recently moved into the Niagara peninsula with a residual supply of Fossil Hill chert in their toolkit, or a band that actually travelled between the Onondaga and Fossil Hill chert outcrops on an annual round, possibly using Mt. Albion as an important seasonal base camp.

SLIDE 32: PROJECT PERSONNEL

SLIDE 33: ACKNOWLEDGEMENTS

Reflections on Early Holocene Chert Use in the Niagara Peninsula



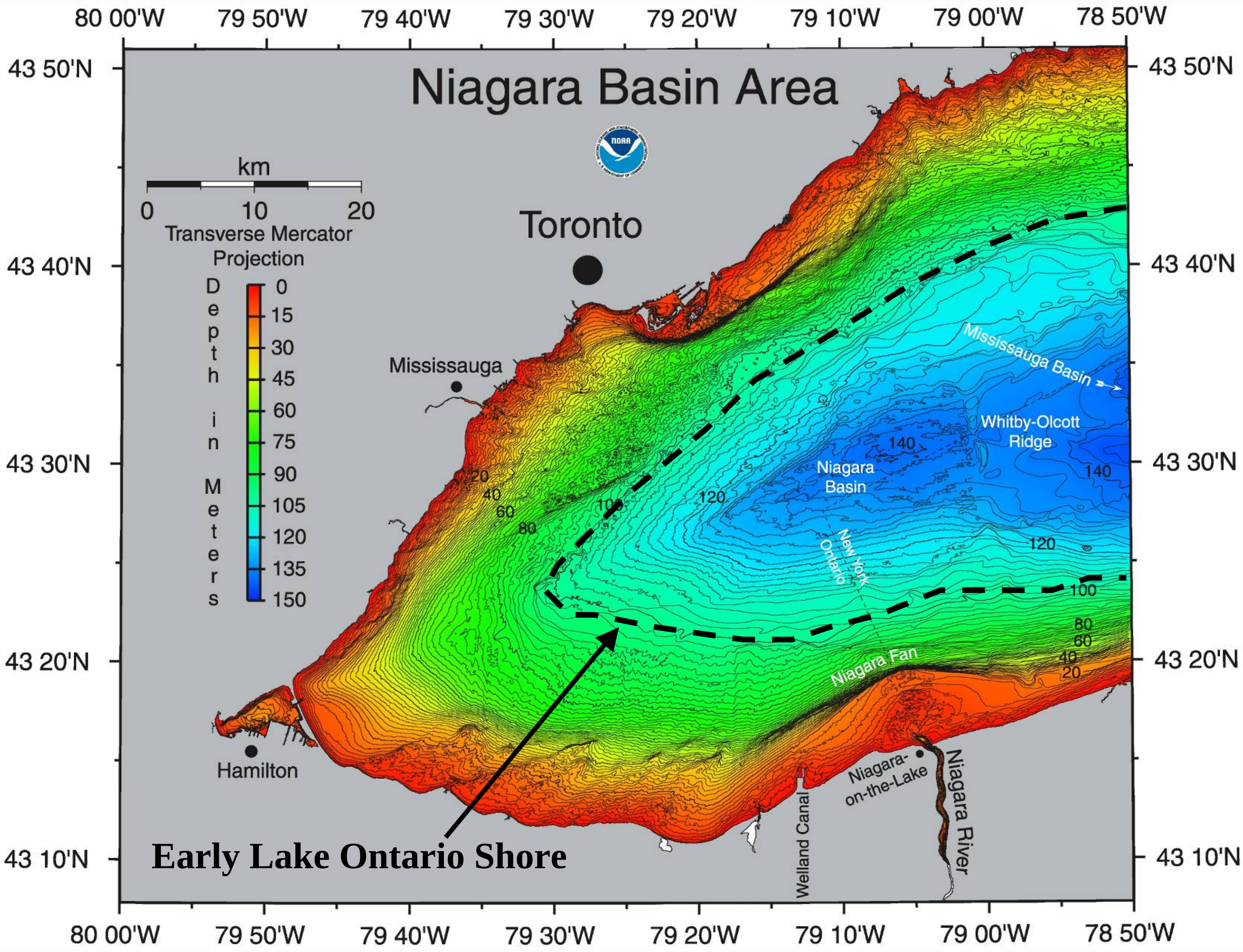
by
Rob MacDonald, Ron Williamson, and Doug Todd

Archaeological Services Inc. 528 Bathurst Street Toronto, Ontario M5S 2P9

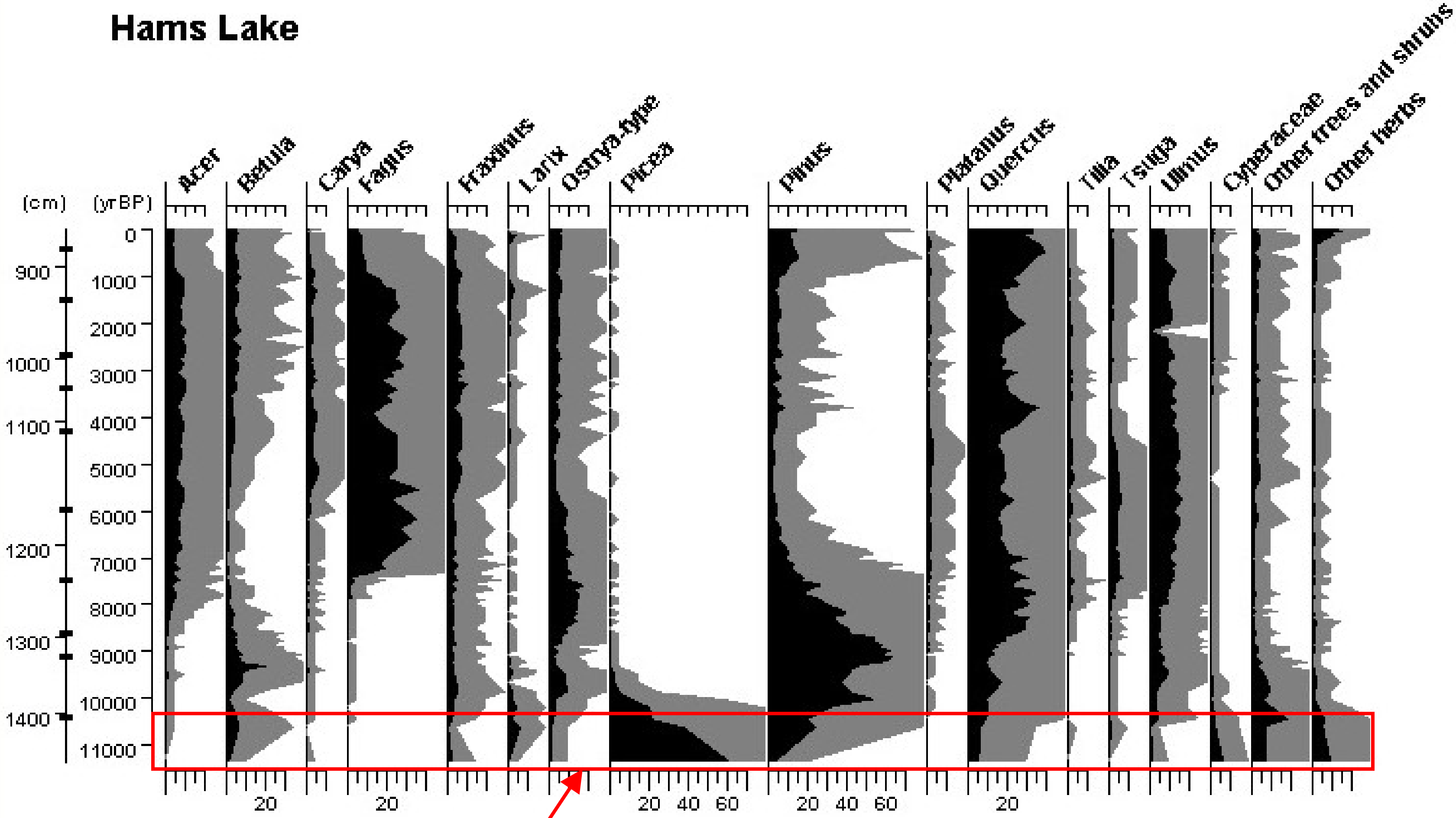
Northeasterly Overview of Mt. Albion West Site Environs – City of Hamilton

image courtesy of Google Earth

Early Lake Ontario Shore ca. 11,000 B.P.



