Ontario Archaeology

Journal of The Ontario Archaeological Society

Number 101 2021

© 2021 The Ontario Archaeological Society, Inc.

ISSN 0078-4672

The Ontario Archaeological Society

2021 Board of Directors
President: Jim Sherratt
Past President: Alicia Hawkins
Vice-President: Abbey Flower
Treasurer: Vacant
Director of Education: Kaitlyn Malleau
Director of Member Services: Joshua Dent
Director of Outreach: Craig Ramsoomair
Director of Heritage Advocacy: Jeff Seibert
Director of Publications: Kate Dougherty
Director of Chapter Services: Greg Braun

***Ontario Archaeology* editors**
Bonnie Glencross, Wilfrid Laurier University
Suzanne Needs-Howarth, Perca Zooarchaeological Research

From Grey to Print editor
Ronald Williamson, Archaeological Services Inc.

Profiles editor
Christopher Watts, University of Waterloo

Book Reviews editor
Alicia Hawkins, University of Toronto Mississauga

Copy editor
Trish O'Reilly-Brennan

Editorial Advisory Board
Matthew Boyd, Lakehead University
John Creese, North Dakota State University
Dena Doroszenko, Ontario Heritage Trust
Christopher Ellis, Sustainable Archaeology Facility, Museum of Ontario Archaeology & University of Western Ontario
Alicia Hawkins, University of Toronto Mississauga
Ronald Williamson, Archaeological Services Inc.

Photoshop editor
John Howarth (selected images)

Production and design
Cheryl Takahashi

Printer
Britannia Printers Inc. (an FSC® Certified Printer)

2021

Ontario Archaeology

Number 101 2021

Contents

Subscriptions

Subscription to *Ontario Archaeology* is through membership in The Ontario Archaeological Society. Address requests for further information, membership applications, and back issues to:

The Ontario Archaeological Society
1444 Queen St. E., Suite 102
Toronto ON M4L 1E1
Telephone: 416-406-5959
Email: info@ontarioarchaeology.org
Website: www.ontarioarchaeology.org

Articles appearing in *Ontario Archaeology* are abstracted and indexed in *America: History and Life,* which is hosted by EBSCO.

Information for Authors

Ontario Archaeology publishes articles on all aspects of archaeology in the Province of Ontario and adjacent regions. Both substantive descriptions and theoretical contributions will be considered. Authors must ensure that the manuscripts are prepared according to the journal's style guide before they are submitted (information available at https://www.ontarioarchaeology.org/ontario-archaeology). Electronic submission is via:

editor@ontarioarchaeology.org

History and Landscape Archaeology at the Nassau Mills, Peterborough (BcGn-11, BcGn-12, BcGn-23)

James Conolly and Kate Dougherty

We report on our recent work at the historic Nassau Mills, north of Peterborough, Ontario, at different scales of analysis. We review the historical context and transformation of the landscape following the settling of this region after the signing of Treaty 20 (1818) and describe the flow of capital and labour into this setting and the resulting impact of logging and mills on the local environment. At the household scale, we report on our excavation of a dwelling place that we interpret as being that of Charles Perry and family and its evolution as a structure before its eventual destruction during the formation of Trent University in the 1960s. We use our work to consider the wider transformative impact of early capital and how the modern university setting retains the traces of its former industrial heritage—but that this transformative phase of landscape history is routinely forgotten in favour of what is perceived as natural rather than anthropogenic.

In 2017 we initiated a landscape-focused research and teaching program centred on the historic community of Nassau Mills, now part of the Trent University campus in the north end of the City of Peterborough, Ontario (Figure 1). Our starting goals were to provide Trent University undergraduate students with a compelling and challenging fieldwork experience while developing a preliminary understanding of the ecological impact, economic organization, and social relations of Nassau's lumber industry at the landscape, community, and household levels. Our program incorporates historical and archive research, field survey, excavation, and material culture analysis. It builds on other fieldwork we have undertaken within the study region in the past decade. The objective of this introductory paper is threefold: first, to provide an overview of our work within its theoretical and historical context; second, to present the initial results of our historical landscape survey; and, third, to provide an initial summary of our recent field excavations and analysis of material culture.

Our engagement with the mills as a topic of interest began serendipitously, when Trent University's Facilities Management department proposed undertaking landscaping work in 2016. Although our involvement with this project was not triggered by the Planning Act, our engagement with this department on other capital projects emphasized the importance of cultural impact assessments for even minor ground disturbances. In this assessment, we identified the partially exposed foundations of a historical drystone wall, duly registered as BcGn-23. This became the focus of a Trent University field school in which we co-directed excavations and conducted an associated field survey of the landscape setting of the mill complex. The excavation diary (Trent Archaeology Field School 2017–) provides first-hand reflections on these topics through participants' eyes. Although the technical training exercise was the priority for field school students, we were motivated to introduce students to our interest in the landscape and the economic and political context of

Figure 1. *Location of Nassau Mills.*

nineteenth-century settler life in the Peterborough region.

Our wider theoretical motivation is driven by a view of historical archaeology as an important contributor to the study of the material and social processes involved in the development and spread of European capitalism over the past 500 years (Leone 2010), to the extent that "capitalism is the raison d'être of historical archaeology" (Prangnell 2020:117). In the context of our work at Nassau Mills, this position compels us to consider the operation at different scales. This starts with an examination of the economic lives and materiality of the community's inhabitants, extending to the structures and buildings in which they worked and lived. We also address larger scales, such as how the logging industry, both in a local and a national context, was part of a colonial-capitalist system focused on extracting resources at minimal cost and moving those resources to markets where wealth and political power were concentrated. This package of ideas can be succinctly described as a landscape of capitalism (Sayre 2000), in which the formation, organization, and evolution of the cultural landscape is directed by the demands of capital and the social structures it requires to operate effectively.

A host of authors have similarly used historical materialist perspectives to contribute understanding to how the wider processes of expanding European and then American colonial capitalism structure the historical archaeological record (e.g., Croucher and Weiss 2011; Johnston 1996; Leone 2010; Leone et al. 2005; McGuire 2006; Shackel 2020). In this regard, we can also point to earlier but important archaeological studies of North American industrialization by Gordon and Malone (1994) and the recent work on the archaeology of logging industries by Franzen (2020). The latter is particularly significant for its focus on using archaeology to explore social relations as well as the environmental change brought by logging at both local and global scales. In analogous settings to southern Ontario, comparative or site-specific studies of logging camps and mills in Wisconsin and Michigan provide informative case studies of the relationships among landscape, labour, and capital as expressed in the archaeological record (Dunham et al. 2021; Franzen 1992; Howe 2015; Rohe 1985, 1986).

We engage with similar themes and ideas in this paper, which has three main sections. We first present a short review of the history of the Nassau Mills (BcGn-11 [Red Mill] and BcGn-12

[Perry's Mill]), focusing on ownership history and capital investments, the evolution of the industrial landscape, and the fate of the complex in the twentieth century. Next, we turn to our excavation of one of the complex's structures (Structure 1—BcGn-23) and review its architecture and material culture, which provide insight into how the inhabitants were linked to the large-scale nineteenth-century networks of mobility and exchange. Finally, we look at the broader regional landscape and consider the role of the mill in the ecological transformation of the Kawarthas and the broader political and environmental impact of mills in this part of Ontario.

History and Landscape

The setting of this archaeological landscape project is the nineteenth-century community of Nassau Mills, located on both sides of the Otonabee River, about 5 km north of Peterborough (settled after the signing of Treaty 20 in 1818 and incorporated as a town in 1850), which was the regional centre in the mid-nineteenth century. As it had for ancestral Michi Saagiig peoples for millennia, the Otonabee River served as the main communication link south to Lake Ontario (Gidigaa Migizi 2018). We here take the opportunity to acknowledge the long relationship between this river and landscape and the Michi Saagiig nation, which predates the more recent settler presence. The university has an archaeological record that extends deeply into Indigenous history, but our focus in this paper is on the activities after 1818. In choosing this focus, we address the abrupt and radical transformation of this landscape that occurred after the arrival of settlers. Although the landscape today retains a semi-rural feel, the university's idea of itself as set in a "breathtaking natural setting" (Trent University 2020) is only true insofar as the landscape has recovered from the nineteenth-century clear-cutting that preceded the suburbanization (Belshaw 2020:720) of Peterborough's north end in the postwar period. In fact, the setting is a complex palimpsest of centuries of modifications to the original watercourses, along with roadways, train tracks, smokestacks, log booms, embankment modifications, residential and storage buildings, power dams, and cribs (Figure 2).

A landscape perspective offers a better understanding of the context in which the individual structures—whether industrial, farm-related, or residential—are elements within a complex set of political-ecological relationships to the land (Bassett and Peimer 2015). The historical landscape of Nassau Mills is the first scale of analysis, as it provides an understanding of the development of the Nassau Mills community and its relationship to its natural and cultural setting. Although much insight can be gleaned from historical documents, such as insurance maps and engineering diagrams, as archaeologists, we are cautious of an over-reliance on the documentary record. In this regard, combining the historical (documentary) record with a study of the relic landscape offers a depth to characterization and can provide context to documentary sources (Rippon 2020:541). Historical geography is as much concerned with this as landscape archaeology, but one point of divergence between the two is the latter's concern for material practice. Written records provide an idealized view and reflect what the cartographers and fire insurers wished to emphasize. Buildings are not necessarily correctly positioned on contemporary maps, nor are their configurations correctly portrayed. Some structures are missing, and some of the maps present a simplified and organized depiction of what was, in fact, a more chaotic assortment of buildings and human activity. To that extent, our field project involved a wider survey of landscape elements that otherwise were not depicted on any of the historical maps. Field observations of relic features augment the historical documentation and include structures such as boat slips, railway embankments, remnant retaining walls, smaller cottages, and midden heaps.

From the period of early settlers through the 1840s, Nassau Mills was a rural community on relatively poor land and without major infrastructure. Descriptions of the river and its power form a major part of the diaries and correspondence of the period (e.g., "Dark, rushing, foaming river!" opens "The Otonabee" by Susanna Moodie, 1803–1885). The Otonabee's several falls and rapids were attractive locations for water

Figure 2. *Historical structures and infrastructure related to the industrial use of the Nassau Mills landscape. Except for the Duke of Wellington Orange Hall (1852), the railway swing bridge, and several boom cribs, the nineteenth-century structures have been masked or removed during the development of the university.*

power, and the northward drive for timber made Nassau and its environs attractive to early capital (Bocking and Znamirowski 2014). The expanding market for sawn wood was the major driver of investment. In 1847 Ebenezer Perry (1788–1876) built a sawmill on the east bank of the river at Nassau (Perry's Mill). Perry also owned a grist mill in Cobourg and mercantile businesses with offices and warehouses in Peterborough. He was a member of the Legislative Council of Upper Canada and, from 1871, the Canadian Senate (Library of Parliament 2022). Forestry, mainly pine, was Canada's primary export product for most of the nineteenth century (Head 1975), and although the industry initially focused on supplying Britain and her imperial needs, by 1849, the United States was the primary export market. Urban construction needs drove the market to

shift from squared to sawn lumber, and imports of the latter at Oswego increased from 6 million to 46 million ft between 1846 and 1849 (Head 1975:87). Trade increased even further from 1854, with the signing of the Reciprocity Treaty, increasing the investment of American capital into Canadian lumber operations. In the same year, Ebenezer's son—and Peterborough's sometime mayor and MP—Charles Perry (1818–1876) built the Red Mill (so called after its painted exterior colour) on the west riverbank opposite his father's mill. Charles Weld, who published an account of his vacation tour shortly after the Red Mill began operation (Weld 1855:100), refers to the scale of the enterprise:

> We visited the largest of these establishments about three miles from Peterborough. The machinery is on a gigantic scale. One hundred thirty-six saws were working with tremendous velocity, reducing huge logs to planks at a rate of nearly fifty an hour. Instead of using files to sharpen the saws, a powerful punching machine is employed, which cuts fresh faces on the teeth; a process combining greater efficiency with saving of time. A portion of the machinery is employed for making laths, beside plank-sawing. This mill, in common with others in Canada, works day and night, devouring 70,000 logs in the season of nine months; but, though the quantity of planks produced is prodigious, the demand generally exceeds the supply.

Despite the scale of his operation, Charles Perry—described in his 1876 obituary as "the pioneer in the business of sawing lumber for the American market" (Peterborough Review [PR], 14 July 1876:2)—struggled to maintain the mills' profitability in the face of major competition from the start. Perry was constantly juggling creditors and appeared to have kept the operation solvent by periodic injections of money from timber auctions; selling his teams of oxen and horses after the winter shanty season (only to frantically repurchase them and rehire labourers the following season); selling property he owned in the city and county; borrowing from his father, Ebenezer, and brother George; taking out mortgages against the mill capital; and also eventually shutting down the Charles Perry & Co. mercantile arm of the company and selling his brick market building downtown (rebuilt after a fire in June 1857). In a cost-saving measure, he moved with his family in 1856 to Nassau Mills, in a house he had built on the property—the focus of our excavation program.

It is likely that Perry had the goal of developing an industrial working community focused on the mills, similar to the factory villages that were increasingly common from the mid-nineteenth century onward and precursors to the company towns of the twentieth. One advantage of this arrangement was that mill or factory owners could more easily control the social life of workers, including via rules around alcohol consumption (Gordon and Malone 1994:95), which seemed to have been a particular concern of Perry's judging by his frequent advertisements specifying the need for "sober young men" as mill workers. During Perry's tenure, Nassau grew into a substantial industrial community of associated residential structures for labourers and overseers, plus workshops, barns, stables and storage buildings, piling yards, water-control dams, races, and a train station. A contemporary description of the setting is an auction listing for the property published in the November 5, 1858, edition of the local *Peterborough Review*, from which we learn that:

> On the premises are situated the well known "Nassau Mills" having a sufficient head and supply of water to enable them to be worked during the whole year with the greatest advantage. They are in length about one hundred and twenty-five feet by eighty feet in width. The saw mill has two Yankee gangs, one slabber gang, one stock gang, and one English gate, carrying from one hundred and thirty to one hundred and forty saws. There are also circular saws for edging, and a lath mill, and the fixtures necessary for lighting the whole with gas, manufactured on the premises,

> ample and extensive piling grounds, with railway tracks and turn tables. There are also on the premises four commodious and comfortable dwelling houses in good order, an office, a blacksmith shop, a carpenter's shop, barn, a large stable and other outhouses. There is also a substantial and permanent bridge across the River Otonabee, immediately at the mills, connecting the township of Smith and Douro.

The concentration of logs and high energy water systems at this location was also a constant danger to the labour force, and Peterborough newspapers of the time often reported the deaths of men at the mills, lumber shanties, or lumber booms. Safety precautions were evidently not robust, and Charles Perry's own six-year-old son William drowned on July 18, 1857, after falling into the Otonabee River above the mill gates.

Despite the considerable personal investment, Perry appears to have overextended himself and was on the edge of ruin, with the mill properties listed at several points in sheriff's auction notices beginning in 1858. These sales seem to all have been staved off at the last minute until 1860, when his assets were seized and sold in a July sheriff's auction overseen by James Hall. From there they changed hands among some local businessmen for a few months, only to be purchased by the American investor John C. Hughson, in November 1860. Hughson joined with A. H. Campbell to run both mills at Nassau Mills. This was a particularly dynamic time for the lumber trade, and the rapid growth and decline of fortunes is covered in detail in Guillet's comprehensive *Valley of the Trent* (1957). By 1860, there were 37 mills in the Peterborough area, employing nearly 700 people (Bocking and Znamirowski 2014:88).

Transportation costs of lumber fell when rail services appeared. By 1865, the east side of the river had a platform of the Cobourg Railway. By 1868, as shown on the "Peterborough and Chemong Railway Lakefield Division Plan," the west side had a railroad platform, houses, an office, a large stable, a blacksmith shed, a carpenter shop, a barn, and other outbuildings (Jones and Dyer 1987). Nevertheless, despite capital investments in the production and transportation of finished products, the scale of operations at Nassau, as at other southern mills, was not sustainable. The costs of moving timber to the mills increased as logging chased timber stands farther north. By 1865, J. C. Hughson had ceased being the principal in the Nassau Mills enterprise and decamped to New York to run a US branch of Hughson and Campbell in Albany. In 1867, Campbell and Hughson declared their intent to abandon the Nassau Mills to erect a large steam mill in Harwood instead, as it was easier to draw saw logs there and cheaper to ship the lumber to Cobourg, because they could avoid the high lumber tolls on the Port Hope Road (PR, 7 June 1867:2). It was projected that the savings of a single year would be enough to defray the costs for the new mill.

By the mid-1870s, the lumber baron Mossom Boyd had mills that were dotted along the Kawartha Lakes north of Peterborough, and he had the advantage, floating timber to the Midland Railway station at Lindsay for transport to Port Hope and its timber schooners. Hughson and Campbell ran the Nassau Mills intermittently until 1872, at which time the lumber market suffered a deep depression. Mill operations at Nassau evidently were impacted by a combination of increasing costs and decreasing revenue.

Hughson and Campbell then sold the mills and a large tract of timber limits to Boyd, Smith & Co. (Gardiner Boyd [Mossom's nephew], Alexander Smith, and James M. Irwin), who immediately invested in new works for refitting the mills and split the mill output between their local lumber yard in downtown Peterborough and the export market. Boyd, Smith & Co. seem to have suffered some of the same problems as earlier mill owners, however, and also considered abandoning the Nassau Mills to set up in Haliburton—but were induced to operate both at Nassau Mills and Haliburton by a $2,800 bonus paid by the Midland Railway company, plus a 10 cent discount on shipping rates (Peterborough Times [PT], 12 May 1877:3).

By 1883, the lumber enterprise at Nassau seems to have settled in the hands of J. M. Irwin as sole proprietor, and at this time, he was living

on the property on the east bank, in a large brick house.[2] However, this was a challenging time for mill owners and the lumber market was again in depression. The *Peterborough Examiner* of Sept 13, 1883, described how:

> The outlook for the lumber trade is decidedly gloomy; prices are ruling low and mill men have great difficulty in disposing of their present stock, not to speak of increasing it in the way implied by extensive limit cuttings. The market being dull and the burdensome taxation on most of the supplies used by lumbermen is not by any means encouraging. Mr. Irwin is now absent visiting the markets, and his operations will depend on the result of his visit. Altogether the prospect of extensive lumbering operations in this district this winter, are not encouraging.

[2] A century later, this was known as "The Commoner," a popular late-twentieth-century student bar at Trent University.

J. M. Irwin was able to hang on, and by 1887, a much-lauded Irwin moved the steam-powered shingle mill from Haliburton to the east bank, replacing Ebenezer Perry's defunct 1847 mill. This renovation of the Nassau Mills was seen as the dawn of a new era of prosperity. However, in 1890, the United States implemented the McKinley Tariff on lumber and other staples, which effectively closed the timber export market (Palen 2010). Figure 3 is an example of this landscape, taken in approximately 1896. By 1897, the mills had fallen in disuse, and J. M. Irwin appears to have removed to Rat Portage (Kenora) and released equity from his property in an agreement with the Bank of Commerce. In July 1898, the steam-powered, three-storey east bank shingle mill was sold to Alfred McDonald, who dismantled and transported it south down the Otonabee River to Charles Point (Little Lake) in Peterborough to replace his mill that had burned down at the end of June (Robnik 2006:146). The west bank mill was purchased by George Stevens, a junk and salvage merchant in Ashburnham, who dismantled it in fall of 1899 and sold the lumber.

Figure 3. *View from the east side of the Otonabee River looking west across to the Red Mill (c. 1896). Source: Trent University Archives.*

Despite the dismantling of the mill, throughout the final decade of the twentieth century, the local landscape was still active with farming and light industry, serviced by an Orange Lodge, post office, road bridge, and railroad station. A period of new investment at the turn of the new century then emerged as the rapids shifted from providing a power source for lumber mills to transport and electricity production for the expanding manufacturing core of the city. Engineering plans for the Nassau section of the Trent–Severn Waterway were drawn in 1890s, with the contract for the canal excavation awarded in 1896 (Wilson 2017:29). However, the lack of experience of the contractors compounded by increased labour costs during the Boer War (1899–1902, in which Canada provided more than 7,000 soldiers; Marshall 2006), delayed its completion until 1904 (Wilson 2017:30). During that period, the Canadian General Electric Company, Ltd. entered a 20-year lease (1901–1921) of part of the subject property in order to build the first powerhouse on the west bank side to supply electricity to its Peterborough factory (opened in 1891). This powerhouse became operational in 1902, but by 1905 needed significant repairs and reinforcement to the forebay walls; it was considered taxed to its limit by 1910. Extensive negotiations between the city and Canadian General Electric ensued, and in 1920, an agreement was reached to build a new, larger powerhouse on the east bank of the river west of the Trent Canal. This was completed in April 1922 and is still in operation as the Stanley Adamson powerhouse, run by Trent University.

The superstructure and turbines of the old west bank powerhouse were then removed in May 1922, and the concrete cushion of the raceway was drilled out and the remaining cribs broken up, although the forebay and foundation are still present. The focus of Nassau shifted to electric power generation, which did not require the same degree of infrastructural support as the earlier mill operations, and so the landscape once again shifted its use characteristics. Over the next 40 years, some buildings on the west bank were abandoned and left to decay, although others evidently were maintained as residences. Along the east bank, a postwar community of *Veteran's Land Act* houses (Harris and Shulist 2007) and small riverside seasonal cottages developed, adopting the name and identity of Nassau Mills, despite being different in character than its industrial precedent. Then, in 1962, the Canadian General Electric Company, Ltd. donated the powerhouse and lands to form the core of the Trent University campus. The landscape then again began a new phase of use and transformation, described in detail in university-sponsored publications (Cole 1992).

The landscape retains the history of extractive economies, the harnessing of water energy, and the development of hydroelectric power, as well as interactions between capital and politics that either drove investment or led to ruin. We have summarized the pre-university traces of this long history of use in Figure 4. Our archaeological investigation begins by acknowledging that the documentary record provides an important source of information but is neither a complete nor an unbiased record of the economic, material, and social organization of the community's workers and inhabitants. For example, the pre-1900 landscape is largely undocumented in terms of building function, leaving basic questions about the organizational pattern unclear. Archaeological investigation is able to provide important details about both a building's use life and the social and economic status of its inhabitants well beyond what is available in the documentary record. It is this aspect of the history of Nassau Mills on which our first phase of excavation work focused, the results of which we now summarize.

Excavation Program

Our field program in 2017 and 2018 focused on ground penetrating radar (GPR) survey, test excavations, and context-based excavation of what we designated Structure 1 (BcGn-23-1), conducted by members of Trent's field program in historical archaeology and members of the Peterborough Chapter of the Ontario Archaeological Society. Although the GPR survey successfully identified buried cultural materials (confirmed by test excavations), these results are preliminary, and we will discuss them in due course. However, the

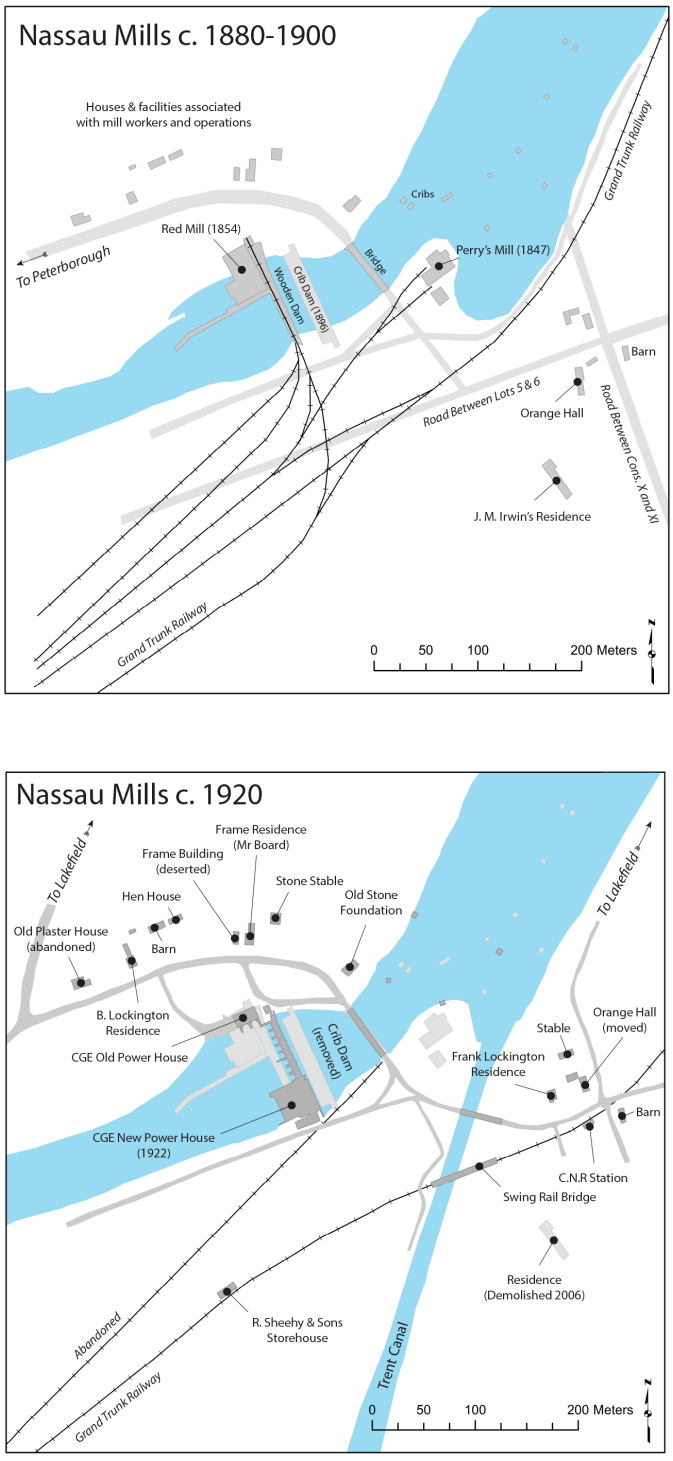


Figure 4. *(a) The later nineteenth-century buildings and infrastructure of Nassau Mills. (b) The buildings and infrastructure at the time of the opening of the Trent–Severn Canal.*

excavation of Structure 1 is completed, and we, thus, focus our discussion on the results of that component of the program.

Structure 1 was a dwelling associated with the mill community from the 1850s through to the early 1900s, and we propose that it was constructed for Charles Perry and his family when he moved to Nassau Mills in 1856. As we explain in further detail below, it went through two phases of activity before it ceased being occupied as a dwelling and then a period in which it was used for storage, after which it was abandoned and left to decay before eventually being destroyed. The structure is visible in an early 1920s photograph taken during the construction of the east bank powerhouse and is described as abandoned on contemporaneous maps (Figure 5). This image depicts a one-and-a-half-storey structure, a common configuration at that time to avoid the tax on a full second storey. There is one chimney on the west wall and one on the east wall, a door is located at the southeast corner, and there appears to be a wooden summer kitchen addition on the east wall. The front door likely was centred on the north wall, facing the main road (now Water Street). During the time of the photograph, it was likely being used for storage associated with the General Electric period. The superstructure was removed sometime between 1930 and 1951, as it is present in the 1929 aerial photograph and not present in the 1951 aerial photograph of the site. The foundation was then filled and bulldozed in the 1960s as part of the university's entranceway development.

The goals of the excavation were to document the methods of vernacular building construction, establish (through stratigraphic control) the history and changing configuration of the building,

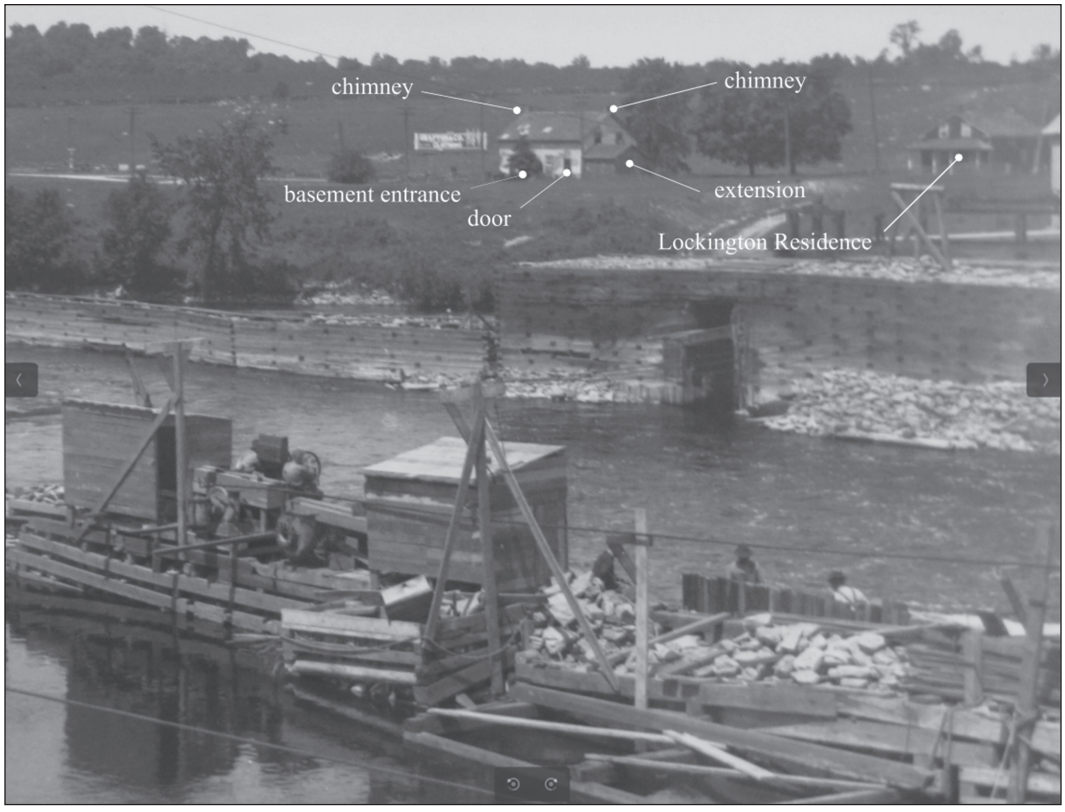


Figure 5. *View from the east side of the Otonabee River looking west to the Lockington residence and the "white plaster house" (1921). Source: Trent University Archives.*

and recover a sample of material culture to help infer the functional and social history of the built space. The excavation required a single-context, stratigraphic-based method to answer the questions and meet the goals of the project. As pointed out by other authors (e.g., Berggren and Hodder 2003; Lucas 2001), the use of one-metre-square units works well to control horizontal patterns and also measure the costs and productivity of labour when working within the constraints of contract archaeology. However, in stratigraphically complex situations, one-by-one units excavated sequentially significantly reduce the possibility of understanding contextual and depositional history at a site level. Accordingly, most excavations of historical sites (and features) from Ontario do not record depositional relationships between strata at the site level, only the unit (or "feature") level, as directed by Ontario's *Standards and Guidelines for Consultant Archaeologists* (Ministry of Tourism and Culture 2011:83). In contrast, open-area, context-based excavation (Museum of London Archaeology Service [MOLAS] 1994; Sandoval 2021) provides opportunities for understanding depositional history and, alongside a Harris Matrix, more complete knowledge of a site's chronological history, which is the approach we use for the excavations at Nassau Mills.

A total of 32,372 artifacts from 54 contexts (defined as an event that leaves a positive or negative record in the stratigraphic sequence; MOLAS 1994:7) were placed into a relative chronological model based on stratigraphic relationship (Figure 6). Stratigraphic and context-based recording enabled the identification of six phases of this single structure, which provides the starting data set for our study of the dwelling's history and changing use in the Nassau Mills area. Summaries of artifacts by primary functional categories per phase are provided in Table 1, along with the distribution of ceramic ware types by phase in Table 2. More detailed descriptions of the stratigraphic phases and their

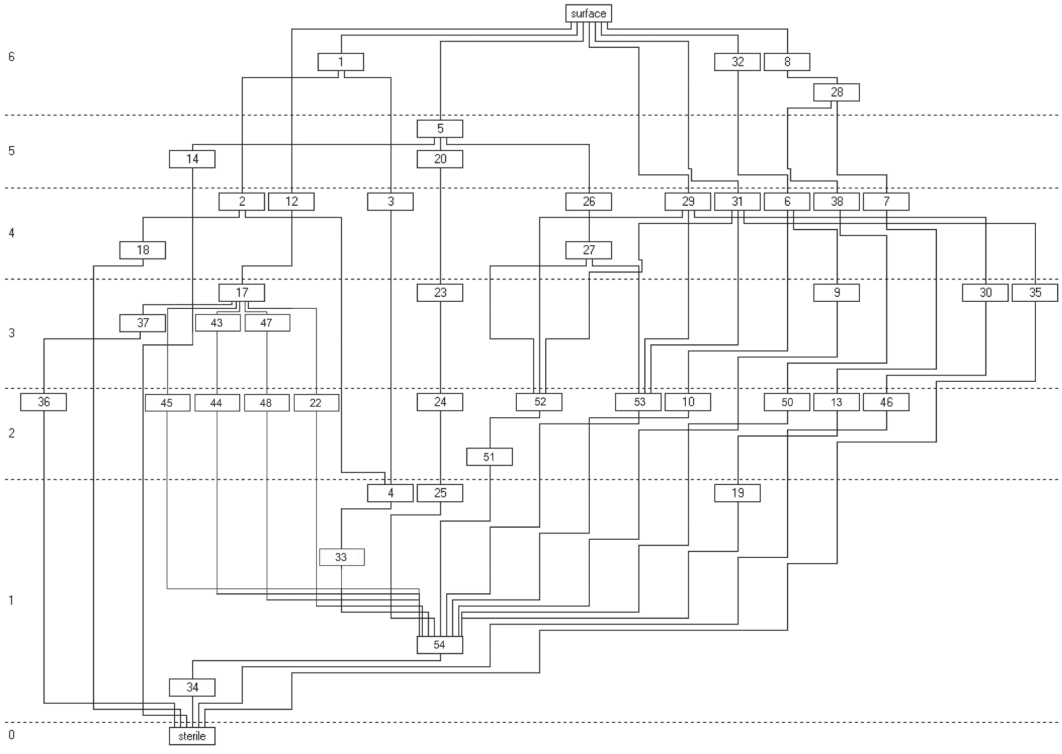


Figure 6. *Phased stratigraphic matrix.*

Table 1. *Artifact counts by object class and phase.*

Class	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
architectural	984	909	4,295	8,101	1,829	91
clothing	11	23	105	152	26	2
food and beverage	198	643	3,207	3,359	1,334	121
faunal remains	328	397	945	1,645	240	32
household	30	12	383	363	129	21
other	7	9	83	311	87	24
personal	7	13	71	105	9	2
smoking	13	8	39	27	4	1
tools/hardware	27	26	602	627	348	7
Total	**1,605**	**2,040**	**9,730**	**14,690**	**4,006**	**301**

Architectural = construction materials, such as nails, bricks, linoleum, plaster and mortar, window glass.
Clothing = buttons, zips, buckles, shoe parts, etc.
Food and beverage = glassware, tableware, cutlery, beverage bottles.
Household = lamp glass, pins, medicine bottles, inkwells, knobs, locks, etc.
Other = clinker and unidentified material.
Personal = keys, coins, beads, jewellery, comb, writing slate, mirrors, etc.
Smoking = pipe fragments, tobacco tags.
Tools/hardware = chain, hinges, horseshoes, whetstone, wire, metal sheeting, metal rods, hooks, nuts and bolts, washers, etc.

material culture patterns are provided in the following paragraphs.

Phase 1, Dwelling I: 1850s–1870s

Dwelling I (Figure 7) is the initial construction and first dwelling phase, contemporary with the early years of Perry's residence at Nassau Mills. The historical records are not sufficiently detailed to indicate the owner or use of the building, but its position, at the entrance to the mill property (somewhat removed from the mill itself), and the associated material culture are consistent with a domestic dwelling. It was constructed by excavating trenches approximately 40 cm below grade and using flat limestone rocks (between 5 and 15 cm in thickness and 20 to 40 cm in length) progressively to build random courses of wall that ended about 15 to 20 cm above grade (so about 60 cm in total height). Although some flecks of what appears to be remnants of plaster are apparent, the lower fieldstone walls do not appear to have been mortared. Some post-deposition slumping has occurred (Figure 7), but a reasonable estimate of the exterior dimensions of the building's foundation walls is 12.6 m by 8.4 m, and, thus, centre to centre, the building is 12.2 m by 8 m (approximately 40 by 26.5 ft, or a 3:2 ratio), giving approximately 100 m^2 of living space per floor. A stepped, one-metre-wide indentation in the north wall indicates an entranceway. Although no longer present, we assume this building followed the same construction process as analogous buildings in this region, with a large square beam placed on the stone foundation wall, on which the superstructure was built. As this building was later described as a plaster house, we assume that it was stacked plank construction, a method that was evidently common, as it used less expensive timber that was not suitable for export. One mid-nineteenth-century example of this construction type is still standing in Peterborough (the Malloch House,

Table 2. *Ceramic wares by phase.*

			Phase 1	Phase 2	Phase 3	Phase 4	Phases 5 and 6
Ware	**Decorative Type**	**Decorative Motif**	**1850s–1870**	**c. 1870**	**1870–1910s**	**1910s–1950**	**1950–**
coarse earthenware			21	17	113	335	32
stoneware	various			16	32	210	41
	blue paste	press-moulded relief		2	1	5	1
	Rockingham	non-moulded			45		
	Rockingham	moulded				5	
yelloware				3			
creamware	moulded				11	2	
ironstone	undecorated		1	1	23	6	
	hand-painted			1	32	31	
	moulded		1	4	1	3	2
	transfer print				3	47	
pearl glaze	undecorated		35	5	10	2	4
	banded				1		
	mocha					2	
	moulded				5	5	
	transfer print		24	3	7	1	7
	sponge stamped			5	2		1
porcelain	undecorated		5	1	23	35	4
	hand-painted	gold lustre			12	1	3
	moulded	ribbed				1	
	maker's mark	crowned serpent				1	
	moulded rim	scalloped edge, gold lustre stripe		4			
	decal	floral			26		
refined white earthenware	undecorated		16	201	956	880	193
	banded			8	29	11	17
	decal			1	1	32	1
	edgeware		16	8	27	33	37
	moulded		2	3	1	14	1
	transfer print		10	52	288	176	27
	hand-painted		2	32	85	113	38
	sponge stamped		2	15	28	25	4
	sponged		14	40	53	111	27
	lustreware					21	
Totals			**149**	**422**	**1,815**	**2,108**	**440**

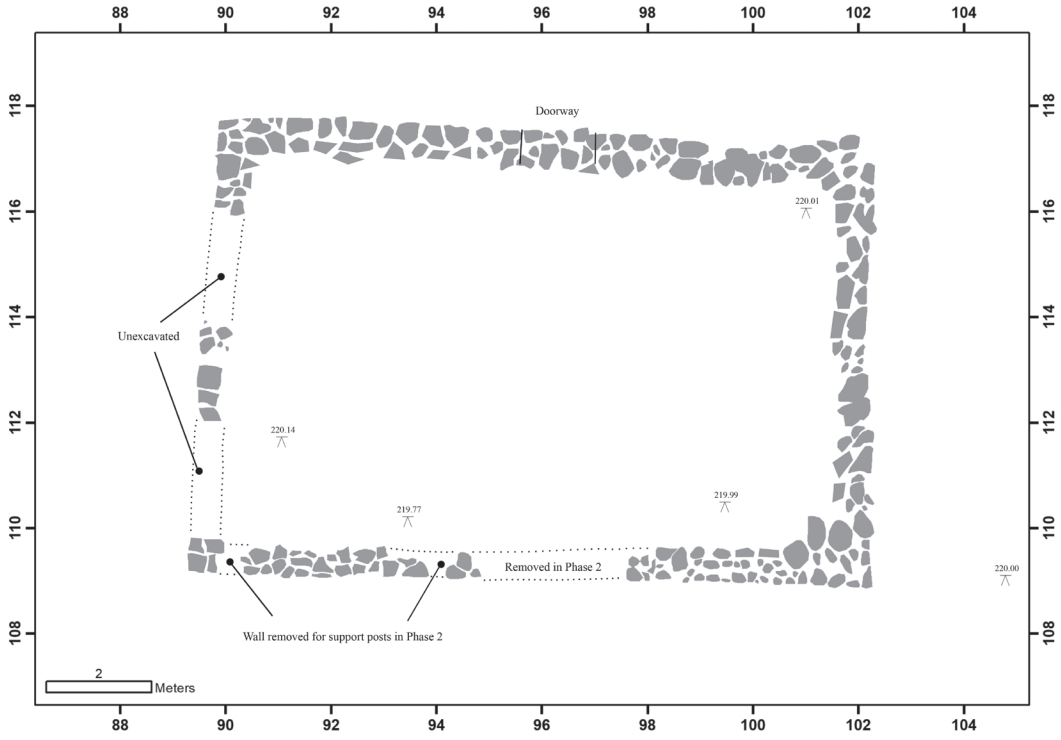


Figure 7. *Structure 1, Phase 1 structure walls.*

on the city's historic register). A dozen unfrogged red bricks were encountered along the centre west wall (disturbed during Phase 5, Destruction and Disturbance), indicating the placement of a brick chimney. Contexts with material culture associated with this phase comprise the basal cultural levels of the exterior walls (Contexts 19 and 25) and the lowest levels in the interior (Context 4), which were sealed by later stratigraphic contexts. Representative artifacts include fragments of purple transfer print, pearlware Blue Willow tea ware (one mark on a Blue Willow plate is from J. & M. P. Bell and was used 1850–1870), edged wares, flow blue, and sprig-painted late palette polychromes. A mouth-blown blowpipe pontil bottle and a folded rim food jar suggest a pre-1870 date for this phase. There are also a woman's Vulcanite side comb (1851+), fragments of mirror, a fragment of a corset busk clasp, calico and piecrust Prosser buttons (1840+), and a brass collar stud. The character of artifacts is consistent with a domestic assemblage, and as it is on the property owned by the mill, our assumption is that it housed a mill employee or employees, perhaps briefly even Charles Perry and his family, as he moved to the mill property in May or June 1857.

Phase 2, Remodelling: c. 1870

Around 1870, a decade or so after Perry had been forced to sell and Hughson and Campbell had taken over the running of the mill, the south foundation wall was removed and four posts installed in those voids to support what was presumably the squared timber beam running along the south wall (Figure 8). The stone foundation was then completely removed in the middle section to enable the excavation of a basement space and construction of support walls, with the ramp under the south wall serving as the final entrance. The excavated soil (which included material from beneath the original floor) was then deposited along the exterior of the house to regrade for drainage away from

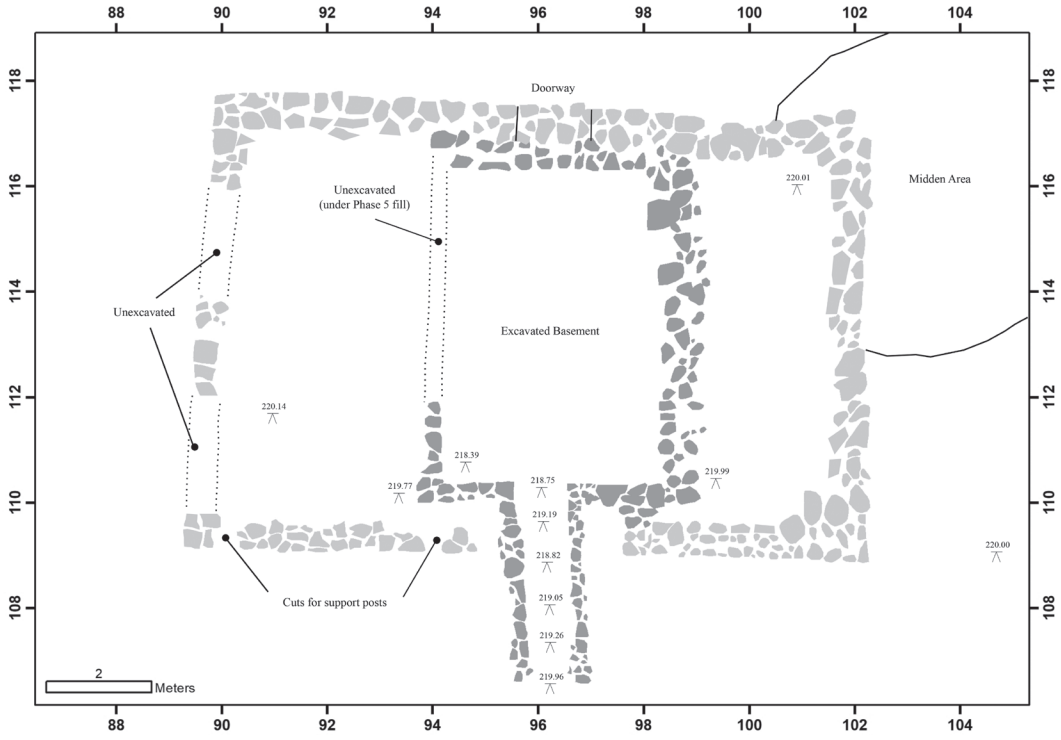


Figure 8. *Structure 1, Phase 3 walls and basement addition.*

the house and new basement entrance. The new, three-sided Phase 2 basement wall was added, with the northern portion against the original Phase 1 north foundation wall. The original south wall was then partially rebuilt on the east side, sealing in the support post. We situate Phase 2 in the 1870s based on the latest dates associated with the material culture incorporated in the fill deposits generated from the basement removal (which is derived from Phase 1 use). Manufactured material in this fill included blue sponged wares, non-moulded edgewares, tea leaf ironstone, moulded poppy and wheat ironstone (c. 1851–1878), and a W & E Corn mark used between 1864 and 1891 on an undecorated ironstone vessel. A glass perfume bottle, Vulcanite and celluloid combs (1850+), and a porcelain doll head suggest that Phase 2 remained a family dwelling. The basement addition may be related to the 1873 transfer of the mill's ownership from Hughson and Campbell to Irwin, Smith, and Boyd, who then operated the mill until 1898.

Phase 3, Dwelling II: 1870–1910s

After the basement was constructed, the structure was occupied and midden deposits accumulated along the exterior, concentrated on the northeast side of the property. While there are some earlier ceramic types and marks, most material culture dates from the 1880s into the early 1900s and represents a mixture of when the structure was still in use and also the first part of abandonment. Some of the early twentieth-century ceramics recovered are from the same pattern sets found from excavations around the neighbouring Lockington house (which remained a dwelling into the first half of the twentieth century) and thus may have been discarded from that location after this structure was abandoned as a dwelling. Representative artifacts include decal wares (post 1890); an 1882 Victorian large cent; a Canadian sports transfer print (1883–1887); and items with various maker's marks, such as Meakin (post 1891), Dudson, Wilcox & Till (1902–1926), Brownfield (1891–1900), a Davidson slag glass shell

and coral sugar bowl (1880–1881), tooled-finish Eclectric Oil bottles from Northrop & Lyman in Toronto (1885–1910), and a Dander-Off medicine bottle from Indiana (1907+). A notable discovery in this phase (Context 9, midden) and in Phase 4 (Context 12, a redeposit of soil removed from the earlier midden) were two sherds from presumably one plate, distinctive for its decorative Jawi script of a Malay pantun poem (Figure 9). Plates of this type were manufactured in England for export to the Dutch East Indies for use by wealthy Malay (Chambert-Loir 1994), and the sherds from Nassau were made by W. Adams and Sons in Staffordshire, probably between 1854 and 1861 (Godden 1964:21). A shell of a juvenile fighting conch (*Strombus pugilis* or *S. alatus*), a marine shell from the Gulf of Mexico or the east coast of the southern United States, was also recovered from a deposit (Contex 17) within this phase (Figure 10). This was likely retained as a curio, as the collecting of shells was popular in the Victorian period, as was conchology (see also Cuming 2019 for a discussion of collectible shells and Victorian men and boarding houses).

Phase 4, Abandonment: 1910s–1950

This spans a period of four or five decades in which the structure decays and accumulates local industrial waste and domestic garbage from the neighbouring farmstead and possibly from the powerhouse manager's residence, which was closer to the dam (see Figure 4). By Phase 4, domestic waste disposal continued in the northeast of the house. The industrial waste is concentrated on the south (road) side of the structure. The material culture relates to General Electric light industrial waste (carbon battery rods, metal scrap, clinker, high voltage pole electrical insulators), while the midden deposits (bone, glass, pottery) are presumably from the neighbouring Lockington residence, which remained occupied through the first half of the twentieth century. Representative artifacts include a cuspidor manufactured between 1909 and 1916 that had been

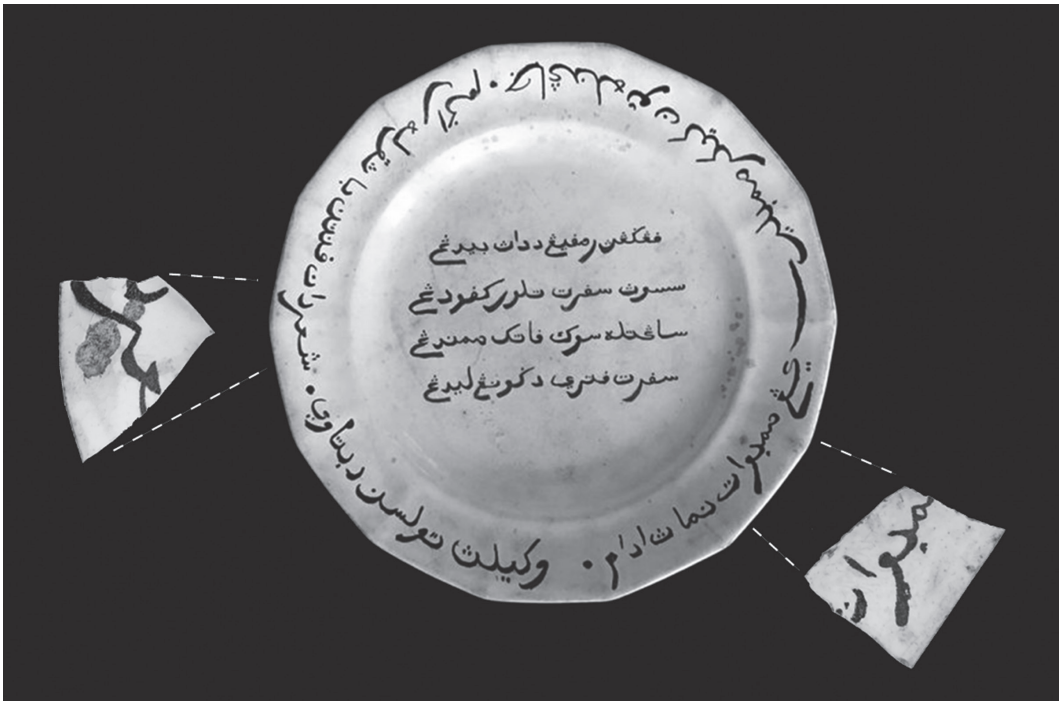


Figure 9. *Two Jawi-script pantun plate sherds (Structure 1, Phase 3) in relation to an example of a complete plate (Source: modified from an image on http://abudervish.blogspot.com/2016/08/ancient-artifact-review-99-antique.html).*

Figure 10. *A shell of a juvenile fighting conch (Structure 1, Phase 3).*

imported from Germany to Indiana, many twentieth-century patent medicine bottles, and Bakelite artifacts. Faunal remains are more abundant than in earlier phases and can be attributed to discard from other houses still in use, rather than from this dwelling. Cattle bones more than triple in frequency, although pig remains the dominant taxon by number of identified specimens (NISP). Notably in Context 1 (which is a deposit created in the 1970s to 1980s, when bottle hunters dug into earlier deposits), we also recovered a 1935 Nazi Party "tinnie" pin-back badge with a depiction of the square-rigger the *Horst Wessel* and the text "SEEFARHT IST NOT" [seafaring is a necessity] from a German World Seafaring Day celebration held in Hamburg, Germany, in May 1935 (Figure 11). General Electric had close relationships with German engineering in the 1930s (Schröter 1996:43), and we speculate that the pin belonged to an employee who had professional or familial links to Germany but decided to discard the pin after the outbreak of the war.

Phase 5, Destruction: 1950–1970s

By 1951 the structure is no longer identifiable in air photographs, indicating that the superstructure had been removed. By the early 1960s, the landscaping of the former General Electric property that became Trent University meant that the building cavity of the 1870s basement addition was filled with rubble from the levelling of this portion of the entranceway (Figure 12). In Phase 5, the house foundations and hollow of the basement served also as the locus of litter disposal. The roadway that ran along the south side of the building was covered and a new road (West Bank Drive) was constructed farther to the south. While there are older artifacts incorporated into these contexts, there are large quantities of applied-colour-label pop bottles, plastic beverage cups and lids, pop cans opened with a church key, and Diamond-D-marked bottles.

Phase 6, Disturbance: 1970s–Today

The site has evidence of periodic disturbances by bottle hunters from the 1970s onwards. The disturbance pits focus mainly on the entrance to the basement and result in a mixing of earlier context material with more recent litter, such as pop-bottle tops and plastic cups, along the sides of the building.

Interpretation

Although the excavation provides details on the construction, layout, and evolving function of the building, we can also turn to the historical

Figure 11. *Nazi Party "tinnie" pin-back badge (1935) with a depiction of the Horst Wessel and "SEEFARHT IST NOT" [seafaring is a necessity] from a German World Seafaring Day celebration held in Hamburg, Germany, in May 1935 (Structure 1, Phase 4).*

record to provide some additional context on its relationship to the industrial complex. Our current hypothesis is that the structure was initially constructed and inhabited by Charles Perry and his family. Although we have no direct evidence, the historical record shows that Perry announced he was selling his house in town to build and live permanently at Nassau (PR, 19 September 1856:3). Leading up to this announcement, Perry advertised a job to clear 7.28 ha (18 acres) of land, a large portion "already chopped," at Nassau near the mills (PR, 2 May 1856:2), and the house footprint is consistent with frame house kits Perry advertised for sale from June to August 1856. He likely was resident with his family from May or June 1857—and certainly by July 1857 (the date of his son's death by drowning at Nassau).

Other circumstantial evidence for our association of this house with Perry is that it sits at the main entrance to the mill complex, fronted onto Water Street, which was a prominent location. It was set apart from the other buildings on the property but also backed on to the main road that led to the bridge connecting Smith and Douro townships. From the historical documentation, we know that Perry was in extreme financial straits during this period. He publicly advertised that he forbade all purchases on his accounts and began selling property he owned in Peterborough and surrounding townships. The auctioning of the furnishings from his Peterborough house in early 1857 is a sharp contrast to the handsome, $10 reward (about $400 adjusted for 2021 purchasing power) he offered for the return of his gold pen and pencil case two years earlier, during his early tenure of Charles Perry & Co. and the opening of the mill (PR, 20 July 1855:1). The first sheriff's auction notice was posted in November 1858, so despite the injection of insurance money from the suspicious burning of his market block in town, Perry was in a precarious financial position during the almost four years (1857–1860) he was resident at Nassau. It is not outside the realm of possibility that he would construct a relatively inexpensive dwelling as a cost-saving measure. We do not think he would have taken up one

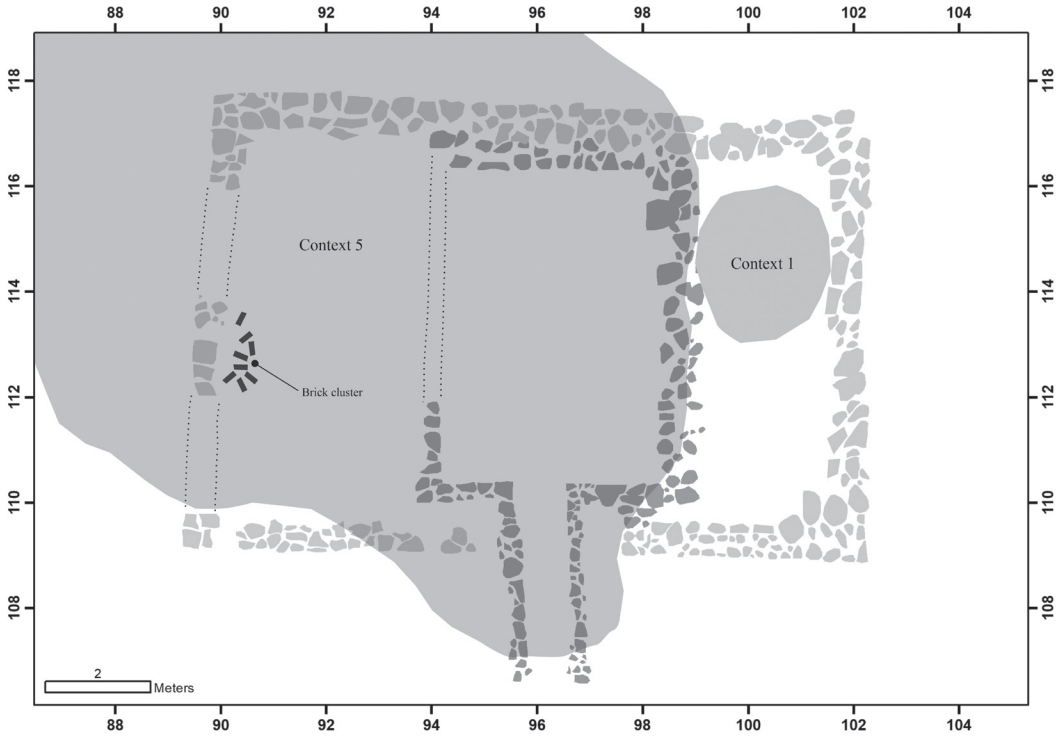


Figure 12. *Structure 1, Phase 5 destruction fill (Context 5) overlaying foundations.*

of the existing boarding houses as a residence, as ads for individuals to run the Nassau boarding houses were still being run in the newspaper after the time Perry was known to be resident.

Perry also appears to have been a supporter of the early temperance movement, suggested by job advertisements for "sober young men" and consistent with the lack of liquor bottles in the glass assemblage. This, though, is not specific to this dwelling, as most of the inhabitants of Nassau Mills appear to have been Wesleyan Methodists and the Nassau Orange Lodge was the home of temperance lectures given to mill workers, especially before they left for the winter shanties (Webb 2013).

Following Perry's loss of the mill holdings in 1860, the dwelling appears to have remained a family dwelling, likely for a mill manager or foreman and his family, as J. C. Hughson and A. C. Campbell both resided in Ashburnham (a village that is now known as East City in Peterborough). It is possible that it was then used as a boarding house, as three are known to have been present on the property. However, these, we suspect, were located closer to the mill; the unnamed structures in Figure 4 are likely candidates.

The material cultural assemblage, based on the range of artifacts from Phases 1 through 3, is essentially domestic in nature, including service sets and food containers. Discarded material also includes elements from men's and women's clothing and personal items, such as combs, harmonicas, a jaw harp, perfume bottles, mirrors, thimbles, and some jewellery items. Children's toys (parts of several porcelain dolls, glass and ceramic marbles, the lid of a doll tea set) are also present in the assemblage during Phases 2 to 4. Residents of this house and of the local community were connected to larger systems of consumption, as demonstrated by advertising souvenirs from a piano factory in Toronto, the Hamburg 1935 Nazi tinnie, a marine shell from the Gulf of Mexico, and a Jawi-script pantun plate made in Staffordshire for the 1850–1860s Indonesian import market.

Discussion

Our investigation of the archaeology and landscape history of Nassau Mills provides insight into the character and impact of nineteenth-century state-managed colonialism in Ontario. We address, first, the impact of the logging industry in this part of the province; second, the creation of a local "landscape of capitalism"; and, finally, the value of archaeology for illustrating the material lives and setting of the individuals who inhabited this community.

As early as 1853, the removal of forests was identified as responsible for increases in summer temperatures and loss of ponds, streams, and wetlands:

> Indeed, the destruction of forests seems to have a marked effect upon swamps, springs, and running streams. In all parts of the country neglected sawmills may be seen, having been abandoned by their proprietors, owing to the want of water. This decrease may reasonably be ascribed to the felling of the forests, whereby extensive swamps are exposed to solar radiation and that supply of moisture which they received in the summer months from the condensation of the aqueous vapour of the atmosphere, by the leaves of the trees overshadowing them being altogether cut off [Strickland 1853:23].

John Langton (1808–1894), at times a Peterborough resident and Canada's first auditor general, recognized the "wanton destruction of timber" that unregulated access was inflicting (Langton 1862:73). He advocated in his 1862 address to the Literary and Historical Society of Quebec that transitioning from licensing to ownership would reduce the propensity of a timber-man "making everything he can off his limits, as rapidly as possible, utterly regardless of what may become of it ten years hence" (Langton 1862:76). Instead of increased regulation, he advocated the selling of land to "the men who have any capital, [who,] being taught provident habits, would turn it to better account" (Langton 1862:76). This process of nineteenth-century state-managed colonialism (Bhambra 2020) unfolds with the emergence of "lumber barons" in the latter half of the nineteenth century. From the 1860s, a quarter of the land in the Trent River watershed fell into private ownership by lumber companies (Riley 2013:189), and the last decades of the nineteenth century saw the rapid removal of millions of trees, mainly pine, from across the southern portions of the Canadian Shield (Head 1975).

In addition to being related to the loss of forests, sawmills dumped tonnes of sawdust into rivers (Benidickson 2011; Boswell 2016), choking the natural habitats of plants, fish, and birds and further impacting the food security of the Michi Saagiig (Treaty 20) Nations. The mill owners, in what modern readers might recognize as a familiar pattern through the later twentieth century, simply ignored the 1873 federal laws (*An Act for the Better Protection of Navigable Streams and Rivers*, S.C. 1873, c. 65, s. 1.) prohibiting the discharge of sawdust into navigable waterways.

The *Peterborough Examiner* (23 January 1886:4) reports:

> That much of the debris from the sawmills lodged in the Little Lake at Peterborough, so that what was once a very beautiful and deep sheet of water, has now become shallow, disfigured and pestilential by reason of the vast accumulation of rotting vegetable matter. To a growing town so fine a sheet of water as the Little Lake once was would have been of inestimable value, and it was little less than a curse for the authorities to permit it to be wantonly destroyed. The action of the present prosecutors though late is commendable. The mill owners have deemed it expedient to plead guilty to those charges. Up to the present they have broken the law with their eyes open—with them it has simply been a matter of money. They have saved money by being allowed to deposit sawdust in the river, but they have inflicted an injury that money will now not remove…

Logging had also shifted the ecology across vast swaths of the wider region. By 1909, the

"wanton destruction" of logging and the resulting wildfires had created tens of thousands of acres of barrens that were seen as detrimental to the well-being of the province, threatening water supplies and the capacity of the land to regenerate (Riley 2013). The 1913 Commission of Conservation survey report of the Trent watershed made several recommendations, including reforestation (Howe and White 1913). A rewilding process began at this time and continues into the present, although it will take centuries to replace what had been lost (Riley 2013). Public resources being used for private profit but then needing public expense to remediate the damage is a theme that is reminiscent of more recent debates over Canadian natural resources and water use.

Our landscape-scale review offers a small case study on the transforming power of small-scale private capital and how waterpower was the key attraction in rural development, creating new cultural landscapes of early capitalism. The two large mills at Nassau were the focal point of what emerged, over the course of 50 years, as a community of light industrial buildings, railway infrastructure, and the associated social structures, such as the post office and Orange Lodge, that integrated the (Protestant) members of this community. It also reminds us to be cognizant about the evolution of space and recognize that the contemporary character of both natural and cultural space is not fixed.

This evolution is abundantly clear to someone standing in the middle of our study landscape at the entrance to Trent University, which bears little resemblance to its previous industrial setting. The impact of the extractive industries of this and the dozens of other nearby mills on the region's longer-term ecological health is less obvious because of shifting baseline syndrome (Papworth et al. 2008; Pauly 1995), in which what is perceived as "normal" is what existed only in recent memory. With the donation of what was then surplus property and power in the 1960s by the last industrial user, Canadian General Electric, the modern university inherited a largely pastoral Nassau Mills, in which the earlier industrial setting was already being forgotten (Figure 13).

Claims of this portion of Peterborough being a "natural setting" (Trent University 2022a) (or "nestled in a pristine" setting; Trent University 2022b), as stated in some of the university's public relations materials, mean that we have forgotten what the area was like in the deeper past. As our work shows, there is little about this landscape that is now "natural," at least in the sense of "pristine," since most of this landscape has been transformed by extractive activity. Although the Michi Saagiig retain oral histories of the pre-settler landscape and its relations (Gidigaa Migizi 2018), most people living here have limited understanding of what the pre-settler, old-growth landscape was actually like—or the extent of the industrial history—and assume that the current configuration (minus the university) is what is natural. But acknowledging that the modern landscape is a palimpsest of 200 years of settler activity allows those residual traces, ranging from former railway beds, embankments, and cribs to dams and historical buildings, to be positioned as part of a history of place.

At a narrower temporal and spatial scale, the excavation of Structure 1 opens a window into the history of the construction of a dwelling place and its transformation over time within this broader history. We were able to document its first use as a relatively simple family dwelling in the first phase of mill history, likely but not conclusively built by Charles Perry, before its substantial modification after he lost his interests during the period when American capital was available. We clarified the period of the structure's eventual abandonment and use for the discarding of both household and light industrial waste, through to the process of its destruction during the early history of the university. The contextual recovery of material culture is typically the focus of much historical archaeology, as it provides direct insight into the economic and social lives of the inhabitants (e.g., Martelle et al. 2018). In the case of Nassau Mills, our recovery of material from the lives of the individuals who inhabited this place is no less telling. We have not focused extensively on this element of our work in this paper, as it is

Figure 13. *Nassau Mills in 1964, looking north. Source: Trent University Archives.*

the subject of ongoing analysis, but what we have illustrated nevertheless provides compelling information about how this relatively small but industrious community was linked in to the emerging global markets of materialism and developing capital trade.

As the study of material history, archaeology provides considerable insight into the lived experiences of early state-managed colonial societies in the late British Empire and is the best source of information about the material lives of its early population. At the nested scales of region, landscape, and structure, we illustrate how archaeology broadens historical analysis from the narrow documentary records and illustrates the lived experience of ordinary people, and the ways in which their collective actions formed these radically new places on landscapes, with all the transformations that this entailed.

Acknowledgements. We thank Dennis Carter Edwards, Trent University Archives, and Trent Valley Archives for assistance in obtaining and interpreting historical plans and photographs of the Nassau Mills area. The two reviewers of the original manuscript provided several helpful recommendations that have improved this revised version, and we thank them for their informed and useful comments.

References Cited

Bassett, Thomas J., and Alex W. Peimer
2015 Political Ecological Perspectives on Socioecological Relations. *Natures Sciences Sociétés* 23:158–165.

Belshaw, John D.
2020 *Canadian History: Post-Confederation*. 2nd ed. BCcampus, Victoria, British Columbia.

Benidickson, Jamie
2011 Cleaning Up after the Log Drivers' Waltz: Finding the Ottawa River Watershed. *Les Cahiers de droit* 51(3–4):729–748.
Berggren, Åsa, and Ian Hodder
2003 Social Practice, Method, and Some Problems of Field Archaeology. *American Antiquity* 68(3):421–434.
Bhambra, Gurminder. K.
2020 Colonial Global Economy: Towards a Theoretical Reorientation of Political Economy. *Review of International Political Economy* 28(2):307–322.
Bocking, Stephen, and Barbara Znamirowski
2014 Stories of People, Land, and Water: Using Spatial Technologies to Explore Regional Environmental History. In *Historical GIS Research in Canada*, edited by Jennifer Bonnell and Marcel Fortin, pp. 83–108. University of Calgary Press, Calgary.
Boswell, Randy
2016 Cholera, the "Sawdust Menace" and the River Doctor: How Fear of an Epidemic Triggered Canada's First "Pollution" Controversy. *Histoire sociale / Social History* 49(100):503–542.
Chambert-Loir, Henri
1994 Eating the Text: English Plates Decorated with Malay Poems. *Indonesia Circle* 22:183–210.
Cole, A. O. C.
1992 *Trent: The Making of a University, 1957–1987*. Trent University, Peterborough, Ontario.
Croucher, Sarah K., and Lindsay Weiss
2011 *The Archaeology of Capitalism in Colonial Contexts*. Springer, New York.
Cuming, Emily
2019 At Home in the World? The Ornamental Life of Sailors in Victorian Sailortown. *Victorian Literature and Culture* 47(3):463–485.
Dunham, Sean B., Charles R. Moffat, and Ryan J. Howell
2021 Past in the Pines: The Archaeology of Historic Era Logging in Wisconsin. *The Wisconsin Archaeologist* 102(1):225–249.
Franzen, John G.
1992 Northern Michigan Logging Camps: Material Culture and Worker Adaptation on the Industrial Frontier. *Historical Archaeology* 26:74–98.
2020 *The Archaeology of the Logging Industry: The American Experience in Archaeological Perspective*. University Press of Florida, Tallahassee.
Gidigaa Migizi
2018 *Michi Saagiig Nishnaabeg: This Is Our Territory*. ARP, Winnipeg.
Godden, Geoffrey A.
1964 *Encyclopaedia of British Pottery and Porcelain Marks*. Barrie and Jenkins, London.
Gordon, Robert, and Patrick Malone
1994 *The Texture of Industry: An Archaeological View of the Industrialization of North America*. Oxford University Press, New York.
Guillet, Edwin
1957 *The Valley of the Trent*. University of Toronto Press, Toronto.
Harris, Richard, and Tricia Shulist
2007 Canada's Reluctant Housing Program: The Veterans' Land Act, 1942–75. *Canadian Historical Review* 82(2):253–282.
Head, C. Grant
1975 An Introduction to Forest Exploitation in Nineteenth Century Ontario. In *Perspectives on Landscape and Settlement in Nineteenth Century Ontario*, edited by J. D. Wood, pp. 78–112. McClelland and Stewart, Toronto.

Howe, Aaron
2015 "Men of Good Timber": An Archaeological Investigation of Labor in Michigan's Upper Peninsula. Master's thesis, Department of Anthropology, Western Michigan University, Kalamazoo. http://scholarworks.wmich.edu/masters_theses/658.

Howe, Clifton D., and James H. White
1913 *Trent Watershed Survey: A Reconnaissance*. The Bryant Press, Toronto.

Johnson, Matthew
1996 *An Archaeology of Capitalism*. Blackwell, Oxford.

Jones, Elwood, and Bruce Dyer
1987 *Peterborough, the Electric City: An Illustrated History*. Windsor Publications, Peterborough, Ontario.

Langton, John
1862 On the Age of Timber Trees and the Prospects of a Continuous Supply of Timber in Canada. *Transactions of the Literary and Historical Society of Quebec* 5:61–79.

Leone, Mark P.
2010 *Critical Historical Archaeology*. Left Coast Press, Walnut Creek, California.

Leone, Mark P., James M. Harmon, and Jessica L. Neuwirth
2005 Perspectives and Surveillance in Eighteenth-Century Maryland Gardens, Including William Paca's on Wye Island. *Historical Archaeology* 39(4):131–150.

Library of Parliament
2022 The Hon. Ebenezer Perry, Senator. Electronic document, https://lop.parl.ca/sites/ParlInfo/default/en_CA/People/Profile?personId=7224, accessed May 30, 2022.

Lucas, Gavin
2001 *Critical Approaches to Fieldwork: Contemporary and Historical Archaeological Practice*. Routledge, London.

McGuire, Randall
2006 Marxism and Capitalism in Historical Archaeology. In *The Cambridge Companion to Historical Archaeology*, edited by Dan Hicks and Mary C. Beaudry, pp. 123–142. Cambridge University Press, Cambridge.

Marshall, Tabitha
2006 *Canada and the South African War (Boer War)*. The Canadian Encyclopedia. https://www.thecanadianencyclopedia.ca/en/article/south-african-war, accessed May 30, 2022.

Martelle, Holly, Michael McClelland, Tatum Taylor, and John Lorinc (editors)
2018 *The Ward Uncovered: The Archaeology of Everyday Life*. Coach House Books, Toronto.

Ministry of Tourism and Culture (Ontario)
2011 *Standards and Guidelines for Consultant Archaeologists*. Queen's Printer for Ontario, Toronto.

Museum of London Archaeology Service (MOLAS)
1994 *Archaeological Site Manual*. 3rd ed. Museum of London, London. https://www.colat.org.uk/_assets/doc/mol-site-manual-3rd-edition.pdf

Palen, Marc-William
2010 Protection, Federation and Union: The Global Impact of the McKinley Tariff upon the British Empire, 1890–94. *The Journal of Imperial and Commonwealth History* 38(3):395–418.

Papworth, Sarah K., J. Rist, L. Coad, and E. J. Milner-Gulland
2008 Evidence for Shifting Baseline Syndrome in Conservation. *Conservation Letters* 2(2):93–100.

Pauly, Daniel
1995 Anecdotes and the Shifting Baseline Syndrome of Fisheries. *Trends in Ecology and Evolution* 10(10):430.

Peterborough Examiner (PE) [Peterborough, Ontario]
1883 "Lumbering Operations," 13 September:8. Peterborough, Ontario.

1886 "The Sawdust Case Disposed Of," 23 January:4. Peterborough, Ontario.

Peterborough Review (PR) [Peterborough, Ontario]
1855 "$10 Reward," 20 July:1. Peterborough, Ontario.
1856 "Clearing Land," 2 May:2. Peterborough, Ontario.
1856 "Desirable Residence for Sale," 19 September:3. Peterborough, Ontario.
1858 "Auction Sale of Real Estate and Mill Property," 5 November:3. Peterborough Ontario.
1867 "Town Gossip," 7 June:2. Peterborough, Ontario.
1876 "The Late Charles Perry," 14 July:2. Peterborough, Ontario.

Peterborough Times (PT) [Peterborough, Ontario]
1877 "A Cool Request," 12 May:3. Peterborough, Ontario.

Prangnell, Jonathan
2020 Capitalism and Globalization. In *The Routledge Handbook of Global Historical Archaeology*, edited by Charles E. Orser, Andrés Zarankin, Pedro Paulo A. Funari, Susan Lawrence, and James Symonds, pp. 117–132. Routledge, New York.

Riley, John L.
2013 *The Once and Future Great Lakes Country: An Ecological History*. McGill-Queen's University Press, Montréal and Kingston.

Rippon, Stephen
2020 Landscape Analysis. In *The Routledge Handbook of Global Historical Archaeology*, edited by Charles E. Orser, Andrés Zarankin, Pedro Paulo A. Funari, Susan Lawrence, and James Symonds, pp. 536–552. Routledge, London and New York.

Robnik, Diane
2006 *The Mills of Peterborough County*. Trent Valley Archives, Peterborough, Ontario.

Rohe, Randall E.
1985 Archaeology: A Key to the Great Lakes Lumber Era. *Wisconsin Archaeologist* 6(4):359–384.
1986 The Evolution of the Great Lakes Logging Camps, 1830–1930. *Journal of Forest History* 30(1):17–28.

Sandoval, Gustavo
2021 Single-Context Recording, Field Interpretation and Reflexivity: An Analysis of Primary Data in Context Sheets. *Journal of Field Archaeology* 46(7):496–512.

Sayre, Robert F.
2000 The Landscape of Capitalism. *Iowa Review* 30(3):114–131.

Schröter, Harm G.
1996 Europe in the Strategies of Germany's Electrical Engineering and Chemical Trusts, 1919–1939. In *The Quest for Economic Empire*, edited by V. R. Berghahn, pp. 35–54. Berghahn Books, New York.

Shackel, Paul A.
2020 *An Archaeology of Unchecked Capitalism: From the American Rust Belt to the Developing World.* Berghahn Books, New York.

Strickland, Samuel
1853 *Twenty-Seven Years in Canada West; or, the Experience of an Early Settler*, Vol. 1. Richard Bentley, London.

Trent Archaeology Field School
2017– Nassau Mills Research Project. Electronic document, https://nassaumills.ca, accessed May 27, 2022.

Trent University
2020 News and Events, "Draft Trent Lands and Nature Areas Plan Available for Public Review." Electronic document, October 14, https://www.trentu.ca/news/story/28115, accessed May 27, 2022.
2022a Conference & Hospitality Services. Electronic document, https://www.trentu.ca/conferences/services, accessed May 27, 2022.

2022b Athletics Campaign. Electronic document, https://www.trentu.ca/athleticscampaign/supportoutdoor.phpv, accessed May 27, 2022.

Webb, Todd
2013 *Transatlantic Methodists: British Wesleyanism and the Formation of an Evangelical Culture in Nineteenth-Century Ontario and Quebec*. McGill-Queen's University Press, Montréal and Kingston.

Weld, Charles
1855 *A Vacation Tour in the United States and Canada*. Longman, Brown, Green and Longmans, London.

Wilson, Andrew H.
2017 *The Building of the Trent-Severn Waterway*. Engineering History Paper 60, Engineering Institute of Canada, EIC History and Archives.

Nous rendons compte ici de nos récents travaux sur le site historique de Nassau Mills, au nord de Peterborough, en Ontario, à différentes échelles d'analyse. Nous examinons le contexte historique et la transformation du paysage suite à la colonisation de cette région après la signature du Traité 20 (1818). Nous décrivons le flux de capital et de main-d'œuvre dans ce milieu et l'impact de l'exploitation forestière et des usines sur l'environnement local. À l'échelle de la maison, nous rendons compte de notre fouille d'une habitation que nous interprétons comme étant celle de Charles Perry et de sa famille, ainsi que de son évolution en tant que structure avant sa destruction finale lors de la formation de l'université Trent dans les années 1960. Nous utilisons notre travail pour considérer l'impact transformateur plus large du capital initial et les façons dont le cadre universitaire moderne conserve les traces de son ancien héritage industriel—mais cette phase transformatrice de l'histoire du paysage est régulièrement oubliée en faveur de ce qui est perçu comme naturel plutôt qu'anthropique.

Received January 3, 2022; accepted April 3, 2022.

James Conolly and Kate Dougherty
Department of Anthropology
Trent University
1600 West Bank Drive
Peterborough, Ontario K9L 0G2
Canada
jamesconolly@trentu.ca, kdougherty@trentu.ca

Living Lightly on the Land: The Archaeological Visibility of the Early Nineteenth-Century Mississauga at Davisville

Gary Warrick

Hunter-gatherers have a reputation for living lightly on the land. Small, short-term camps occupied prior to European contact can be difficult to detect archaeologically. Those occupied in the postcontact period are even more elusive to archaeologists. This paper presents the results of the archaeological search for and excavation of a Mississauga (Anishinaabe) encampment at Davisville, on the Grand River, Ontario, occupied in the 1820s. Concentrations of calcined animal bone mark the location of postcontact Mississauga camps. The assemblage of postcontact artifacts recovered from the test excavation of two Mississauga camp sites is meagre, despite the use of 1.6 mm mesh and water screening in the field. Comparisons with other postcontact hunter-gatherer sites reveal remarkably similar patterns of archaeological invisibility. The archaeological invisibility of postcontact period hunter-gatherers suggests that the postcontact history of many Indigenous peoples in Ontario will rely predominantly on oral tradition and historical documents.

Introduction

Hunter-gatherers have a reputation for being mobile and living lightly on the land. Prior to European contact, hunter-gatherer occupations and special-use sites are detectable archaeologically by limited concentrations of chipped lithic tools and debitage, potsherds, and zooarchaeological remains. In the postcontact period, however, such sites are highly elusive archaeologically. This paper presents the results of the archaeological search for and excavation of the 1820s Mississauga (Anishinaabe) settlement at Davisville, on the Grand River, Ontario. Partial excavation of one of the dwellings in this settlement produced only a handful of postcontact artifacts. In fact, without the use of 1.6 mm mesh and water screens, the Davisville Mississauga settlement would have been relatively invisible. The archaeological invisibility of postcontact hunter-gatherer sites is a widely recognized phenomenon (Byrne 2002, 2003a; Ferris 1989; Gordon 1988; Janes 1983; Klimko 2004:173). The goal of this paper is to demonstrate the level of invisibility of postcontact hunter-gatherers on the archaeological landscape and to discuss the inherent limitations of the postcontact archaeological record, with special emphasis on the Anishinaabeg in Ontario. The relatively invisible archaeological record has implications for the importance of oral tradition to the history of Indigenous peoples after European contact.

Postcontact Archaeology of Indigenous Peoples in Ontario

Direct European contact with Indigenous peoples in Ontario happened in the early seventeenth century and is represented archaeologically by European items in settlements and burials. Although the terminology is problematic (Silliman 2020), archaeologists in Ontario distinguish between precontact and postcontact sites based on the absence/presence of European items. Considerable archaeological attention has been focused on seventeenth-century (postcontact)

Attawandaron, Huron-Wendat, and Tionontaté village sites because of their large size and high artifact density and because of the historical interest in the French Jesuit missions and Indigenous–European trade relations. However, until the 1980s, except for the archaeology of fur trade posts (Klimko 2004), there was no archaeology of Indigenous peoples for eighteenth- and nineteenth-century Ontario. In fact, the standard reference, *The Archaeology of Southern Ontario to A.D. 1650* (Ellis and Ferris 1990), and a more popular book, *Before Ontario: The Archaeology of a Province* (Munson and Jamieson 2013), send an unintentional but clear message that Indigenous archaeology in Ontario ends in the middle of the seventeenth century. The lack of archaeological attention to Indigenous peoples of the eighteenth and nineteenth century reflects the colonial bias and anthropological training of most Ontario archaeologists, the high visibility of precontact archaeological sites, and the reality that those centuries were deemed to be the domain of historical archaeology (Beaudoin 2019, 2022; Ferris 2009; Silliman 2020)—archaeology of European colonialism and capitalism over the last 500 years (Orser 1996). In the early 1980s, Ian Kenyon and Neal Ferris turned their attention to Anishinaabe and Haudenosaunee archaeology of the eighteenth and nineteenth century, mainly out of personal interest in examining the lives of Indigenous peoples through historical archaeology (Ferris 2009; Ferris et al. 1985; Kenyon and Ferris 1984; Kenyon and Kenyon 1986). However, except for my own research at Davisville in the early 2000s and Matt Beaudoin's recent work (2019, 2022), archaeology of Indigenous peoples of the eighteenth, nineteenth, and even early twentieth century in Ontario remains inadequately investigated. Archaeology has been and continues to be complicit in erasing Indigenous peoples from the historical/colonial landscape of southern Ontario (through lack of research interest and/or misidentification of sites), supporting the popular settler fallacy that by the early 1800s Indigenous peoples had lost their authentic cultures and ceased to use the land beyond the bounds of their small reserve communities (Beaudoin 2022; Schneider and Panich 2022).