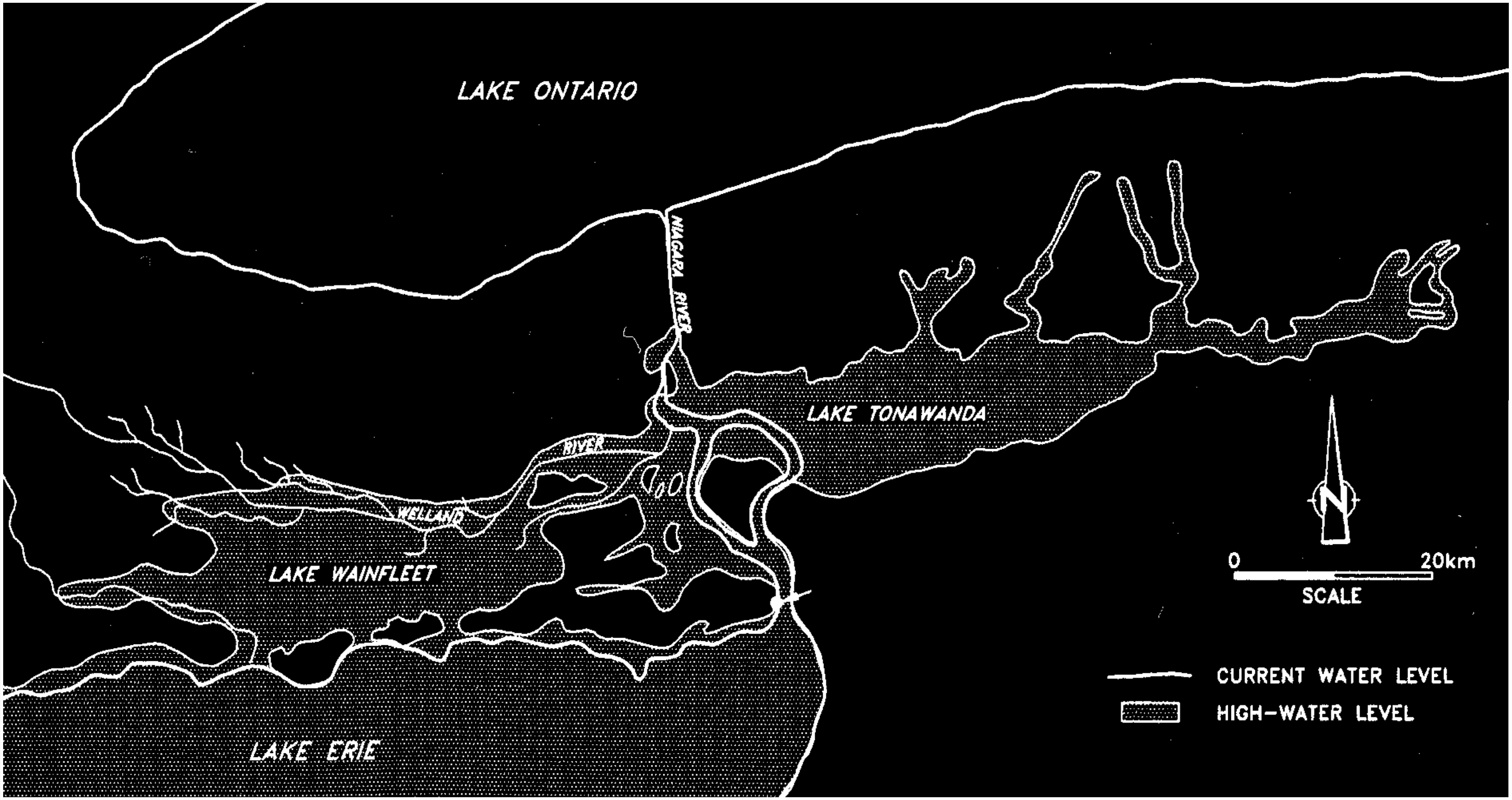
Pollen Spectrum Showing Early Paleo-Indian Period Vegetation



Early Paleo-Indian Period

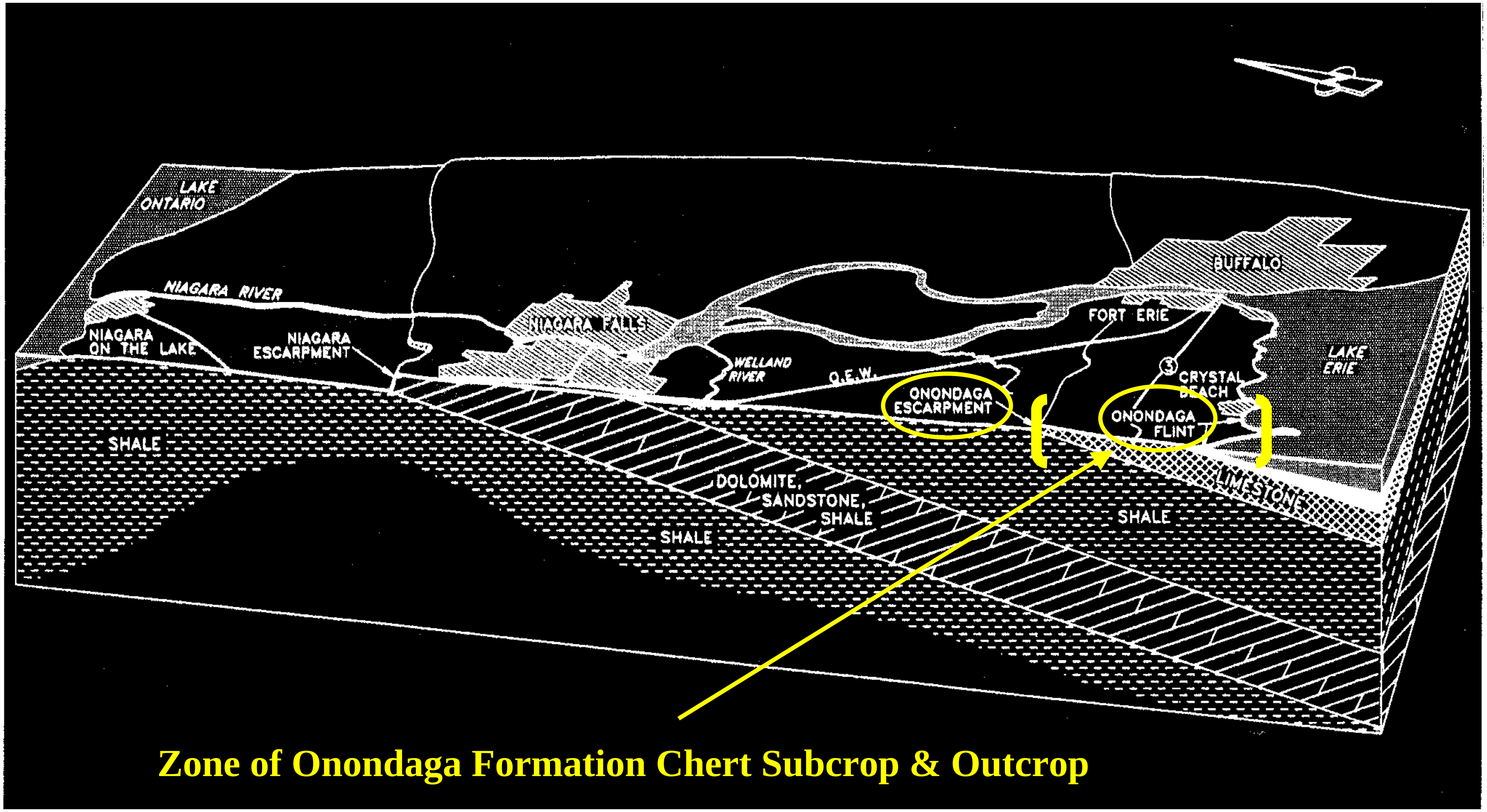
Transition from Spruce Parkland to Spruce Forest

Early Lake Erie ca. 11,000 B.P. – Lake Wainfleet/Tonawanda Transgression

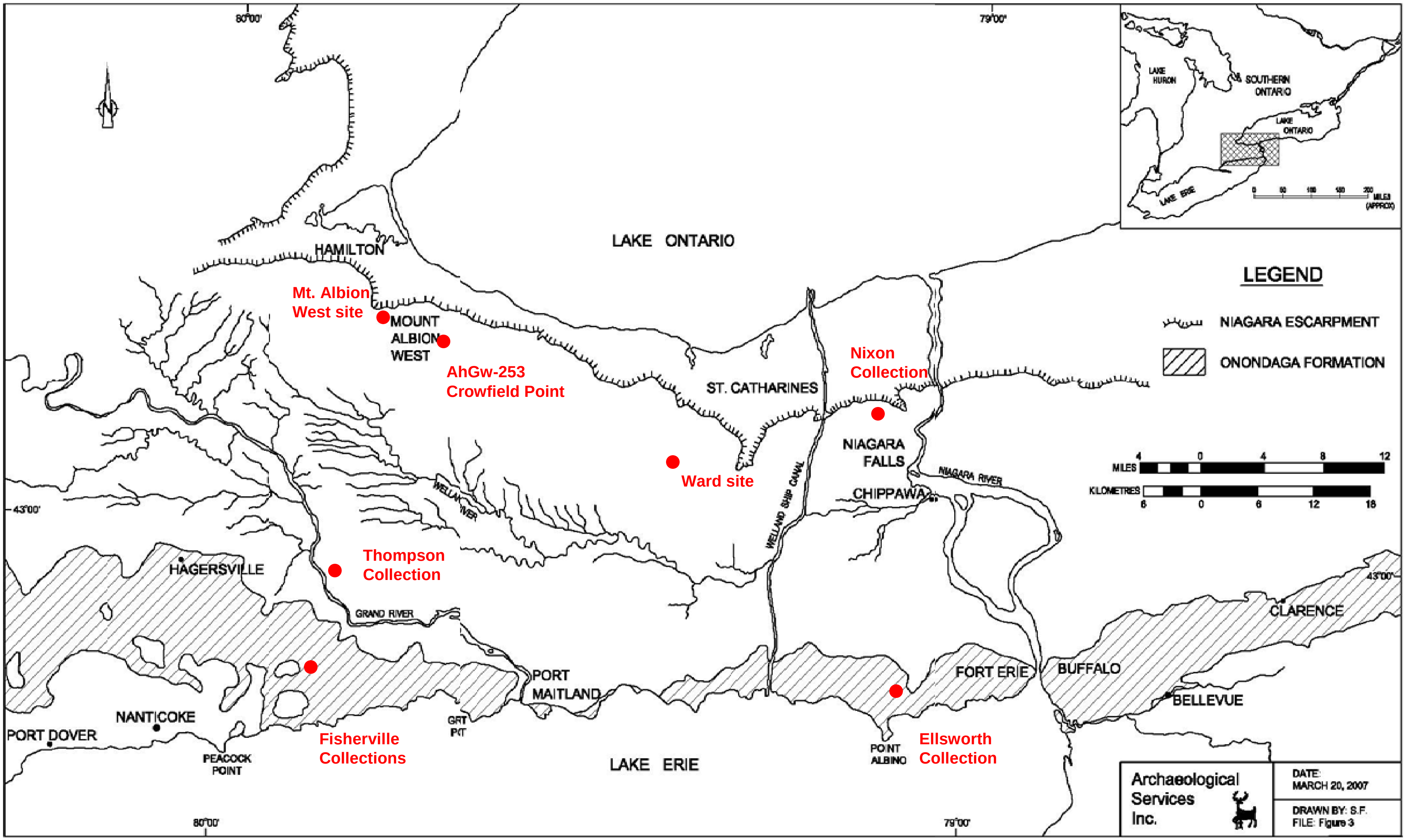


after Tinkler *et al*. 1992

Cut-away Diagram of Niagara Bedrock Stratigraphy



Distribution of Onondaga Chert and Fluted Points in Niagara



Crowfield Point – AhGw-253

Photo: ASI

Nixon Collection – St. Catharines Museum

Photo: Doug Todd

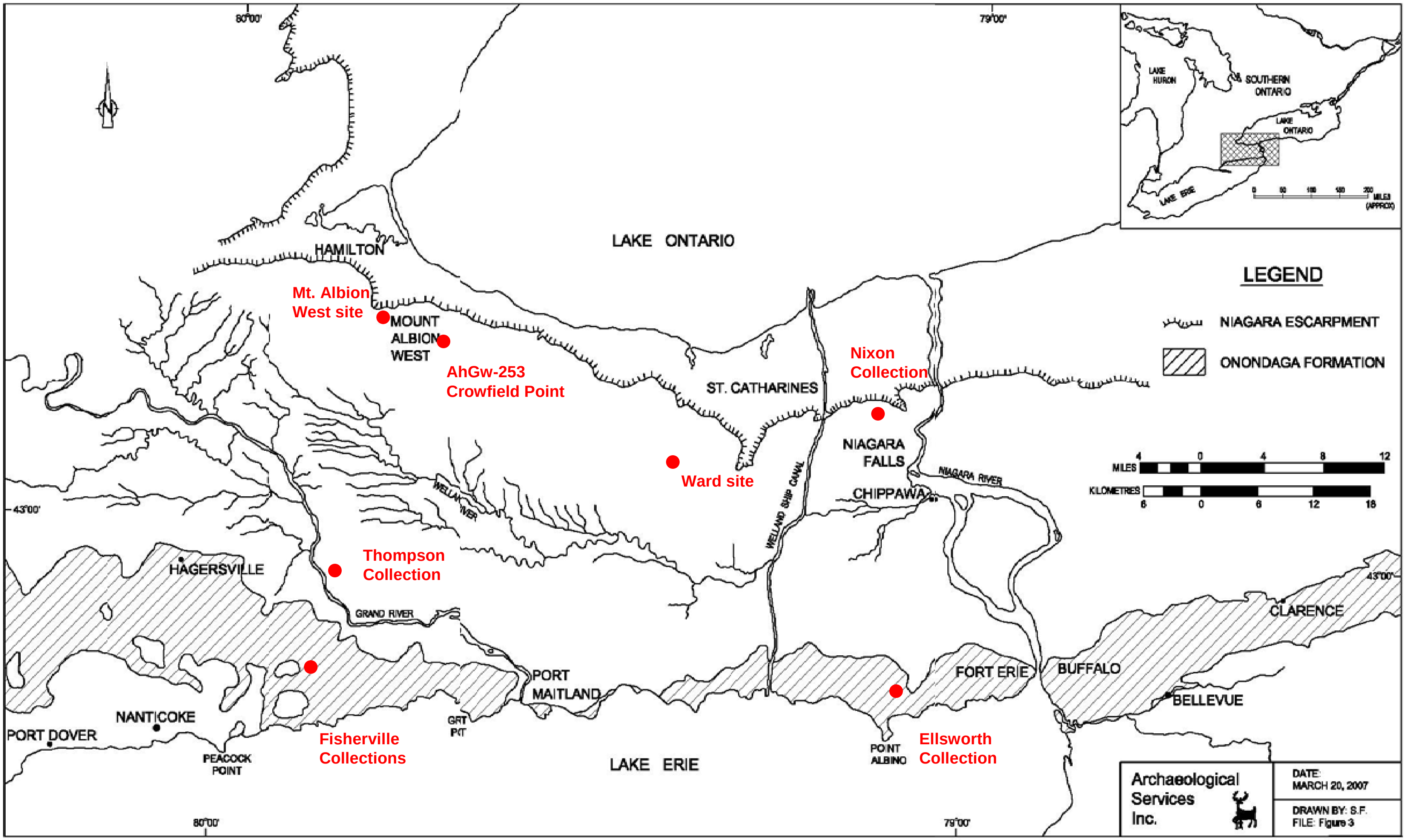
Ellsworth Collection – Fort Erie

Photo: Martin Cooper

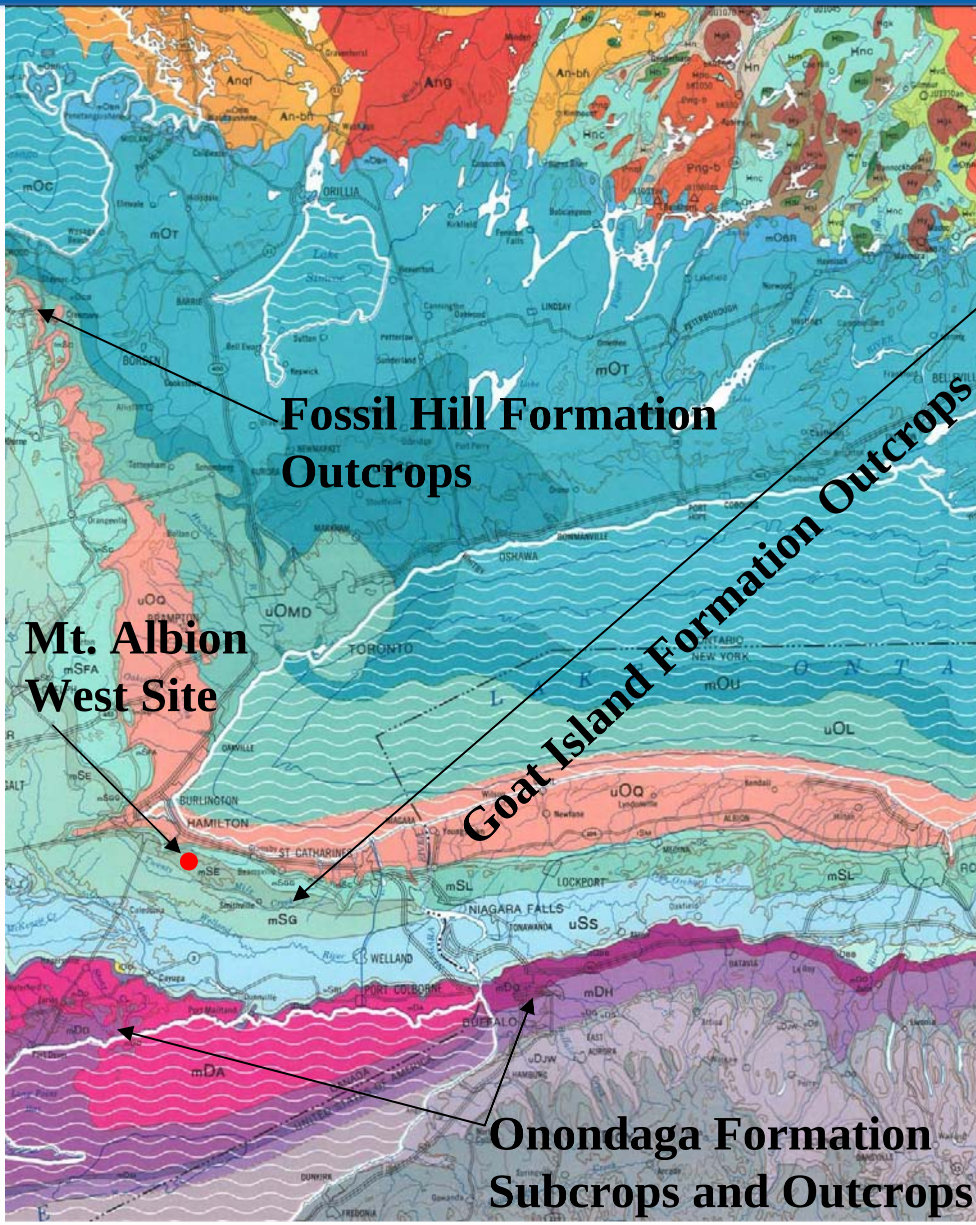