In southern Ontario, the historical archaeology of Indigenous peoples covers the seventeenth to nineteenth centuries, and European–Indigenous relations are situated on a continuum from cultural entanglement (the seventeenth and eighteenth centuries, when Indigenous peoples were on more equal terms with settlers) (Silliman 2020) to full-blown settler colonialism and imperialism (the nineteenth century) (Beaudoin 2019; Ferris 2009). In an effort to contextualize the archaeology of Davisville and the Mississauga, the 1820s in southern Ontario (at the time, Upper Canada) are best described as a period of settler colonialism. The Mississauga had been dispossessed of their lands by a series of treaties; they had suffered massive depopulation from disease epidemics; settlers were flooding into their territories, clearing the forest, damming rivers and streams, and prohibiting the Mississauga to hunt, fish, and gather on their farms (Smith 1987:30–40). Yet, despite this settler colonial onslaught, the Mississauga persisted in their traditional subsistence pursuits (Smith 2013:38–40), and the archaeology at Davisville, as limited as it is, confirms this.

The Mississauga and Davisville

The Mississauga (Michi Saagig Nishnaabeg) are Anishinaabeg (Algonquian speakers) and have inhabited southern Ontario since at least 1700 CE (Mississaugas of the Credit First Nation 2022; Rogers 1978:769; Smith 1987:17–21). However, Doug Williams (2018) cites oral tradition that the Mississauga have occupied south-central Ontario from time immemorial. Prior to 1700, the Mississauga were resident on the north shore of Lake Huron, allied with other Lake Huron Anishinaabe (Ojibwe) nations (Smith 2013:33–36), the Wendat, and the French in the late seventeenth-century conflict with the Haudenosaunee. According to Mississauga oral tradition, after several hard-fought battles, the Mississauga managed to force the Haudenosaunee from their villages on the north shore of Lake Ontario (Eid 1979; MacLeod 1992; Schmalz 1991:16–34) and established two regional groups in southern Ontario, namely the Rice Lake–Quinte Mississauga (from the Bay of Quinte to the Humber River) and the

Credit Mississauga (from the Humber River to Long Point on Lake Erie) (Smith 1987:17–21; Williams 2018).

In the eighteenth and early nineteenth century, the Mississauga occupied the north shore of Lake Ontario, the Grand River watershed, and the Niagara Peninsula. Settlement-subsistence patterns manifested in an annual cycle of late winter maple sugar camps, spring aggregation villages at the mouths of major rivers for fishing, summer villages and planting of maize and potatoes on river flats, mid-summer and fall deer hunting camps, and winter hunting and trapping camps (Ferris 1989:171–183; Good 1998:153–155, 157; Rogers 1994:138–140). In 1787, the Mississauga population was estimated at 500 for the western end of Lake Ontario. Epidemics of measles and smallpox in the 1790s and tuberculosis and alcohol abuse reduced the population to 200 by 1819 (Smith 1987:30, 39). Historical accounts indicate that in the early 1820s, Mississauga access to fish and wild game was becoming difficult because of Euro-Canadian settlement and land clearance (Schmalz 1991:150–151; Smith 1987:38–40).

The Six Nations (Haudenosaunee) neighbours of the Mississauga were also experiencing their own problems with Euro-Canadian settlers and squatters in the Grand River valley (Harring 1998; Warrick 2003, 2004). Forest clearance, farms, towns, and dams were dramatically increasing in southern Ontario, causing ecological and social damage to some Six Nations communities. One community that temporarily sheltered its inhabitants from the negative impacts of colonialism was Davisville, located a few kilometres upriver from the village of Brantford and Mohawk Village (Figure 1). It consisted of 25 to 30 Mohawks, led by Thomas Davis, a Mohawk Confederacy chief and a devout Methodist (Smith 1987;

Figure 1. *Lewis Burwell's 1833 CE Map of Davisville (note "Indian Settlement" and "Methodist Mission House" on north side of river and "Indian Farms" on south side). Courtesy of Brant County Museum and Archives.*

Warrick 2020). Recent archaeological work demonstrates that the Davisville Mohawks were living in Euro-Canadian-style log cabins, but were engaged in trapping, hunting, fishing, gathering, and maize-beans-squash agriculture. Their local environment in the 1820s appears to have been a healthy oak parkland with no signs of ecological stress (Warrick 2004, 2020).

In the 1820s, one frequent visitor to Davisville was Peter Jones (Kahkewaquonaby), who was born in 1802 to British surveyor Augustus Jones and Tuhbenahneequay, a Mississauga woman from the Credit River community. Peter Jones converted to Methodism in 1823 and became good friends with Alvin Torry, a Methodist missionary, and Thomas Davis (Smith 1987). In the spring of 1824, Peter Jones, in the role of Methodist lay preacher, invited the Credit River Mississauga to stay at Davisville, hoping to demonstrate that the survival of the Mississauga depended on them becoming settled farmers and Methodists. Some of Peter Jones's maternal relatives (about three households) accepted his invitation and moved to Davisville in early 1824. In the summer of 1825, about 35 Mississauga journeyed from the Credit River to Davisville and pitched tents (Jones 1860). In the summer of 1825, 45 more Mississauga travelled to Davisville and stayed in tents or wigwams (Jones 1860; Smith 1987). A census of January 10, 1826 lists 79 Mississauga as Davisville residents (although as many as 100 to 150 Mississauga may have been resident for short periods of time [Torry 1869]) (Figure 2). Most of the Mississauga left Davisville in the spring of 1826 to return to the Credit River Mission, where they awaited the construction of log cabins built by the British government. In the spring of 1827, 20 log cabins were occupied by 205 Mississauga (two families per cabin) (Smith 2013:54–56). A few Mississauga families still remained on

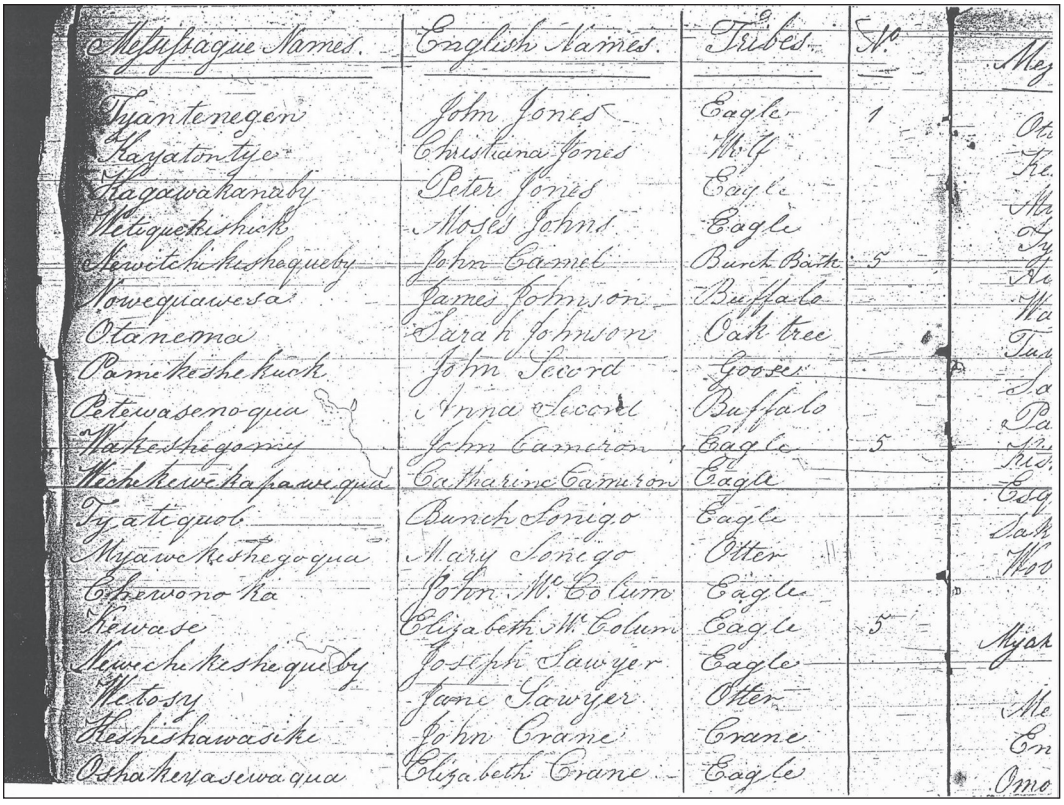


Figure 2. *Census of Mississauga members of the Davisville Methodist Mission (1826 CE). Source: United Church Archives Toronto.*

the Grand River, perhaps at Davisville, as late as December 10, 1827 (Jones 1860:94).

While we know that between 70 and 100 Mississauga lived at Davisville between the spring of 1825 and the spring of 1826, there is little historical documentation of Mississauga life at Davisville, except for brief mention of church service attendance, plough agriculture demonstrations, mission house construction, jacklight fishing, and deer hunting, and that the Mississauga inhabited tents or wigwams within earshot of the Methodist mission house, located at the eastern edge of Davisville (Jones 1860; Torry 1869; Warrick 2020). In 2002, archaeological survey was undertaken to find the remnants of the Davisville settlement. The archaeological remnants of three Mohawk cabins at Davisville, situated on coldwater streams, were easily located with shovel testing. Archaeological survey between the cabin sites and farther upriver produced over a dozen discrete positive shovel tests, which produced only calcined bone. Seven test pits yielded more than a dozen pieces of bone, and three produced over 90 pieces each—Davisville 2, East Locus; Davisville 3; and Davisville 5 (Warrick 2004). The lack of other cultural material in the test pits was puzzling, and I had never encountered this before in southern Ontario. After consulting the published literature and asking colleagues who had worked on Anishinaabe, Cree, Chipewyan, Dene, and Innu sites in the boreal forest, it dawned on me that the test pits filled with bone could be the remnants of Mississauga encampments.

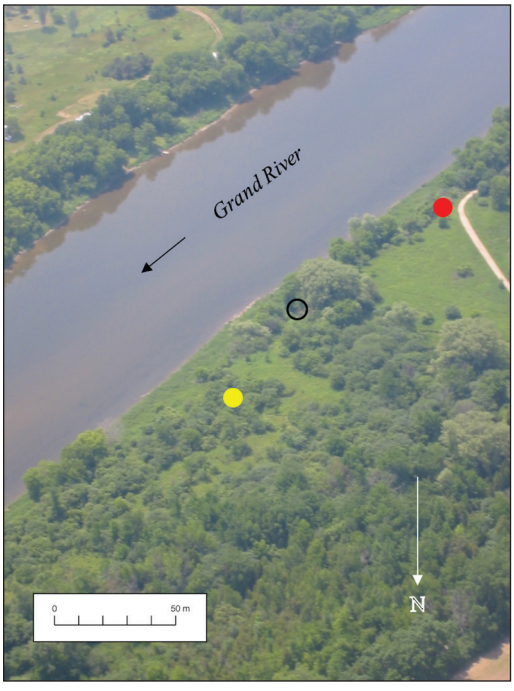
Archaeological Traces of Davisville

Archaeological investigation of Davisville took place between 2000 and 2004. The area of northwestern Brantford marked on the 1830s Lewis Burwell maps as "Indian Settlement" (i.e., Davisville) was targeted for archaeological survey (Figure 1). The footprints of two Mohawk cabins—Davisville 1 (AgHb-241) and Davisville 2 (AgHb-242)—were identified by limited shovel testing and collection of artifacts from a coldwater streambed. In 2002, a systematic test-pit survey was undertaken at a five-metre interval using 6.4 mm mesh screens, along the north bank of the Grand River, extending upriver (west) over a kilometre from the Davisville 1 and Davisville 2 sites. This survey discovered several distinct concentrations of calcined bone, in some instances over 100 pieces of bone from one shovel test. The calcined bone test pits were mapped by GPS and formed seven discrete loci. Two of these loci flanked Davisville 2, one of the Mohawk cabins that was partially excavated in 2001/2002. The loci were labelled Davisville 2, East Locus (50 m east of the Davisville 2 cabin) and Davisville 3 (AgHb-243) (70 m west of the Davisville 2 cabin). Test excavations were conducted of both loci and the results are reported below (Figures 3 and 4).

Archaeology of Davisville 2, East Locus

In 2004, test excavation was undertaken in the east portion of Davisville 2, labelled Davisville 2, East Locus (Figure 5). All artifacts were recovered by water screening site matrix in the field through 1.6 mm mesh. Almost all (140 of a total of 144 pieces) of the comminuted charred and calcined bone and Onondaga chert debitage from the 2004 excavations was recovered from 299E/300N (20–30 cm depth below surface [DBS]). Only one cut nail fragment, one chert flake, two small pieces of pottery, and four pieces of bone were recovered from 300E/293N, which is surprising because the latter unit is less than 5 m east of test pit 22, which yielded 95 pieces of bone from a 30 cm diameter shovel test pit in 2002. The 140 animal bone fragments in 299E/300N were intermixed with Onondaga chert debitage, a drill tip, two pieces of pottery, and one piece of lead shot (Figure 6). It is difficult to argue that the comminuted charred and calcined bone is associated exclusively with a nineteenth-century Mississauga occupation on the basis of a single lead shot. However, in every case in the Davisville 3 site, high concentrations of comminuted burned bone (95% of all bone) were found in association with postcontact artifacts, as described later in this report. This supports the interpretation that most of the burned and comminuted bone in the east locus of Davisville 2 was deposited during an 1820s Mississauga occupation of the site.

Figure 3. *Location of the Davisville 2 and 3 sites.*



Only two European or postcontact artifacts were found, a small machine-cut nail fragment and one lead shot—0.10 calibre. The nail fragment was found in the 15–20 cm DBS level of 299E/300N. The lead shot was recovered from the 20–25 cm DBS level of 300E/293N.

Archaeology of Davisville 3

In 2003, the bone locus (Davisville 3) situated 70 m upriver of Davisville 2 was tested with six one metre square units (using 6.4 mm mesh). The results were remarkable—three of the units revealed a layer of calcined bone that was 35 cm below surface and 3 to 4 cm thick. Flotation samples were taken from two units, producing over 14,000 pieces of bone from one unit. The only postcontact artifacts found in 2003

Figure 4. *Oblique aerial view of the Davisville 2 site, Mohawk cabin (open circle) and East Locus (yellow dot), and the Davisville 3 site (red dot).*

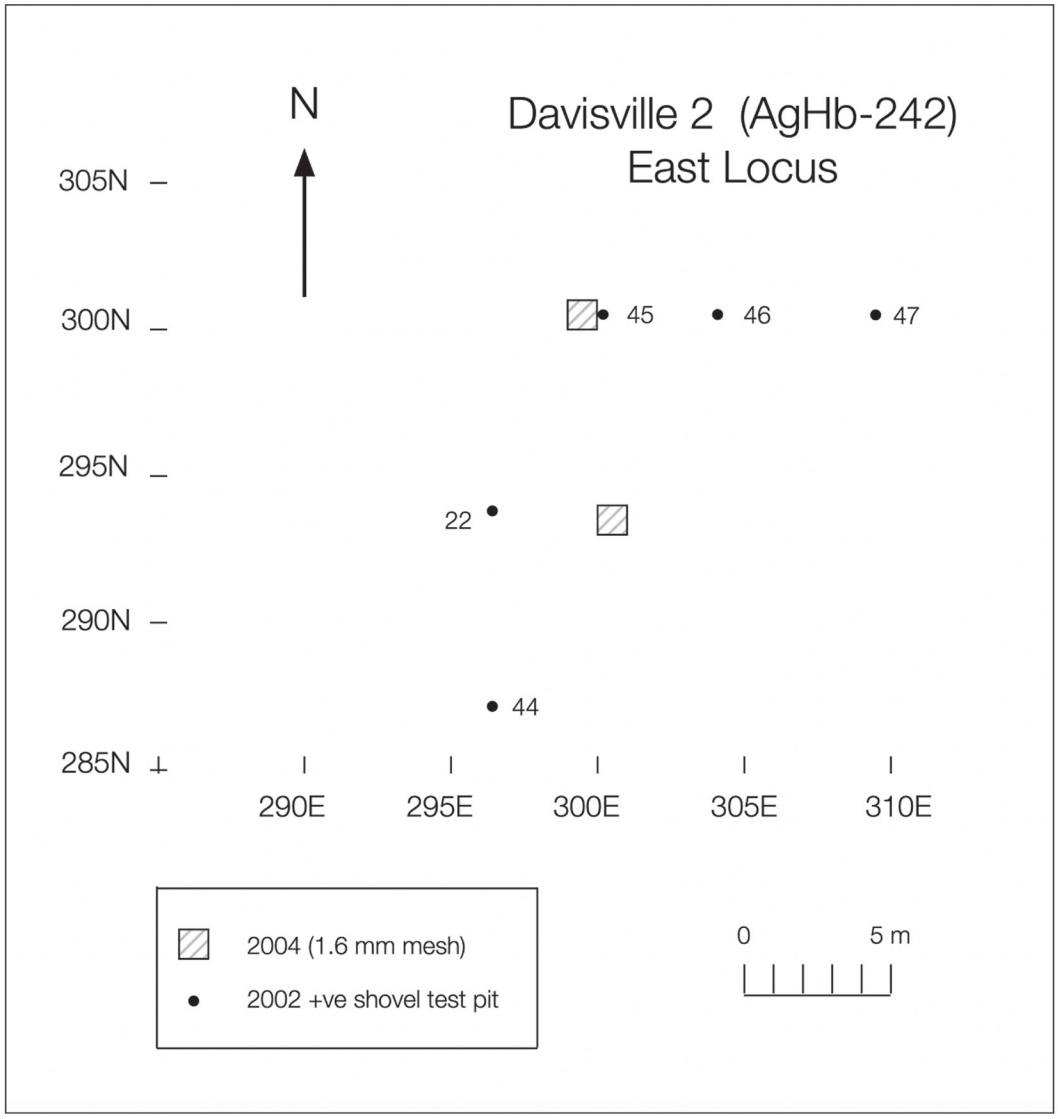


Figure 5. *Plan of excavation units at the Davisville 2 site, East Locus (square co-ordinates labelled as easting-northing from southwest corner of unit). +ve = positive.*

excavations are a small piece of iron scrap, a gunflint or strike-a-light fashioned on Onondaga chert, and one lead shot. In 2004, 20 additional one metre squares were excavated from Davisville 3, 14 of them being excavated with 1.6 mm mesh using water screens in the field. In an effort to determine the degree of stratigraphic disturbance caused by annual flooding, four units with concentrations of bone fragments and artifacts were piece-plotted (Figures 7 and 8). The 2003 and 2004 excavation of the post-contact component of Davisville 3 produced 22,732 bone fragments, 43 lead shot, 13 glass seed beads, 6 brick fragments, 2 gunflint flakes, 1 piece of blue painted ceramic, 2 pieces of blue edgeware ceramic, 1 piece of brass scrap, 1 brass plaque fragment, 1 small iron disc, 3 iron scraps, 1 strike-a-light or possible gunflint of local Onondaga chert, and 1 shell wampum bead (string wampum) (Table 1, Figures 9 and

Figure 6. *Davisville 2 site, East Locus, artifacts from 299E/300N 20–25 cm DBS: (1) fragmentary sherds; (2) lead shot; (3) drill tip (Onondaga chert); (4) chert debitage (Onondaga chert); (5) zooarchaeological remains (charred and calcined bone).*

Figure 7. *Excavation of the Davisville 3 site in 2004.*

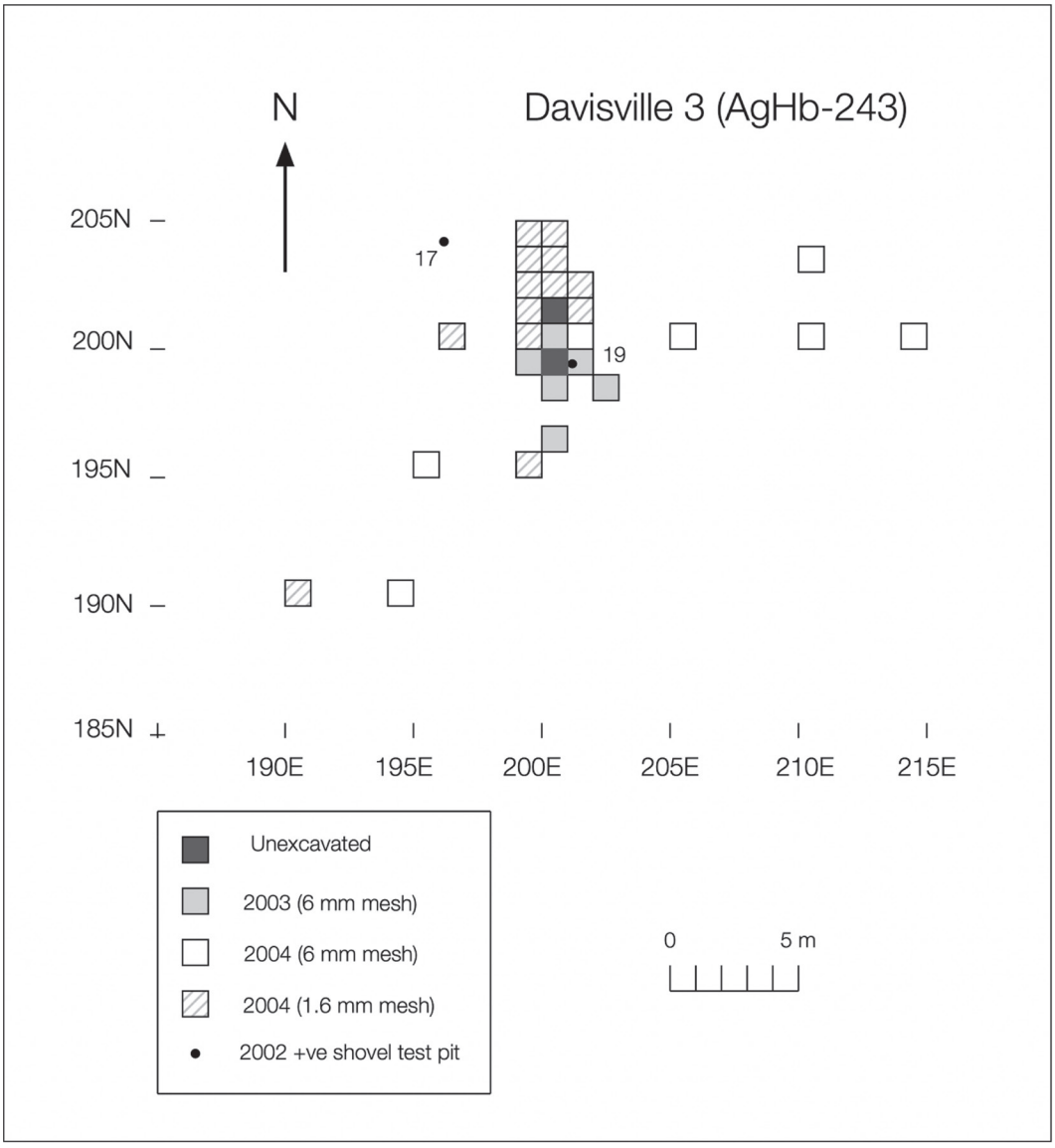


Figure 8. *Plan of excavation units at the Davisville 3 site (square co-ordinates labelled as easting-northing from southwest corner of unit). +ve = positive.*

10). Postcontact artifact density is about three artifacts per square metre. These artifacts are attributed to a postcontact (c. 1820s) Mississauga occupation of the Davisville 3 site.

Ceramics

Refined Earthenware. One tiny piece of blue painted ceramic and two pieces of a blue edged pearlware plate were found in the excavation units (Figure 9). The two small rim pieces of blue edged plate were found at 30–35 cm DBS in 201E/202N. The blue painted microsherd was recovered from 200E/202N at a depth of 20–25 cm DBS. All of the ceramics appear to be pearlware.

Brick. Six very small pieces of red brick were collected from 199E/200N from 25–30 cm DBS. Except for one piece, most are essentially brick

Table 1. *Postcontact artifacts from the Davisville 3 site.**

Artifact	Excavation Unit n	%
refined earthenware	3	4.4
gunflint or strike-a-light	1	1.5
gunflint flake	2	3.0
lead shot	43	63.2
glass seed bead	13	19.1
shell wampum bead	1	1.5
brass plaque	1	1.5
brass scrap	1	1.5
iron sheet scrap	3	4.4
Total	**68**	**100.0**

* Excludes 22,732 zooarchaeological remains attributed to postcontact component and excludes modern items (see text).

dust and would not have been recovered without the use of 1.6 mm mesh in the field. It is unlikely that the brick fragments are related to the postcontact Mississauga occupation.

Glass Beads. A total of 13 glass beads were recovered from Davisville 3 and all are drawn round, seed beads used for embroidery (Figure 9). Without the use of fine-mesh water screening in the field, none of these beads would have been recovered. Glass beads were concentrated in the 30–40 cm DBS layer of the site, although two white beads were found at a depth of only 23–25 cm DBS. The beads have similar diameters (2.3 mm on average) and various colours are represented: white (5), robin egg blue (3), black (2), yellow (2), orange (1) (Table 2). In the late eighteenth and early nineteenth century, glass seed beads on Indigenous

Figure 9. *Davisville 3 site postcontact artifacts: (1) iron disc from 200E/198N 33 cm DBS; (2) brass plaque fragment from 200E/200N 30–40 cm DBS; (3) blue edge (pearlware) from 201E/202N 34–35 cm DBS; (4) blue edge (pearlware) from 201E/202N 30–35 cm DBS; (5) glass seed beads (orange from 201E/200N 36–37 cm DBS; black and white from 201E/200N 38–39 cm DBS; robin egg blue and yellow from 199E/201N 30–31 cm DBS); (6) shell wampum bead (machine-drilled hole) from 199E/202N 40–41 cm; (7) lead shot from 200E/204N.*

Figure 10. *Davisville 3 site gunflint/strike-a-light on Onondaga chert from 200E/196N 25 cm DBS.*

Table 2. *Glass seed beads from the Davisville 3 site.*

Provenience	Type	Colour	Diameter (mm)
199E/201N, 23–24 cm	seed	white	2.1
199E/201N, 24–25 cm	seed	white	2.3
199E/201N, 30–33 cm	seed	robin egg blue	2.4
199E/201N, 30–33 cm	seed	yellow	2.3
200E/202N, 30–32 cm	seed	robin egg blue	2.4
200E/202N, 34–35 cm	seed	yellow	2.4
201E/200N, 38–39 cm	seed	black	2.1
201E/200N, 38–39 cm	seed	black	2.6
201E/200N, 38–39 cm	seed	white	2.3
201E/200N, 36–37 cm	seed	orange	2.0
201E/200N, 36–37 cm	seed	robin egg blue	2.3
201E/201N, 36–37 cm	seed	white	2.3
201E/202N, 32–33 cm	seed	white	2.4

sites in Ontario are most commonly white or black in colour. For example, at the Beasley site dating to the 1790s, black and white glass beads comprise 91% of 1,076 beads at the Mississauga encampment and 97% of 2,106 beads found at the Beasley trading post (Triggs 2004:164). Obviously, by the 1820s in Ontario, there was more choice in glass bead colours or a change in colour preference amongst the Mississauga.

Metal Artifacts

Brass. A fragment of a small, incised brass plaque was found in 200E/200N at 30–40 cm DBS. About half of the plaque is represented and the entire piece was likely octagonal in outline. The plaque measures 20.6 mm long, 10.8 mm wide, and 0.6 mm thick and is slightly concave (Figure 9). Its function is not known but it may be a brass fitting from a pistol or rifle. In

addition, a small piece of brass sheet scrap was found.

Iron. A small oval iron disc, slightly concave, was recovered from 33 cm DBS in 200E/198N. It measures 14.5 mm long, 11.6 mm wide, and 1.4 mm thick (Figure 9). Its function is unknown. In addition, three small pieces of iron sheet scrap were found.

Lead Shot. Lead shot was the most common postcontact artifact recovered from Davisville 3. Lead shot was measured according to imperial units instead of metric because the size of lead ammunition in the nineteenth century was moulded to fit a certain calibre measured in fractions of an inch. The most common sizes are 0.09, 0.11, and 0.12 calibre (or 12-gauge) (2.3, 2.8, and 3.0 mm, respectively; Figure 9 and Table 3). Lead shot would have been used for hunting birds (e.g., passenger pigeon) and small game.

Other Artifacts

Gunflints. One gunflint (or strike-a-light) and two gunflint flakes were recovered from Davisville 3. The gunflint was found at 25 cm DBS in 200E/196N and is made on a natural blocky pebble of Onondaga chert and measures 22.7 mm in length, 18.5 mm in width, and 11.0 mm in thickness (Figure 10). One edge is battered with multiple hinge fractures. Based on these dimensions, the gunflint was likely a rifle flint (Hunt 1993:92). Two small gunflint flakes were found, both black or English (Brandon) flint.

Wampum Bead. A white, tubular wampum bead made of what is assumed to be marine shell (based on historical accounts) (Corbiere 2019) was discovered at 40–41 cm DBS in 199E/202N.

Table 3. *Size of lead shot from the Davisville 3 site.*

Size (calibre in inches)	n	%
0.14	2	4.6
0.13	3	7.0
0.12	15	34.9
0.11	10	23.3
0.10	2	4.6
0.09	11	25.6
Total	**43**	**100.0**

Its dimensions are 5.3 mm in length, 6.1 mm in width, 4.4 mm in thickness (the bead has an oblong cross-section), with a hole diameter of 2.5 mm (Figure 9). The hole is perfectly symmetrical and circular, indicating that it was probably produced with a metal drill. The bead is too large to have been mounted on a wampum belt. It is likely a loss from a string of wampum, commonly used in the seventeenth, eighteenth, and early nineteenth century by both Six Nations and the Mississauga in ceremony and in treaty making (Corbiere 2019:87–97; Tehanetorens 1972).

Zooarchaeological Remains. No detailed analysis was carried out of zooarchaeological remains recovered from Davisville 2, East Locus, because of their small size and highly fragmentary state. A total of 139 of 144 (96.5%) zooarchaeological remains show heat alteration, mostly calcined bone. All of the recovered pieces appear to be mammal bone, based on cortical thickness.

A zooarchaeological analysis of Davisville 3 was completed by Debbie Berg (former zooarchaeological lab instructor in the Department of Anthropology, University of Toronto Mississauga) in 2005 (2005c). Despite the highly fragmented and calcined condition of the bone, 304 of 22,732 specimens are identifiable to species. Over 90% of the bone is heat altered (mostly calcined) and 90% of the heat-altered bone is mammal. For reasons presented below, only the heat-altered bone can be assigned with any confidence to the Mississauga occupation of Davisville 3. For heat-altered bone only, identified taxa are lake sturgeon (*Acipenser fulvescens*), redhorse sp. (*Moxostoma* sp.), bass sp. (*Micropterus* sp.), freshwater drum (*Aplodinotus grunniens*), red squirrel (*Tamiasciurus hudsonicus*), American beaver (*Castor canadensis*), and white-tailed deer (*Odocoileus virginianus*). No domesticated species were identified (Table 4).

Age and Cultural Affiliation of Burned and Comminuted Zooarchaeological Remains

Stratigraphic separation of the pre- and postcontact occupations of Davisville 3 is not possible. The distribution of pre- and postcontact artifacts in the site reflects considerable stratigraphic mixture, doubtless the result of annual flooding and

Table 4. *Heat-altered zooarchaeological specimens from the Davisville 3 site.*

Taxon	Number of Specimens
clam species (Pelecypoda)	22
fish species (Fish)	21
lake sturgeon (*Acipenser fulvescens*)	2
redhorse species (*Moxostoma* sp.)	3
smallmouth/largemouth bass (*Micropterus* sp.)	2
freshwater drum (*Aplodinotus grunniens*)	5
small perching bird species (Passeriformes)	1
mammal species (Mammalia)	20,378
red squirrel (*Tamiasciurus hudsonicus*)	1
American beaver (*Castor canadensis*)	1
white-tailed deer (*Odocoileus virginianus*)	52
Total	**20,488**

Source: Berg 2005c.

ice scouring of river banks. However, there is sufficient evidence that makes it possible to assign zooarchaeological remains to pre- and postcontact components on the basis of heat alteration of the bone. A concentration of heat-altered and calcined mammal bone was found in four contiguous excavation units (at 35–40 cm depth below sod) in association with glass beads, lead shot, and glazed ceramics, suggesting a single depositional event—possibly a shallow refuse feature (Figure 11). While the "feature" also contains precontact artifacts and unheated bone, these were likely introduced by digging of the original pit and fluvial reworking of the deposits. Statistically, there is a highly significant association of heated deer bone with excavation units and layers containing post-occupation artifacts (heated bone with the postcontact layer, $n = 50$, and heated bone with the precontact layer, $n = 3$).

Based on the co-occurrence of postcontact artifacts and ultra-high concentration of calcined bone in the four contiguous units and the absence of heat-altered bone in three excavation units that produced only precontact artifacts, the heat-altered bone for the entire site was assigned (somewhat arbitrarily) to the postcontact occupation and the identified species are listed in Table 4. It is important to note that charred and calcined animal bone comprised only 16 to 32% of the total zooarchaeological assemblage from the Donaldson (BdHi-1) and Thede (BcHi-7) sites, respectively (these are Middle Woodland Saugeen sites) (Finlayson 1977:210, 481). And the percentage of charred and/or calcined large mammal bone from Western Basin Tradition sites ranged from 5 to 50% (Foreman 2011:230). So the relative frequency of heat-altered animal bone at Davisville 3 at 90% is unique and does not fit the pattern for other Middle or Late Woodland sites in southwestern Ontario, adding support to the inference that most of the zooarchaeological remains recovered from the site relate to the nineteenth-century Mississauga occupation.

The large quantity of comminuted or highly fragmented charred and calcined bone at Davisville 2, East Locus, and Davisville 3 is interpreted as the by-product of rendering bone grease. Bone grease was widely used by hunter-gatherers in Canada as a source of fat and essential nutrients in the winter months (Church and Lyman 2003; Prince 2007; Vehik 1977). Bone grease is most efficiently rendered by breaking mammal bones into small pieces and then boiling them. Analyses of highly fragmented, charred, and calcined mammal bone from archaeological sites has revealed that most bone fragments tend to be 6 to 15 mm in size, with an obvious preference for a size of 10 mm for reasons of speed and efficiency in bone grease production (Foreman

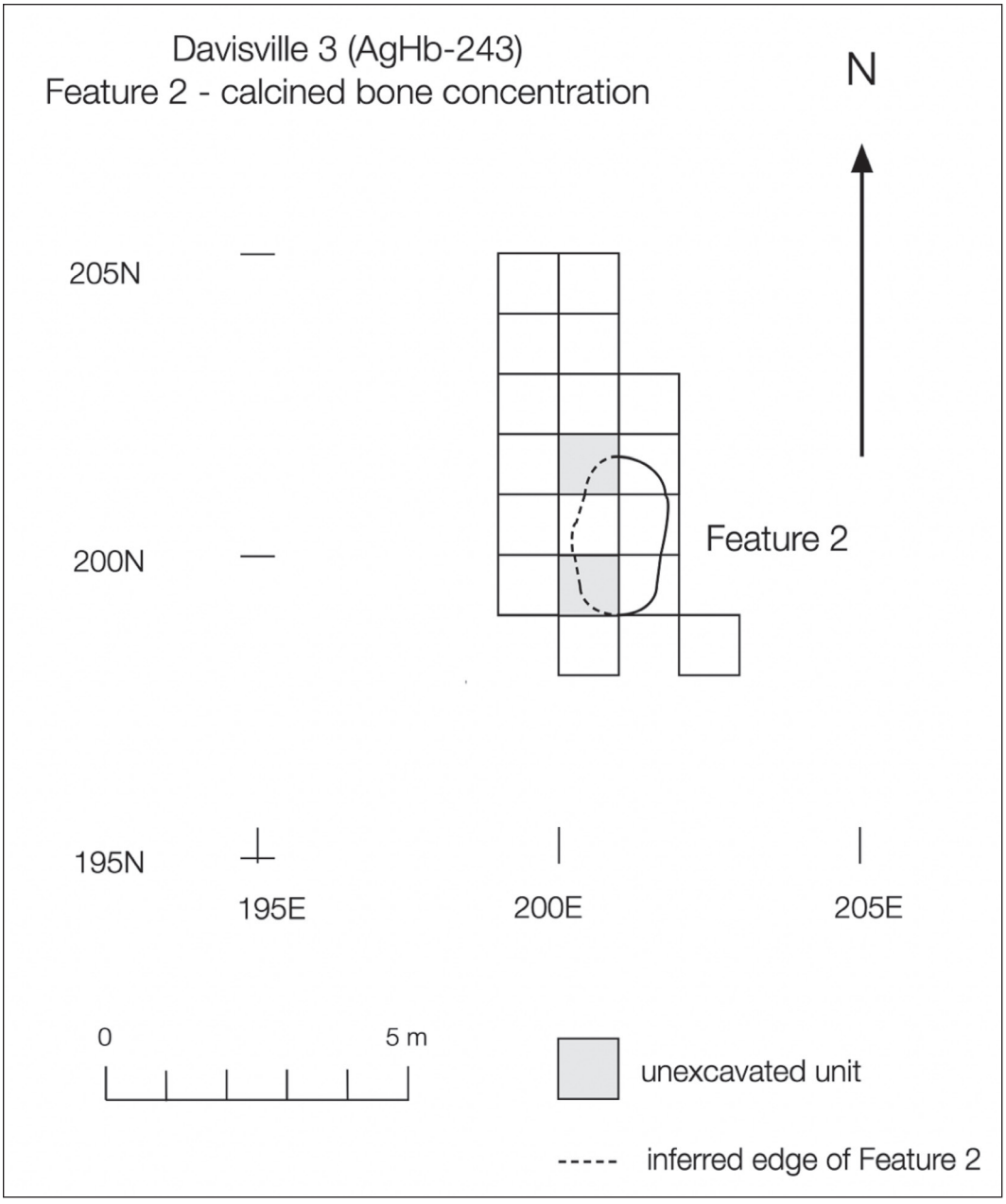


Figure 11. *Davisville 3 site, Feature 2 (calcined bone concentration) location.*

2011:109–143; Morin 2020; Prince 2007). Bone fragment size distribution for samples of fragmented charred and calcined bone from Davisville 2, East Locus; Davisville 3; and shovel test pits in Davisville 4 (AgHb-244) and Davisville 5 (AgHb-251) (presumed locations of other Mississauga encampments) reveal modal frequencies of 6 to 8 mm for Davisville 3 and 10 to 15 mm for Davisville 2, East Locus; Davisville 4; and Davisville 5 (see histograms in Figure 12). It is noteworthy that the incidence of charred and calcined bone at Davisville 3 and Davisville 2,

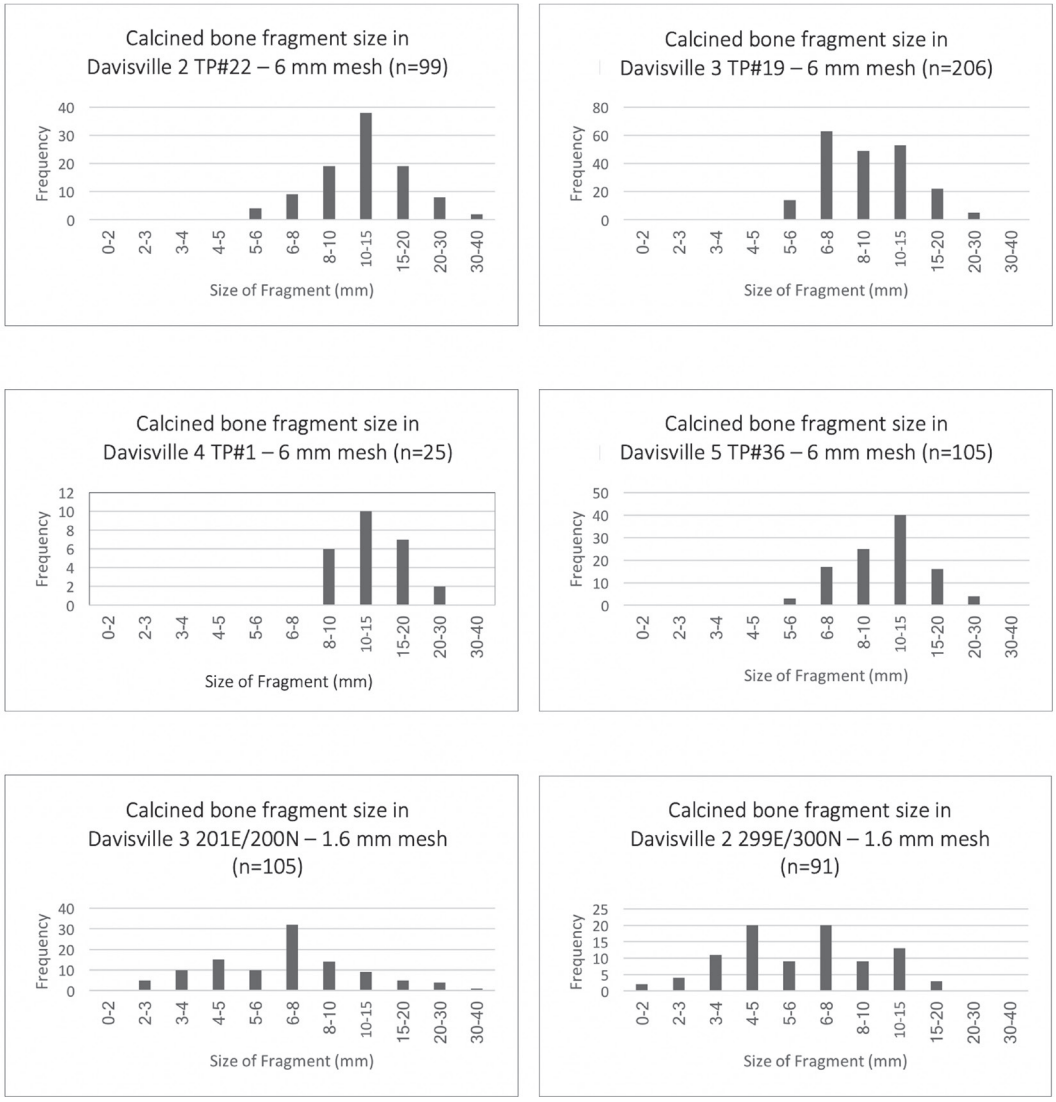


Figure 12. *Fragment size of calcined bone in shovel testpits and excavated units in the Davisville sites.*

East Locus, is over 90%, whereas the incidence of charred and calcined bone at Davisville 1 and Davisville 2, both Mohawk cabins, is only 7.1% and 22%, respectively (Berg 2005a, 2005b). At the Townley-Read site, a mid-eighteenth-century Seneca site in New York State, only 24% of the animal bones are heat altered (Watson and Thomas 2013). Lindsay Foreman (2011:109–143) found that 5 to 50% of all cervid bones from Late Woodland Western Basin sites are burned, interpreted as waste from making bone grease. It would appear that the zooarchaeological assemblages of Davisville 2, East Locus, and Davisville 3 are in a class of their own, overwhelmingly dominated by highly fragmented heat-altered bone. It is obvious that the Mississauga at Davisville made a concerted effort to render bone grease for their overwintering stay at Davisville from 1825 to 1826.