Thompson Collection – Cayuga

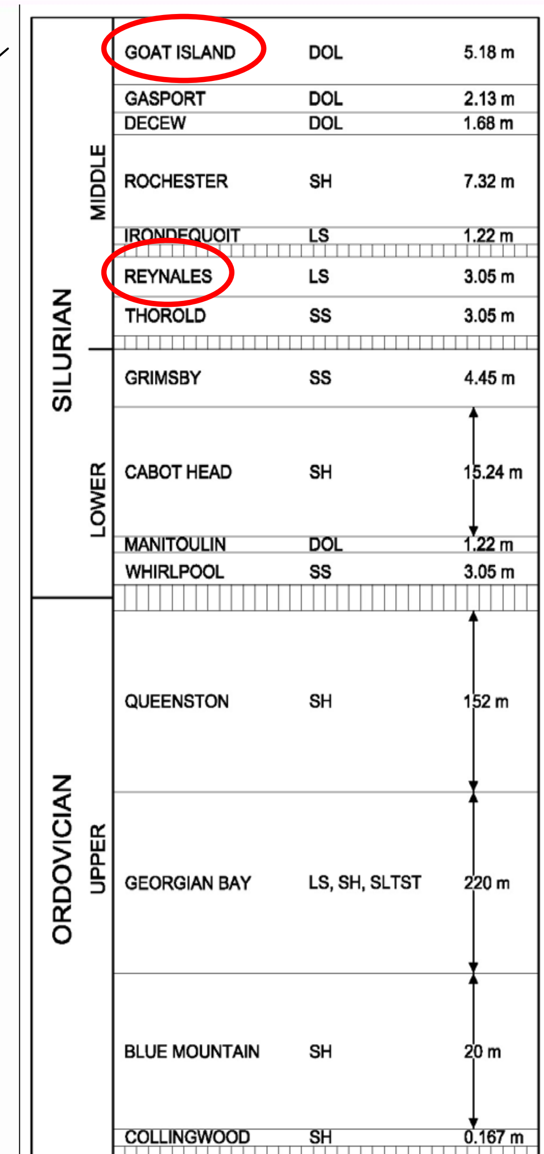
Photo: ASI

Distribution of Onondaga Chert and Fluted Points in Niagara



Chert Sources



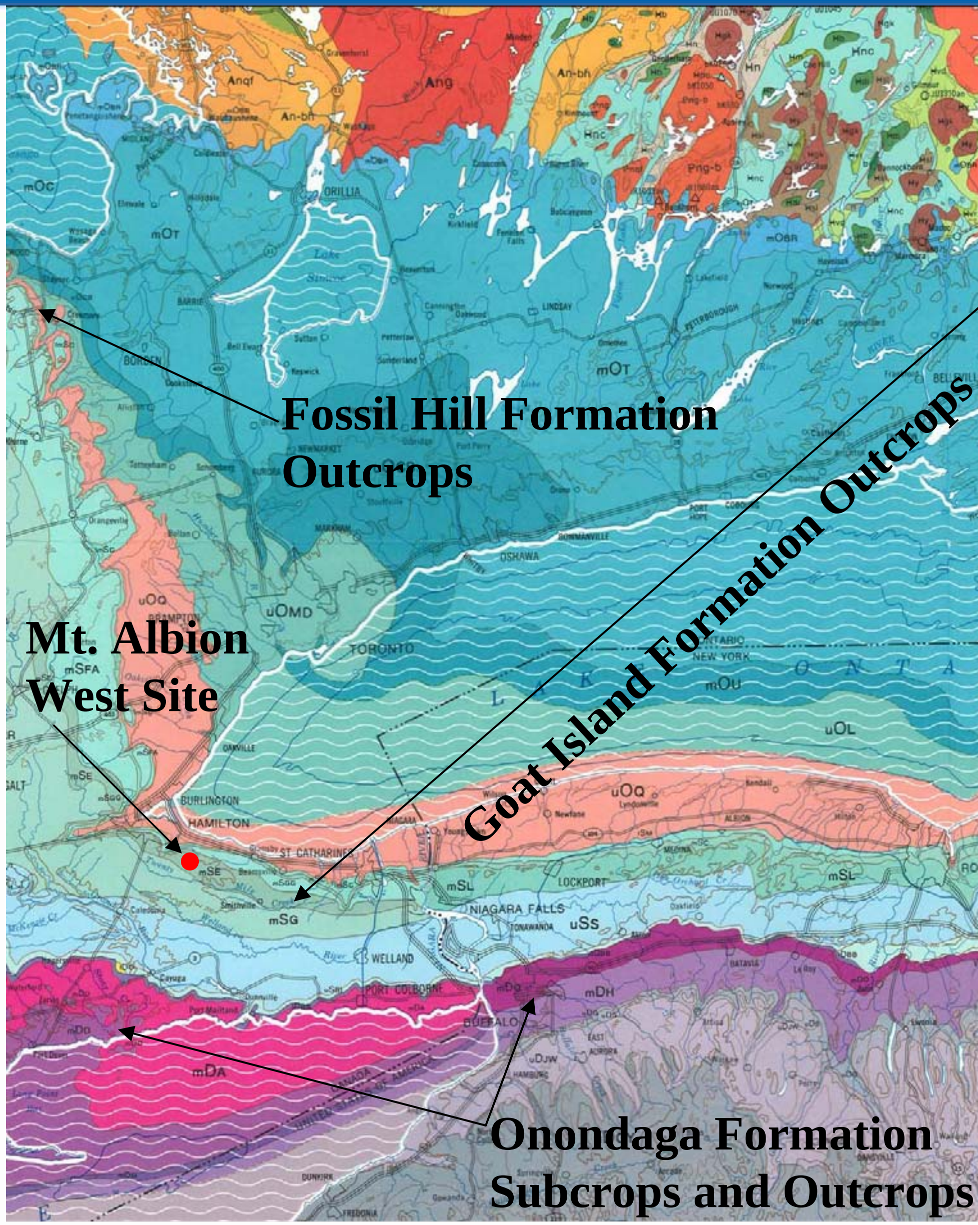


geology by Dr. Peter von Bitter

Replica Gainey Point on Goat Island Formation Chert by Mr. Dan Long

Mt. Albion West Site: Natural Goat Island Chert Chunks & Shatter

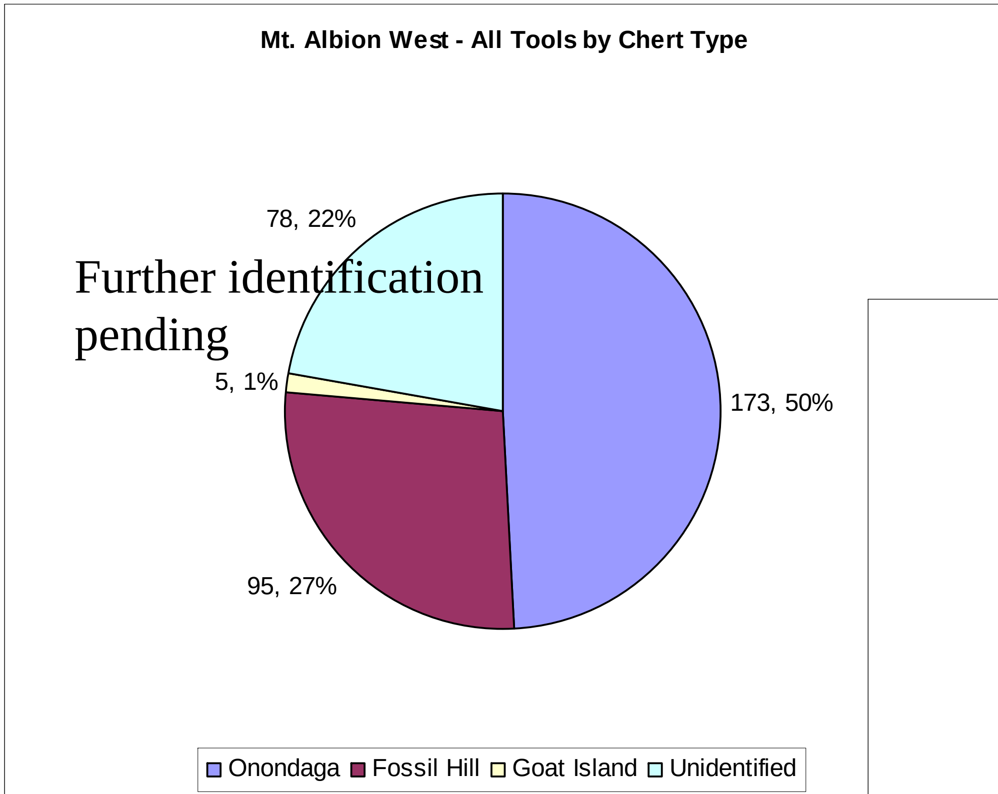
Chert Sources



SILURIAN	MIDDLE	GOAT ISLAND	DOL	5.18 m
		GASPORT	DOL	2.13 m