Table 4 clearly demonstrates that the Davisville Mississauga primarily hunted deer and fished. Peter Jones (1860) notes that jacklight

fishing in the Grand River was very productive in the 1820s (he and two other Mississauga men caught 120 fish in one night). Deer hunting was also locally productive and accounts for most of the identified mammal remains in Six Nations cabin sites at Davisville (Berg 2005a, 2005b; Warrick 2003). Debbie Berg (2005c:4–5) identified various axial elements of deer, implying local hunting and transport of the entire deer back to camp, and suggests that most of the burned mammal bone is probably deer as well. Historical sources in the early nineteenth century relate that deer hunting was carried out by Mississauga and other Anishinaabe peoples in the summer, fall, and over the winter (Ferris 1989:105–106). The inferred season of occupation matches the historical record of the summer 1825 to spring 1826 occupation of Davisville by the Credit River Mississauga.

Archaeological Signature of Late Eighteenth- to Early Nineteenth-Century Mississauga

In addition to Davisville 3 and Davisville 2, East Locus, there are two other sites in southern Ontario that have been identified as late eighteenth-/early nineteenth-century Mississauga—the Beasley site (AhGx-26) (Triggs 2004) and the Nursery site (AhGx-8) (Martin 2021). Excavations at the Beasley site uncovered the remains of a late eighteenth- and early nineteenth-century Mississauga camp, occupied periodically over 30 years, that produced thousands of glass embroidery beads, lead shot, and highly fragmented and burned animal bone (deposits water screened through 1.6 mm mesh), as well as numerous gunflints, gun parts, trade silver jewellery, brass and iron scrap, and white ball clay tobacco pipe fragments (Triggs 2004). It should be noted that this Mississauga camp was adjacent to Richard Beasley's trading post that was in operation approximately from 1785 to 1815, explaining the highly visible archaeological footprint of this site. Excavation of the Nursery site, at Cootes Paradise (Royal Botanical Gardens), produced a few late eighteenth-/early nineteenth-century artifacts (glass beads, punched lead bale seal, a King George III military button, trade silver, French and English gunflint flakes, and a possible gunflint on Kettle Point chert) and comminuted calcined mammal bone. Scott Martin interprets these finds as the remains of a small short-term Mississauga encampment of Chief Wahbonosay's Credit River Mississauga dating to approximately 1800 (Martin 2021).

It is noteworthy that all known late eighteenth-/early nineteenth-century Mississauga sites (i.e., Davisville 3, Beasley, and Nursery) are multi-component, with a significant amount of precontact material intermixed stratigraphically. John Triggs (2004) found at the Beasley site, in Hamilton, Ontario, hundreds of pieces of corded pottery and chipped lithic tools and debitage in stratigraphic association with a 1790s Mississauga encampment. He attributes the co-association of "precontact" artifacts and postcontact artifacts to cultural continuity. Triggs (2004:169–170) argues that the Mississauga of the 1790s may have been still producing pottery vessels and chipping stone tools. Similar claims have been made for the continued use of chipped lithics and hand-thrown pottery in postcontact times for the nineteenth-century Kickapoo and Potawatomi (Wagner 2006) and for chipped lithic use by the nineteenth-century Metis (Supernant 2018). While there are examples of gunflints being fashioned out of southern Ontario chert (e.g., Nursery and Davisville 3 sites), and there is the possibility for the use of expedient flake tools on local chert by the postcontact Anishinaabeg, formal lithic tools (e.g., projectile points, knives) and pottery do not appear to have survived into the late eighteenth and early nineteenth century in Ontario and adjoining regions (Ferris 2009; Jordan 2008). It is interesting that the pottery at Davisville 3 is mostly corded, similar to that at Beasley. However, the presence of a Levanna point, a Kettle Point knife, and the tip of an exotic quartz or chalcedony point, in association with corded pottery and biface thinning and trimming flakes, argues for a late Middle Woodland age (c. 500–800) for the precontact pottery and lithics at Davisville 3. In fact, it could be argued that the Beasley site has a similar admixture of artifacts from postcontact Mississauga and Middle Woodland components because of compressed stratigraphy due to extremely slow accumulation

of soil and anthropogenic and natural reworking of the occupation layers. Based on the relatively shallow depth of upland forested Archaic sites (vertical distribution of artifacts from less than 10 to 20 cm below the topsoil of the modern forest floor), showing evidence of admixture of artifacts from occupations thousands of years apart (e.g., Little Shaver [AhHa-146] [Timmins 1996] and Huson [AgGt-111] [Archaeological Services Inc. (ASI) 2004] sites), and the thickness of paleosols of known age (e.g., Grand Banks site [AfGx-3]) (Crawford et al. 1998; Walker et al. 1997), it appears that non-alluvial soils in southern Ontario accumulate at a very slow rate of about 1 to 2 cm or less per thousand years. Consequently, based on the relative absence of overbank flooding between 500 and 1800 on the Grand River (Crawford et al. 1998:134; Walker et al. 1997:882–883), only 1 or 2 cm of soil would have covered Middle Woodland deposits when postcontact Mississauga reoccupied both the Davisville 3 and Beasley sites. Daily activities (e.g., trampling) of the Mississauga would have effectively incorporated the living surface deposits and artifacts of Middle Woodland times into the postcontact Mississauga living floor. Trampling in sandy soils can cause artifacts to be displaced several centimetres deeper in site deposits from their original position on an occupation surface (Villa and Courtin 1983).

Ethnographic Analogy, Taphonomy, and Interpretation of Davisville 3

Historical evidence, site location and context, site structure, and archaeological assemblage support the interpretation of Davisville 3 as the remains of one of the 1825–1826 Mississauga dwellings at Davisville.

Historical evidence indicates that over 80 Mississauga encamped at Davisville, living in tents or wigwams, some of them in the forest. An 1833 map drafted by surveyor Lewis Burwell clearly shows that Davisville stretched upriver for over a kilometre from the Methodist mission house constructed in 1824 (Figure 1). Archaeological survey has confirmed the linear nature of the Davisville settlement, with Mohawk cabins spaced 250 to 300 m apart, adjacent to coldwater streams, upriver from the Methodist mission house (Warrick 2020).

Until recently, boreal forest hunter-gatherers in Canada followed a highly mobile seasonal round, shifting camp as often as ten times per year (Kelly 2013). Ethnoarchaeological work in the 1970s and 1980s revealed some common features of Subarctic hunter-gatherer camps, including relatively clean habitation areas, artifact-rich refuse dumps/pits at a considerable distance (20–30 m) beyond the habitation area, regular burning of food bones and waste in exterior clean-up hearths (to reduce odours and discourage scavenging animals), quantities of smashed and calcined bone in dumps and hearths (pulverized from rendering bone grease), high reuse and curation of tools, and scavenging of old camps for useable materials (Brumbach and Jarvenpa 1989:177–181, 188–191; Gordon 1980, 1988; Janes 1983). Archaeological excavation of nineteenth-century Cree camps on the Severn River, northern Ontario, produced hearth features with abundant calcined bone (often 50 to 90% of food bones) and very few European or Indigenous-made artifacts within the inferred habitation area (from two to six artifacts per square metre) (Pilon 1987). In fact, very low artifact densities (normally just two to three artifacts per square metre) within habitation areas on other nineteenth-century hunter-gatherer (i.e., Potawatomi, Dakota, Gwitchin and Koyukon) sites appears to be the norm (Clark 1996; Fafard and Le Blanc 1999; Morlan 1972; Spector 1993; Wagner 1998; Table 5).

Davisville 3 displays a number of characteristics similar to Subarctic hunter-gatherer camps, including abundant smashed, calcined bone (90% of food bone is heat altered), few artifacts (two to six artifacts per square metre), and dense concentrations of bone refuse surrounded by relatively sterile areas. The bone deposit which also contains small amounts of postcontact artifacts at Davisville 3 is interpreted as a shallow midden or dump associated with one of the 1825–1826 Mississauga dwellings at Davisville. Two square metres were excavated in another bone test-pit locus (Davisville 2) 50 m downriver from Davisville 3. One unit was virtually sterile but the other contained pieces of calcined bone and one

Table 5. *Most common artifacts in postcontact northern hunter-gatherer artifact assemblages.*

Group	Most Common Artifacts (in order of decreasing frequency)	Artifact Density (n/m^2)	Reference
Southwestern Ontario Ojibwa (1790s CE)	glass beads, ammunition, brass scrap, gunflints		Ferris 1989, 2009
Mississauga (1790s CE)	glass beads, ammunition, trade silver, gunflints		Triggs 2004
Cree (1700–1900 CE)	glass beads, bottle glass, clay pipes, ammunition	2–6	Pilon 1987
Potawatomi (1820–1840 CE)	glass beads, ammunition, trade silver, gunflints	4	Wagner 1998
Mississauga (1825 CE)	ammunition, glass beads	2.5	Warrick this volume
Wahpeton Dakota (1830s CE)	glass beads, glass, iron scrap, ammunition, gunflints	1.5	Spector 1993
Koyukon (1870s CE)	glass beads, ammunition, gun parts		Clark 1996
Gwitchin (1850–1880 CE)	glass beads, clay pipes	2	Fafard and Le Blanc 1999
Gwitchin (1850–1880 CE)	glass beads, glass, gun parts, nails	3	Morlan 1972
Metis (1850s–1880s CE)	glass beads, ammunition		Supernant 2018, 2021
Inuvialuit (1870s–1900 CE)	glass beads, ammunition, bottle glass		Friesen 2013

lead shot. This is interpreted as another Mississauga dwelling at Davisville. The Subarctic hunter-gatherer nature of the 1825–1826 Mississauga occupation of Davisville is striking considering that six months after leaving Davisville, the Mississauga were living in log cabins with glass windows and practising plough agriculture in fenced fields on the Credit River (Smith 1987:77–78).

In summary, archaeological test excavation of two of the bone test-pit loci revealed a similar pattern of abundant heat-altered bone fragments mixed with a very small number of postcontact artifacts (mainly lead shot and glass seed beads). Adhering to the standard survey coverage (five-metre interval) and mesh size (6.4 mm) used in archaeological work in Ontario (Ontario Ministry Tourism and Culture 2011), most Mississauga camp sites would avoid detection during a shovel test survey, because most of the artifacts found at Davisville 3 would not have been recovered using standard 6.4 mm or even 3.2 mm mesh excavation sieves. The postcontact age of the bone deposits was only determined by using 1.6 mm mesh and water screens that captured lead shot and glass seed beads in association with the bone. Except for the abundant animal and fish bones, which could be mistaken as precontact in age (given the mixed stratigraphy due to soil disturbance caused by flooding and ice scouring), the postcontact Mississauga occupation at Davisville is essentially invisible to Ontario government-mandated minimum standard techniques of archaeological recovery. In conversation with members of the Mississaugas of the Credit First Nation (direct descendants of Davisville Mississauga), the author expressed his frustration over the difficulty of finding archaeological traces of nineteenth-century Mississauga life. One might imagine that the Mississaugas of the Credit would be concerned that their nineteenth-century ancestors are barely visible archaeologically, as this could support the colonial myth

that Indigenous hunter-gatherer-fishers barely used the land. The Mississaugas of the Credit did not share the author's concerns; they expressed considerable pride that their ancestors lived so incredibly sustainably and left so few permanent residues on the landscape of southern Ontario.

Postcontact Hunter-Gatherer Sites and Archaeological Visibility

The archaeology of the 1820s Mississauga occupation of Davisville revealed a meagre artifact inventory, dominated by ammunition (lead shot) and glass seed beads. How does the archaeological signature of an 1820s Mississauga camp compare with other late 1700s to early 1900s hunter-gatherer sites in North America? A survey of the published literature reveals a remarkably similar archaeological signature for late postcontact hunter-gatherers (Table 5).

Postcontact hunter-gatherer sites characteristically display impoverished artifact assemblages and are notoriously difficult to find and identify. The reasons for the poor archaeological visibility of postcontact hunter-gatherer sites are: highly perishable material culture; light ecological footprint; brief occupation span; small site population; high curation of non-perishable tools; scavenging and recycling of artifacts and building materials; and misidentification with precontact (when postcontact bone and fire-cracked rock on a site are intermixed with lithics and ceramics from precontact occupations) or settler (presence on a site of kaolin pipe, brass or iron fragments, gunflint in the absence of trade silver, or glass beads mistakenly assigned to non-Indigenous occupants) occupations (Beaudoin 2016; Ferris 2009:41; Gordon 1988; Janes 1983; Pilon 1990). An ethnoarchaeological observation of the Mackenzie Basin Dene by Robert Janes (1983:94) captures the invisible nature of northern hunter-gatherers after European contact:

> The fish and fowl, a fire, several cooking sticks, a bough mat, and knives were all that were required for this small feast. Given the curation of the knives by their owners, little or nothing remained for the archaeologist.

Ethnoarchaeological work (Gordon 1988; Janes 1983), land-use and heritage landscape studies (Andrews and Zoe 1997; Byrne 2002, 2003a; Godwin and L'Oste-Brown 2002; Greer 1997), and archaeological work of recent hunter-gatherer camps in Australia and northern Canada indicate that about 70% of postcontact hunter-gatherer land use leaves little or no archaeological trace (e.g., trails, fishing and picnic spots, short-term camps, socializing places) and the postcontact camps leave ambiguous archaeological remains that either elude standard techniques of archaeological detection or can be conflated with precontact or settler components (in cases of overlapping occupations with no or minimal stratigraphy) (Byrne 2002; Gordon 1988; Janes 1983). In Subarctic Canada, fur trade–period (1670–1880) Indigenous sites are often grossly under-represented in the archaeological record (Gordon 1988; Klimko 2004; Pilon 1991), constituting only 20% or less of sites discovered in regional surveys (Dawson 1976b; Denton 1988; Gordon 1988; Klimko 2004; Pilon 1987, 1991). No eighteenth- or nineteenth- century sites were found at all in a survey of northern Saskatchewan, despite the involvement of Indigenous community historians (Brumbach and Jarvenpa 1989). In contrast, boreal forest archaeological site inventories typically contain 40 to 90% twentieth-century Indigenous sites (high visibility from standing structures or surface artifacts and oral history of local Indigenous communities) (Brumbach and Jarvenpa 1989; Denton 1988; Gordon 1988; Nolin and Pilon 1994; Pilon 1991). While catastrophic depopulation of Indigenous groups from European epidemic diseases might account for the low number of eighteenth- and nineteenth-century sites in the Canadian Subarctic (Dawson 1976a:26; Pilon 1991), poor archaeological visibility of postcontact hunter-gatherers is more likely responsible for "missing" sites in the northern forests of North America.

In southern Ontario, most eighteenth- and nineteenth-century Anishinaabe sites will be difficult to find archaeologically. The colonial period Mississauga subsistence-settlement pattern was based on an annual cycle of mobility within a defined territory: in early spring, family

groups would have gathered for maple syrup production; after sugaring season ended, the entire group would have left the interior to establish a large aggregation camp at a major river mouth or lakeshore (e.g., the Credit River) to capture spring spawning fish; in May, the summer village site, situated on high ground overlooking maize fields on river flats, would have been reoccupied (individuals and families would have left the village periodically to set up temporary camps for hunting, fishing, and berry picking); in the fall, after maize and/or wild rice and edible nuts were harvested and processed (nut gathering and wild rice harvesting sites would leave no archaeological trace at all, except for carbonized remains in settlements) (Lepofsky and Armstrong 2018), teams of hunters and their families would have left the summer village to hunt deer; after which, individual families dispersed to winter campsites in upland areas (where trapping of fur-bearing animals would have been a key activity) (Smith 2013:38). The sugaring camps, spring fishing camps, and summer village would likely have been repeatedly reoccupied; however, smaller hunting, fishing, and collecting camps would probably not have been (Ferris 2009:45–48; Good 1998:153–155, 157; Rogers 1994: 138–140; Smith 2013:38–40). Archaeologically, small short-term/special-purpose camps would be virtually invisible—perhaps only a single cooking hearth or pit feature, some animal bones, and a few artifacts in an area of less than 150 m^2. For example, two seventeenth-century Attawandaron hunting camps were excavated in the early 1980s by Ministry of Transportation archaeologists on the Highway 403 corridor west of Brantford. If chert debitage and tools and pottery are removed from artifact assemblages, all that would remain are one small piece of iron and highly fragmented and calcined animal bones at the Horner Creek site (AgHd-11) (Lennox 1995) and just one glass bead (3 mm in diameter and recovered during fine-sieve flotation) at the Alder site (AhHa-71) (Hagerty and Lennox 1995). Similarly, eighteenth- and nineteenth-century maple sugar camps, although they were probably reused for many years, would contain relatively few artifacts per square metre (Franzen et al. 2018). In contrast, spring fishing camps and summer villages would have been reused annually, possibly for decades (and usually contain evidence of extensive precontact use), resulting in a substantial archaeological footprint. For example, excavations at both the Beasley (late eighteenth- to early nineteenth-century Mississauga winter/spring camp) and Bellamy (AdHm-7) (late eighteenth- to early nineteenth-century Chippewa summer camp) sites revealed house floors, pit features, and middens containing abundant glass embroidery beads, lead shot, highly fragmented and burned animal bones, and a variety of other European-made items (e.g., gun flints, trade silver jewellery, brass and iron scrap, gun parts, tobacco pipe fragments) (Ferris 2009:48–56; Ferris et al. 1985; Triggs 2004).

Postcontact Mississauga spring and summer aggregation and village sites will be highly visible archaeologically because of high artifact density. Small postcontact Mississauga camp and special-purpose sites (e.g., maple sugar camps), on the other hand, have very low artifact densities, typically only two to six items per square metre. Additionally, the most common artifacts on Mississauga sites are seed beads and lead shot smaller than 3 mm in diameter, which would not be recovered using standard 6.4 and 3.2 mm mesh screens. The relatively numerous zooarchaeological remains on Mississauga sites would be found, but, in the absence of European-made artifacts, such remains might be attributed to a precontact occupation. Conversely, if only a tobacco pipe fragment, gunflint, or iron fragment were found, in the absence of wild mammal bone, such finds would likely be attributed to a nineteenth-century settler occupation (Beaudoin 2016, 2022; Ferris 2009:41). In an effort to improve discovery and identification of postcontact Indigenous camp sites, while it might be impractical to do so under current provincial standards and guidelines for CRM archaeology, if a shovel test-pit or pedestrian survey produces numerous pieces of burned, comminuted bone, the archaeologist should recommend further testing of the area using 1.6 mm mesh to ensure the capture of lead shot, glass seed beads, and gunflint flakes that might signal a postcontact Indigenous camp. In

addition, the archaeologist should consult with the appropriate Indigenous community for oral tradition on historical use of the property in question and search the archives for documentary evidence that may identify a postcontact Indigenous presence (Beaudoin 2022; Lelièvre 2017). Methodologically, in order to increase the archaeological visibility of postcontact hunter-gatherer camp sites, Ontario Ministry of Tourism, Culture and Sport (MTCS) will need to upgrade the archaeological standards and guidelines to allow for Indigenous consultation and use of fine sieves at the Stage 1 and Stage 3 phases of CRM work, respectively.

Certain factors improve the visibility of Mississauga and other postcontact Indigenous sites in Canada. First of all, Indigenous oral history, place names, and contemporary use of earlier occupation sites—related to continuity in land use—all have great potential for locating postcontact sites (Andrews and Zoe 1997; Greer 1997). Modern cabins and tent camps are often spatially associated with archaeological sites (Dawson 1976b; Gordon 1988; Greer 1997; Nolin and Pilon 1994; Pilon 1991). Furthermore, postcontact occupations are commonly superimposed stratigraphically on precontact ones, for example, on major rivers (Pilon 1987; Nolin and Pilon 1994). We note that multi-component sites (i.e., those with both a precontact and postcontact component) in northern Canada range from 10 to 30% of regional site inventories (Dawson 1976a, 1976b; Julig 1988; Nolin and Pilon 1994; Pilon 1987, 1991). The characteristically high artifact density of the precontact components of such sites makes them extremely visible, thus increasing the probability of finding and identifying the postcontact components. The dense concentration of calcined bone in postcontact sites is another factor that can improve discovery (Pilon 1987). Some archaeologists have actually assigned a tentative postcontact age to sites in northern Canada which have yielded only calcined bone and no artifacts (Nolin and Pilon 1994; Pilon 1987). Despite these factors which improve visibility, postcontact hunter-gatherer sites in Canada will continue to elude traditional techniques of archaeological discovery (i.e., surface inspection and shovel testing with 6.4 mm mesh).

The relative absence of post-1650 Indigenous sites registered in the archaeological sites database of the MTCS is likely the result of the archaeological invisibility of small, short-term postcontact camps, misidentification of them as either precontact or postcontact settler sites, and the inherent colonial bias of Ontario archaeological site labels, all resulting in an apparent absence and erasure of Indigenous peoples from southern Ontario's historical landscape after 1650 (Beaudoin 2016, 2022). Similar erasures are documented for the USA (Panich and Schneider 2019; Schneider and Panich 2022) and Australia (Byrne 2003b). The archaeological erasure of Indigenous peoples because of low archaeological visibility of sites and the misrecognition of postcontact sites contributes to the myth that Indigenous peoples in colonial Upper Canada were no longer using the landscape beyond their settlements and villages (Warrick 2003)—as well as to racist notions that Indigenous peoples did not create and maintain "civilized" managed landscapes (i.e., *terra nullius*, the racist fiction that asserted that the land was not occupied or was not being used) and were going to disappear either demographically or culturally anyway, justifying the theft and dispossession of Indigenous lands and resources in the nineteenth and twentieth centuries (Ferris 2009; Francis 1998; Harring 1998; Hill 2017; Smith 1987, 2013). However, even after Indigenous peoples in Canada and the USA were confined to reserve settlements in the nineteenth century, seasonal mobility and the use of temporary and seasonal camps far from settlements continued (Ferris 2009; Pawling 2016) and does to this day (Lelièvre 2017), leaving archaeological traces of Indigenous territories that have persisted for centuries despite the best efforts of settler colonialism to erase them from the land and from historical memory (e.g., Schneider and Panich 2022). In Canada, archaeological evidence of past land use is important in court cases involving Indigenous claims to rights and title (i.e., territory) (Borrows 2019; Hogg and Welch 2020a). But what if the archaeological traces of Indigenous land use in colonial times are difficult to find and identify?

In contemporary times, the archaeological invisibility of postcontact hunter-gatherer sites (i.e., the limited archaeological evidence demonstrating continuity in use and occupation of a specific territory) has been and can be used by the Crown in legal cases to deny Aboriginal rights and title to territory (Martindale and Armstrong 2020). Since 1979, Canadian archaeologists have provided expert testimony in the form of archaeological evidence to support Aboriginal title claims (Hogg and Welch 2020a, 2020b, 2021; Kristmanson 2008; Martindale and Armstrong 2020). In Aboriginal title litigation, archaeology can provide acceptable evidence of precontact (i.e., before assertion of Crown sovereignty) occupation and use of a territory—although demonstrating cultural affiliation and a continuous record of exclusive use by an Indigenous nation can be a challenge (Hogg and Welch 2020a, 2021; Martindale and Armstrong 2020). Producing sufficient archaeological data to document postcontact occupation and use is difficult. The recent declaration of Aboriginal title in Canada through the landmark 2014 *Tsilhqot'in* decision (*Tsilhquot'in Nation v British Columbia*) relied heavily on historical documents and maps as well as the testimony of Elders and oral history (Hogg and Welch 2020b). Archaeological evidence that was accepted in the *Tsilhqot'in* ruling was pit-house village sites that could be identified with the location of historical settlements. More ephemeral sites, for example, hunting, gathering, and berry picking camps, were not available for this case (Hogg and Welch 2020b). For Anishinaabe nations in southern Ontario, only the main fall/spring fishing camps and summer villages would be highly visible archaeologically (provided they have not been destroyed by historical land development), and all of them would be at river mouths or lakeshores. Interior special-purpose sites in southern Ontario at the time of Crown sovereignty (*Royal Proclamation, 1763* in Ontario) would be very difficult to identify archaeologically. The interior extent of eighteenth- and nineteenth-century Indigenous territories away from river mouths and lakeshores would need to be established on the basis of Indigenous oral history, toponymy, historical maps and documents, and land-use studies (Hogg and Welch 2020b).

In summary, the archaeological invisibility of many postcontact Indigenous special-purpose/resource extraction sites suggests that archaeology may not be very useful to contemporary Indigenous peoples in Canada who are trying to demonstrate land use and extent of territories for the eighteenth and nineteenth centuries. Traditional land-use and environmental management studies incorporate Indigenous knowledge and Elders' stories and, in certain cases, have been documented by archaeologists working in close collaboration with Indigenous peoples (Andrews and Zoe 1997; Denton 1988; Gordon 1988; Lepofsky and Armstrong 2018; Loring 1997; Vuntut Gwitchin First Nation and Smith 2009). Such studies are particularly useful for documenting twentieth-century camps and traditional use locations, which are highly visible in the archaeological record (often with preserved wood structures and surface scatters of artifacts) (Andrews and Zoe 1997; Gordon 1988; Janes 1983; Vuntut Gwitchin First Nation and Smith 2009). The precise locations of camp sites that are beyond living memory, however, are less likely to be remembered and less likely to be visible archaeologically.

Conclusions

The relative invisibility of postcontact Indigenous hunter-gatherer sites and the difficulty of finding and identifying such sites on the landscape (never mind attempting to assign ethnicity and age to the meagre material remains, often just a few European-manufactured items) calls into question the utility of archaeological data for illuminating the eighteenth- and nineteenth-century history of hunter-gatherers in Ontario. The archaeology of postcontact Australian Aboriginals and of the Apache in the southwestern USA suffers from similar limitations (Byrne 2002, 2003a, 2003b; Laluk 2015). Most Indigenous people in Ontario are descended from hunter-gatherers (and many are still very active hunter-gatherer peoples) and, except for the farmlands of southern Ontario, archaeological sites of colonial period hunter-gatherers rest in forested regions,

where they are particularly difficult to discover and identify. While there are a few success stories (e.g., Ferris 1989; Pilon 1990), we must face the truth that archaeological contributions to the writing of hunter-gatherer history over the last 300 years will necessarily be limited. Thus, oral history, land-use studies, and historical maps and documents are and will continue to be the essential sources of information and stories from which to write the recent history (eighteenth- and nineteenth-century) of most Indigenous hunter-gatherers in Ontario (e.g., Williams 2018). Leaving the last words to the Mississaugas of the Credit:

> Archaeology maintains a tight focus on material remains, and may not venture to address traditional land use or cultural patterns that are not visible in artifacts and features. But cultural and traditional insights are recoverable through alternative techniques and approaches to site investigation. These include community engagement and adopting diverse perspectives on archaeological resources, including seeking understanding of the intangible values of a place, and the consideration of sites in their wider landscape context. These insights cannot be gained by simply tacking Indigenous knowledge and narratives onto archaeological sites after the archaeological work is complete. Indigenous perspectives must be integrated into assessment and research designs from the outset. [Mississaugas of the Credit First Nation 2018:9].

Acknowledgements. The 2003 and 2004 archaeological work at the Davisville 3 site was funded by a Standard Research Grant from the Social Sciences and Humanities Research Council of Canada and logistical support from the Brantford Campus, Wilfrid Laurier University. Over the last two decades, my understanding of Indigenous life at Davisville has been greatly informed by numerous discussions with Tom Deer, Paul General, Owen Greene, Rick Hill, Susan Hill, Wayne Hill, Norm Jacobs, Carolyn King, Rick Monture, Margaret Sault, Donald Smith, Darren Thomas, and Joanne Thomas. Also, I wish to thank the 2003 and 2004 field research assistants Kevin Smith (field supervisor), Owen Greene, Drew Hussey, Nathalie Lachance, Joanne Thomas, Susan Weldon, and the Ministry of Tourism, Culture and Sport (now MTCS) archaeological field assistants Jenna Flannigan, Sarah Hewitt, Greta James, Jordan Leichnitz, Annelise Martin-Cavalcante, Charlene Murphy, Shannon Neill-Sword, and Derek Pauuw. Lastly, I want to thank the anonymous reviewers and the editors of *Ontario Archaeology,* who suggested revisions and edits that improved the final version of this paper.

References Cited

Andrews, Thomas D., and John B. Zoe
1997 The *Idaa* Trail: Archaeology and the Dogrib Cultural Landscape, Northwest Territories. In *At a Crossroads: Archaeology and First Peoples in Canada*, edited by George P. Nicholas and Thomas D. Andrews, pp. 160–177. Department of Archaeology Publication No. 24, Simon Fraser University, Burnaby, British Columbia.

Archaeological Services Inc. (ASI)
2004 *Stage 3 and 4 Archaeological Excavation of the Huson Site (AgGt-111), Mountain Road, City of Thorold, Regional Municipality of Niagara, Ontario.* Report on file with Ontario Ministry of Tourism, Culture and Sport, Toronto.

Beaudoin, Matthew
2016 Archaeologists Colonizing Canada: The Effects of Unquestioned Categories. *Archaeologies: Journal of the World Archaeological Congress* 12:7–37.
2019 *Challenging Colonial Narratives: Nineteenth-Century Great Lakes Archaeology.* University of Arizona Press, Tucson.
2022 The Struggle to Identify Nineteenth-Century Indigenous Sites in Cultural Resource Management. In *Archaeologies of Indigenous Presence*, edited by Tsim D. Schneider and Lee M. Panich, pp. 109–125. University Press of Florida, Gainesville.

Berg, Debbie J.
2005a *Faunal Analysis of the Davisville 1 Site (AgHb-241).* Report on file, Department of Anthropology, University of Toronto Mississauga, Mississauga.
2005b *Faunal Analysis of the Davisville 2 Site (AgHb-242).* Report on file, Department of Anthropology, University of Toronto Mississauga, Mississauga.
2005c *Faunal Analysis of the Davisville 3 Site (AgHb-243).* Report on file, Department of Anthropology, University of Toronto Mississauga, Mississauga.

Borrows, John
2019 *Law's Indigenous Ethics.* University of Toronto Press, Toronto.

Brumbach, Hetty Jo, and Robert Jarvenpa
1989 *Ethnoarchaeological and Cultural Frontiers: Athapaskan, Algonquian and European Adaptations in the Central Subarctic.* American University Studies, Series XI, Anthropology and Sociology, Vol. 20. Peter Lang, New York.

Burwell, Lewis
1833 "Map—Brantford Township, Lewis Burwell." Copy of original map on file, Brant County Museum and Archives, Brantford.

Byrne, Denis R.
2002 An Archaeology of Attachment: Cultural Heritage and the Post-contact. In *After Captain Cook: The Archaeology of the Recent Indigenous Past in Australia*, edited by Rodney Harrison and Christine Williamson, pp. 135–146. AltaMira Press, Walnut Creek, California.
2003a Nervous Landscapes: Race and Space in Australia. *Journal of Social Archaeology* 3:169–193.
2003b The Ethos of Return: Erasure and Reinstatement of Aboriginal Visibility in the Australian Historical Landscape. *Historical Archaeology* 37(1):73–86.

Church, Robert R., and R. Lee Lyman
2003 Small Fragments Make Small Differences in Efficiency When Rendering Grease from Fractured Artiodactyl Bones by Boiling. *Journal of Archaeological Science* 30:1077–1084.

Clark, Annette McFadyen
1996 *Who Lived in This House?: A Study of Koyukon River Semisubterranean Houses.* Mercury Series, Archaeological Survey of Canada Paper No. 153. Canadian Museum of Civilization, Ottawa.

Corbiere, Alan Ojiig
2019 Anishinaabe Treaty-Making in the 18th and 19th-Century Northern Great Lakes: From Shared Meanings to Epistemological Chasms. PhD dissertation, Department of History, York University, Toronto.

Crawford, Gary, David G. Smith, Joseph R. Desloges, and Anthony M. Davis
1998 Floodplains and Agricultural Origins: A Case Study in South-Central Ontario, Canada. *Journal of Field Archaeology* 25:123–137.

Dawson, Kenneth C. A.
1976a *Algonkians of Lake Nipigon: An Archaeological Survey*. Mercury Series, Archaeological Survey of Canada Paper No. 48. National Museums of Canada, Ottawa.
1976b *Albany River Survey, Patricia District, Ontario*. Mercury Series, Archaeological Survey of Canada Paper No. 51: 53–106. National Museums of Canada, Ottawa.

Denton, David
1988 Long Term Land Use Patterns in the Caniapiscau Area, Nouveau Quebec. In *Boreal Forest and Sub-Arctic Archaeology*, edited by C. S. "Paddy" Reid, pp. 146–156. Occasional Publications of the London Chapter, Ontario Archaeological Society, Number 6. London.

Eid, Leroy V.
1979 The Ojibwa-Iroquois War: The War the Five Nations Did Not Win. *Ethnohistory* 26(4):297–324.

Ellis, Chris J., and Neal Ferris (editors)
1990 *The Archaeology of Southern Ontario to A.D. 1650.* Occasional Publication No. 5. London Chapter, Ontario Archaeological Society, London.

Fafard, Mélanie, and Raymond Le Blanc
1999 Dechyoo Njik (MlVm-4) and Traditional Land Use Patterns on the Old Crow Flats, Yukon Territory. *Canadian Journal of Archaeology* 23:29–50.

Ferris, Neal
1989 Continuity within Change: Settlement-Subsistence Strategies and Artifact Patterns of the Southwestern Ontario Ojibwa A.D. 1780–1861. Master's thesis, Department of Geography, York University, Toronto.
2009 *The Archaeology of Native-Lived Colonialism: Challenging History in the Great Lakes.* University of Arizona Press, Tucson.

Ferris, Neal, Ian Kenyon, Rosemary Prevec, and Carl Murphy
1985 Bellamy: A Late Historic Ojibwa Habitation. *Ontario Archaeology* 44:3–22.

Finlayson, William D.
1977 *The Saugeen Culture: A Middle Woodland Manifestation in Southwestern Ontario.* Mercury Series Paper No. 61. Archaeological Survey of Canada, National Museums of Canada, Ottawa.

Foreman, Lindsay J.
2011 Seasonal Subsistence in Late Woodland Southwestern Ontario: An Examination of the Relationships between Resource Availability, Maize Agriculture, and Faunal Procurement and Processing Strategies. PhD dissertation, Department of Anthropology, University of Western Ontario, London.

Francis, Mark
1998 The "Civilizing" of Indigenous People in Nineteenth-Century Canada. *Journal of World History* 9:51–87.

Franzen, John G., Terrance J. Martin, and Eric C. Drake
2018 *Sucreries* and *Ziizbaakdokaanan*: Racialization, Indigenous Creolization, and the Archaeology of Maple-Sugar Camps in Northern Michigan. *Historical Archaeology* 52:164–196.

Friesen, T. Max
2013 *When Worlds Collide: Hunter-Gatherer World-System Change in the 19th Century Canadian Arctic.* University of Arizona Press, Tucson.

Godwin, Luke, and Scott L'Oste-Brown
2002 A Past Remembered: Aboriginal "Historical" Places in Central Queensland. In *After Captain Cook: The Archaeology of the Recent Indigenous Past in Australia*, edited by Rodney Harrison and Christine Williamson, pp. 191–212. AltaMira Press, Walnut Creek, California.

Good, E. Reginald
1998 Colonizing a People: Mennonite Settlement in Waterloo Township. In *Earth, Water, Air and Fire: Studies in Canadian Ethnohistory*, edited by David T. McNab, pp. 145–180. Wilfrid Laurier University Press, Waterloo, Ontario.

Gordon, Diana Lynn
1980 Reflections on Refuse: A Contemporary Example from James Bay, Quebec. *Canadian Journal of Archaeology* 4:83–98.
1988 Discovering Patterns of Change at North Caribou Lake in the Post-contact Period: Implications for Finding and Interpreting the Archaeological Record. In *Boreal Forest and Sub-Arctic Archaeology*, edited by C. S. "Paddy" Reid, pp. 3–36. Occasional Publications of the London Chapter, Ontario Archaeological Society, Number 6. London.

Greer, Sheila C.
1997 Traditional Knowledge in Site Recognition and Definition. In *At a Crossroads: Archaeology and First Peoples in Canada*, edited by George P. Nicholas and Thomas D. Andrews, pp. 145–159. Department of Archaeology Publication No. 24, Simon Fraser University, Burnaby, British Columbia.

Hagerty, Wayne, and Paul A. Lennox
1995 The Alder Site: An Historic Neutral Special Purpose Encampment, Brant County, Ontario. In *MTO Contributions to the Archaeology of Late Woodland Period in Southwestern Ontario: Small Sites Investigations*, edited by Paul A. Lennox, pp. 271–281. Research Report No. 24, London Museum of Archaeology. London Museum of Archaeology and Ontario Ministry of Transportation, Southwest Region, London.

Harring, Sidney L.
1998 *White Man's Law: Native People in Nineteenth-Century Canadian Jurisprudence*. University of Toronto Press, Toronto.

Hill, Susan M.
2017 *The Clay We Are Made Of: Haudenosaunee Land Tenure on the Grand River.* University of Manitoba Press, Winnipeg.

Hogg, Erin A., and John R. Welch
2020a Aboriginal Rights and Title for Archaeologists: A History of Archaeological Evidence in Canadian Litigation. *Journal of Social Archaeology* 20:214–241.
2020b Archaeological Evidence in the *Tsilhqot'in* Decision. *Canadian Journal of Archaeology* 44:155–184.
2021 Expert Witnesses' and Lawyers' Perspectives on the Use of Archaeological Data as Evidence in Aboriginal Rights and Title Litigation. *BC Studies* 211:19–47.

Janes, Robert
1983 *Archaeological Ethnography among Mackenzie Basin Dene, Canada.* The Arctic Institute of North America Technical Paper No. 28. Arctic Institute of North America, University of Calgary.