		DECEW	DOL	1.68 m
		ROCHESTER	SH	7.32 m
		IRONDEQUOIT	LS	1.22 m
		REYNALES	LS	3.05 m
		THOROLD	SS	3.05 m
	LOWER	GRIMSBY	SS	4.45 m
		CABOT HEAD	SH	15.24 m
		MANITOULIN	DOL	1.22 m
		WHIRLPOOL	SS	3.05 m
ORDOVICIAN	UPPER	QUEENSTON	SH	152 m
		GEORGIAN BAY	LS, SH, SLTST	220 m
		BLUE MOUNTAIN	SH	20 m
		COLLINGWOOD	SH	0.167 m

geology by Dr. Peter von Bitter

Initial Chert Type Identifications



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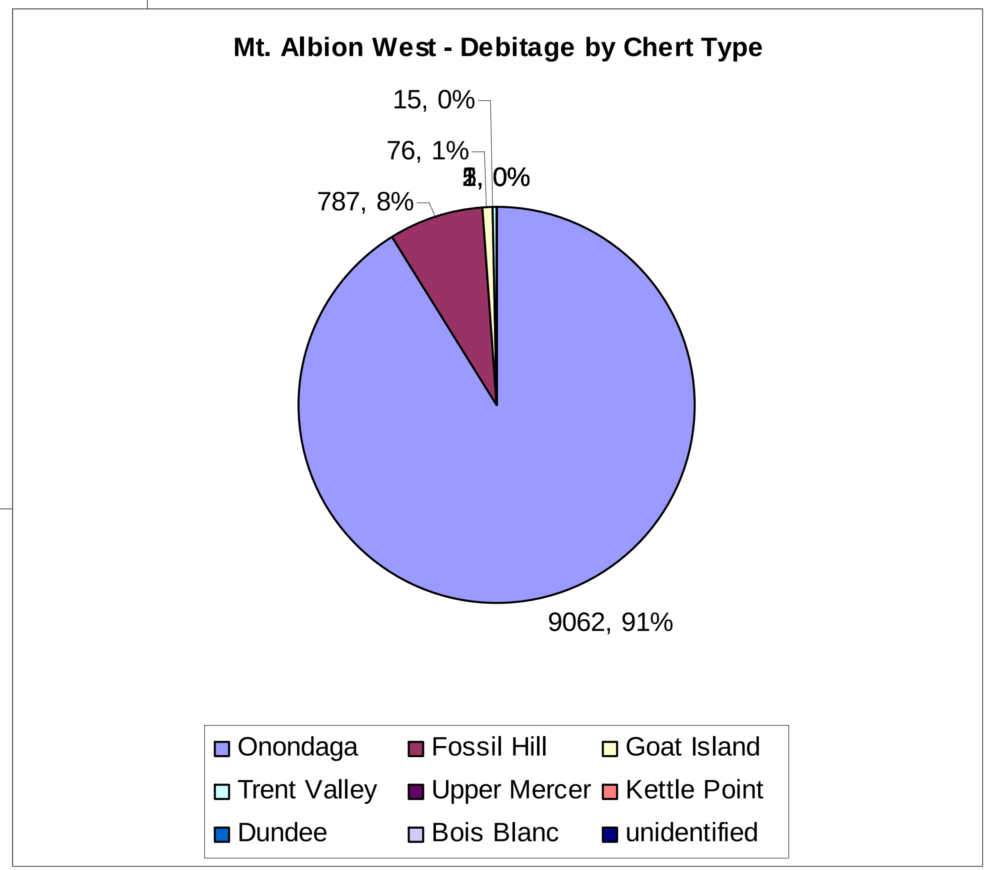

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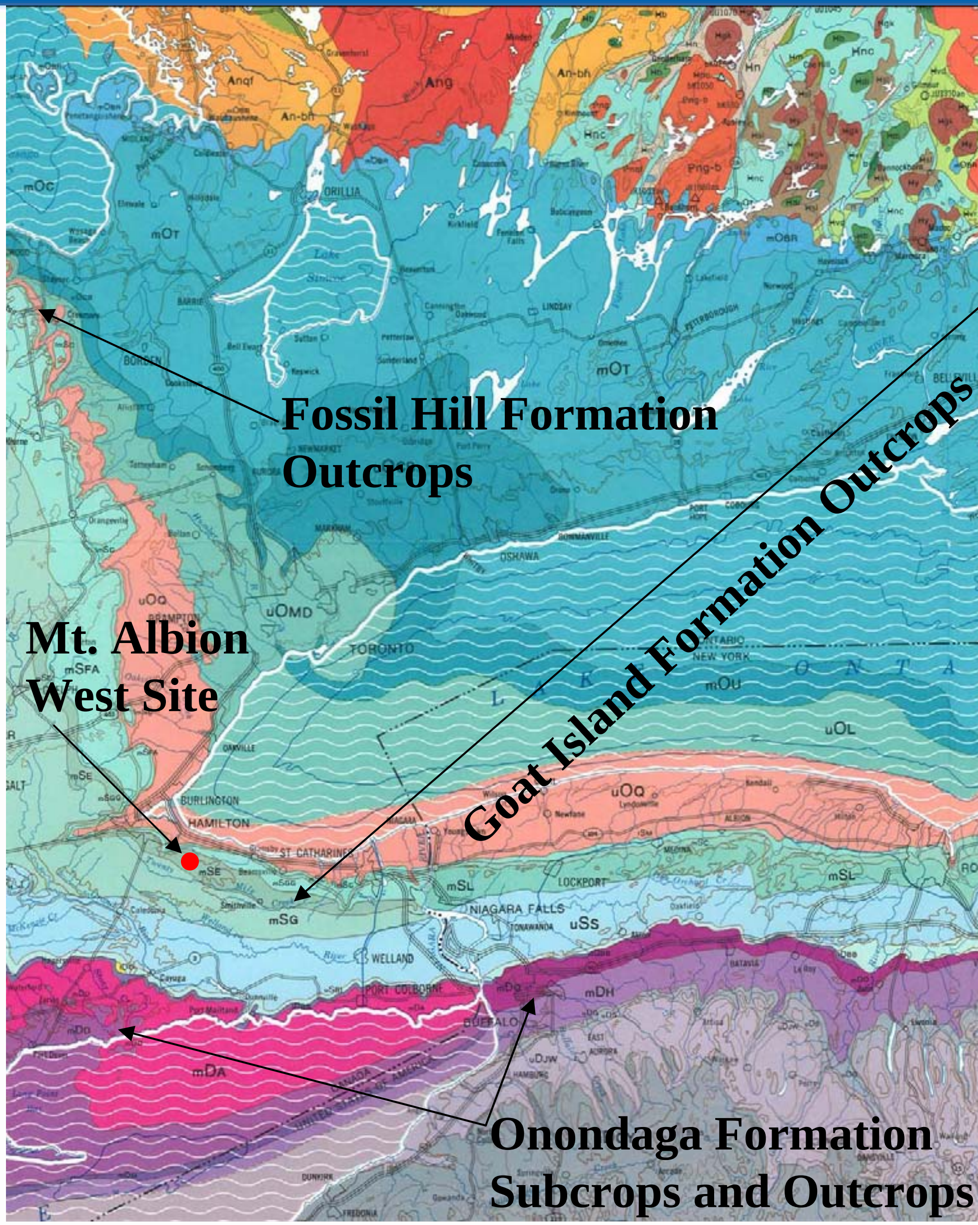

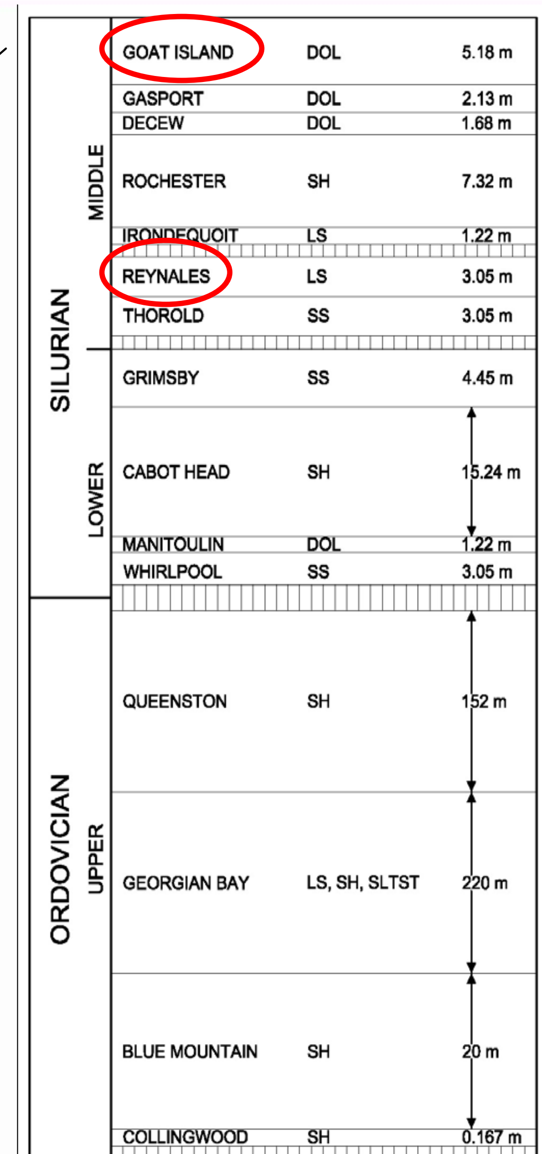

geology by Dr. Peter von Bitter

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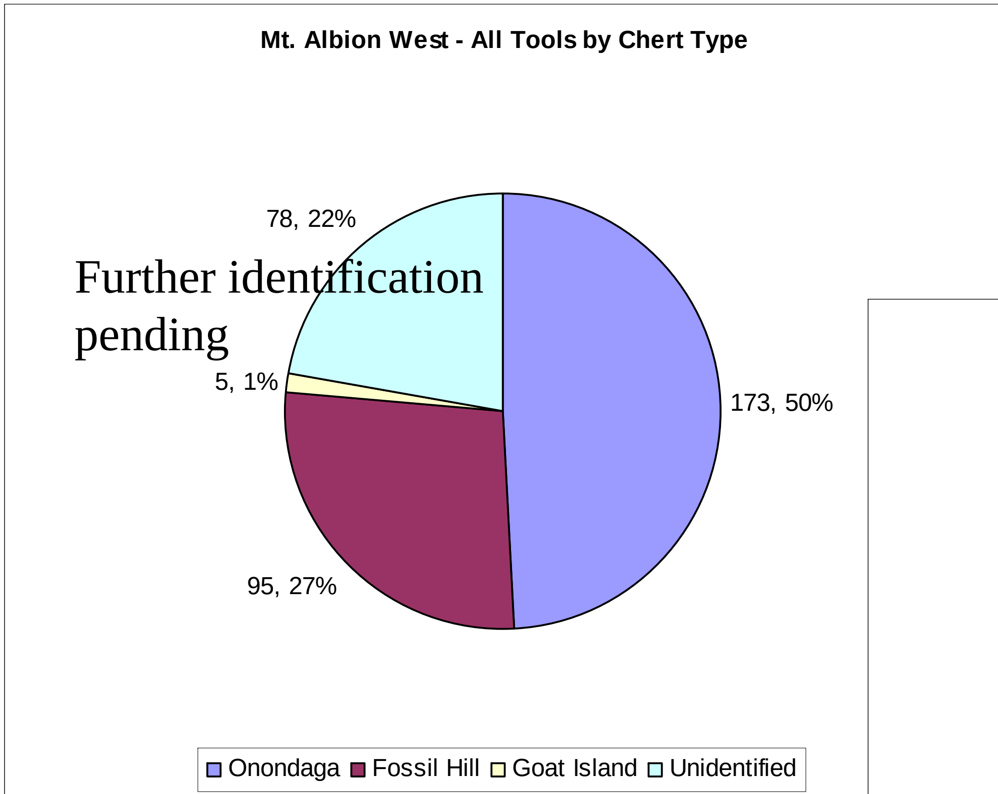