Jones, Peter
1860 *Life and Journals of Kah-ke-wa-quona-by: (Rev. Peter Jones), Wesleyan Missionary.* Anson Green, at the Wesleyan Printing Establishment, Toronto.

Jordan, Kurt A.
2008 *The Seneca Restoration, 1715–1754: An Iroquois Local Political Economy.* University Press of Florida, Gainesville.

Julig, Patrick J.
1988 Prehistoric Site Survey in the Western James Bay Lowlands, Northern Ontario. In *Boreal Forest and Sub-Arctic Archaeology*, edited by C. S. "Paddy" Reid, pp. 121–145. Occasional Publications of the London Chapter, Ontario Archaeological Society, Number 6. London.

Kelly, Robert L.
2013 *The Lifeways of Hunter-Gatherers: The Foraging Spectrum.* Cambridge University Press, New York.

Kenyon, Ian, and Neal Ferris
1984 Investigations at Mohawk Village, 1983. *Arch Notes* [newsletter of the Ontario Archaeological Society] 84(1):19–50.

Kenyon, Ian, and Thomas Kenyon
1986 Echo the Firekeeper: A Nineteenth-Century Iroquois Site. *KEWA* [newsletter of the London Chapter, Ontario Archaeological Society] 86(2):4–27.

Klimko, Olga
2004 Fur Trade Archaeology in Western Canada: Who Is Digging up the Forts. In *The Archaeology of Contact in Settler Societies*, edited by Tim Murray, pp. 157–175. Cambridge University Press, New York.

Kristmanson, Helen E.
2008 Taking Archaeology to Court: The Use of Archaeological Knowledge in Aboriginal Rights and Title Litigation. PhD dissertation, School of Arts, History, and Culture, University of Manchester, Manchester, UK.

Laluk, Nicholas C.
2015 Historical-Period Apache Occupation of the Chiricahua Mountains in Southeastern Arizona: An Exercise in Collaboration. PhD dissertation, School of Anthropology, University of Arizona, Tucson.

Lelièvre, Michelle A.
2017 *Unsettling Mobility: Mediating Mi'kmaw Sovereignty in Post-contact Nova Scotia*. University of Arizona Press, Tucson.

Lennox, Paul A.
1995 The Horner Creek Site: An Historic Neutral Hunting Encampment, Brant County, Ontario. In *MTO Contributions to the Archaeology of Late Woodland Period in Southwestern Ontario: Small Sites Investigations,* edited by Paul A. Lennox, pp. 189–250. Research Report No. 24, London Museum of Archaeology. London Museum of Archaeology and Ontario Ministry of Transportation, Southwest Region, London.

Lepofsky, Dana, and Chelsey Geralda Armstrong
2018 Foraging New Ground: Documenting Ancient Resource and Environmental Management in Canadian Archaeology. *Canadian Journal of Archaeology* 42:57–73.

Loring, Stephen
1997 On the Trail to the Caribou House: Some Reflections on Innu Caribou Hunters in Northern Ntessinan (Labrador). In *Caribou and Reindeer Hunters of the Northern Hemisphere*, edited by Lawrence J. Jackson and Paul T. Thacker, pp. 185–220. Avebury, Aldershot, UK.

MacLeod, Peter
1992 The Anishinabeg Point of View: The History of the Great Lakes Region to 1800 in Nineteenth-Century Mississauga, Odawa, and Ojibwa Historiography. *Canadian Historical Review* 73(2):194–210.

Martin, Scott
2021 Through the Thick Wood: Wahbanosay's Band and Indigenous: Settler Connections at the Head of the Lake. Paper presented online at the Ontario Archaeological Society Annual Symposium, hosted by Ottawa Chapter, OAS, October 23, 2021.

Martindale, Andrew, and Chelsey Geralda Armstrong
2020 The Vulnerability of Archaeological Logic in Aboriginal Rights and Title Cases in Canada: Theoretical and Empirical Implications. *Collaborative Anthropologies* 11(2):55–91.

Mississaugas of the Credit First Nation, Department of Consultation and Accommodation
2018 Mississaugas of the New Credit First Nation Standards and Guidelines for Archaeology. Electronic document, https://niagarafalls.civicweb.net/document/33298/MCFN%20Standards%20and%20Guidelines%20for%20Archaeology%20[202.pdf?handle=BFDC6DBA60854403A82B37F5D97AFDB9, accessed 20 June 2022.
2022 Community Profile: History of the Mississaugas of the Credit. Electronic document, http://mncfn.ca/about-mncfn/community-profile/, accessed 10 May 2022.

Morin, Eugène
2020 Revisiting Bone Grease Rendering in Highly Fragmented Assemblages. *American Antiquity* 85:535–553.

Morlan, Richard E.
1972 *The Cadzow Lake Site (MjVi-1): A Multi-component Historic Kutchin Camp*. Mercury Series Paper No. 3 Archaeological Survey of Canada, National Museum of Canada, Ottawa.

Munson, Marit K., and Susan M. Jamieson (editors)
2013 *Before Ontario: The Archaeology of a Province.* McGill-Queen's University Press, Montréal & Kingston.

Nolin, Luc, and Jean-Luc Pilon
1994 Archaeological Potential Along the Lower Mackenzie River, N.W.T.: Recent Data and Some Considerations. In *Bridges Across Time: The NOGAP Archaeological Project*, edited by Jean-Luc Pilon, pp. 151–170. Canadian Archaeological Association Occasional Paper No. 2. Canadian Archaeological Association, Victoria.

Ontario Ministry of Tourism and Culture
2011 *Standards and Guidelines for Consultant Archaeologists*. Queen's Printer for Ontario, Toronto. https://files.ontario.ca/mhstci-standards-guidelines-consultant-archaeologists-en-2022-03-29.pdf.

Orser, Charles E., Jr.
1996 *A Historical Archaeology of the Modern World.* Plenum Press, New York.

Panich, Lee M., and Tsim D. Schneider
2019 Categorical Denial: Evaluating Post-1492 Indigenous Erasure in the Paper Trail of American Archaeology. *American Antiquity* 84:651–668.

Pawling, Micah
2016 Wabanaki Homeland and Mobility: Concepts of Home in Nineteenth-Century Maine. *Ethnohistory* 63:621–643.

Pilon, Jean-Luc
1987 *Washahoe Inninou Dahtsuounoaou: Ecological and Cultural Adaptation Along the Severn River in the Hudson Bay Lowlands of Ontario*. Ontario Ministry of Citizenship and Culture Conservation Archaeology Report No. 10, Northwestern Region. Ontario Ministry of Citizenship and Culture, Kenora.
1990 Historic Native Archaeology Along the Lower Severn River, Ontario. *Canadian Journal of Archaeology* 14:123–142.
1991 Insights into the Prehistory of the Lower Mackenzie Valley, Anderson Plain Region, Northwest Territories. In *NOGAP Archaeology Project: An Integrated Archaeological Research and Management Approach*, edited by Jacques Cinq-Mars and Jean-Luc Pilon, pp. 89–112. Canadian Archaeological Association Occasional Paper No. 1. Canadian Archaeological Association, Victoria.

Prince, Paul
2007 Determinants and Implications of Bone Grease Rendering: A Pacific Northwest Example. *North American Archaeologist* 28:1–28.

Rogers, Edward S.
1978 Southeastern Ojibwa. In *Northeast*, edited by Bruce G. Trigger, pp. 760–771. Handbook of North American Indians, Vol. 15, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.
1994 The Algonquian Farmers of Southern Ontario. In *Aboriginal Ontario,* edited by Edward S. Rogers and Donald B. Smith, pp. 122–166. Dundurn Press, Toronto.

Schmalz, Peter S.
1991 *The Ojibwa of Southern Ontario.* University of Toronto Press, Toronto.

Schneider, Tsim D., and Lee M. Panich (editors)
2022 *Archaeologies of Indigenous Presence*. University Press of Florida, Gainesville.

Silliman, Stephen W.
2020 Colonialism in Historical Archaeology: A Review of Issues and Perspectives. In *The Routledge Handbook of Global Historical Archaeology*, edited by Charles E. Orser, Jr., Andrés Zarankin, Pedro Funari, Susan Lawrence, and James Symonds, pp. 41–60. Routledge, New York.

Smith, Donald B.
1987 *Sacred Feathers: The Reverend Peter Jones (Kahkewaquonaby) and the Mississauga Indians*. University of Toronto Press, Toronto.
2013 *Mississauga Portraits: Ojibwe Voices from Nineteenth-Century Canada.* University of Toronto Press, Toronto.

Spector, Janet D.
1993 *What This Awl Means: Feminist Archaeology at a Wahpeton Dakota Village*. Minnesota Historical Society Press, St. Paul.

Supernant, Kisha
2018 Archaeology of the Métis. In *Historical Archaeology Oxford Handbook Online.* Oxford University Press, Oxford. Electronic document, https://doi.org/10.1093/oxfordhb/9780199935413.013.70, accessed 10 May 2022.
2021 From Hybridity to Relationality: Shifting Perspectives on the Archaeology of Métis Emergence. In *The Routledge Handbook of the Archaeology of Indigenous-Colonial Interaction in the Americas,* edited by Lee M. Panich and Sara L. Gonzalez, pp. 357–373. Routledge, New York.

Tehanetorens
1972 *Wampum Belts*. Iroquois Reprints, Ohsweken.

Timmins, Peter
1996 The Little Shaver Site: Exploring Site Structure and Excavation Methodology on an Unploughed Site in the Region of Hamilton-Wentworth, Ontario. *Ontario Archaeology* 61:45–81.

Torry, Alvin
1869 *Autobiography of Rev. Alvin Torry, First Missionary to the Six Nations and the Northwestern Tribes of British North America.* (edited by Rev. Wm. Hosmer). William J. Moses, Auburn.

Triggs, John
2004 The Mississauga at the Head-of-the-Lake: Examining Responses to Cultural Upheaval at the Close of the Fur Trade. *Northeast Historical Archaeology* 33:153–176.

United Church Archives
1826 Grand River Mission Record Book: List of Names of Members of the Methodist Society at the Upper Mohawks, Grand River, January 10th, 1826. Film 77.202L, United Church Archives, Toronto.

Vehik, Susan C.
1977 Bone Fragments and Bone Grease Manufacturing: A Review of Their Archaeological Use and Potential. *Plains Anthropologist* 22:169–182.

Villa, Paola, and Jean Courtin
1983 The Interpretation of Stratified Sites: A View from Underground. *Journal of Archaeological Science* 10:267–281.

Vuntut Gwitchin First Nation, and Shirleen Smith
2009 *People of the Lakes: Stories of Our Van Tat Gwich'in Elders/Googwandak Nakhwach'ànjòo Van Tat Gwich'in.* University of Alberta Press, Edmonton.

Wagner, Mark J.
1998 Some Think It Impossible to Civilize Them at All: Cultural Change and Continuity among the Early Nineteenth-Century Potawatomi. In *Studies in Culture Contact: Interaction, Culture Change and Archaeology*, edited by J. G. Cusick, pp. 430–456. Southern Illinois University, Carbondale.
2006 "He Is Worst Than the [Shawnee] Prophet": The Archaeology of Nativism among the Early Nineteenth Century Potawatomi of Illinois. *Midcontinental Journal of Archaeology* 31:89–116.

Walker, Ian J., Joseph R. Desloges, Gary W. Crawford, and David G. Smith
1997 Floodplain Formation Processes and Archaeological Implications at the Grand Banks Site, Lower Grand River, Southern Ontario. *Geoarchaeology* 12:865–887.

Warrick, Gary
2003 Historical Archaeology of the Six Nations of the Grand River. Paper presented at 36th Annual Meeting of the Canadian Archaeological Association, Hamilton.
2004 *Archaeological Investigation of the Davisville Community, City of Brantford, Brant County: Results of the 2002 Test Pit Survey, Test Excavation of Davisville 7 Site (AgHb-253) and Partial Excavation of Davisville 2 Site (AgHb-242).* Report on file, Ontario Ministry of Heritage, Sports, Tourism and Culture Industries, Toronto.
2020 Thomas Davis and the Methodist Mission at Davisville: Archaeology of the Davisville 7 Site, Brantford, Ontario. *KEWA* 20-04–06:1–26.

Watson, Adam S., and Stephen Cox Thomas
2013 The Lower Great Lakes Fur Trade, Local Economic Sustainability, and the Bone Grease Buffer: Vertebrate Faunal Remains from the Eighteenth-Century Seneca Iroquois Townley-Read Site. *Northeast Anthropology* 79–80:81–123.

Williams, Doug (Gidigaa Migizi)
2018 *Michi Saagiig Nishnaabeg: This Is Our Territory.* ARP Books, Winnipeg.

Les chasseurs-cueilleurs ont la réputation de vivre légèrement sur la terre. Les petits camps de courte durée occupés avant le contact avec les Européens peuvent être difficiles à détecter sur le plan archéologique. Ceux occupés pendant la période post-contact sont encore plus insaisissables pour les archéologues. Cet article présente les résultats de la recherche archéologique et de la fouille d'un campement Mississauga (Anishinaabeg) à Davisville, sur la rivière Grand, en Ontario, occupé dans les années 1820. Des concentrations d'os d'animaux calcinés marquent l'emplacement des camps post-contact des Mississauga. L'assemblage d'artefacts post-contact récupérés lors de l'excavation d'essai de deux sites de campement Mississauga est maigre, malgré l'utilisation de mailles de 1,6 mm et d'un tamisage à l'eau sur le terrain. Les comparaisons avec d'autres sites de chasseurs-cueilleurs post-contact révèlent des modèles remarquablement similaires d'invisibilité archéologique. L'invisibilité archéologique des chasseurs-cueilleurs de la période post-contact suggère que l'histoire post-contact de nombreux peuples autochtones de l'Ontario reposera principalement sur la tradition orale et les documents historiques.

Received February 2, 2022; accepted May 6, 2022.

Gary Warrick
Department of Archaeology and Heritage Studies
Wilfrid Laurier University
32 Redwood Road
Brantford, ON N3R 3M1
Canada
gwarrick@wlu.ca

Oldies but Goodies: Past Successes and Future Potential of Legacy Collections Research in Ontario Archaeology

This is the third article of the series New Insights from Old Collections

Trevor J. Orchard, Alexis Dunlop, and Heather Hatch

More than a century of academic research; avocational collecting; and, more recently, cultural resource management archaeology has produced a massive number of archaeological collections from sites in Ontario. There has been relatively widespread discussion over the past several decades of the "curation crisis" that has arisen from this increasingly large-scale production of archaeological collections. We focus here on creating broader understanding of the potential of such collections for archaeological research and for engaging with other interested parties. We aim to work toward making such collections better understood and more widely accessible. Legacy collections can be a valuable resource for research and can help advance an understanding of Ontario's heritage. We highlight the challenges of connecting researchers with collections and present ideas on how to make them more accessible. Drawing on our experiences in CRM, museum, and university contexts, we aim to present a multi-faceted perspective on facilitating research with archaeological collections. Through this perspective, we address what legacy collections are; who has generated these collections; where such collections can be found in the Ontario context; how researchers can identify and access legacy collections; and, perhaps most importantly, why researchers might benefit from working with legacy collections. Finally, we aim to highlight the vast, and largely under-exploited, research potential of legacy collections by highlighting some examples of recent research projects that have drawn upon legacy collections.

Introduction: To Dig, or Not to Dig?

Archaeology has been practised in Ontario for well over a century (Dawson 1984; Hawkins and Lesage 2018; Hawkins and Raynor 2013; Williamson 2014). That long history of academic research; avocational collecting; and, more recently and now most prominently, cultural resource management archaeology has produced a massive number of archaeological collections from sites in Ontario. Globally, the scale at which archaeological collections have been generated in recent decades far exceeds the ability of researchers to adequately analyze and properly document all of these collections. This has resulted in a so-called "curation crisis" in archaeology (e.g., Bawaya 2007; MacFarland and Vokes 2016). The issue has become increasingly problematic with the rise of compliance-driven archaeology (Cherry 2011; Childs and Benden 2017; Kersel 2015). While the extent of this crisis in archaeology is global (e.g., Kersel 2015), it has also been particularly recognized and discussed in the Ontario context (Ferris 2002; Karrow 2017; Williamson 2010). Ontario's curation crisis has been addressed in articles in such mainstream media as *Toronto Life* magazine (Dewar 1997), the *Toronto Star* (Lorinc and Williamson 2016; Winsa 2018), and *The Walrus* (Tesar 2015), but this broader attention has done little to remedy the situation.

Our aim here is not to examine the curation crisis in detail, nor to address all possible solutions to that crisis, both of which topics have been extensively addressed by others, as cited in the previous paragraph. Nor do we address in detail the complexities involved in curating legacy collections, or archaeological collections generally, a subject that has also been broadly and comprehensively addressed by others (Childs and Benden 2017; MacFarland and Vokes 2016; Meister 2019; Nielsen-Grimm and Haynie 2019). Rather, our aim is to address the nature and research potential of legacy collections within the Ontario context. From this perspective, the curation crisis raises the question of whether it really makes sense, in a research context, to generate new archaeological collections through new excavations (e.g., Bawaya 2007) or, instead, to shift the focus of research projects onto existing, legacy collections (Clinton and Peres 2011; Frieman and Janz 2018; Glencross et al. 2015; Kersel 2015; King 2016). The resistance to a shift in focus toward more collections-based research is deeply rooted in archaeology's long emphasis on fieldwork and excavation as the key roles of the discipline (e.g., Frieman and Janz 2018; King 2016). In an editorial on the curation crisis in the United States, Bawaya notes that "many more PhDs are awarded for field-based than collections-based research, and that few universities offer classes in collections management" (Bawaya 2007). One of the challenges, then, in increasing research focused on legacy collections, is changing the widespread and persistent attitude among archaeologists, particularly those in academic contexts, that devalues collections-based research in favour of research based on fieldwork and excavation. We acknowledge that there has been a shift away from an exclusive emphasis on fieldwork in recent decades, with a concurrent rise in emphasis on methodological and analytical skills. The numerous graduate student projects that we highlight in our synthesis of Ontario case studies, below, demonstrate that numerous graduate degrees in Ontario archaeology have been awarded based on collections-based research.

A related issue with the generation of vast quantities archaeological collections by commercial (i.e., CRM) archaeology is the tendency for the results of commercial archaeology to be under-published or not to be published in a timely manner (e.g., Cherry 2011; Demoule 2011). Cherry goes so far as to suggest that:

> a site that has been dug in the public trust and (almost always, one way or another) at public expense, but that remains unpublished decades later, is really little different from one that has been looted: a part of the archaeological record has been destroyed forever, with nothing to show for it, rendering the entire process both meaningless and ethically reprehensible [Cherry 2011:12].

This is particularly true in Ontario, where the majority of archaeological sites excavated are documented only in the licensing report. Certainly, this is not solely a concern with CRM archaeology; academic excavation projects also produce large quantities of material culture that are subject to relatively little subsequent analysis. An increased focus on collections-based research can help to remedy this situation by facilitating the more complete analysis, and, ultimately, the publication, of legacy collections.

While our goal in this paper is to promote the increased use of legacy collections research as an alternative to further destructive excavation, we acknowledge that it is not always a viable alternative. Salvage archaeology in advance of development will likely remain a necessity in many cases, although site avoidance should be pursued when possible. Both in Ontario and globally there are also aspects of the archaeological record that have not been excavated sufficiently to facilitate the examination of specific research questions through research with legacy collections alone. Excavation is also critical when research questions of interest focus on testing recovery methods or on ground-truthing alternative sampling methods to facilitate minimally invasive approaches in the future (e.g., Glencross et al. 2017; Hawkins et al. 2017; Warrick et al. 2021). In many cases, however, research questions *can* be meaningfully addressed through research with existing collections, and this should be promoted as a primary approach whenever possible.

What Are Legacy Collections?

Archaeological collections are the result of past archaeological excavation or collecting work. Some are generated by relatively small-scale work through academic research projects, others result from larger-scale development projects via CRM activities, and some are amassed through more informal site collection. The origins of collections are highly variable in terms of scale and quality. Major governmental stimulus or development projects can result in large-scale archaeological activities. In Ontario, for example, the eastern extension of the Highway 407 toll highway had a study area of approximately 33 km^2 that required assessment. This single project, which began in 2005 and was potentially the largest ever carried out in the province, resulted in dozens of archaeological sites, both Indigenous and Euro-Canadian, being found and excavated over multiple years (MacDonald 2014). Regardless of the scale, archaeology is destructive, so the preservation of collections to facilitate future research with improved techniques is a key tenet of archaeological practice, at least in theory. We return to this point below.

A quick review of the literature on archaeological collections reveals a wide range of definitions of what constitutes legacy collections and other categories of archaeological collections. According to MacFarland and Vokes, for example, "legacy collections … contain artifacts that are housed and documented in a way that is not in keeping with modern curation standards and therefore cannot easily meet research demands" (MacFarland and Vokes 2016:162). King and Samford distinguish between legacy collections and incoming collections, with the former being "those inherited by a museum or archaeological repository … [that] are typically older, larger, and more poorly packaged or housed" (King and Samford 2019:312). They also note that, with legacy collections, context or provenience information and even artifacts are often missing. Jones and Gabe (2015) use the term "older collections," although they define these by condition rather than by age, as even newer collections can suffer from many of the same limitations:

> In our definition, older collections may (1) be disassociated from their initial site or project; (2) have gone through not just post-depositional processes before their excavation, but post-collection processes as well (potentially including the culling or trading of material, either for analytical purposes or because the material was thought insignificant); (3) no longer be housed together; (4) vary in state of preservation and curation; and/or (5) lack provenience and collection information [Jones and Gabe 2015:1].

One of the key variables in these definitions of collections is the degree to which accompanying documentation was created and curated to the present. While collections without documentation may not be completely without research value (e.g., Cipolla 2021), extant documentation of excavation approaches, site contexts, and artifact associations is often necessary for collections to be meaningfully used in subsequent research projects (e.g., Emerson and Hoffman 2019; Jones and Gabe 2015). Even when excavation records exist and are accessible, it can be very difficult for a researcher other than the original excavator to meaningfully analyze and extract useful interpretive information from such records (Demoule 2011).

The variable terminology and range of collections categories outlined by these various authors nicely capture the range of archaeological collections held by many institutions, including museums, educational institutions, and CRM companies, and by private collectors. While sub-categories of collections may be useful in terms of curation approaches and management of these collections (e.g., King and Samford 2019), these categories are not discrete but, rather, represent a continuous range of collections that vary in terms of excavation standards, extant documentation, completeness, and past and present curation conditions. We suggest that, for our purposes, all of these varied categories of archaeological collections can be meaningfully categorized as legacy collections (cf. King 2016), in that they are, in most cases, now removed from the

initial context in which they were excavated or collected. In essence, once a site has been excavated and all required reporting is complete, it slips into the category of legacy collection. More recent collections are not inherently less problematic than older collections, as even very recent collections have the potential to pose significant challenges to subsequent researchers (King 2016). The various categories of archaeological collections outlined above, then, highlight the range of collection standards, documentation, and ease of reanalysis and reinterpretation that researchers are likely to be faced with in working with legacy collections.

Legacy Collections in Ontario

In Ontario the vast majority of archaeological excavation is now done in the context of CRM projects (Ferris 2002; Williamson 2010). Warrick and colleagues (2021), for example, have recently noted that 99% of archaeology carried out in the province is CRM archaeology (cf. Hawkins and Lesage 2018). The principle of site mitigation in advance of development is aimed at preserving archaeological contextual information and archaeological collections to facilitate future research. Archaeological assessment and the avoidance or salvage of identified "significant" archaeological resources are mandated by provincial legislation (Ahmed et al. 2014; Williamson 2010). Unlike many other jurisdictions, which require only partial excavation (with a sampling strategy), Ontario, under its *Standards and Guidelines for Consultant Archaeologists,* requires 100% excavation of an archaeological site that is to be salvaged in advance of development, as well as retention of all artifacts recovered during that excavation (Ontario Ministry of Tourism and Culture [MTC] 2011). The licensing agreement for professional archaeological licences states,

> the licensee shall hold in safekeeping all artifacts and records of archaeological fieldwork carried out under this licence, except where those artifacts and records are transferred by the licensee to Her Majesty the Queen in right of Ontario or the licensee is directed to deposit them in a public institution in accordance with subsection 66(1) of the Act,

which ties the licensee to the artifact collections in perpetuity unless they can find a provincially approved institution or facility willing to take them (Ontario Ministry of Tourism, Culture and Sport [MTCS] 2012).

As noted above, CRM archaeologists are continuing to excavate sites, so what can be done with this ever-increasing number of artifact collections? There is often a fundamental mismatch between the goals of CRM archaeology and the research questions of academic archaeologists (e.g., Hawkins 2017). Ferris addresses this mismatch, noting that in responding to criticisms about the CRM industry, practitioners will often rely on

> various well-intentioned, rhetorical arguments, such as … 'even if no one understands these sites now or have the time to properly analyse them, future archaeologists can analyse the collections we make' [Ferris 2002:78].

Such arguments are only valid if the collections generated by the CRM industry are suitable for subsequent research, are curated in such a way as to ensure their preservation, and are relatively easily findable and accessible to researchers who wish to include them in subsequent research projects. As Ahmed and colleagues note, for example,

> the scale of this resource-management regime has generated a staggering mass of material and data, and the capacity of individual archaeologists to care for this accumulated record, let alone make it accessible for research, has long since failed [2014:138].

There is also a notable disconnect between the number of CRM collections generated and the numbers of academic archaeologists who work with such collections (e.g., Ferris 2002). With only a handful of university departments in

Ontario with dedicated programs that specialize in Ontario archaeology, there is not a lot of demand for these collections to be used for research.

In addition to CRM projects, archaeological collections in Ontario have come from academic research projects, avocational archaeology, and personal collecting. These categories have historically overlapped. Prior to the passing of the *Ontario Heritage Act,* in 1975, it was more common for individuals who were involved in academic or professional research to also amass personal collections. The Act formalized licensing for professional, research, and avocational collection. It also made recovery of artifacts from sites illegal without a licence and circumscribed what kinds of archaeological work are permissible for each licence type. Despite the regulation, however, individuals have continued to engage in unlicensed collection, whether through ignorance of or indifference to the law (e.g., Ionico 2021).

The state of these collections varies greatly, as do their levels of documentation, in line with the range of archaeological collections outlined in the previous section. There are very well-documented and -provenienced private and avocational collections; indeed, avocational archaeologists are often among the most passionate stewards and protectors of the archaeological past (Hawkins and Raynor 2013). Likewise, there are professional and academic collections that were recorded to much looser standards than those expected in the present, or that have, in the time since their generation, been divorced from their associated records. Any collection divorced from its context loses value not only for research, but also for anyone looking to connect to a material heritage of place. Collections tied strongly to individual archaeologists, whether they be avocationals, CRM professionals, or academics, are at risk of this loss, as individuals may change fields or interests, move away from companies or institutions, retire, or die. To provide some sense of scale, we summarize results from a survey of licensed Ontario archaeologists conducted in 2014, about the collections currently in their care and plans for their care in the future (Ontario MTCS 2014): The survey had a 36% response rate, and the respondents cared for a combined total of 17,500 boxes of artifacts. Given the number of licensed archaeologists who did not respond to the survey and the number of collections housed in museums and other institutions that pre-date the licensing requirements, there are likely to be substantially more than those 17,500 boxes housed in the province. The industry has seen steady growth since 2014, and so the number of legacy collections has likewise increased.

As is the case elsewhere (e.g., Clinton and Peres 2011), collections resulting from past archaeological field excavation projects in Ontario are housed in a wide range of locations, including museums (large and small); universities; the offices and laboratory spaces of CRM companies; or even, in the case of both smaller CRM firms and avocational archaeologists, in private homes or self-storage facilities (e.g., Karrow 2017). Unfortunately, it is not at all uncommon for older legacy collections, or even more recent, CRM-derived collections, to be incomplete or stored in multiple locations, split by stage of excavation, excavation seasons, or by material classes. As Frieman and Janz note, for example,

> even when artifacts derive from large site assemblages where most of the material is kept together, it is not unusual for more visually striking pieces to be put on display or removed for some special purpose and misplaced or not returned [2018:262].

Certainly, we have been faced with similar situations within the collections that are under our stewardship. For example, we have regularly received requests from interested researchers to access specific artifacts or artifact classes, even from relatively recently generated site collections that are held by our institutions, only to find that those specific items or assemblages are not found within the larger site collections under our stewardship. While frustrating, these occurrences are not overly surprising and largely reflect a curation history wherein specific artifact classes are sent to various specialists for analysis and not always returned in a timely manner, and wherein particularly interesting or visually appealing artifacts

are regularly removed for subsequent analysis or display by other institutions. While it is usually possible to find the "missing" items or collections by reaching out to those responsible for generating or previously curating these collections, this nevertheless poses challenges and creates delays for researchers wishing to work with these collections. Such removals of select items from collections may be poorly documented, such that the absence of these items may not be easily identified without physically searching through collections boxes. As people move between institutions and companies or retire from archaeology, the circumstances and agreements surrounding these loans can be forgotten through the losses of institutional knowledge. These are not insurmountable problems, but they are common enough occurrences that researchers need to be aware of the potential for such issues when working with existing collections (e.g., Fox 2000).

Even when a researcher knows that collections were generated by a certain excavation or project, it can be very difficult to track down where those collections are currently housed if the final repository information is not recorded in the excavation report or site files (e.g., Childs and Benden 2017). All the authors, for example, regularly receive requests from researchers asking whether particular collections are located within our repositories. Currently, there is no central database for "finding" collections in Ontario that is freely accessible to researchers. As noted previously, the lack of a mandated provincial central repository means that collections are widely dispersed, with the degree of accessibility highly variable, based on the conditions under which they are currently housed. Individual repositories can take steps to facilitate both the ease of identification of collections within their holdings and the accessibility of those collections (e.g., King and Samford 2019). In the institutions that the three of us represent, for example, we have internal databases that are generally easily accessible to researchers who reach out to us individually, and the Museum of Ontario Archaeology is actively working to expand online accessibility to information about their collections holdings. Lack of resources may preclude even this level of inventory or accessibility work, however, for very small institutions or individual archaeologists who currently hold artifact collections in the province. And, while CRM firms can share individual artifacts and full reports on their websites, doing so involves additional time and expense. Sites excavated in the pre-digital era will have only paper field records, film camera photos, and typewritten reports, which take time to locate and scan for researchers. Smaller companies may not have the capacity or resources to facilitate any outreach. Also, clients of CRM companies are sometimes reluctant to be publicly identified as proponents.

The current Ontario MTCS, which is responsible for archaeological licensing in the province, does maintain a provincial archaeological site database. Ontario's Past Portal (PastPort) contains much information on sites from which existing collections originated, and in many cases records information on the current locations of those collections. While sites excavated after the 2013 migration into PastPort have good data integrity, sites excavated before this time period often have inaccurate or missing data. As such, PastPort does not contain information for all legacy collections from Ontario. Perhaps most critically, PastPort is not accessible to researchers, descendant communities, or other interested members of the public, unless they are licensed. If more open access to PastPort were possible, this could serve as a useful central database for researchers and others seeking to identify legacy collections relevant to their research or other interests and would benefit museums and universities—as well as municipalities, as the approval authorities. While it is critical to maintain the security of, and limit access to, some of the information contained within PastPort, access could be improved via a system that recognizes multiple user audiences and uses variable interfaces to tailor access to those audiences (e.g., Hansen 2019). Related to this, in contexts where many collections result from compliance-driven archaeology, such as in Ontario, access to the so-called grey literature of typically unpublished compliance reports is critical to ensure that subsequent researchers can meaningfully work with legacy collections.

PastPort, significantly, can also facilitate access to those reports, rather than the archaeologist being relied upon to provide them.

Moving forward, then, a number of steps could be taken to improve access to information about legacy collections in Ontario (Table 1). Ultimately, a central and accessible database of collections is a worthwhile goal. As an initial step in that direction, it may be possible to crowd-source collections information or to compile a central list of institutions in Ontario holding archaeological collections and provide key points of contact at those institutions. Such a data portal could, perhaps, be hosted by one of the professional organizations active in the province (i.e., Ontario Archaeological Society, Association of Professional Archaeologists [APA]) (Table 1). The initial work on such an initiative may even be appropriate for a student internship or a Master's student project. Importantly, however, there are several challenges that would need to be addressed for such an initiative to be successful. Any such central repository or database must not only store and provide a record of the locations of the collections themselves, but also facilitate the management and identification of the accompanying data and documents. Such a central data repository would require at least a minimal set of data standards (e.g., Emerson and Hoffman 2019; Hansen 2019). While the implementation of even relatively simple standards will require a shift in archaeological practice, this would lead to a much more consistent and easily navigable system of storing collections data and facilitate the identification of potential research collections by future researchers. Inconsistencies and gaps in collections documentation, as discussed previously, will undoubtedly present challenges to compiling a central database, as will the massive scale of the database that would be required to bring together all such collections (e.g., Hansen 2019). In Ontario, then, the provincial government would arguably be the most suitable organization to manage such an undertaking under the existing framework, which would also require consistent, long-term funding in addition to significant start-up costs—although other approaches may certainly be possible (e.g., Dent

Table 1. *Possible steps for improving access to information about legacy collections in Ontario.*

Level of Organization	Actions	Limitations and Benefits for Researchers
individual	• If acting as caretaker for collections, provides an accessible contact point for research. • Makes select reports available online. • Makes a listing of collections/sites available online.	Limitations: • Is labour intensive. Benefits: • Enables research. • Encourages network building.
professional organization (e.g., OAS, APA)	• Provides crowd-sourced collections resource hub.	Limitations: • Is limited to voluntary participants. Benefits: • Provides centralized source for collection information.
governmental (i.e., MTCS)	• Creates accessibility for non-licensed individuals, such as researchers and individuals working at public institutions, to use PastPortal.	Limitations: • Results in reduced opportunities for networking. • Results in data sets that may not relate directly to research questions. Benefits: • Results in all data being centralized.

2020). We therefore suggest that an expanded, tiered access system, recognizing both licensed and unlicensed users, within an improved and updated PastPort, may ultimately be the most desirable solution in the future (Table 1).

Unfortunately, until an open central database of collections held within Ontario is created and made accessible to the full range of researchers and others with legitimate interests in legacy collections, a more labour-intensive approach is required. This necessarily involves accessing institutional databases or making direct contact with curators or collections managers at individual museums, universities, CRM firms, and other institutions to inquire about their holdings or about the locations of targeted archaeological collections. All of us, for example, regularly receive such requests, and are more than happy to discuss both our institutions' holdings and potential future research projects with interested individuals. While this system may not be the most efficient, the initial ground work can be highly productive both in terms of accessing legacy collections and in terms of building useful contacts to facilitate access and research. And while the process may be somewhat labour intensive, this is far from an insurmountable barrier to research, as exemplified by the diverse case studies we outline below, many of which drew on varied collections from a range of current repositories.

Why Work with Legacy Collections?

As the preceding sections have no doubt made clear, legacy collections present a range of challenges, including methods of collection that do not meet contemporary standards, curation in multiple locations under variable conditions, and incomplete or missing documentation and contextual information. But, when these limitations are explicitly considered and transparently mediated, legacy collections can be very useful for a range of new purposes (Glencross et al. 2015; Jones and Gabe 2015; King 2016). Using existing, legacy collections takes their value from the potential to the real. This is particularly important given that collections can have a limited life span. Analysis of legacy collections, then, provides an important record of the data and insights they contain that may be unavailable once a collection deteriorates or once the excavator's site knowledge is lost. Furthermore, if collections are being used, a stronger case can be made to prioritize their management and rehabilitation at the institutional level. Using such collections also allows new perspectives and interpretations to be generated for these collections. Here we touch on just a few examples of what we see as some of the key advantages or potentials of working with legacy collections (Table 2).

Importantly, a wide range of stakeholders may have legitimate interests in using legacy collections

Table 2. *Summary of some key benefits of research with legacy collections.*

Benefit	Context/Discussion
minimally invasive	• There is no need for further, destructive excavation.
numerous stakeholders	• Opportunities exist for interaction and collaboration with curators/ collections managers, descendant communities, students, other researchers.
easily scalable	• Possible research ranges from single-site analyses to large-scale regional syntheses or meta-analyses.
application of new techniques	• New techniques have huge potential to provide new insights into even previously analyzed collections by applying methodologies that were not previously employed or were not available when the initial analysis occurred.
increased exposure	• Working with legacy collections increases their visibility, which often stimulates subsequent work and can lead to improved curation.

for a wide range of research and other purposes (e.g., King and Samford 2019). These stakeholders may include researchers (both academic and otherwise); descendant communities (both Indigenous and settler); educators and students; and institutions, such as museums and universities, for the purposes of public outreach, interpretation, and public history. These are not mutually exclusive categories, and while the field of archaeology in Ontario has long been dominated by individuals of settler-colonial descent, increasing numbers of First Nations individuals and individuals from other traditionally under-represented groups are pursuing archaeology. Existing collections present useful opportunities for engaging undergraduate students in practical research opportunities and for building collaborative research relationships between students and faculty (e.g., Clinton and Peres 2011; Glencross et al. 2015). Work with legacy collections can also provide a useful basis for developing and facilitating community-involved research using existing material culture collections to incorporate and prioritize perspectives and interpretations from members of descendant communities (e.g., Davidson 2021; Hennessy 2016; Hennessy et al. 2013; Syms 1997). Katherine Davidson, for example, is currently undertaking a community-centred research project in Ontario, in the context of a doctoral program at Carleton University, that combines local, community knowledge and specialist knowledge to gain a better understanding of under-studied archaeological collections (Davidson 2021). This research explicitly engages communities in the process of archaeology. Many sites were excavated without the knowledge or consent of descendant communities, but engaging with these communities while studying legacy collections can provide opportunities for these communities to have direct input into the management and use of their material heritage as well as breathe new life into the understanding of the artifacts and site context.

The excavation of an archaeological site destroys that site, and the resulting collections and documentation comprise the only remaining record of human activity at that site in the past (e.g., Glencross et al. 2015; Karrow 2017). An increased focus on research with legacy collections, then, serves to minimize further impact on the intact and increasingly scarce archaeological record (e.g., Glencross et al. 2015, 2017; Warrick et al. 2021). Minimally invasive approaches are also increasingly demanded by Indigenous groups and other descendant communities. The Huron-Wendat Nation, for example, has been actively pushing to limit further excavation of ancestral sites (Warrick et al. 2021). This is, unfortunately, in contrast to the tendency, under the current regulatory framework in Ontario, for sites to be excavated in advance of development projects, rather than excavation being avoided (Williamson 2010:35–37).

The quantity of existing, legacy collections is truly massive, presenting huge potential for a range of new research at multiple scales, without the expensive and time-consuming need to excavate new sites (e.g., Clinton and Peres 2011). Collections-based research, for example, can facilitate broad, multi-site, regional analyses of varied archaeological data to address large-scale research questions (e.g., King 2016) or more focused meta-analyses of more specific data classes (e.g., Alsgaard 2020; Jones and Gabe 2015) at scales that would simply not be possible were it necessary to first excavate all these collections from previously unexcavated archaeological sites. While previous analyses of many of these collections may have produced data sets that are available in previous publications or in CRM reports, those data sets may not be well suited to addressing new or different research questions. In the case of CRM reports, the minimal levels of analysis required by the *Standards and Guidelines* may not have produced data that are a reliable representation of the archaeological remains from a site, nor may the interpretations based on those limited data sets hold up under consideration of larger patterns in the site assemblages. This is not meant as a criticism of such previous CRM analyses; rather, it is meant to highlight the mismatch or gap that may exist between current research questions and analysis and reporting done within a more restricted standards and guidelines context (cf. King 2016). This may particularly be the case with specialist analyses of assemblages of faunal and paleobotanical remains, which are

often sub-sampled and subject to only minimal analysis under the *Standards and Guidelines* (e.g., Hawkins 2017).

Finally, we return to the notion that the preservation of collections to facilitate future research with improved techniques is a key tenet of archaeological practice. This has long been one of the central arguments for the long-term curation and preservation of archaeological assemblages (e.g., Reitz and Wing 2008:393–395), although often this may be seen more as a theoretical argument to justify the curation of such collections rather than a practical call to arms for reanalysis of those collections. Regardless of such debates, the reanalysis of old collections using new approaches or new methodologies has often yielded significant new insights into the past (e.g., Cherry 2011; Valladas et al. 1988). This is very well demonstrated in the Ontario context by our synthesis of case studies in collections-based research, below.

The Research Potential of Legacy Collections in Ontario Archaeology

We turn now to a synthesis of case studies of collections-based research in Ontario archaeology conducted in recent decades, in order to provide some concrete examples of the advantages and potentials of working with existing, legacy collections. Despite the current challenges of locating and accessing Ontario legacy collections, as discussed previously, the diverse projects outlined below highlight recent, groundbreaking research that has been accomplished via collections-based approaches, and these projects exemplify the potential contributions of increasing work with legacy collections in the future if accessibility can be improved. To provide a balanced perspective on this diverse research, we begin by considering research conducted by graduate students (Table 3) and then outline examples of projects conducted by non-student researchers (Table 4). We do not aim for this to be an exhaustive survey, but, rather to provide a few select examples and to highlight some of the potential of collections-based research in terms of a range of scales and approaches. These kinds of projects demonstrate the depth of knowledge and experience that can be gleaned by working with previously excavated collections—and the significance of the contributions that can result. The results can be relevant not only to the archaeological community in Ontario and beyond, but also to descendant communities and other communities.

A focus on legacy collections is often particularly suitable for graduate student research projects, particularly those involving material culture analyses or the analysis of faunal or botanical remains (Table 3). In contrast to the costly and time-consuming approaches of site survey and excavation, collections-based student projects allow a more intensive focus on the detailed analysis of particular classes of artifacts or ecofacts at a scale suitable for completion within the timelines typically expected for Master's or PhD programs. Furthermore, as the pace and scope of the work done in CRM often does not allow for in-depth research, more intensive graduate student projects provide an opportunity to generate useful new insights into important, but under-analyzed, collections.

Student work on legacy artifact collections has been highly varied. Several projects that have made use, in part, of ceramic collections currently housed at our institutions, among others, illuminate the breadth of possibilities not only of work, but of engagement. Amy St. John (2020), for example, used micro–computed tomography (micro-CT) scanning to examine ceramic manufacturing practices from the Late Woodland Arkona cluster. The material examined by St. John was initially excavated by Archaeologix Inc. (2005) and Golder Associates (2012) and later transferred to Sustainable Archaeology: Western (now the Museum of Ontario Archaeology). Her sample consisted of 106 sherds from 76 vessels collected from 7 sites within the cluster (St. John 2020). She scanned these on a Nikon XTH 225 ST micro-focus X-ray tomography system operated by Western University. These non-destructive scans provide high-resolution 3D X-ray images, allowing a close examination of the properties of the vessel and facilitating the study of ceramic production as a means to understand individual potters and the sharing and dissemination of potting techniques through

Table 3. *Examples of student research with Ontario legacy collections.*

Researcher	Project Collections and Summary	Contributions	Citation
Chelsey Armstrong (MA)	Performed ancient DNA (aDNA) analysis of charred maize kernels from the Late Woodland Bingo Village (AgHk-42) to demonstrate DNA preservation.	• Demonstrated utility of aDNA analysis for charred maize kernels. • Used CRM-generated materials.	Armstrong 2013
Christopher Ball (PhD)	Combined synthesis of CRM data with analysis of legacy paleoethnobotanical samples from eight Princess Point complex sites to identify inter-site variability and broader trends in human–environment relationships.	• Conducted regional multi-site analysis. • Combined synthesized CRM data with analysis of legacy collections.	Ball 2020
Laura Booth (MA)	Conducted stable isotope analysis of bear, deer, and dog remains from special-purpose and general refuse contexts at nine Ontario Iroquoian Tradition sites to explore variations in human–animal relationships across contexts.	• Introduced a new application of stable isotope analysis. • Showed utility of inter-site comparison.	Booth 2015
Steven Dorland (PhD)	Examined ceramics from five sites, including Draper (AlGt-2) and Keffer (AkGv-14), to examine how and where children learn to form pots.	• Deepened understanding of craft communities and learning. • Demonstrated utility of broad regional and temporal multi-site analysis.	Dorland 2019
Lindsay Foreman (PhD)	Examined subsistence practices, seasonality, and broader cultural patterns across 50+ Late Woodland Western Basin and Iroquoian sites.	• Demonstrated utility of a large-scale, synthetic approach. • Demonstrated utility of a focused reanalysis and multi-site analysis.	Foreman 2011
Kyle Forysthe (MA)	Examined and refit lithic debitage from the Middle Archaic Mount Albert (BaGt-40) to test theory of intentional breakage.	• Used CRM materials to test new hypothesis and create greater accessibility.	Forsythe 2016
Tiziana Gallo (PhD)	Examined ground stone celts from 20 fourteenth- to seventeenth-century Huron-Wendat villages to understand how the stones' properties contributed to their shaping and their relations with humans and other, non-human beings.	• Demonstrated utility of regional and temporal multi-site analysis. • Used materials generated through CRM research.	Gallo 2022

Table. 3 *continued*

Researcher	Project Collections and Summary	Contributions	Citation
Jesse Garland (PhD)	Compared material from Christchurch, New Zealand, with material from contemporary British colonial cities, including ceramics from Bishop's Block (AlGu-49) in Toronto, to assess local expressions of a broader shared British identity.	• Introduced international/cross-continental comparison of nineteenth-century British colonial materials from Ontario. • Used CRM-generated materials.	personal communication 2021
Hillary Kiazyk (MA)	Performed 3D recreation of a ceramic pot based on archaeological remains from Providence Bay (BkHn-3) for use in community programming.	• Demonstrated utility of community-guided research. • Examined new uses for 3D scanning and printing technology.	Kiazyk 2021
Zoe Morris (PhD)	Conducted stable isotope analysis of faunal remains from 28 previously excavated archaeological sites in southwestern Ontario (most Late Woodland) to examine local food webs, animal access to crops, and changes to human subsistence.	• Introduced new application of stable isotope analysis. • Demonstrated utility of regional and temporal multi-site analysis.	Morris 2015
Charlene Murphy (MA)	Analyzed paleoethnobotanical samples from 1976 excavations at Richardson (BbGl-4) to provide new interpretations of site seasonality and chronology.	• Used previously unanalyzed samples. • Supported and expanded earlier research conclusions.	Murphy 2006a, 2006b
Suzanne Needs-Howarth (PhD)	Analyzed fish remains from Barrie (BcGw-18), Dunsmore (BcGw-10), and Carson (BcGw-9) to examine taphonomy and the potential to understand and interpret fishing strategies and approaches within larger subsistence systems.	• Introduced new approaches to analyzing archaeological fisheries. • Demonstrated utility of a focused analysis and multi-site analysis. • Used PhD student– and CRM-generated materials.	Needs-Howarth 1999
Thomas Royle (PhD)	Developed and tested techniques to use ancient DNA (aDNA) to determine sex in salmonid fish species, including Atlantic salmon and lake trout from Antrex (AjGv-38).	• Introduced a new application of aDNA analysis. • Used CRM-generated materials.	Royle 2021; Royle et al. 2020
Amy St. John (PhD)	Used micro-computed tomography (micro-CT) scanning to examine ceramic manufacturing practices from the Late Woodland Arkona cluster.	• Introduced a new technology for ceramic analysis. • Deepened understanding of craft traditions. • Used CRM-generated materials.	St. John 2020
Amanda Suko (PhD)	Analyzed decorative elements of rim sherds from the Arkona cluster to trace the spread of pottery decoration techniques.	• Examined continuity of craft traditions in a single community. • Used CRM-generated materials.	personal communication 2021; also see Suko 2017

Table 4. *Other examples of research with Ontario legacy collections.*

Researcher(s)	Project Summary	Contributions	Citation(s)
Jennifer Birch, Sturt Manning, and colleagues	Dating Iroquoia – Application of modern accelerator mass spectrometry (AMS) radiocarbon dating to organic samples from legacy collections, including paleoethnobotanical and faunal samples from many Iroquoian sites from southern Ontario. Dates interpreted through a Bayesian statistical approach to re-examine chronological sequences in southern Ontario.	• Challenged past assumptions about chronological sequencing. • Introduced new methods of analysis (Bayesian statistics). • Engaged descendant communities. • Used CRM-generated materials.	Birch et al. 2021; Manning et al. 2018, 2019, 2020
Suzanne Needs-Howarth, Christian Gates St-Pierre, and colleagues	Reanalysis of Quackenbush fauna – Comprehensive (re)analysis of the worked and unworked animal bone from Quackenbush (BdGm-1), excavated in 1967 and 1972 and not previously published.	• Produced analysis of a legacy collection previously only analyzed by a learner analyst and of worked bone never previously analyzed. • Employed an integrated approach to analysis of worked and unworked faunal remains.	Gates St-Pierre et al. 2021
Eric Guiry, Eric Tourigny, and colleagues	Dogs and rats as surrogates for understanding human diet and behaviour – Building on a more theoretical groundwork (Guiry 2012, 2013; Guiry and Gaulton 2016), several projects have used stable isotope analysis of dogs and rats from legacy collections from late eighteenth- and nineteenth-century sites in the Toronto area to understand human diet and behaviour.	• Applied new analytical techniques (stable isotope analysis, ZooMS). • Used CRM-generated materials. • Used faunal material as a proxy for understanding humans.	Guiry and Buckley 2018; Tourigny et al. 2016
Eric Guiry and colleagues	Historic foodways in Upper Canada – Conducted stable carbon and nitrogen isotope analyses of more than 300 cow (*Bos taurus*) and pig (*Sus scrofa*) remains from 18 late eighteenth- and nineteenth-century urban and rural contexts in southern Ontario to provide insights into feeding regimes for domestic livestock and socioeconomic aspects of foodways in Upper Canada.	• Applied new analytical techniques (stable isotope analysis). • Used faunal material as a proxy for understanding humans. • Conducted broad, regional, multi-site analysis.	Guiry et al. 2017
Eric Guiry and colleagues	Iroquoian garden hunting in southern Ontario – Performed targeted isotopic analysis of archaeological faunal remains of potentially garden-hunted species from 56 Ontario Iroquoian sites to test the hypothesis that some animals commonly identified in Iroquoian faunal assemblages in southern Ontario may have been hunted in maize fields.	• Applied new analytical techniques (stable isotope analysis). • Conducted large-scale, multi-site analysis.	Guiry, Orchard, et al. 2021

Table. 4 *continued*

Researcher(s)	Project Summary	Contributions	Citation(s)
Eric Guiry and colleagues	Southern Ontario/Lake Ontario historical ecology – Analyzed and interpreted stable carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotopes from a range of faunal species from numerous archaeological and historical contexts across the Lake Ontario drainage. This extensive, ongoing project has provided new insights into historical Lake Ontario ecology and the historical ecology of iconic now-extinct species, namely Lake Ontario Atlantic salmon (*Salmo salar*) and passenger pigeon (*Ectopistes migratorius*).	• Applied new analytical techniques (stable isotope analysis, aDNA analysis, and ZooMS analysis). • Used legacy collections as a proxy to study paleoenvironment and environmental changes. • Conducted broad, regional analysis.	Guiry et al. 2016; Guiry, Buckley, et al. 2020; Guiry, Orchard, et al. 2020; Guiry, Royle, et al. 2020
Alicia Hawkins	Reanalysis of Allandale fauna – Reanalyzed the faunal assemblage derived from CRM excavations of Allandale (BcGw-69) to systematically compare analyses required by the *Standards and Guidelines for Consultant Archaeologists in Ontario* (Ontario MTC 2011) against more comprehensive, research-driven analysis.	• Used CRM-generated materials. • Provided new analysis of a legacy collection. • Tested limitations of analyses required by the *Standards and Guidelines for Consultant Archaeologists in Ontario* (Ontario MTC 2011).	Hawkins 2017
Alicia Hawkins and colleagues	Southern Ontario fisheries meta-analysis – Synthesized fisheries data from 136 faunal assemblages from 106 Late Woodland–period archaeological sites in southern Ontario to examine spatial and temporal variability in the focus and scale of Indigenous fisheries.	• Used legacy faunal data and data from reanalyses of legacy collections. • Synthesized large, complex faunal data set. • Conducted broad, regional analysis.	Hawkins et al. 2019
Travis Jones and colleagues	Soapstone characterization and sourcing – Used energy-dispersive X-ray fluorescence (EDXRF) to investigate the chemical composition of 100 soapstone artifacts from 11 fifteenth- to seventeenth-century northern Iroquoian sites as well as investigate potential trade links to groups close to soapstone sources.	• Employed non-destructive analysis. • Identified preferred materials for production of different object types. • Illuminated processes of material distribution. • Used CRM-generated materials.	Jones et al. 2018

communities of practice (St. John 2020). Prior to St. John's (2020) work, only small-scale studies and proof-of-concept work had been done to examine the potential of this technology; her work was truly cutting edge for Ontario archaeology. Notably, other projects are making use of the same Arkona cluster ceramics collection, in part as a result of its now-increased accessibility. Amanda Suko's ongoing PhD research analyzing decorative and design elements of the rim sherds from Location 10 of the Bingo Pit site (AgHk-42), for example, will expand on St John's research examining the spread of pottery techniques (Amanda Suko, personal communication 2021; also see Suko 2017). While these projects highlight the deep potential of even a single collection to help us learn more about aspects of ceramic production, neither would have been possible if the excavated materials and their records had not been accessible to student researchers. Furthermore, these two projects directly demonstrate the increased visibility of legacy collections that results from research with those collections and the way in which such increased exposure can lead to further research.

Individual collections allow for great depth of analysis, but projects that span multiple collections can inform us about broader cultural trends and practices. Steven Dorland's (2019) PhD dissertation compared pottery assemblages from two fifteenth-century sites in Ontario and three fifteenth-century sites in upstate New York to access childhood learning experiences using the production of juvenile pottery. Like St. John, Dorland is less interested in pottery as a technology and more in pottery as a lens through which to understand the experiences of its creators. He investigated how and where children learn to form pots from engaging with more experienced potters and how that learning relies on the absorption of knowledge beyond the physical motions of making objects out of clay (Dorland 2019). Using multiple sites that cover a wide span of time and space allowed him to test similarities in patterns and make broader projections. In addition to his dissertation, Dorland has published several papers in which he makes use of legacy collections for his research into childhood social learning through pottery (e.g., Dorland 2018, 2021; Dorland and Ionico 2021).

Another ongoing doctoral research project demonstrates the potential of legacy collections held by Ontario institutions to reach well beyond the regional level. Jessie Garland, a PhD Candidate at LaTrobe University in Australia, came to Ontario seeking materials excavated from late-nineteenth-century British colonial cities to act as comparative reference samples for excavations in Christchurch, New Zealand. Comparing that city's material culture with contemporary British colonial cities, such as Toronto, allows Garland to test its homogeneity and look for differences in access to and consumption of goods to assess local expressions of a broader shared British identity (Jessie Garland, personal communication 2021). Research of this scope would simply not be possible for a graduate student project without access to legacy collections.

Hillary Kiazyk's (2021) graduate work with ceramic materials from the Providence Bay site (BkHn-3), on Manitoulin Island, highlights the potential for student research to form the basis for meaningful engagement with descendant communities. Kiazyk used fragmentary ceramics from the collections now held by the Ojibwe Cultural Foundation (OCF) to extrapolate a 3D model and create a 3D print of a completed pot. This printed pot, which could be more easily handled by numerous people than the more fragile and fragmentary sherds, provided a means of creating a tangible relationship with the past for community members, who had not previously been aware of the stories held by the Providence Bay site. Only after these collections were transferred to the OCF by the Ministry of Heritage, Culture and Sport (now the MTCS) was the island's Indigenous population made aware that pottery was a craft that was practised by their ancestors (Kiazyk 2021). Kiazyk was able to use this collection for her research because it benefited the community and because she was committed to engaging in a respectful collaboration. This project represents both the potential of these collections to benefit descendant communities in innovative ways and the responsibility of archaeological researchers to be mindful that part of the

legacy of these collections is the discipline's colonial past.

While graduate student analysis of legacy ceramic collections has been particularly common, analysis of collections of other artifact types has also occurred. After the excavations at the Middle Archaic Mount Albert site (BaGt-40), initial analysis suggested that the nature of the lithic debitage was unusual and not reflective of stone tool production but of intentional stone tool destruction (Archaeological Services Inc. [ASI] 2015). In his Master's thesis, Kyle Forysthe (2016) examined the artifacts in depth using refitting, spatial analysis, and comparisons with other sites of a similar nature. He was able to refit 147 lithic fragments to their original tools and determine that the breakage took place on site and was likely intentional. His work reaffirmed "the hypothesis that the artifacts at Mt. Albert were 'killed' to fulfill some form of sacred sacrificial offering" (Forsythe 2016:115). Such re-evaluation of CRM sites by academics serves a dual purpose: it allows for theoretical hypotheses to be tested, and it brings a site that would have been stuck in the grey literature into a format that is more widely accessible to the public and to other researchers.

As suggested for ceramics above, the focus on a single material type across multiple sites from a region or temporal period is where the use of legacy collections can play a starring role. For her PhD research at University of Toronto, Tiziana Gallo studied ground stone celts from fourteenth- to seventeenth-century Huron-Wendat village sites, across a region spanning from the Credit River to Huronia (Gallo 2022). Gallo analyzed 2,660 celt artifacts in various stages of manufacture, including celt fragments (repurposed or not) and debitage products, from 20 different legacy site collections. These collections are currently housed at the University of Toronto Mississauga, Archaeological Services Inc., the Museum of Ontario Archaeology, the Canadian Museum of History, and the Royal Ontario Museum. The primary focus was on how the selected stones' properties contributed to their shaping and their relations with humans and other, non-human beings (e.g., trees, plants, animals, minerals, and places). Gallo compared potential geological sourcing areas with the materials used to make these objects and has documented their various production sequences (Gallo 2022).

Graduate student research looking at legacy faunal assemblages has also involved varied scales of analysis and analytical approaches. In her PhD dissertation, Suzanne Needs-Howarth (1999) examined faunal assemblages, with a primary focus on fish remains, from three Iroquoian village sites near Lake Simcoe that collectively span the period from the thirteenth through sixteenth centuries. The assemblage from the Carson site (BcGw-9) was a legacy assemblage excavated in the late 1980s (Archaeological Research Associates Ltd. 1990). The other two sites, Barrie (BcGw-18) and Dunsmore (BcGw-10), were salvage-excavated more recently (Robertson and Williamson 1996; Sutton 1996a, 1996b). While portions of the faunal assemblages from all three sites had been subject to previous analyses, Needs-Howarth (1999) performed additional identifications and conducted a detailed reanalysis of the assemblages included in her dissertation, exploring the taphonomy of fish remains and the potential to understand and interpret fishing strategies and approaches within larger subsistence systems. As part of this research, Needs-Howarth also initiated innovative analysis of incremental structures using fisheries methods, allowing more detailed and nuanced interpretations of past fisheries than possible through more traditional approaches to zooarchaeological analysis. Lindsay Foreman (2011) took a very broad-scale approach to the analysis of faunal data for her doctoral research, combining a synthesis of previously analyzed assemblages with her own new analyses of faunal assemblages from four previously excavated sites. This large-scale, synthetic approach, which ultimately considered data from more than 50 archaeological sites in southwestern Ontario, allowed a detailed examination and comparison of subsistence practices, seasonality, and broader cultural patterns between Western Basin and Iroquoian inhabitants of the region during the Late Woodland period. Other examples of these varied scales of graduate student research examining legacy faunal assemblages

and data include theses by Campbell (2004) and Tourigny (2016).

A similar range of scales and approaches is evident in recent examples of graduate student research projects exploring legacy paleoethnobotanical assemblages. Charlene Murphy (2006a; published as 2006b), for example, examined previously unanalyzed botanical samples from excavations in 1976 at the Richardson site (BbGl-4) (Pearce 1977). This new analysis both confirmed previously identified patterning in botanical remains from the site and provided new interpretations of site seasonality and chronology. A broader, multi-site perspective is exemplified by Christopher Ball's (2020) doctoral research, which analyzed macrobotanical remains from eight previously excavated Princess Point Complex sites in southern Ontario. Combining both the synthesis of previously generated botanical data from CRM projects and new analyses of legacy macrobotanical samples, this research identified significant inter-site variability in subsistence practices, while highlighting broader trends in human–environment relationships among Princess Point peoples. Other examples of graduate student research projects drawing on legacy paleoethnobotanical collections and data include theses by Ounjian (1998) and Saunders (2002).

Graduate students have also been at the forefront of applying new analytical approaches to the analysis of legacy faunal and botanical assemblages. Booth (2015), for example, examined stable isotopes of bear, deer, and dog remains from both special-purpose features and general refuse contexts at nine previously excavated Ontario Iroquoian Tradition sites, to explore whether human–animal relationships varied from basic subsistence contexts to more ideological and ritual settings. On a larger scale, Morris's (2015; also see Morris et al. 2016) PhD dissertation involved stable isotope analysis of faunal remains from 28 previously excavated archaeological sites in southwestern Ontario, most of which date to the Late Woodland period (c. 1000–1650 CE). A particular focus on canids, wild turkeys, and white-tailed deer, with select other taxa also analyzed for broader context, provided new insights into local food webs; animal access to crops; and, via animal proxies, changes in human subsistence. Chelsey Armstrong's (2013) Master's thesis examined the potential for ancient DNA (aDNA) recovery and analysis from charred maize remains, including analysis of botanical remains from the Late Woodland period Bingo Village site (AgHk-42), previously excavated, in a CRM context, between 2006 and 2008 (Golder Associates 2012). This study demonstrated that, despite prevailing sentiments to the contrary, aDNA is occasionally preserved in, and can be recovered from, charred maize kernels from archaeological contexts in Ontario. Thomas Royle's (2021) PhD research involved the development and testing of aDNA methods for determining the sex of salmonid remains and the taxonomic identification of fish remains more broadly from archaeological fish bone assemblages. One component of this research, published separately as Royle et al. (2020), used these aDNA methods to identify the sex of a sample of Atlantic salmon (*Salmo salar*) and lake trout (*Salvelinus namaycush*) remains from the Middle Ontario Iroquoian period Antrex site (AjGv-38) in southern Ontario, previously subject to complete salvage excavation through both CRM and field school projects (ASI 2010; Mayer Poulton and Associates Inc. 1991; Smith 1993). Lack of statistically significant bias in sex representation in either species suggests that the inhabitants of the Antrex site were not practising sex-selective fishing in the past, although an apparent over-abundance of female Atlantic salmon is interesting and needs further examination in the future (Royle et al. 2020).

Beyond students, other researchers are also increasingly turning to the analysis or reanalysis of legacy collections to address a wide range of research questions of contemporary concern (Table 4). One ongoing and ambitious research project in Ontario archaeology that relies heavily on the use of legacy collections is the Dating Iroquoia project, directed by Dr. Jennifer Birch, of the University of Georgia Anthropology Department, and Dr. Sturt Manning, of the Cornell Tree-Ring Laboratory. This project uses modern accelerator mass spectrometry (AMS) radiocarbon dating techniques applied to organic samples from

legacy collections, interpreted through a Bayesian statistical approach, to re-examine chronological sequences in southern Ontario. Birch, Manning, and the rest of their team have released several peer-reviewed publications (Manning et al. 2018, 2019, 2020; Birch et al. 2021) in addition to a public blog (Dating Iroquoia 2018) and a series of more casual articles in the *SAA Archaeological Record* (Birch 2020; Birch et al. 2020; Conger 2020; Conger et al. 2020; Manning 2020; Sanft 2020; also see Abel et al. 2020). This project provides an excellent example of how the application of new techniques to older (legacy) collections can provide new insights and force us to revise previous interpretations of archaeological data sets. While AMS dating has been in use for more than 40 years and is thus not new, techniques for calibrating and interpreting AMS dates have improved considerably in recent decades. To compensate for inconsistencies ("wiggles") in the calibration curve between 1300 and 1600 CE and for the effects of the burning of fossil fuels and other environmental factors after 1600 CE, the Dating Iroquoia project applies Bayesian statistical analysis to find a "best fit" time frame (e.g., Birch et al. 2016). This approach incorporates such factors as provenience; stratigraphic ordering; and input from other forms of dating, including dendrochronology, to interpret the results of AMS dating in order to provide a solid basis for reconsidering the dating of individual sites and of entire cultural sequences (Birch et al. 2016, 2021; Manning et al. 2019).

The broader aims and implications of the Dating Iroquoia project are quite wide ranging—the collaborators want to introduce and legitimize their approach to dating, examine ongoing and lingering debates in Ontario archaeology, and reconsider cultural sequences based on these proposed new chronologies. These aims build on each other through successive publications. In a paper that preceded the formal project, Birch and colleagues (2016) introduce Bayesian chronological modelling to this period of Ontario archaeology by re-examining the Roebuck site. Manning and colleagues (2019) engage with old debates surrounding the location of Cahiagué, re-dating two sites (Ball and Warminster) that have been proposed to potentially be the site of Samuel de Champlain's 1615 visit, as well as two others (Benson and Sopher) related to the same occupational sequence, and ultimately arguing that Warminster most likely represents Cahiagué. Most recently Birch and colleagues (2021) attempted to refine and revise the entire cultural sequence for Iroquoian groups in the Humber, Don, and Trent River systems. They conclude that their revised dates generally push the sequences later in time than previously determined, although they recognize some circularity in how they are applying their methods to the sequence modelling (Birch et al. 2021). They argue that Ontario archaeologists must rethink not only the time frames and sequences for these sites, but also the frameworks currently in use to explain sociocultural development, and they call for further chronological refinements and more precise methods than have been relied on previously (Birch et al. 2021).

While the importance of legacy collections to the Dating Iroquoia project is clear, we would also emphasize how this reanalysis of legacy collections is contributing to a de-colonialized approach to Ontario archaeology. Birch and colleagues (2021) recognize that modern Indigenous peoples have stakes in archaeological work and interpretation and that their concerns and voices have not been heard in the past. The project researchers consulted with the Nation Huronne-Wendat (Huron-Wendat Nation) Bureau du Nionwentsïo from the research design phase through to the presentation of results (which included a video aimed at a general public as well as a specifically Huron-Wendat audience), and, moving forward, the project will involve even closer collaboration (Birch et al. 2022). Research with legacy collections, then, can form a basis to create new partnerships with Indigenous communities that enrich the discipline along with our interpretations. This attitude of respect extends to past Indigenous peoples as well. Manning and colleagues (2019) note that examining chronologies of Indigenous sites in terms of the presence or absence of colonially derived goods undermines the agency of Indigenous peoples, ignoring the fact that European goods were not

accepted by or accessible to all communities at an even rate and that the accessibility of trade goods was determined by political and trade relationships between Indigenous groups. Furthermore, Birch and colleagues (2021) argue that focusing on chronological refinements creates an opportunity for archaeologists to place Indigenous agency and relationships at the forefront of our understanding of the past. Certainly, these are attitudes of respect that can be carried into contemporary work, but if we do not revisit our own disciplinary past, then there is a risk that future partnerships and interpretations will be based on a foundation that reduces the visibility of Indigenous agency in the archaeological record.

While legacy collections can be useful as a source of organic samples for large-scale re-dating projects, they also represent a massive, geographically broad repository of a wide range of artifact types. The existence of such collections can facilitate the more detailed analysis and categorization of artifacts that are commonly acquired through trade and, thus, are found over a wide geographical area. Such items are typically not overly abundant in individual sites and, as a result, are not often subject to in-depth analysis through single-site excavation projects; but when data are synthesized across multiple legacy collections, interesting patterns can emerge. Jones and colleagues (2018), for example, used energy-dispersive X-ray fluorescence (EDXRF) on a sample of 100 soapstone artifacts excavated from 11 Northern Iroquoian sites dating between the fifteenth and seventeenth centuries CE to investigate the chemical composition of the materials as well as investigate potential trade links to groups close to soapstone sources. This non-invasive and non-destructive process allowed for a method of classifying these soapstone artifacts into categories—steatite and non-steatite soapstone—and, in doing so, potentially linking them to their original sources. The complexity of bead and pipe production indicated that there were preferable types of soapstone for different types of goods and that completed items as well as raw materials were traded between groups along the St. Lawrence River and in what is now New York state. This research also revealed that all artifacts were not distributed among these sites in a straightforward and linear manner through space and time; rather, "these patterns reflect the non-centralized nature of political organization and the processes by which individuals and communities navigated the complexities of the Iroquoian world" (Jones et al. 2018:513).

In terms of analyses of previously excavated faunal assemblages, recent research spans a wide range of scales and analytical approaches. Gates St-Pierre and colleagues' (2021) reanalysis of the worked and unworked animal bone assemblage from the Quackenbush site (BdGm-1) provides a good example of a single-site analysis focused on a more traditional legacy collection. Quackenbush, an ancestral Wendat village occupied in the fifteenth century, was partially excavated in 1967 and 1972, but no previous analyses of the faunal material from the site have been published. In another small-scale example, Hawkins (2017) outlines a reanalysis of a faunal assemblage derived from more recent CRM excavations. This analysis of legacy faunal collections from the Allandale site (BcGw-69) provides not only useful new interpretations of site function and seasonality, but also an important cautionary tale about the limitations of zooarchaeological data and interpretations generated through the more limited analyses required by the *Standards and Guidelines* (Ontario MTC 2011). The *Standards and Guidelines* do not establish any minimal qualifications for analysts undertaking zooarchaeological, or other specialist, analyses, which certainly contributes to issues with data quality (Hawkins 2017; Hawkins et al. 2022). While single-site analyses are fascinating in and of themselves and provide considerable new insights into site-level subsistence and cultural patterns, they also provide data useful for larger, regional, multi-site analyses. Such large-scale meta-analyses are increasingly common, as researchers develop technologies and approaches for synthesizing large, complex faunal data sets (e.g., Alsgaard 2020; Jones and Gabe 2015; McKechnie and Moss 2016; Orchard and Clark 2014; Orton et al. 2014). In the Ontario context, for example, Hawkins and colleagues (2019) have synthesized fisheries data for 136 faunal

assemblages from 106 Late Woodland period archaeological sites in southern Ontario. This broad, regional analysis provided insights into spatial and temporal variability in the focus and scale of Indigenous fisheries.

As noted previously, new analytical techniques are also increasingly being applied to legacy collections to provide refined, and often previously unavailable, insights into past cultures and environments. One such use of legacy faunal assemblages that is increasing globally is as paleoenvironmental archives that contain useful proxy records of past climatic and environmental conditions and of human impacts on those environments (e.g., Guiry et al. 2018; Jackson et al. 2001; St. Amand et al. 2020; Szpak et al. 2018). Meta-analyses of broad collections of such paleoenvironmental data from regional archaeological contexts can provide high-resolution insights into past biological and environmental conditions, and into human–environmental relationships in those contexts, that have considerable potential to provide deep-time baselines that can contribute to contemporary discussions of environmental change and resource management (e.g., Barrett 2019; Guiry, Kennedy, et al. 2021; McKechnie et al. 2014; Szpak et al. 2012). In the Ontario context, Guiry and colleagues' (Guiry, Buckley, et al. 2020) analysis of carbon and nitrogen isotope compositions in fish remains from archaeological contexts across the Lake Ontario drainage provides a good example of this type of research. This project involved the analysis of stable nitrogen isotopes ($\delta^{15}N$) from a sample of more than 650 archaeological and historical specimens of lake trout, Atlantic salmon, and whitefishes (*Coregonus* spp.) and their interpretation through comparison with other environmental proxies and historical records. Long-term consistency in nitrogen isotope compositions from the thirteenth through eighteenth centuries CE suggests that human activities during that time period had little to no impact on the nitrogen cycle of Lake Ontario, while changes in $\delta^{15}N$ values after roughly the 1830s appear to reflect increased nutrient loading from soil erosion following deforestation (Guiry, Buckley, et al. 2020).

This last example is just one of a range of research projects that Eric Guiry and colleagues have been undertaking involving the application of new analytical techniques, primarily stable isotope analysis, but also aDNA analysis and zooarchaeology through mass spectrometry (ZooMS) analysis (e.g., Buckley 2018), to legacy faunal collections from Ontario. Given that these are destructive analyses, there are important ethical considerations that accompany such research (e.g., Pálsdóttir et al. 2019; Tite 2002). However, the extent and importance of the interpretive insights gained through these analyses are impressive. Two papers have provided evidence that Lake Ontario's Atlantic salmon populations did not migrate to salt water but were resident within the lake system throughout their life cycle (i.e., they were potamodromous), prior to their extirpation from the lake around 1900 CE (Guiry et al. 2016; Guiry, Royle, et al. 2020), providing new data to understand the ecological role and life cycle of this once-important component of the Lake Ontario ecosystem. Other research from this group has explored aspects of the dietary behaviour of passenger pigeons (*Ectopistes migratorius*) and, by extension, clarified possible factors contributing to the early twentieth-century extinction of this once hyper-abundant bird species (Guiry, Orchard, et al. 2020). Based on isotopic analysis, the majority of passenger pigeon samples indicate a diet focused on tree mast, such as beech nuts and acorns; a small number of individuals, however, were clearly consuming significant quantities of C_4 plants, probably maize. This implies that, as a species, passenger pigeons were capable of shifting their diet to foods other than exclusively tree mast and, thus, that habitat destruction alone may not have been sufficient to cause their extinction (Guiry, Orchard, et al. 2020). This passenger pigeon project also involved some limited aDNA analysis, which may indicate that genetic diversity in older passenger pigeon populations was greater than the diversity recognized from analysis of only more recent museum specimens (Murray et al. 2017), although more work is needed to clarify this possibility (Guiry, Orchard, et al. 2020).

Other research resulting from collaborative projects led by Eric Guiry has addressed more traditional archaeological questions. Guiry and colleagues, for example, have done seminal work on the use of dogs (Guiry 2012, 2013) and rats (Guiry and Gaulton 2016) as surrogates for understanding human diet and behaviour via stable isotope analysis. Both of these approaches have been specifically applied to legacy faunal material in the Ontario context. Tourigny and colleagues (2016), for example, provide a detailed osteobiography of a single dog burial from the Bell site (AjGu-68), a nineteenth-century CE Euro-Canadian context in Toronto, previously excavated by Archaeological Services Inc. (ASI 2012). Notably, others are building on this dog research and are beginning to apply this approach to dog remains from other legacy faunal assemblages in Ontario (e.g., Glencross et al. 2021, 2022). In their research on rats, Guiry and Buckley (2018) used stable isotope and ZooMS analyses to compare the diet of brown rats (*Rattus norvegicus*) from 13 previously excavated urban and rural sites dating to the late eighteenth and nineteenth centuries in the vicinity of Toronto. They found that urban rats had diets that were higher quality and more stable over time, while rural rats showed greater diversity and likely competed with native species, showing a clear relationship between human population density and the diet and ecology of introduced commensal animals. Drawing on a similar array of legacy collections from 18 late eighteenth- and nineteenth-century urban and rural contexts in southern Ontario, Guiry and colleagues (2017) conducted stable carbon and nitrogen isotope analyses of more than 300 cow (*Bos taurus*) and pig (*Sus scrofa*) remains. The results of these analyses provide archaeological evidence for different feeding regimes for domestic animals in the USA and Canada and reveal differences in the consumption of locally raised versus imported meats in rural versus urban contexts, providing insights into socioeconomic aspects of foodways in Upper Canada at the time. Most recently, Guiry, Orchard, and colleagues (2021) tested the hypothesis that some animals commonly identified in Iroquoian faunal assemblages in southern Ontario may have been hunted in the maize fields to which those species would have been attracted (e.g., Thomas 1996; Williamson et al. 2003). Through targeted isotopic analysis of potentially garden-hunted species, Guiry, Orchard, and colleagues (2021) compiled isotopic data from 710 specimens from 56 sites, including both previously published data and a substantial number of new samples from previously excavated assemblages. The results of this study indicate that, while small rodents often show strong maize signatures and may have been successfully feeding in maize fields or stores, larger animals show limited evidence of maize consumption and were either avoiding maize fields or, if they were attracted to maize fields, were killed relatively soon after they began to eat maize.

The case studies we have synthesized here clearly highlight the potential for important new insights to be gained through the analysis of a range of artifact categories from legacy archaeological collections. This synthesis also clearly demonstrates that the application of new analytical techniques to legacy archaeological collections can provide fascinating new insights that were not possible using the more traditional analyses available when many of these sites were excavated. The fact that all of this highly successful collections-based research was completed in the absence of a central, accessible database of legacy collections in Ontario demonstrates that such research is possible even with the current dispersed and patchy state of collections management across the province. An improvement in accessibility should lead to even more potential for a diversity of successful collections-based archaeological research.

Conclusions

Our synthesis of recent case studies of research involving legacy collections in Ontario, although far from exhaustive, clearly highlights the immense research potential of such collections. While the number of projects and the breadth of research represented in this synthesis make it clear that both graduate students and other researchers have been conducting research based on existing, legacy collections (see Tables 3 and 4), we contend that the research potential of

such collections remains broadly under-appreciated and that the collections themselves remain underused in ongoing research projects. Although we have been encouraged by one of the reviewers of this article to highlight specific collections or types of collections that are underused and to identify major gaps in the Ontario archaeological record that could be filled with additional work with legacy collections, we are very hesitant to do so. Such assessments will vary based on the perspectives or research interests of individual archaeologists, and our own priorities for future research will not reflect the priorities of others. The reality is that almost all aspects of our understanding of the archaeology of the province could benefit from additional work with legacy collections. While some groundbreaking research has been accomplished, as highlighted in the synthesis above, none of those research topics have been addressed exhaustively, and many other research questions have yet to be considered from the perspective of collections-based work. We strongly encourage all individuals and communities with an interest in Ontario archaeology to consider whether their own research interests and priorities might be addressed through work with existing, legacy collections and to explore whether collections exist that might allow them to pursue those research questions.

We have aimed in this paper to help make Ontario legacy collections better understood and to provide some suggestions to make those collections more widely accessible. We have taken a very broad approach to the definition of what constitutes a legacy collection, arguing that once a site has been excavated and the required reporting completed, the collections resulting from that project immediately constitute legacy collections in that they are then separated from the initial project under which they were generated. Under such an approach, legacy collections include not just older collections from antiquarian collecting activities, avocational research, or past academic excavations, but also all of the thousands of collections generated over the past several decades by the cultural resource management industry.

While we have not considered in detail all issues related to the curation and management of legacy collections, it is worth noting that the preventative care of these collections is the responsibility not just of the curators from the institutions that act as the current stewards of these collections, but also of all other parties that work with the collections (Meister 2019; Nielsen-Grimm and Haynie 2019). Archaeological sites are irreplaceable, but so, too, are the legacy collections that have resulted from past excavations. Unfortunately, long-term care of archaeological collections in Ontario has not been prioritized or adequately addressed by heritage legislation, and legacy collections in the province are, thus, stored in a wide range of locations and under a wide range of curatorial conditions. One of the main impediments to widespread use of legacy collections, then, involves the lack of a clear, accessible, central database documenting where such collections are currently housed and whom to contact to inquire about the possibility of working with such collections. Even in our own work, the three of us are regularly faced with trying to track down the current locations of collections. In many cases we are able to succeed by reaching out to our own networks of like-minded curators, lab managers, and others responsible for taking care of the vast assortment of collections that have accumulated through past archaeological activities in Ontario. While a central database may be ideal as a long-term goal, an expansion of the informal collaborative network that the three of us have developed among ourselves and with many of our colleagues may be a productive first step toward increasing the accessibility of legacy collections in Ontario (see Table 1). While none of us has an exhaustive understanding of the locations of all such collections in the province, collectively we can usually point an interested researcher in the right direction.

Regardless of the difficulties that may complicate a researcher's ability to find and access legacy collections under the current situation, however, we hope that the broad overview of a wide range of successful legacy-collections-based research that we have presented here highlights how productive and informative such research can be. The diverse research in that synthesis

involves several themes that highlight the importance of collections-based research (see Table 2). Legacy collections can address a wide range of questions in Ontario archaeology, at a variety of scales, without the expensive, time-intensive, and destructive need for new excavations. One of the key strengths of work with legacy collections is the ability to conduct inter-site comparative analyses and meta-analyses at a scale that is simply not possible when excavation is prioritized. The application of new analytical techniques, such as micro-CT scanning, Bayesian AMS dating, isotopic analysis, or aDNA analysis, is providing fascinating new insights that were often not possible during the excavation projects that initially produced these collections. We would also highlight that many of the research projects we summarize above involve large, collaborative, and often multi-national research teams, building connections among researchers in Ontario and beyond. The ability to return to older collections and engage directly with previously excavated materials and, in many cases, all of their associated records, is thus invaluable. Importantly, working with legacy collections increases their visibility, which can both stimulate additional work and raise their profile, which, in turn, can lead to improved attention to and resources for their curation. Also invaluable is the potential to involve a broader community of stakeholders, including descendant communities, in the interpretation of previously excavated sites that cannot otherwise be revisited. While several of the research projects we summarize in the previous section have directly and explicitly engaged with Indigenous communities as a key component of the work, we acknowledge that this should be more heavily prioritized in the future. In conclusion, we strongly encourage all researchers interested in Ontario archaeology to consider collections-based research projects not as a second-tier option to traditional field-based projects but as a primary means to make substantial and fascinating contributions to our archaeological understanding of the province.

Acknowledgements. We thank the organizers of the 2020 Ontario Archaeological Society virtual symposium for hosting the session "New Insights from Old Collections: The Research Potential of Legacy Collections in Ontario Archaeology" (organized and chaired by TJO), in which we each presented preliminary aspects of the material that we have assembled in this paper. We also thank the other presenters and the audience members from that session for presentations and discussions that stimulated some of our thoughts on this topic. Eric Guiry and Jennifer Birch kindly provided comments and feedback on an early draft of some sections of this paper. Comments and suggestions provided by Bonnie Glencross and Suzanne Needs-Howarth, the current editors of *Ontario Archaeology*, and by two anonymous reviewers, greatly improved the paper.