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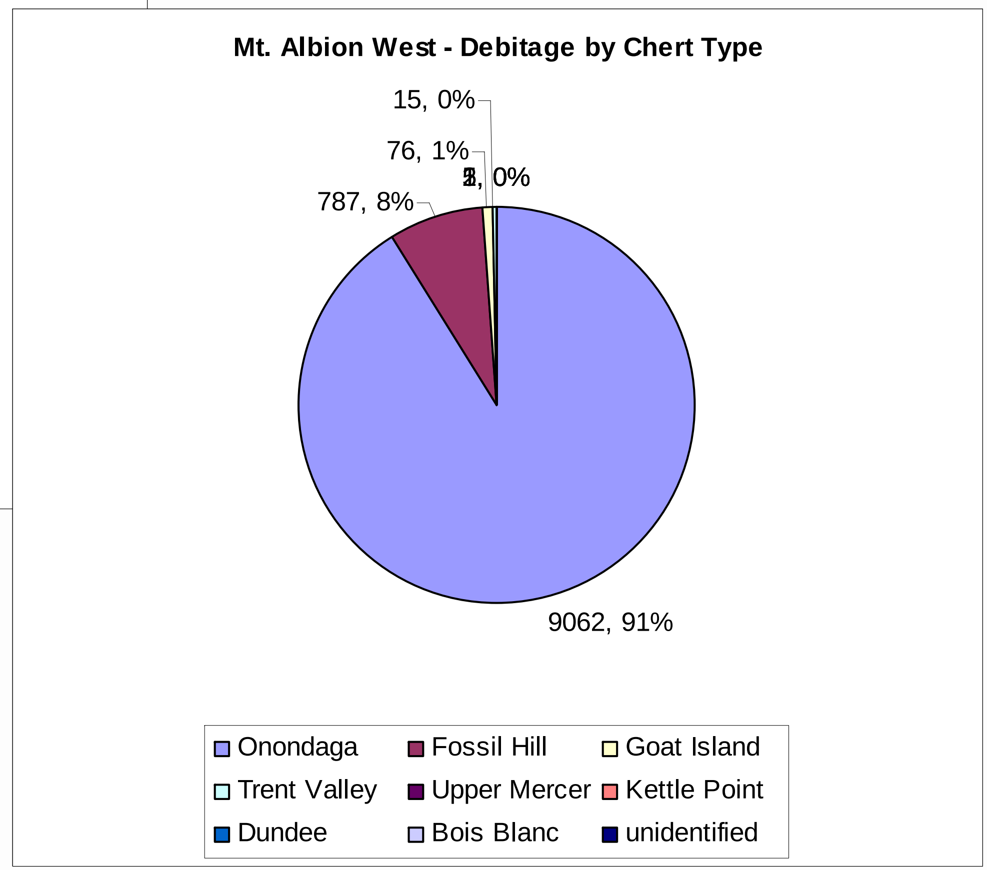
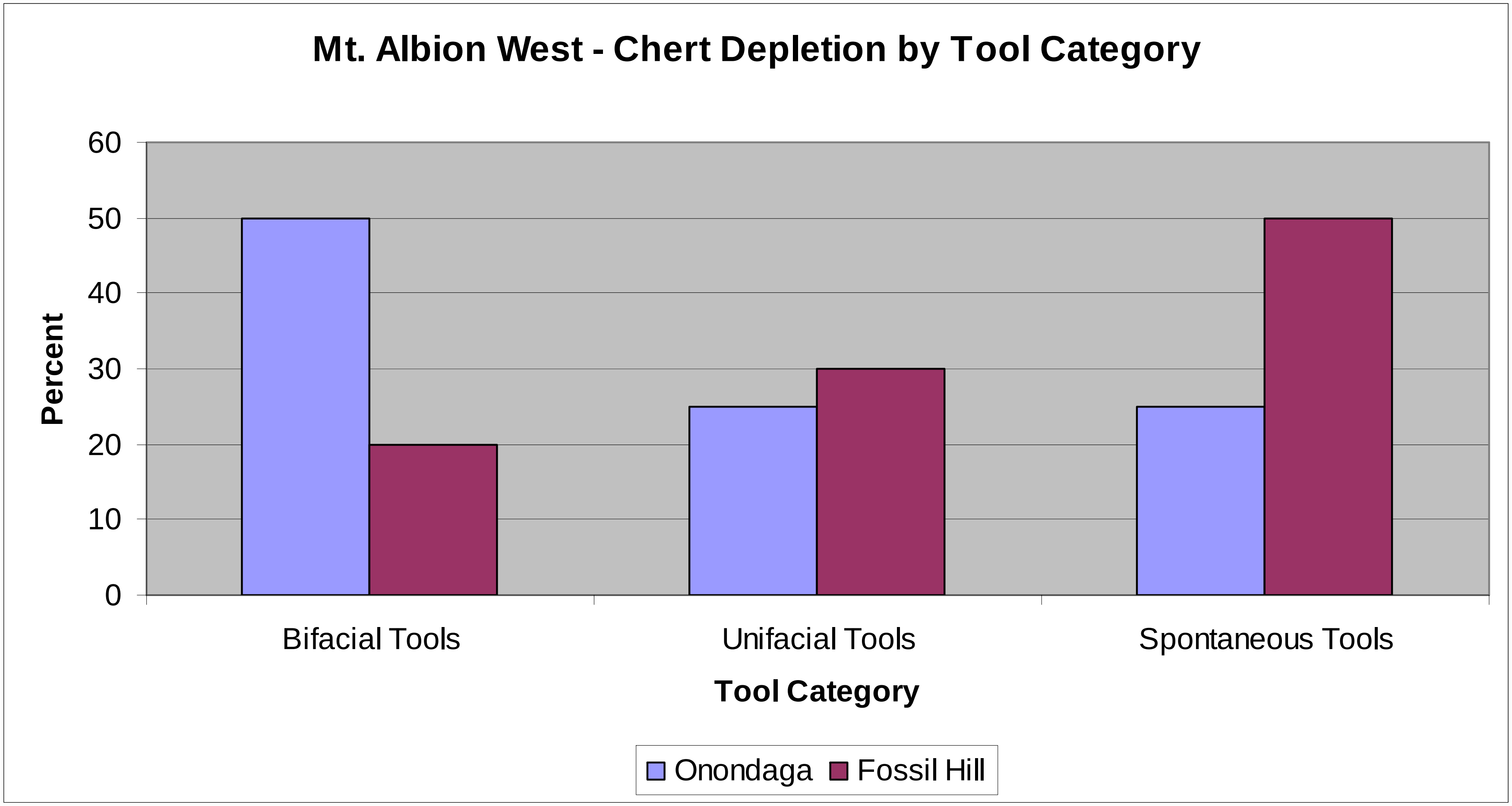


Chert Depletion by Tool Category



analysis by Dr. Peter Storck

Replica Gainey Point on Goat Island Formation Chert
by Mr. Dan Long

Mt. Albion West Site (AhGw-131): Excavations

Mt. Albion West Site (AhGw-131): Preforms

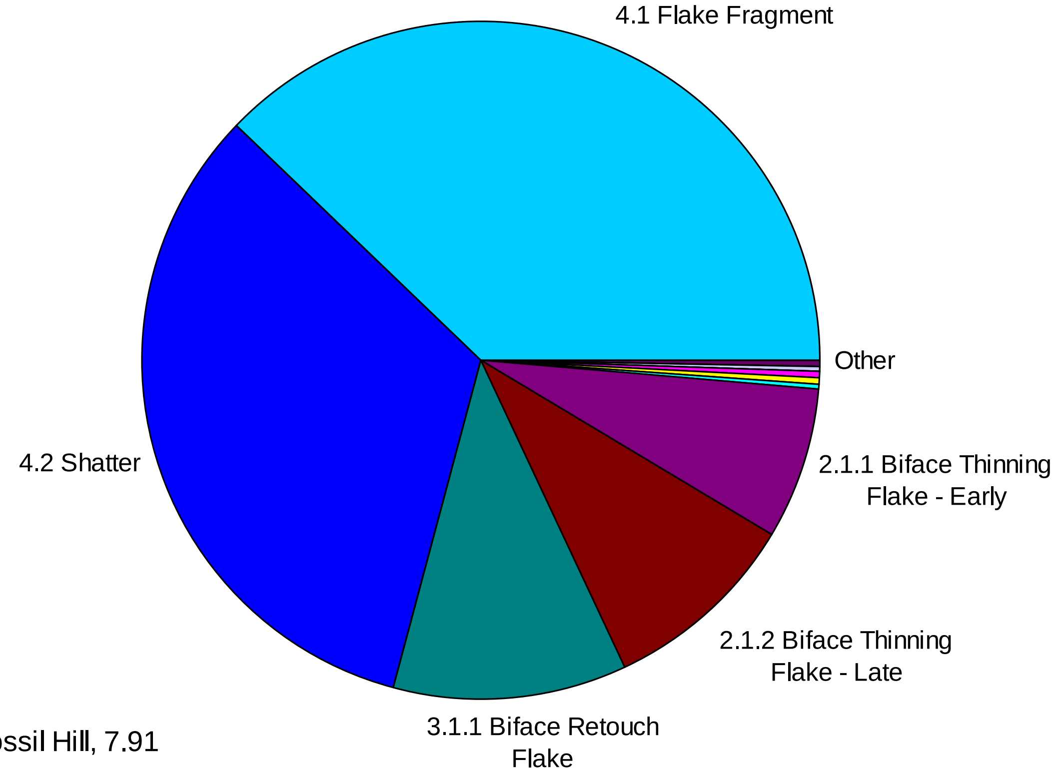
Mt. Albion West Site (AhGw-131): Fluted Points

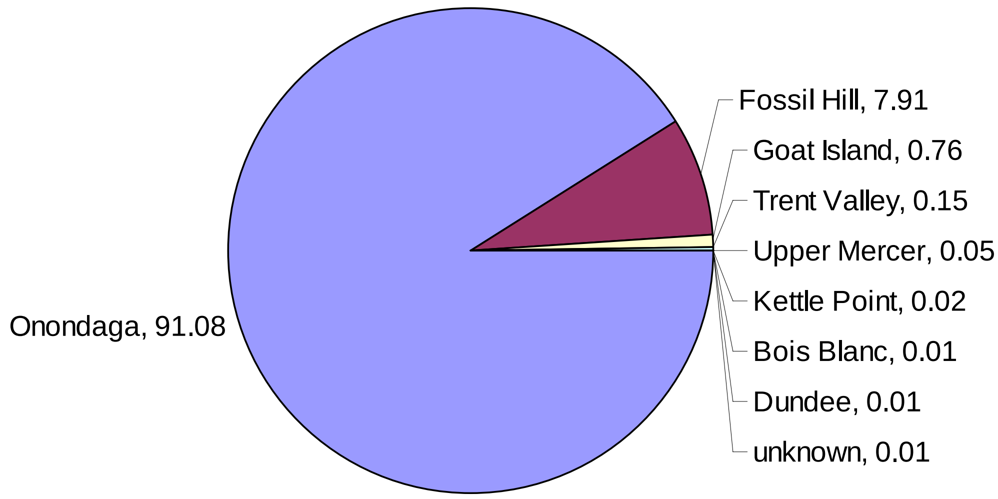
Mt. Albion West Site (AhGw-131): Scrapers

Mt. Albion West Site (AhGw-131): Gravers

Mt. Albion West Site (AhGw-131): Combination Tools

Mt. Albion West Site (AhGw-131): Debitage Analysis





Mt. Albion West Site – Distribution of Tools and Debitage

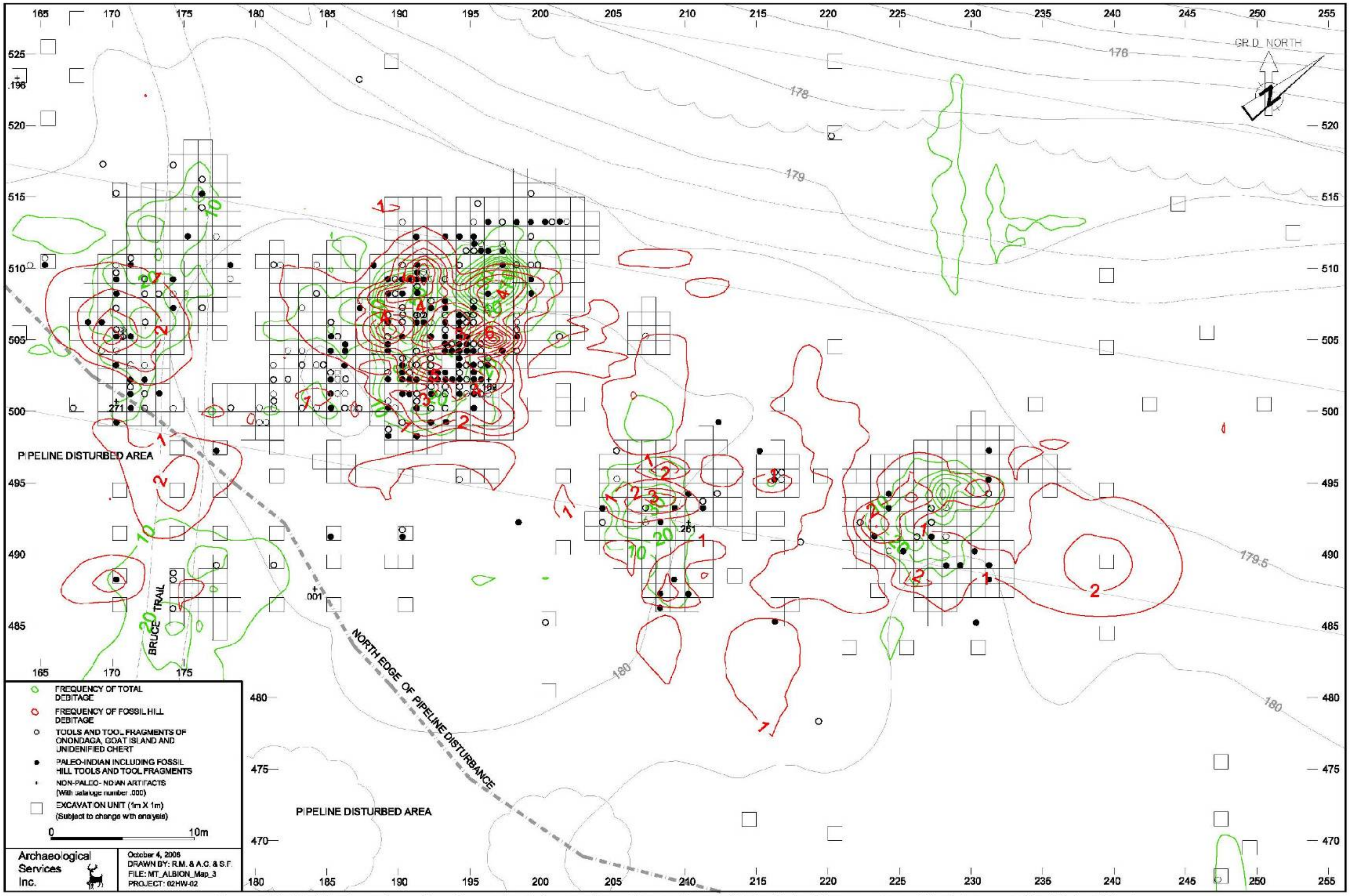


Figure 10: Distribution of combined samples (diagnostic and non-diagnostic) tools/tool fragments and toolstones at Mt. Albion West

Southwesterly View of Mt. Albion West Site Environs

image courtesy of Google Earth

Project Personnel

Project Directors:	Robert I. MacDonald Peter Storck Ronald F. Williamson	
Project Archaeologists:	Greg Braun Andrew Clish	Heidi Ritscher Christopher Watts
Field Archaeologists:	Shaun Austin Kristi Bates Dana Campbell Katherine Cappella Andrea Carnevale George Clark Lana Crucefix Sonya Ellis Jeremy Galea Kevin Gibbs Cara Howell Shelly Huson Tara Jenkins	Stewart Jones Vivian Livojevic Mark Mahood Jennifer McKee Irena Miklavcic Chris Moore Rob Pihl Susan Scozzaro Andrew Stewart Mike Tetreau Doug Todd Bruce Welsh
Laboratory Manager:	Kristine Crawford	
Artifact Processing:	Kristine Crawford Tara Jenkins Danielle Macdonald	
Analysis & Report Preparation:	Robert I. MacDonald[1] Andrew Stewart[2] Peter Storck David Robertson[1]	Doug Todd[1] Peter von Bitter[3] Ronald F. Williamson[1]
Graphics:	Andrew Clish Sarina Finlay	Roberto Grillo Robert I. MacDonald
Report Compilation & Editing	Andrea Carnevale	

[1] Archaeological Services Inc.
[2] Strata Consulting
[3] Department of Natural History, Royal Ontario Museum & Department of Geology, University of Toronto

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