References Cited

Abel, Timothy J., John P. Hart, and Jessica L. Vavrasek
2020 Radiocarbon-Based Chronology-Building in Northern New York. *SAA Archaeological Record* 20(4):67–72.

Ahmed, Namir, Michael Carter, and Neal Ferris
2014 Sustainable Archaeology through Progressive Assembly 3D Digitization. *World Archaeology* 46(1):137–154. DOI:10.1080/00438243.2014.890911.

Alsgaard, Asia V.
2020 A Meta-analysis Approach to Understanding Maya Fish Use on the Yucatán Peninsula. *Journal of Ethnobiology* 40(4):499–518. DOI:10.2993/0278-0771-40.4.499.

Archaeological Research Associates Ltd.
1990 *Archaeological Mitigation Carson Site (BcGw-9) 1988–1989 Preliminary Report*. Report on file at Huronia Museum, Midland, Ontario.

Archaeological Services Inc. (ASI)
2010 *Report on the Salvage Excavation of the Antrex Site (AjGv-38) City of Mississauga, Regional Municipality of Peel, Ontario*. Report on file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

2012 *Stage 4 Salvage Excavation of the Bell Site (AjGu-68) 621 King Street West, Lots 11 and 12, South Side of King Street. Registered plan D-82 and part of Lots 4 and 5, Section M, Military Reserve, City of Toronto, Ontario*. Report on file at Archaeological Services Inc., Toronto.

2015 *Stage 4 Salvage Excavation of BaGt-40, 5751 Mount Albert Road, Town of East Gwillimbury, Regional Municipality of York, Ontario*. Report on file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

Archaeologix Inc.

2005 *Archaeological Assessment (Stage 4), AgHk-40, AgHk-41, AgHk-47, Bingo West Pit, Part of Lot 2, South Boundary Concession, Township of Bosanquet, Lambton County, Ontario*. Report on file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

Armstrong, Chelsey Geralda D.

2013 Ancient DNA in Archaeologically Charred *Zea mays L.*: Prospects and Limitations. Master's thesis, Department of Anthropology, University of Western Ontario, London, Ontario.

Ball, Christopher

2020 Princess Point: Inter-community Variation and Localized Settlement-Subsistence Practice. PhD dissertation, Department of Anthropology, University of Toronto, Toronto.

Barrett, James H.

2019 An Environmental (Pre)History of European Fishing: Past and Future Archaeological Contributions to Sustainable Fisheries. *Journal of Fish Biology* 94(6):1033–1044. DOI:10.1111/jfb.13929.

Bawaya, Michael

2007 Archaeology: Curation in Crisis. *Science* 317(5841):1025–1026. DOI:10.1126/science.317.5841.1025.

Birch, Jennifer

2020 Challenging Orthodoxy in Explanatory Frameworks, or, How I Learned I Was Wrong about the Timing of Coalescence and Conflict in Southern Ontario. *SAA Archaeological Record* 20(4):47–50.

Birch, Jennifer, Carley A. Crann, and Jean-Luc Pilon

2016 Chronological Modeling and Insights on European-St. Lawrence Iroquoian Interaction from the Roebuck Site, Ontario. *Canadian Journal of Archaeology* 40:332–347.

Birch, Jennifer, Turner W. Hunt, Louis Lesage, Jean-Francois Richard, Linda A. Sioui, and Victor D. Thompson

2022 The Role of Radiocarbon Dating in Advancing Indigenous-Led Archaeological Research Agendas. *Humanities and Social Sciences Communications* 9:228. DOI:10.1057/s41599-022-01249-7.

Birch, Jennifer, Sturt W. Manning, Megan Anne Conger, and Samantha Sanft

2020 Introduction: Why Are We Dating Iroquoia? Building Chronologies to Write Enhanced Archaeological Histories. *SAA Archaeological Record* 20(4):38–39.

Birch, Jennifer, Sturt W. Manning, Samantha Sanft, and Megan Anne Conger

2021 Refined Radiocarbon Chronologies for Northern Iroquoian Site Sequences: Implications for Coalescence, Conflict, and the Reception of European Goods. *American Antiquity* 86(1):61–89. DOI:10.1017/aaq.2020.73.

Booth, Laura E.

2015 A Stable Isotope Analysis of Faunal Remains from Special Deposits on Ontario Iroquoian Tradition Sites. Master's thesis, Department of Anthropology, University of Western Ontario, London, Ontario.

Buckley, Michael
2018 Zooarchaeology by Mass Spectrometry (ZooMS): Collagen Fingerprinting for the Species Identification of Archaeological Bone Fragments. In *Zooarchaeology in Practice*, edited by Christina M. Giovas and Michelle J. LeFebvre, pp. 227–247. Springer, Cham, Switzerland. DOI:10.1007/978-3-319-64763-0_12.

Campbell, Jennifer
2004 The Huron of the Kawartha Lakes: Faunal Exploitation Strategies as Indicators of Change During the Pre, Proto and Historic Periods. Master's thesis, Department of Anthropology, Memorial University of Newfoundland, St. John's.

Cherry, John F.
2011 Still Not Digging, Much. *Archaeological Dialogues* 18(1):10–17. DOI:10.1017/S1380203811000055.

Childs, S. Terry, and Danielle M. Benden
2017 A Checklist for Sustainable Management of Archaeological Collections. *Advances in Archaeological Practice* 5(1):12–25. DOI:10.1017/aap.2016.4.

Cipolla, Craig N.
2021 Situating Copper Crescents. *Canadian Journal of Archaeology* 45:77–92.

Clinton, Jennifer, and Tanya M. Peres
2011 Evaluating Mississippian Period Hunting Strategies at the Rutherford-Kizer Site. In *Museums and Memory*, edited by Margaret W. Huber, pp. 45–63. Newfound Press, The University of Tennessee Libraries, Knoxville.

Conger, Meagan Anne
2020 Brass, Beads, Bayesian Statistics: Integrating Relative and Absolute Chronologies in Sixteenth- and Seventeenth-Century Iroquoia. *SAA Archaeological Record* 20(4):51–56.

Conger, Meagan Anne, Jonathan Micon, Jennifer Birch, and Louis Lesage
2020 Constructing Huron-Wendat Histories through Oral History and Scientific Advances. *SAA Archaeological Record* 20(4):57–61.

Dating Iroquoia
2018 Dating Iroquoia: Radiocarbon Chronology in Northeastern North America. Blog, https://datingiroquoia.wordpress.com, accessed June 17, 2022.

Davidson, Katherine
2021 Zoom, Collaborative Approaches and Remote Research. *ArchNotes* [newsletter of the Ontario Archaeological Society] 26(2):15–17.

Dawson, K. C. A.
1984 A History of Archaeology in Northern Ontario to 1893 with Bibliographic Contributions. *Ontario Archaeology* 42:27–92.

Demoule, Jean-Paul
2011 We Still Have to Excavate—But Not at Any Price. *Archaeological Dialogues* 18(1):5–10. DOI:10.1017/S1380203811000043.

Dent, Joshua
2020 Community-Sourced Archaeology and Relinquishing the Inception of Research. *Canadian Journal of Archaeology* 44:48–65.

Dewar, Elaine
1997 Behind This Door... *Toronto Life* May 1997:85–92.

Dorland, Steven G. H.
2018 The Touch of a Child: An Analysis of Fingernail Impressions on Late Woodland Pottery to Identify Childhood Material Interactions. *Journal of Archaeological Science: Reports* 21:298–304. DOI:10.1016/j.jasrep.2018.07.020.

2019 Childhood Learning on Turtle Island: A Ceramic Analysis of Late Woodland Villages in the Lower Great Lakes Region. PhD dissertation, Department of Anthropology, University of Toronto, Toronto.

2021 Let's Start with Something Small: An Evaluation of Social Learning and Scaling Practices in Great Lakes Potting Communities during the Late Woodland. *Journal of Anthropological Archaeology* 62:101287. DOI:10.1016/j.jaa.2021.101287.

Dorland, Steven G. H., and Daniel Ionico

2021 Learning from Each Other: A Communities of Practice Approach to Decorative Traditions of Northern Iroquoian Communities in the Late Woodland. *Journal of Archaeological Method and Theory* 28:671–703. DOI:10.1007/s10816-020-09487-2.

Emerson, Patricia, and Nancy Hoffman

2019 Technical, Political, and Social Issues in Archaeological Collections Data Management. *Advances in Archaeological Practice* 7(3):258–266. DOI:10.1017/aap.2019.19.

Ferris, Neal

2002 When the Air Thins: The Rapid Rise of the Archaeological Consulting Industry in Ontario. *Revista de Arqueología Americana* 21:53–88.

Foreman, Lindsay J.

2011 Seasonal Subsistence in Late Woodland Southwestern Ontario: An Examination of the Relationships between Resource Availability, Maize Agriculture, and Faunal Procurement and Processing Strategies. PhD dissertation, Department of Anthropology, University of Western Ontario, London, Ontario.

Forsythe, Kyle D.

2016 Buried Dreams: Refitting and Ritual at the Mount Albert Site, Southern Ontario. Master's thesis, Department of Anthropology, University of Western Ontario, London, Ontario.

Fox, William

2000 George Gustav Heye and His Looted Lake Medad Collection: An Allegory for All That Went Before in Ontario. *Ontario Archaeology* 100:90–101.

Frieman, Catherine J., and Lisa Janz

2018 A Very Remote Storage Box Indeed: The Importance of Doing Archaeology with Old Museum Collections. *Journal of Field Archaeology* 43(4):257–268. DOI:10.1080/00934690.2018.1458527.

Gallo, Tiziana A.

2022 Vibrant Stone: Ground Stone Celt Biographies among the Ancestral and Historic Wendat in Southern Ontario from the 14th to mid-17th Centuries. PhD dissertation, Department of Anthropology, University of Toronto, Toronto.

Gates St-Pierre, Christian, Suzanne Needs-Howarth, and Marie-Ève Boisvert

2021 Indicators for Interactions from Legacy Worked and Unworked Faunal Assemblages from the Quackenbush Site, a Late Woodland Site in the Kawartha Lakes Region, Ontario. *Canadian Journal of Archaeology* 45:230–258. DOI:10.51270/45.2.230.

Glencross, Bonnie, Louis Lesage, Tracy Prowse, Taylor Smith, and Gary Warrick

2021 New Insights from Old Dog Bones: Dogs as Proxies for Understanding Ancient Human Diets. In *Working with and for Ancestors: Collaboration in the Care and Study of Ancestral Remains*, edited by Chelsea H. Meloche, Laure Spake, and Katherine L. Nichols, pp. 190–201. Routledge, Taylor and Francis Group, New York. DOI:10.4324/9780367809317.

Glencross, Bonnie, Gary Warrick, Katherine Anderson, Stefanie MacKinnon, Shannon Millar, and Samantha Patterson

2015 The Chew Site (BeGx-9): A Case Study in the Value of Archived Collections. *Ontario Archaeology* 95:3–20.

Glencross, Bonnie, Gary Warrick, Edward Eastaugh, Alicia Hawkins, Lisa Hodgetts, and Louis Lesage
2017 Minimally Invasive Research Strategies in Huron-Wendat Archaeology: Working toward a Sustainable Archaeology. *Advances in Archaeological Practice* 5(2):147–158. DOI:10.1017/aap.2017.7.

Glencross, Bonnie, Gary Warrick, Taylor Smith, and Tracy L. Prowse
2022 Estimating Ancient Huron-Wendat Diet in Southern Ontario Using Stable Isotopes from Dogs. *Journal of Archaeological Science: Reports* 41:103324. DOI:10.1016/j.jasrep.2021.103324.

Golder Associates Ltd.
2012 *Stage 4 Archaeological Assessment, Bingo Village (AgHk-42), Bingo West Pit, Part of Lot 2, South Boundary Concession, Township of Bosanquet, Lambton County, Ontario*. Report on file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

Guiry, Eric J.
2012 Dogs as Analogs in Stable Isotope-Based Human Paleodietary Reconstructions: A Review and Considerations for Future Use. *Journal of Archaeological Method and Theory* 19:351–376. DOI:10.1007/s10816-011-9118-z.
2013 A Canine Surrogacy Approach to Human Paleodietary Bone Chemistry: Past Development and Future Directions. *Archaeological and Anthropological Sciences* 5:275–286. DOI:10.1007/s12520-013-0133-8.

Guiry, Eric, Fiona Beglane, Paul Szpak, Rick Schulting, Finbar McCormick, and Michael P. Richards
2018 Anthropogenic Changes to the Holocene Nitrogen Cycle in Ireland. *Science Advances* 4(6):eaas9383. DOI:10.1126/sciadv.aas9383.

Guiry, Eric, and Michael Buckley
2018 Urban Rats Have Less Variable, Higher Protein Diets. *Proceedings of the Royal Society B* 285:20181441. DOI:10.1098/rspb.2018.1441.

Guiry, Eric J., Michael Buckley, Trevor J. Orchard, Alicia L. Hawkins, Suzanne Needs-Howarth, Erling Holm, and Paul Szpak
2020 Deforestation Caused Abrupt Shift in Great Lakes Nitrogen Cycle. *Limnology and Oceanography* 65:1921–1935. DOI:10.1002/lno.11428.

Guiry, Eric J., and Barry C. Gaulton
2016 Inferring Human Behaviors from Isotopic Analyses of Rat Diet: A Critical Review and Historical Application. *Journal of Archaeological Method and Theory* 23:399–426. DOI:10.1007/s10816-015-9248-9.

Guiry, Eric J., Jonathan R. Kennedy, Martin T. O'Connell, D. Ryan Gray, Christopher Grant, and Paul Szpak
2021 Early Evidence for Historical Overfishing in the Gulf of Mexico. *Science Advances* 7(32):eabh2525. DOI:10.1126/sciadv.abh2525.

Guiry, Eric J., Suzanne Needs-Howarth, Kevin D. Friedland, Alicia L. Hawkins, Paul Szpak, Rebecca Macdonald, Michelle Courtemanche, Erling Holm, and Michael P. Richards
2016 Lake Ontario Salmon (*Salmo salar*) Were Not Migratory: A Long-Standing Historical Debate Solved through Stable Isotope Analysis. *Scientific Reports* 6:36249. DOI:10.1038/srep36249.

Guiry, Eric, Trevor J. Orchard, Suzanne Needs-Howarth, and Paul Szpak
2021 Isotopic Evidence for Garden Hunting and Resource Depression in the Late Woodland of Northeastern North America. *American Antiquity* 86(1):90–110. DOI:10.1017/aaq.2020.86.

Guiry, Eric J., Trevor J. Orchard, Thomas C. A. Royle, Christina Cheung, and Dongya Y. Yang
2020 Dietary Plasticity and the Extinction of the Passenger Pigeon (*Ectopistes migratorius*). *Quaternary Science Reviews* 233:106225. DOI:10.1016/j.quascirev.2020.106225.

Guiry, Eric J., Thomas C. A. Royle, Trevor J. Orchard, Suzanne Needs-Howarth, Dongya Y. Yang, and Paul Szpak
2020 Evidence for Freshwater Residency among Lake Ontario Atlantic Salmon (*Salmo salar*) Spawning in New York. *Journal of Great Lakes Research* 46:1036–1043. DOI:10.1016/j.jglr.2020.05.009.

Guiry, Eric, Paul Szpak, and Michael P. Richards
2017 Isotopic Analyses Reveal Geographical and Socioeconomic Patterns in Historical Domestic Animal Trade between Predominantly Wheat- and Maize-Growing Agricultural Regions in Eastern North America. *American Antiquity* 82(2):341–352. DOI:10.1017/aaq.2016.34.

Hansen, John S.
2019 Cutting Edge and Cutting Corners: Evolving Technology, Expanding Usership, and Responsive Solutions in a Museum Database. *Advances in Archaeological Practice* 7(3):234–246. DOI:10.1017/aap.2019.20.

Hawkins, Alicia L.
2017 Sampling and Subsampling at the Allandale Site: An Evaluation of the Standards of Practice of Zooarchaeology in Compliance Archaeology in Ontario. *Canadian Journal of Archaeology* 41:308–329.

Hawkins, Alicia L., Michael Buckley, Suzanne Needs-Howarth, and Trevor J. Orchard
2022 Practice Makes Perfect? Inter-analyst Variation in the Identification of Fish Remains from Archaeological Sites. *International Journal of Osteoarchaeology* 32:694–705. DOI:10.1002/oa.3096.

Hawkins, Alicia, Jake Cousineau, and Kaitlyn Malleau
2017 Weighing the Evidence: An Experiment in Nested Screening on Contact Period Iroquoian Sites. Poster presented at the 44th Annual Symposium of the Ontario Archaeological Society, 17–19 November, Brantford, Ontario.

Hawkins, Alicia L., and Louis Lesage
2018 Huron-Wendat Archaeological Heritage: Building Relationships towards Collaboration. *História: Questões & Debates, Curitiba* 66(2):111–138.

Hawkins, Alicia L., Suzanne Needs-Howarth, Trevor J. Orchard, and Eric J. Guiry
2019 Beyond the Local Fishing Hole: A Preliminary Study of Pan-regional Fishing in Southern Ontario (ca. 1000 CE to 1750 CE). *Journal of Archaeological Science: Reports* 24:856–868. DOI:10.1016/j.jasrep.2019.03.007.

Hawkins, Alicia L., and John Raynor
2013 Local Custodians: The Role of Avocational Archaeologists in Protection of Wendat Heritage in Ontario. In *Wendat et Wyandot d'hier et d'aujourd'hui – Wendat and Wyandot then and now – Eonywa'ndiyonhratehkwih chia' ekwäa'tatehkwih*, edited by Louis-Jacques Dorais and Jonathan Lainey, pp. 99–124. Les éditions Hannenorak, Wendake, Quebec.

Hennessy, Kate
2016 From the Smithsonian's MacFarlane Collection to Inuvialuit Living History. In *Museums in a Digital Culture: How Art and Heritage Become Meaningful*, edited by Chiel van den Akker and Susan Legêne, pp. 109–127. Amsterdam University Press, Amsterdam.

Hennessy, Kate, Natasha Lyons, Stephen Loring, Charles Arnold, Mervin Joe, Albert Elias, and James Pokiak
2013 The Inuvialuit Living History Project: Digital Return as the Forging of Relationships between Institutions, People, and Data. *Museum Anthropology Review* 7(1–2):44–73.

Ionico, Daniel A.
2021 Taking on Looting: Pursuing Sustainable Site Protection Policies in Southern Ontario. *Canadian Journal of Archaeology* 45:20–52. DOI:10.51270/45.1.20.

Jackson, Jeremy B. C., Michael X. Kirby, Wolfgang H. Berger, Karen A. Bjorndal, Louis W. Botsford, Bruce J. Bourque, Roger H. Bradbury, et al.
2001 Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science* 293(5530):629–638. DOI:10.1126/science.1059199.

Jones, Emily Lena, and Caroline Gabe
2015 The Promise and Peril of Older Collections: Meta-analyses and the Zooarchaeology of Late Prehistoric/Early Historic New Mexico. *Open Quaternary* 1(1):6. DOI:10.5334/oq.ag.

Jones, Travis W., Jennifer Birch, Ronald F. Williamson, Timothy J. Abel, Robert J. Speakman, and Louis Lesage
2018 Steatite Characterization Using X-ray Fluorescence and Insights into Northern Iroquoian Interregional Interaction. *Journal of Archaeological Science: Reports* 20:506–515. DOI:10.1016/j.jasrep.2018.05.018.

Karrow, Stuart
2017 Ontario's Archaeological Curation Crisis—Twenty Years Later. Master's thesis, Department of Anthropology, University of Waterloo, Waterloo, Ontario.

Kersel, Morag M.
2015 Storage Wars: Solving the Archaeological Curation Crisis? *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 3(1):42–54.

Kiazyk, Hillary
2021 Visualizing Anishinaabe Ceramics: A Collaborative Approach to Digital Archaeology. Master's thesis, Department of Anthropology, Western University, London, Ontario.

King, Julia A.
2016 Comparative Colonialism and Collections-Based Archaeological Research: Dig Less, Catalog More. *Museum Worlds: Advances in Research* 4:4–17. DOI:10.3167/armw.2016.040102.

King, Julia A., and Patricia Samford
2019 Making Archaeological Collections Available for Research: Recommendations for Repositories. *Advances in Archaeological Practice* 7(3):311–316. DOI:10.1017/aap.2019.27.

Lorinc, John, and Ronald F. Williamson
2016 Ontario's Hidden Archaeological Scandal. *Toronto Star*, June 10. https://www.thestar.com/opinion/commentary/2016/06/10/ontarios-hidden-archaeological-scandal.html, accessed December 21, 2021.

MacDonald, Robert I.
2014 Collaborative and Innovative Heritage Impact Assessment for Highway 407 East: Archaeology, Built Heritage, Cultural Landscapes. Paper presented at the Ontario Association for Impact Assessment Conference, 22–23 October, Ottawa.

MacFarland, Kathryn, and Arthur W. Vokes
2016 Dusting Off the Data: Curating and Rehabilitating Archaeological Legacy and Orphaned Collections. *Advances in Archaeological Practice* 4(2):161–175. DOI:10.7183/2326-3768.4.2.161.

Manning, Sturt W.
2020 Radiocarbon Dating, Bayesian Modeling and American Archaeology: 2020. *SAA Archaeological Record* 20(4):40–46.

Manning, Sturt W., Jennifer Birch, Megan Anne Conger, Michael W. Dee, Carol Griggs, and Carla S. Hadden
2019 Contact-Era Chronology Building in Iroquoia: Age Estimates for Arendarhonon Sites and Implications for Identifying Champlain's Cahiagué. *American Antiquity* 84(4):684–707. DOI:10.1017/aaq.2019.60.

Manning, Sturt W., Jennifer Birch, Megan Anne Conger, Michael W. Dee, Carol Griggs, Carla S. Hadden, Alan G. Hogg et al.
2018 Radiocarbon Re-dating of Contact-Era Iroquoian History in Northeastern North America. *Science Advances* 4(12):eaav0280. DOI:10.1126/sciadv.aav0280.

Manning, Sturt W., Jennifer Birch, Megan Anne Conger, and Samantha Sanft
2020 Resolving Time among Non-stratified Short-Duration Contexts on a Radiocarbon Plateau: Possibilities and Challenges from the AD 1480–1630 Example and Northeastern North America. *Radiocarbon* 62(6):1785–1807. DOI:10.1017/RDC.2020.51.

Mayer Poulton and Associates Inc.
1991 *Archaeological Assessment and Mitigation Antrex Development Limited Subdivision Draft Plan 21T–89040M (Phase 2) City of Mississauga, R.M. of Peel, Ontario*. Report on file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

McKechnie, Iain, Dana Lepofsky, Madonna L. Moss, Virginia L. Butler, Trevor J. Orchard, Gary Coupland, Fredrick Foster, Megan Caldwell, and Ken Lertzman
2014 Archaeological Data Provide Alternative Hypotheses on Pacific Herring (*Clupea pallasii*) Distribution, Abundance, and Variability. *PNAS* 111(9):E807–E816. DOI:10.1073/pnas.1316072111.

McKechnie, Iain, and Madonna L. Moss
2016 Meta-analysis in Zooarchaeology Expands Perspectives on Indigenous Fisheries of the Northwest Coast of North America. *Journal of Archaeological Science: Reports* 8:470–485. DOI:10.1016/j.jasrep.2016.04.006.

Meister, Nicolette B.
2019 A Guide to the Preventive Care of Archaeological Collections. *Advances in Archaeological Practice* 7(3):267–273. DOI:10.1017/aap.2019.7.

Morris, Zoe H.
2015 Reconstructing Subsistence Practices of Southwestern Ontario Late Woodland Peoples (AD 900–1600) Using Stable Isotopic Analyses of Faunal Material. PhD dissertation, Department of Anthropology, University of Western Ontario, London, Ontario.

Morris, Zoe, Christine White, Lisa Hodgetts, and Fred Longstaffe
2016 Maize Provisioning of Ontario Late Woodland Turkeys: Isotopic Evidence of Seasonal, Cultural, Spatial and Temporal Variation. *Journal of Archaeological Science: Reports* 10:596–606. DOI:10.1016/j.jasrep.2016.06.017.

Murphy, Charlene A.
2006a The Richardson Site Revisited: An Examination of the Plant Remains and Dates from a Late Pickering Site. Master's thesis, Department of Anthropology, Trent University, Peterborough, Ontario.
2006b The Richardson Site Revisited: Examination of Plant Remains and Dates from a Late Pickering Site. *Ontario Archaeology* 81/82:30–43.

Murray, Gemma G. R., André E. R. Soares, Ben J. Novak, Nathan K. Schaefer, James A. Cahill, Allan J. Baker, John R. Demboski, et al.
2017 Natural Selection Shaped the Rise and Fall of Passenger Pigeon Genomic Diversity. *Science* 358:951–954. DOI:10.1126/science.aao0960.

Needs-Howarth, Suzanne J.
1999 Native Fishing in the Great Lakes—A Multidisciplinary Approach to Zooarchaeological Remains from Precontact Iroquoian Villages near Lake Simcoe, Ontario. PhD dissertation, Groninger Instituut voor Archeologie, Rijksuniversiteit Groningen, Groningen, the Netherlands. www.researchgate.net/publication/315983102

Nielsen-Grimm, Glenna, and Robyn Haynie
2019 Care of Archaeological Materials Begins in the Field. *Advances in Archaeological Practice* 7(3):284–291. DOI:10.1017/aap.2019.18.

Ontario Ministry of Tourism and Culture (MTC)
2011 *Standards and Guidelines for Consultant Archaeologists*. Queen's Printer for Ontario, Toronto. Electronic document, http://www.mtc.gov.on.ca/en/publications/SG_2010.pdf, accessed June 29, 2021.

Ontario Ministry of Tourism, Sport and Culture (MTCS)
2012 Terms and Conditions for Archaeological Licences. Electronic document, http://www.mtc.gov.on.ca/en/archaeology/TermsAndConditions-EN-(2012).pdf, accessed January 6, 2022.
2014 Archaeological Collections Management Study: Final Report. Paper presented at the Ontario Archaeological Symposium, 24–26 October, Peterborough, Ontario.

Orchard, Trevor J., and Terence N. Clark
2014 Shell Middens, Vertebrate Fauna, and Northwest Coast Subsistence: Intensification and Generalization of Prehistoric Northwest Coast Economies. In *The Cultural Dynamics of Shell-Matrix Sites*, edited by Mirjana Roksandic, Sheila Mendonça de Souza, Sabine Eggers, Meghan Burchell, and Daniela Klokler, pp. 199–219. University of New Mexico Press, Albuquerque.

Orton, David C., James Morris, Alison Locker, and James H. Barrett
2014 Fish for the City: Meta-analysis of Archaeological Cod Remains and the Growth of London's Northern Trade. *Antiquity* 88:516–530. DOI:10.1017/S0003598X00101152.

Ounjian, Glenna Lorraine
1998 Glen Meyer and Prehistoric Neutral Paleoethnobotany. PhD dissertation, Department of Anthropology, University of Toronto, Toronto.

Pálsdóttir, Albína Hulda, Auli Bläuer, Eve Rannamäe, Sanne Boessenkool, and Jón Hallsteinn Hallsson
2019 Not a Limitless Resource: Ethics and Guidelines for Destructive Sampling of Archaeofaunal Remains. *Royal Society Open Science* 6(10):191059. DOI:10.1098/rsos.191059.

Pearce, Robert J.
1977 Archaeological Investigation of the Pickering Phase in the Rice Lake Area. *Ontario Archaeology* 29:17–24.

Reitz, Elizabeth J., and Elizabeth S. Wing
2008 *Zooarchaeology*. 2nd ed. Cambridge Manuals in Archaeology. Cambridge University Press, Cambridge, UK.

Robertson, David A., and Ronald F. Williamson (editors)
1996 The Archaeology of the Dunsmore Site: A Late Iroquoian Community in Southern Simcoe County. Manuscript on file, Ontario Ministry of Tourism, Culture and Sport, Toronto.

Royle, Thomas C.
2021 Ancient DNA Analysis of Archaeological Fish Remains: Methods and Applications. PhD dissertation, Department of Archaeology, Simon Fraser University, Burnaby, British Columbia.

Royle, Thomas C. A., Hua Zhang, Eric J. Guiry, Trevor J. Orchard, Suzanne Needs-Howarth, and Dongya Y. Yang
2020 Investigating the Sex-Selectivity of a Middle Ontario Iroquoian Atlantic Salmon (*Salmo salar*) and Lake Trout (*Salvelinus namaycush*) Fishery through Ancient DNA Analysis. *Journal of Archaeological Science: Reports* 31:102301. DOI:10.1016/j.jasrep.2020.102301.

Sanft, Samantha M.
2020 Dating the Circulation of Shell and Copper Beads in the Fifteenth through Seventeenth-Century Northeast. *SAA Archaeological Record* 20(4):62–66.

Saunders, Della
2002 Princess Point Palaeoethnobotany. PhD dissertation, Department of Anthropology, University of Toronto, Toronto.

Smith, David G.
1993 The 1992 Erindale College Field School at the Antrex Site (AjGv-38). *Annual Archaeological Report, Ontario* 4(New Series):68–72.

St. Amand, Frankie, S. Terry Childs, Elizabeth J. Reitz, Sky Heller, Bonnie Newsom, Torben C. Rick, Daniel H. Sandweiss, and Ryan Wheeler
2020 Leveraging Legacy Archaeological Collections as Proxies for Climate and Environmental Research. *PNAS* 117(15):8287–8294. DOI:10.1073/pnas.1914154117.

St. John, Amy
2020 Inside Perspectives on Ceramic Manufacturing: Visualizing Ancient Potting Practices through Micro-CT Scanning. PhD dissertation, Department of Anthropology, Western University, London, Ontario.

Suko, Amanda
2017 Practice Molds Place: Communities of Pottery Production and Situated Identities at Location 3 (AgHk-54). *Canadian Journal of Archaeology* 41:238–268.

Sutton, Richard
1996a The Middle Iroquoian Colonization of Huronia. PhD dissertation, Department of Anthropology, McMaster University, Hamilton, Ontario.
1996b *Results of the 1991–1993 Excavations at the Barrie Site (BcGw-18): A Pioneering Community Located in Simcoe County, Ontario*. Report on file at the Ontario Heritage Foundation, Toronto.

Syms, E. Leigh
1997 Increasing Awareness and Involvement of Aboriginal People in Their Heritage Preservation: Recent Developments at the Manitoba Museum of Man and Nature. In *At a Crossroads: Archaeology and First Peoples in Canada*, edited by George P. Nicholas and Thomas D. Andrews, pp. 53–68. Archaeology Press, Department of Archaeology, Simon Fraser University, Burnaby, British Columbia.

Szpak, Paul, Michael Buckley, Christyann M. Darwent, and Michael P. Richards
2018 Long-Term Ecological Changes in Marine Mammals Driven by Recent Warming in Northwestern Alaska. *Global Change Biology* 24(1):490–503. DOI:10.1111/gcb.13880.

Szpak, Paul, Trevor J. Orchard, Iain McKechnie, and Darren R. Gröcke
2012 Historical Ecology of Late Holocene Sea Otters (*Enhydra lutris*) from Northeastern British Columbia: Isotopic and Zooarchaeological Perspectives. *Journal of Archaeological Science* 39:1553–1571. DOI:10.1016/j.jas.2011.12.006.

Tesar, Alexander
2015 To the Point: Digging Up History in Ontario's Golden Horseshoe. *The Walrus*, August 28. *https://thewalrus.ca/to-the-point/,* accessed December 21, 2021.

Thomas, Stephen Cox
1996 Zooarchaeological Analysis. In *The Archaeology of the Dunsmore Site: A Late Iroquoian Community in Southern Simcoe County*, edited by David Robertson and Ronald F. Williamson, pp. 125–179. Report on file at the Ministry of Tourism, Culture and Sport, Toronto.

Tite, Michael S.
2002 Archaeological Collections: Invasive Sampling versus Object Integrity. *Papers from the Institute of Archaeology* 13:1–5.

Tourigny, Eric D.
2016 Upper Canada Foodways: An Analysis of Faunal Remains Recovered from Urban and Rural Domestic Sites in Toronto (York), AD 1794–1900. PhD dissertation, School of Archaeology and Ancient History, University of Leicester, Leicester, UK.

Tourigny, Eric, Richard Thomas, Eric Guiry, Richard Earp, Andrew Allen, Jamie L. Rothenburger, Dennis Lawler, and Marc Nussbaumer
2016 An Osteobiography of a 19th-Century Dog from Toronto, Canada. *International Journal of Osteoarchaeology* 26:818–829. DOI:10.1002/oa.2483.

Valladas, Helene, John-Louis Reyss, Jean-Louis Joron, Georges Valladas, Ofer Bar-Yosef, and Bernard Vandermeersch
1988 Thermoluminescence Dating of Mousterian "Proto-Cro-Magnon" Remains from Israel and the Origin of Modern Man. *Nature* 331:614–616. DOI:10.1038/331614a0.

Warrick, Gary, Bonnie Glencross, and Louis Lesage
2021 The Importance of Minimally Invasive Remote Sensing Methods in Huron-Wendat Archaeology. *Advances in Archaeological Practice* 9(3):238–249. DOI:10.1017/aap.2021.7.

Williamson, Ronald F.
2010 Planning for Ontario's Archaeological Past: Accomplishments and Continuing Challenges. *Revista de Arqueologia Americana* 28:7–45.
2014 The Archaeological History of the Wendat to A.D. 1651: An Overview. *Ontario Archaeology* 94:3–64.

Williamson, Ronald F., Stephen Cox Thomas, and Robert I. MacDonald
2003 The Archaeology of the Moatfield Village Site. In *Bones of the Ancestors: The Archaeology and Osteobiography of the Moatfield Site*, edited by Ronald F. Williamson and Susan Pfeiffer, pp. 19–88. Mercury Series Paper 163. Archaeological Survey of Canada, Canadian Museum of Civilization, Ottawa.

Winsa, Patty
2018 Insight: Toronto's Archaeological Treasures Still Buried (in Bankers' Boxes, Garages, Basements and Lockers). *Toronto Star*, June 16. *https://www.thestar.com/news/insight/2018/06/16/torontos-archeological-treasures-still-buried-in-bankers-boxes-garages-basements-and-lockers.html*, accessed December 21, 2021.

Plus d'un siècle de recherche académique, de collecte amateur et, plus récemment, d'archéologie de gestion des ressources culturelles a produit un nombre considérable de collections archéologiques provenant de sites en Ontario. Alors qu'au cours des dernières décennies, la " crise de la conservation " découlant de cette production à grande échelle de collections archéologiques a fait l'objet d'un débat relativement large, nous nous attachons ici à faire mieux comprendre le potentiel de ces collections pour la recherche archéologique et pour l'engagement d'autres parties intéressées. Notre objectif est de faire en sorte que ces collections soient mieux comprises et plus largement accessibles. Les collections patrimoniales peuvent être une ressource incroyable pour la recherche et peuvent aider à mieux comprendre le patrimoine de l'Ontario. Nous soulignons les défis que pose la mise en relation des chercheurs avec les collections et présentons des idées sur la façon de les rendre plus accessibles. En nous appuyant sur nos expériences dans des contextes de CRM, de musées et d'universités, nous visons à présenter une perspective à multiples facettes sur la facilitation de la recherche avec des collections archéologiques. Dans cette perspective, nous abordons ce que sont les collections patrimoniales, qui les a générées, où se trouvent ces collections dans le contexte ontarien, comment les chercheurs peuvent identifier et accéder aux collections patrimoniales et, ce qui est peut-être le plus important, pourquoi les chercheurs peuvent bénéficier du travail avec les collections patrimoniales. Enfin, nous souhaitons mettre en évidence le vaste potentiel de recherche, largement sous-exploité, des collections patrimoniales en présentant quelques exemples de projets de recherche récents qui ont fait appel à ces collections.

Received February 11, 2022; accepted May 26, 2022.

Trevor J. Orchard
Department of Anthropology
University of Toronto Mississauga
3359 Mississauga Road
Mississauga, Ontario L5L 1C6
Canada
trevor.orchard@utoronto.ca (corresponding author)

Alexis Dunlop
Archaeological Services Inc. (ASI)
528 Bathurst Street
Toronto, Ontario M5S 2P9
Canada
alexis.dunlop@araheritage.ca

Heather Hatch
Museum of Ontario Archaeology
1600 Attawandaron Road
London, Ontario N6G 3M6
Canada
heather@archaeologymuseum.ca

Terminal Neutral Iroquoian Glass Bead Assemblages: A Refinement of the "Red Shift" Metrics

William Fox, James Conolly, and April Hawkins

Postcontact Ontario Iroquoian site chronologies were originally established using the presence or absence of specific European goods, particularly glass bead types. We here consider mid-seventeenth-century glass bead style trends defined for the well-established Seneca site sequence in New York State as applied to the glass bead assemblages of the Sealey (AgHa-4) and Walker (AgHa-9) villages, which sites represent the final Ontario occupation of a population that had moved southeast into the Brantford area over a period of two centuries. Nineteenth-century legacy collections held by the former Provincial Museum, Ontario, are used to modify red glass tubular bead frequencies previously calculated on the basis of twentieth-century collections. We reaffirm the value of European trade goods as providing reliable chronological information for the early seventeenth century.

Introduction

Since the standardization of the glass bead typology by Ken and Martha Kidd (1970) over 50 years ago, our understanding of glass bead type spatial and temporal trends in the Great Lakes region from the late sixteenth to the mid-seventeenth century has evolved (Kenyon and Fox 1982; Kenyon and Kenyon 1983; Wray 1983) and has been refined (Fitzgerald 1982, 1983), permitting the definition of Iroquoian village movements and chronologies (Birch et al. 2021:66; Garrad 2014). During this time, geochemical analyses have provided important information concerning glass bead production sites and recipes operating over specific time periods (Hancock et al. 1994, 2000; Karklins 1974; Karklins and Bonneau 2019; Walder 2013, 2018). Fine mesh water screening has extended knowledge of the range of glass bead types available to Indigenous communities by capturing the smaller bead size ranges used in embroidery as opposed to stringing (Glencross et al. 2021:169; Kenyon 1985:19, Table 1).

The data presented has considered the validity of glass beads as "the single most useful dating tool" (Kenyon 1984:4) among the range of trade goods accepted by Iroquoian tribes in the lower Great Lakes region. A particular transition in bead glass colour from white and blue to red has been termed the "red shift" (Kenyon 1984:4) and hypothesized to derive from a simultaneous change in fur trading companies in New France (Fitzgerald 1983:20, Table 1) and an awareness concerning the symbolic importance of the colour red among Iroquoian peoples (Hamell 1983:23). The highest percentage of red glass beads of tubular form is characteristic of Ontario Iroquoian and associated European sites abandoned in 1650–1651 due to the escalating Iroquois Wars. A 1653–1654 Jesuit eye-witness account of gifts presented to an Iroquois delegation by the French describes a "hundred little tubes or pipes of red glass, which constitute the diamonds of the country …. cents petits tuyaux ou canons de verre rouge qui sont les diamas

du pais (Thwaites, 1896–1901:41:110–111)" (Kenyon 1984:6).

The present study was undertaken because of what appeared to be the anomalously low percentages of tubular red beads reported from the Sealey (AgHa-4) and Walker (AgHa-9) villages, two terminal Neutral communities (Kenyon 1969) that form the latter part of a series of village movements southeast from a late fifteenth- to early sixteenth-century occupation of the Kitchener–Waterloo region to the Brantford vicinity (Figure 1). The Sealey and Walker villages and associated cemeteries have been known to artifact collectors since the nineteenth-century settler clearance of the lands for agricultural purposes (Boyle 1904a; Ridley 1961:9–19; Steele 1944; Waugh 1903; Wright 1963:80; Wright 1981). Vast quantities of artifacts were surface collected and excavated from these sites during the late nineteenth and twentieth centuries and widely dispersed in Ontario and the USA among private collectors and museums (Fox 2013).

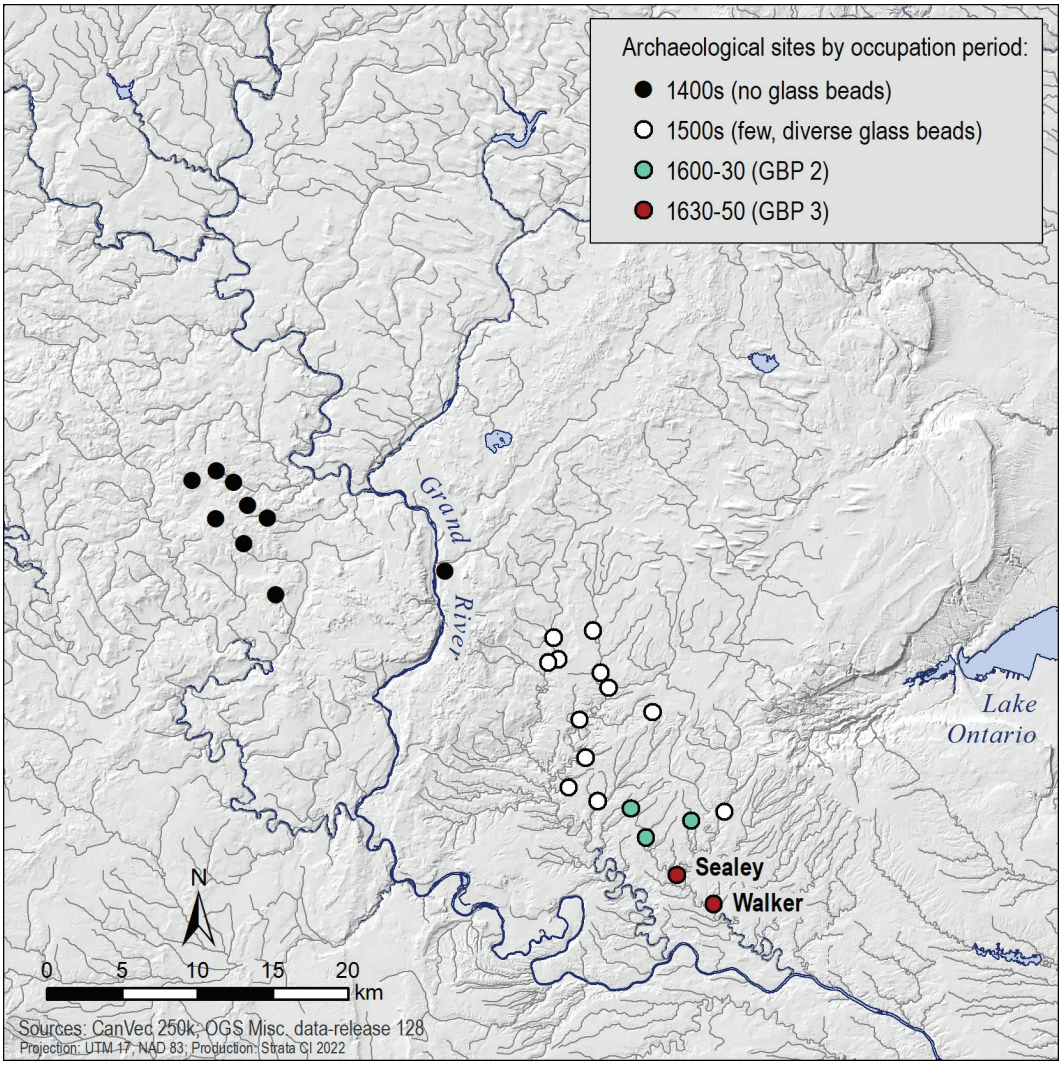


Figure 1. *Village movement from the Kitchener cluster to the Fairchild–Big Creek cluster. (Map courtesy of Andrew Stewart, Strata Consulting.)*

The Sites

Figure 1 presents the distribution of Neutral villages situated from the Kitchener–Waterloo region southeast to an area east of Brantford, ranging in age from the late fifteenth to mid-seventeenth century. These constitute the Kitchener and Fairchild–Big Creek clusters as defined by Lennox and Fitzgerald (1990:412–413, Table 13.1). Complete material culture assemblages from these sites display a transition defined by ceramic vessel decorative attribute change (MacDonald 1986), smoking pipe styles, transitions in projectile point and end scraper form (Fox 1972:6), and the presence of European goods, among other attributes (Kenyon 1972:3–6; Lennox and Fitzgerald 1990:406, Figure 13.1, 411–425; Mannen 1983; Noble 1972; Warrick 1979; Wright 1981). This temporal and spatial pattern is similar to the unidirectional village movements defined for Haudenosaunee communities in upstate New York (Bradley 1987:49–51, Map 6, 115–117, Map 9; Wray and Schoff 1953). The relatively numerous late sixteenth-century villages in this specific Neutral tribal distribution may reflect an influx of western Neutral peoples (Fitzgerald 2001:38, Figure 5.1), considering novel ceramic vessel attributes and an elaborated bone and antler industry (Fitzgerald 2001:40–44). Based on the relative abundance of European goods, Fitzgerald (1982:43, Figure 6) has interpreted the Walker village as a 1651 dispersal site. As illustrated in Figure 1 and indicated by its geographic location, the Sealey village is similar in age and may represent the termination of a paired village movement of communities similar to that of the Seneca (Wray et al. 1987:1–5, Figures Intro-1 and Intro-2).

The Beads

As part of an ongoing review of nineteenth-century collections from seventeenth-century Neutral sites donated to Ontario's Provincial Museum and currently curated by the Royal Ontario Museum, glass beads recovered from the Walker site (Ridley 1961:12–19; Waugh 1903:75–77) were recorded using the Kidd typology (see Table 1). All type Ia1, Ic′1, IIIa1, and IIIe′1 red tubes were measured to compare metrics with specimens from the mid-seventeenth-century Seneca Warren, Power House, Steele, and Marsh sites held as the Rock Foundation collections in the "Seneca vault" of the Rochester Museum and Science Center (Figure 2).

This was done to compare the percentage of "red tubulars" (Kenyon and Kenyon 1983:62) among the turn of the century Provincial Museum donations by Walter M. Dick (Boyle 1904b, 1906) with reported twentieth-century collections from Walker (Kenyon 1969:16–19, 1972:6; Wright 1981:104–105). Using assemblages from the Provincial Museum and the Heye Foundation (Fox 2005) plus bead type counts from Kenyon (1969:17–19, 23–24) and Lennox (1984:122–125), the percentages of tubular red glass beads from the seventeenth-century Neutral Sealey, Dwyer (AiHa-3), St. David's, and Hood (AiHa-7) sites have been compared with the various nineteenth- and twentieth-century collections from Walker in Figure 3 and evaluated using the 15% plus criterion for sites dating to the 1640s (Kenyon and Kenyon 1983:68).

Based on the available strings from the Walker site in the ROM collections (Figure 4), we were able to count 447 glass beads, representing 17 Kidd types, 5 of which can be considered

Table 1. *Glass bead types from the Walker site in the Walter Dick donation, Royal Ontario Museum.*

Colour	Form	*N*	Kidd Types/Varieties
Red	Round/oval	331	IVa2, IVa3, IIbb1, IIbb2, IVa9
Red	Tube	93	Ia1, Ic'1, IIIa1, IIIe'1
Blue	Oval	8	IVa19
Turquoise	Tube	6	Ia12, IIIc, IIIc'3
Turquoise	Round	4	IIa43
Star	Round/tube	5	IIIk1, IIIm1
	Total	447	

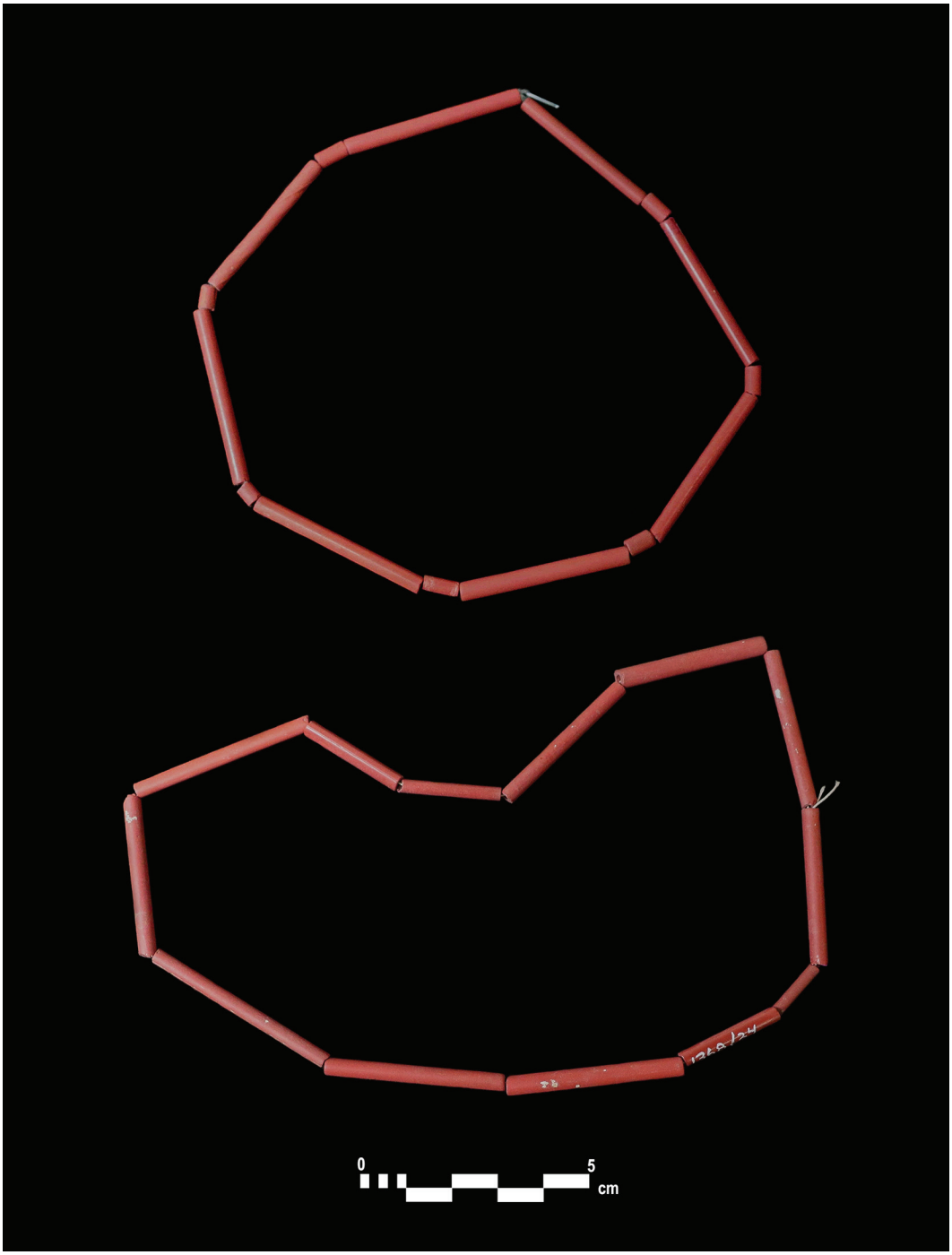


Figure 2. *Seneca red glass tubes from the Warren site (top) and the Power House site (bottom). Photos by William Fox, enhanced by John Howarth Photography.*

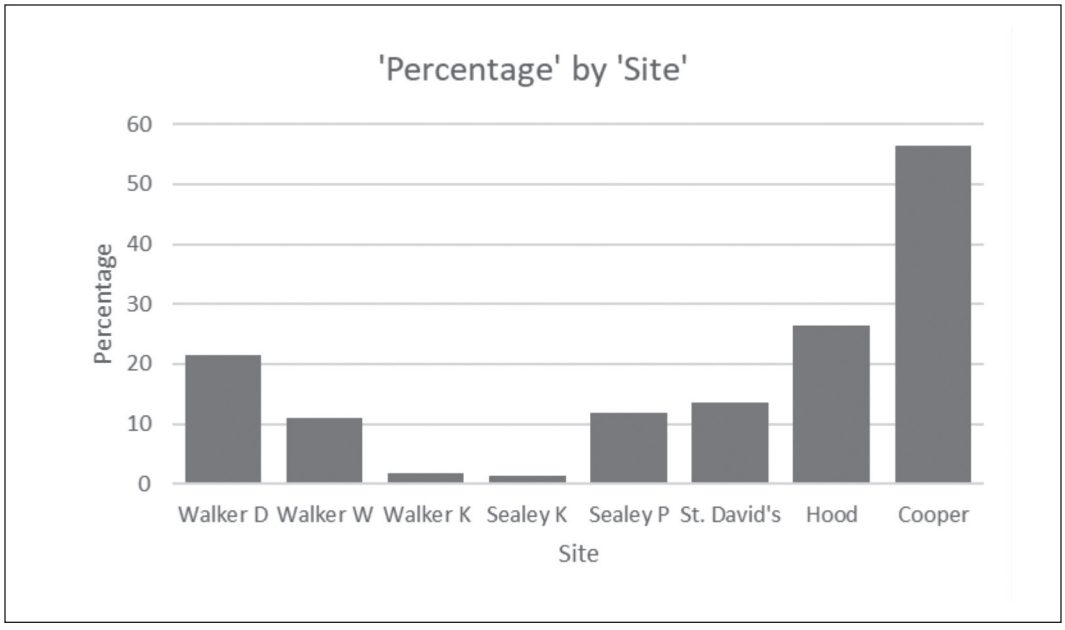


Figure 3. *Proportions of red glass tubes on Neutral sites.*

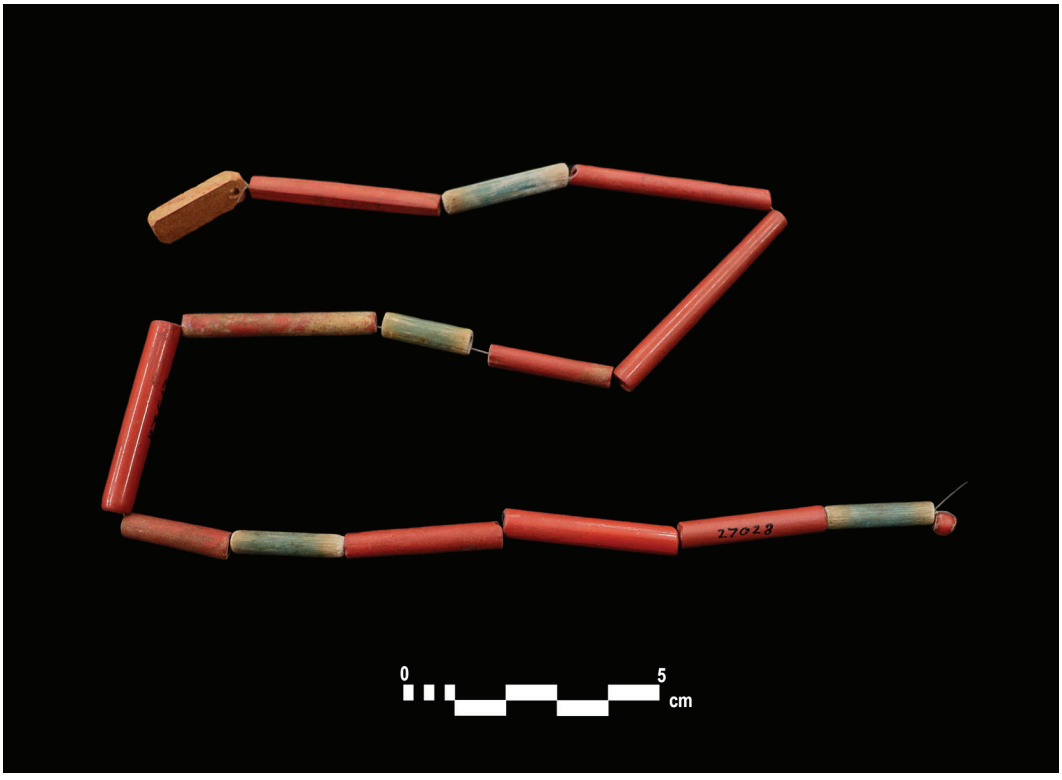


Figure 4. *Red and turquoise glass tubes from the Walker site. String NS 27028. Photo by William Fox, enhanced by John Howarth Photography.*

tubular red forms, although the primary type is Ia1, at 82 specimens. Of the 7 Ic′1 bead identifications, 3 are tentative, as one of us (WF) noted a tendency for these twisted rectangular red tubes to be ground into a round cross-section. Boyle's description of the Walker village cemetery (Figure 5) is "mainly from the notes supplied by Mr. Dick" (Boyle 1904a:92). There can be little doubt concerning the intensity of Dick's looting, based on the 199 seed beads in string NS 25,456, which are likely to have required fine mesh screening to recover, although Steele (1944:4) reports finding a cluster of "278 small blue beads […] so small that they would pass through our screen."

Ian Kenyon (1969:17–19) reports 23 of his types (which we converted to Kidd types) among a sample of 1,245 beads recorded in his own collection and in the private collections of F. Kingdon, I. Kocsis, and H. Smith. As illustrated in Figure 3, a mere 1.7% represent red tubes (Ia1/IIIa1 and Ic′1). Unlike the Dick collection, this assemblage was surface collected from the agricultural fields and recovered through midden and disturbed

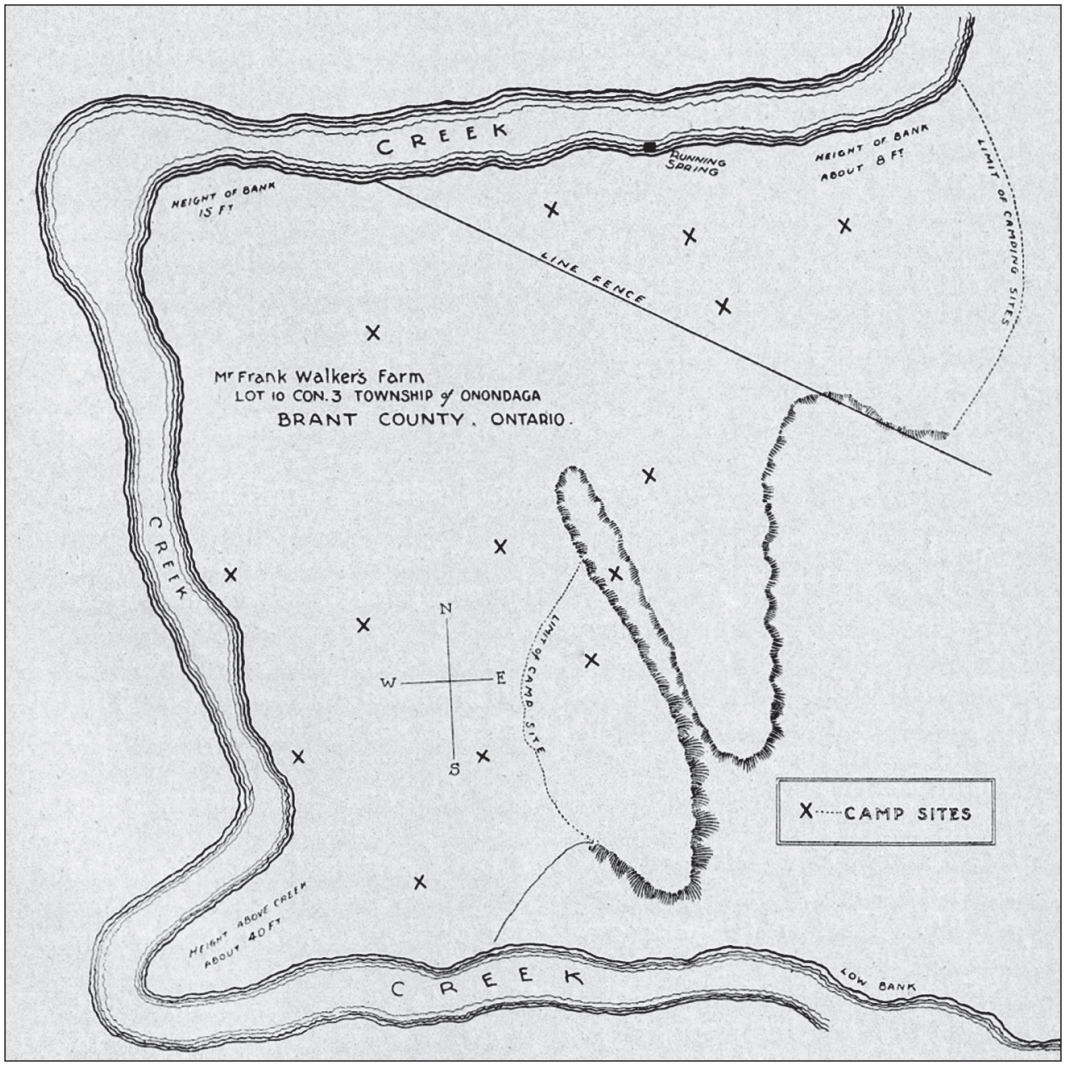


Figure 5. *Map of the Walker site (modified from Boyle 1904:93, Figure 63). "Camp Sites" indicates midden locations.*

burial fill screening during the mid-twentieth century. Finally, the glass bead assemblage recovered during the 1973–1974 McMaster University excavation project on the Walker site is small and somewhat problematic, as the Kidd typology was not used to describe 92 recovered beads, the majority of which derived "from the ossuary where years of looting have certainly depleted the original glass bead and tube count" (Wright 1981:104). Given the descriptions of colour and form presented in Wright (1981:105, Table 42), we believe that it is safe to assume that 10 of the specimens are Ia1 or IIIa1 type, amounting to 10.9% of the sample (see Figure 3).

Other Terminal Neutral Sites

The first reference to the Dwyer site in Beverly Township is by Henry Schoolcraft, who visited the site in October of 1843 (Schoolcraft 1851:324–325). Subsequently, the cemetery complex was dug over by numerous collectors and avocationals, including James Dwyer in the 1880s (Boyle 1888:14, 48, 53–54, Figure 108), Rutherford Smith and Robert Murphy (Fox 2013:5–8; Ridley 1960:28–31, Plate 11; Smith and Murphy 1939), and John and Sanford Bonham in 1938 and 1943 (Bonham 1978:19–24, 42–43). Combining the 54 Rutherford Smith beads held at McMaster (Kenyon 1969:6) and the 8 beads donated by James Dwyer to the Provincial Museum, we have a total of 23 red tubes, or 37.1% (see Figure 3).

Waugh (1903:70) notes that, "Over forty years ago two boys, while unearthing a woodchuck on the back of a farm then occupied by a Mr. Seeley [sic], discovered an ossuary or bone pit." He goes on to describe the subsequent looting of the village and cemetery areas, describing the range of artifacts unearthed, including "numerous glass beads […] of various sizes and colors" and "catlinite beads of Indian manufacture" (Waugh 1903:73). The site and artifact assemblages were later described by Frank Ridley (1960:9, 11, 47–49), while Ian Kenyon recorded 1,320 glass beads from the site collected through surface collection and midden screening by Kingdon, MacDonald, Envers, Axelson, and himself (Kenyon 1969:5). He recorded separately as "Sealey Ossuary" 365 beads looted from "a series of undisturbed burials in 1967" by George Parkin (Kenyon 1969:5; see also Fox 1985). Kenyon's village sample includes only 18 red tubes, or 1.4% (Kenyon 1969:17–18); however, Parkin's looted burial sample has 43 red tubes, or 11.8% (Kenyon 1969:23), much closer to the 1640s 15% cut-off (see Figure 3).

The St. David's "ossuary" was exposed in 1908 by topsoil stripping for sand quarrying on the Dorchester farm property "near the village of St. David's" (Boyle 1911:9). When he obtained permission to visit the site, Boyle "found it occupied by a large number of men and boys—some even from the United States—who were making havoc of the graves" (Boyle 1911:9). Consequently, looted artifacts have been scattered to institutional collections from Toronto to Hamilton to Buffalo and Washington (Fox 2005) and lost to the anonymity of countless private collections in Canada and the USA. Using the 331 beads in the E. Case collection at McMaster (Kenyon 1969:6) and the 18 beads from the Heye Foundation collection (Fox 2005:18), we have a total of 47 red tubes, or 13.5%, very close to the 1640s cut-off (see Figure 3).

The Hood village site was heavily surface collected by George Allison, who once held a mortgage on the property (Lennox 1984:4), and by others during the late nineteenth and early twentieth century (Fox 2021:5–6). Sadly, item 862 in Allison's catalogue simply lists "about 5500 Glass beads some very small, some slim bright and 3⅜ inches [8.5 cm] long, others 1¼ [3.2 cm] thick, some curiously marked all together there is a great variety" (Smith c. 1923:37). No specific site provenience is provided for the glass beads in Allison's collection, which were acquired by the Royal Ontario Museum of Archaeology, Toronto, in 1915; however, many of the unprovenienced strings of glass beads among the "HD 5000" new series catalogue numbers for his collection include numerous type Ia1 red tubes. The McMaster excavation of the Hood site in 1977 was directed by Paul Lennox and produced a sample of 292 glass beads "primarily from a few concentrations of beads within burials" (Lennox 1984:122). Lennox (1984:123,

Table 29) records 77 red tubes, or 26.3%, well above the cut-off (see Figure 3).

A rescue excavation conducted in 1980–1981 on the Cooper (AgHb-18) site in Brantford located a Neutral cemetery component (Warrick 1983:1, 4, Figure 2, 14), which had probably been disturbed as a result of nineteenth-century road construction. Out of a total of 33 glass beads recovered (Warrick 1983:53, Table 33), 18 were red tubes, constituting 56.3% of the assemblage (Warrick 1983:60, Table 38) (see Figure 3). In addition, 15 catlinite beads, measuring 15.6 mm and 4 mm in mean length and width, were recovered. Most displayed a rectangular cross-section (Warrick 1983:47).

Thinner Red Tubes on Seneca Sites?

Diameter metrics have been recorded for Kidd type Ia1 and IIIa1 beads from the Seneca Warren, Power House, Steele, and Marsh sites and Neutral Walker site to test the validity of the observed thinner versions of these bead types in Seneca assemblages, as reported by Kenyon (1969:25) and Kenyon and Kenyon (1983:64) and as described by Wray (1983:44) as "small" (see Figure 2). Table 2 displays the length and diameter metrics for the Walker Neutral site and four Seneca site red tube assemblages dating between c. 1630 and 1675.

A summary of bead diameters is provided in Table 2, by site. Diameter is the critical variable, and a graphical summary is provided in Figure 6. The observed variation in bead diameters between all sites is significantly different (ANOVA, diameter $F = 40.1$, length $F = 60.54$, both variables $p < 0.001$). When Walker is compared to the combined measurements of the other four samples, the difference in bead diameter is significant (Welch Two-Sample t-test, $t = 7.8$, $df = 127$, $p < 0.001$). With confidence, we can state that beads from the Walker site are on average significantly larger than those considered collectively from the other four site samples. Comparison of variability is equivocal—although bead diameters are more variable than at most of the other sites, when viewed collectively, Walker is not significantly different ($F = 0.65$, $p = 0.07$).

Discussion

The massive artifact assemblages from mid-seventeenth-century Seneca villages establish a benchmark for declining Indigenous tool production (i.e., ceramics and stone projectile points) and the increasing availability and use of European products (i.e., muskets and brass kettles) in the lower Great Lakes region. Vast quantities of glass beads provide reliable evidence concerning temporal trends in bead types. Wray (1983:44–45) reports the recovery of over 21,000 beads from the Steele and Power House sites and over 45,000 from Marsh and Dann, with red tubular (Ia1 and Ibb1) popular on the earlier village pair and Ic′1, IIIa2, and IIIa3 well represented on the latter. The first red tubular (Ia1) beads appear and are a key drawn bead type on the Warren site, dating to c. 1630–1645 (Wray 1983:43) (see Figure 2).

One hundred and fifty years of village midden surface collecting and cemetery looting have widely scattered artifacts from the Neutral Sealey and Walker sites, as represented in Ian Kenyon's bead type counts; however, the few assemblages donated to the Provincial Museum during the 1890s by Brantford-area collectors like Walter Dick appear to represent the larger, more visible range of glass bead types characteristic of these occupations (see Figure 4). Later collections,

Table 2. *Sample size (N), mean and standard deviation, and coefficient of variation (CV) of bead diameters and lengths of red glass tubes for the five site samples.*

Site	*N*	Mean Diameter	Diameter CV	Mean Length	Length CV
Marsh	15	4.94 ± 0.75	0.15	89.59 ± 21.04	0.23
Power House	33	3.84 ± 0.50	0.12	24.06 ± 10.88	0.45
Steele	11	3.08 ± 0.42	0.14	12.52 ± 5.11	0.41
Warren	8	3.73 ± 0.34	0.09	39.11 ± 2.08	0.05
Walker	74	4.90 ± 0.64	0.13	43.33 ± 16.62	0.38

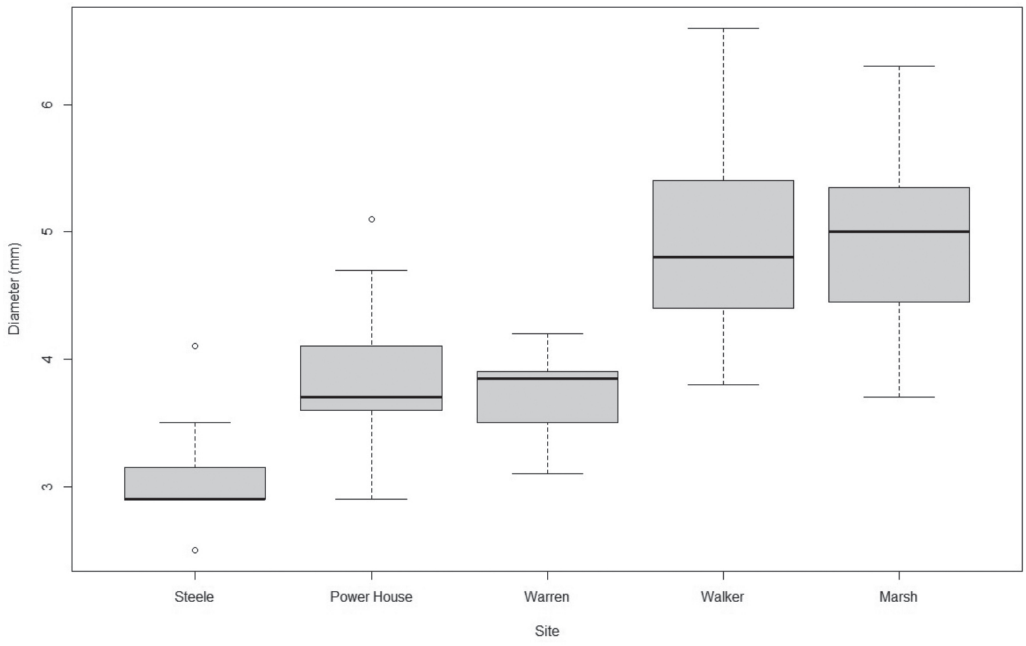


Figure 6. *Inter-site comparison showing median (dark line), 1st and 3rd quartiles (box), minimum and maximum (whiskers), and outliers (dots) of red glass tube diameters from each of the five site samples.*

obtained during the latter half of the twentieth century, display considerably fewer of the larger, more visible type Ia1 and IIIa1 red tubes.

Unlike post-1630 Huron-Wendat and Tionontaté or Odawa sites with relatively high red tubular glass bead counts, Neutral sites do not normally present goods related to Jesuit missionizing activities. The Hood village assemblage is anomalous in containing four complete and two portions of IHS and L-Heart rings and a medallion (Lennox 1984:112–117, 164–165, Figure 52). Also, such a ring is reputed to have been recovered by George Parkin from a looted grave on the Walker site (William Fitzgerald, personal communication 2022).

The higher percentages of red tubulars from the Provincial Museum Neutral collections compare well with other Ontario Iroquoian assemblages derived from immediate pre-dispersal 1640s villages, such as the Jesuit mission station Ste. Marie I (Kidd 1949:141, Figure 25, N-P and 142) and Ossossané village (BeGx-25) (Kenyon 1969:6, 23) and the Tionontaté mission sites of St. Jean and St. Mathieu (Garrad 2014:350–352, Table 7.1, 354, Plate 7.2), which were excavated using one-half to one-quarter inch (12.8 to 6.4 mm) screens. Consistent with the Neutral pattern, mortuary contexts produce larger quantities of these bead types at the Huron-Wendat Ossossané ossuary (Kidd 1953:367, Figure 123r, u, 369) and the Odawa Plater-Fleming (BdHb-2) site. The Long (BcHb-9) site individual, interred adjacent to the latter Anishinaabe village and mission of St. Simon and St. Jude (paired with St. Mathieu, immediately to the south [Garrad 2014:465, Figure 9.5]), wore a bracelet of seven type Ia1 beads (Garrad 2014:355, Table 7.3). A similar demand for red tubular beads is represented in village and cemetery assemblages from Seneca sites (Wray 1983:43–45) spanning the period from c. 1630 to 1670 (Sempowski and Saunders 2001:6, Figure Intro-3).

Finally, mention should be made of the parallel rise in red stone bead quantities on post-1620 Iroquoian sites. Red siltstone tubes, usually rectangular but sometimes ground into an oval

to circular cross-section, begin to be manufactured on Blue Mountain–region sites during the 1620s and continue until the 1650 dispersal of the Tionontaté and Odawa (Fox 1980:91–93. Figure 6). They occur commonly on post-1630 Neutral sites (Kenyon and Fox 1982:12) and sporadically on Seneca sites such as Dutch Hollow (Hne-001) (Sempowski and Saunders 2001:271–272, Figure 3-217), Factory Hollow (Hne 7-2) (Sempowski and Saunders 2001:544–545, Figure 7-224), Warren, and Power House. No specimens are documented on later Seneca sites, as production and distribution terminated due to the 1650 dispersal of the Tionontaté and Odawa from their homeland.

Catlinite beads begin to arrive on Iroquoian sites c. 1630, apparently associated with the establishment of the Arbre Croche Odawa community, at Little Traverse Bay, on Lake Michigan (Fox 1992:55–56), and of the 54 specimens from "Lake Medad" in the Heye Foundation collection, the majority are four-sided (square or rectangular), while a few are triangular or oval to round in cross-section. They range in length from 81.4 to 3.3 mm, with the majority being in the 20 to 8 mm range. Thickness ranges from 14.3 to 2.8 mm, and the majority are 12 to 5 mm. Six specimens display edge notching and three have zigzag incising on one face. While the designation is "Lake Medad," these beads doubtless derive from a number of c. 1630–1651 Neutral sites; this style of bead evidently predates 1650 and is contemporary with the red glass tubes (none of the collected/looted sites are Tinawatawa). Evidence from the Seneca site sequence indicates that long catlinite beads begin to arrive on the Warren site (c. 1630–1645) and there is a florescence in the catlinite necklace industry by Power House times (c. 1640–1655), with abundant rectangular beads and drop components to some necklaces. A necklace from Walker donated by Walter Dick consists of six thin beads ranging in length from 91.6 to 24.7 mm, consistent with the later Seneca specimens. One catlinite bead from Dwyer is 33.2 mm in length and 4.9 and 4.8 mm in width and thickness.

With the parallel evolution of red stone with red glass forms, numerous researchers have commented on the grinding of glass bead surfaces to remove colours (usually white, blue, or blue and white) and expose a solid red surface similar to red stone (Kenyon 1982:226–227; Kenyon 1984:11; Kenyon and Kenyon 1983:62, 69; Fitzgerald 1990:128; Garrad 2014:350; Lennox and Fitzgerald 1990:436), while some have further argued that this glass bead grinding was done to imitate red stone beads (Boyle 1904b:13, 25, 468; Lennox and Fitzgerald 1990:436). If this was the objective, it provides an interesting perspective concerning the Indigenous relative valuation of Indigenous versus European products.

Conclusions

A 15%+ presence of red glass beads of tubular form has been identified as a definitive identification criterion for site occupations dating to the 1640s (Kenyon and Kenyon 1983:68). This appears to apply to the poorly historically documented Neutral sites of the period and has been shown to be the case with contemporary Seneca sites, despite the historically documented Dutch source of their beads (Kenyon 1969:38). A previously observed minor difference in red tubular bead diameters between Ontario and New York State assemblages (Kenyon and Kenyon 1983:64) has been confirmed by our statistically evaluated metric studies, which substantiate claims concerning the Dutch origin of some red tubes on 1640s Ontario Iroquoian sites (Garrad 2014:349). A complicating factor in the use of glass bead types to date occupations is that the large, red tubes are particularly visible on ploughed field surfaces and in quarter-inch mesh screens, unlike the earlier, Period 2 glass bead assemblages (Glencross et al. 2021:168–170). Consequently, they are rapidly removed from the archaeological record in heavily collected regions such as the former mid-seventeenth-century territory of the Neutral nation. Intense late-nineteenth- and early twentieth-century looting of cemeteries associated with Neutral village occupations has also biased the glass bead type percentages from these sites, as we have demonstrated that many of the diagnostic red glass tubes were deposited in mortuary features.

Acknowledgements. This article is dedicated to the memory of Ian Kenyon, a brilliant Ontario archaeologist who left us far too soon. The authors wish to express their appreciation for the technical support provided during recent research at the Rochester Museum and Science Center by George and Kathleen Hamell, Elizabeth Pietrzykowski, and Kathryn Murano. Documentation concerning Neutral archaeological sites was provided by Scott Martin of Sustainable Archaeology, McMaster, and Robert von Bitter of the Ontario Ministry of Tourism, Culture and Sport. David Harris assisted in consolidating Annual Archaeological Reports of Ontario references to the history and artifact recoveries of the Walker and Sealey sites. The observations and comments of the manuscript reviewers were valuable, as always, in improving the clarity of the article, particularly those of Alicia Hawkins. Last, but certainly not least, we wish to thank Andrew Stewart, who has generously provided excellent map images for countless reports and papers over the years and who kindly and patiently produced Figure 1 for our article.

Note. The authors sought and received permission to document the artifacts published in this article, via Lonny Bomberry, Director, Lands & Resources of the Six Nations of the Grand River Elected Council (letter dated March 3, 2022). The editors additionally sought guidance from the OAS Reconciliation, Restitution, and Reclamation Committee. The OAS is continuously working with descendant Indigenous communities and individuals to learn which items (particularly sacred items) are appropriate to discuss and publish in Ontario Archaeology. We welcome feedback on those ideas.

References Cited

Birch, Jennifer, Sturt W. Manning, Samantha Sanft, and Megan A. Conger
2021 Refined Radiocarbon Chronologies for Northern Iroquoian Site Sequences: Implications for Coalescence, Conflict, and the Reception of European Goods. *American Antiquity* 86(1):61–89.

Bonham, John C.
1978 Copies of two books containing catalogues and field notes. On file at Sustainable Archaeology, McMaster University, Hamilton.

Boyle, David
1888 Archaeological Report. In *Annual Report of the Canadian Institute, Session 1886–87: Being Part of Appendix to the Report of the Minister of Education, Ontario, 1887,* pp. 9–17. Warwick & Sons, Toronto.
1904a A Burial Place in Onondaga Township. In *Annual Archaeological Report 1903. Being Part of Appendix to the Report of the Minister of Education Ontario*, pp. 92–95. Toronto.
1904b Accessions to the Museum. In *Annual Archaeological Report 1903. Being Part of Appendix to the Report of the Minister of Education Ontario*, pp. 13–16. Toronto.
1906 Additions to the Museum. In *Annual Archaeological Report 1905. Being Part of Appendix to the Report of the Minister of Education Ontario*, p. 7. Toronto.
1911 Queenston Heights. In *Annual Archaeological Report 1911 Including 1908–9–10. Being Part of Appendix to the Report of the Minister of Education, Ontario*, pp. 9–11. Toronto.

Bradley, James W.
1987 *Evolution of the Onondaga Iroquois Accommodating Change, 1500–1655*. Syracuse University Press, Syracuse, New York.

Fitzgerald, William R.
1982 A Refinement of Historic Neutral Chronologies: Evidence from Shaver Hill, Christianson and Dwyer. *Ontario Archaeology* 38:31–46.
1983 Further Comments on the Neutral Glass Bead Sequence. *Arch Notes* [newsletter of the Ontario Archaeological Society] 83(1):17–25.

1990 Chronology to Culture Process: Lower Great Lakes Archaeology, 1500–1650 A.D. PhD dissertation, Department of Anthropology, McGill University, Montréal.

2001 Contact, Neutral Iroquoian Transformation, and the Little Ice Age. In *Societies in Eclipse: Archaeology of the Eastern Woodlands Indians, A.D. 1400–1700*, edited by David S. Brose, C. Wesley Cowan, and Robert C. Mainfort Jr., pp. 37–47. Smithsonian Institution Press, Washington, DC.

Fox, William A.

1972 Neutral Lithics. Paper presented at the 5th Annual Meeting of the Canadian Archaeological Association, St. John's, Newfoundland. On file at Sustainable Archaeology, McMaster University, Hamilton.

1980 Miskwo Sinnee Munnidominug. *Archaeology of Eastern North America* 8:88–98.

1985 The Freelton/Misner Site Looting and Prosecution. *KEWA* [newsletter of the London Chapter, Ontario Archaeological Society] 85(5):4–13. (Re-published in *Arch Notes* 85(4):31–39.)

1992 Odawa Lithic Procurement and Exchange: A History Carved in Stone. *Archéologiques* 6:52–58.

2005 Beaucoup de Rassades Rouges (or an Ode to Ian). *KEWA* 5(1 & 2):17–20.

2013 The "Old Sites" Project. *Arch Notes* 18(3):7–10.

2021 The Reminiscences of George Allison (1841–1926). *KEWA* 21(1–4):2–9.

Garrad, Charles

2014 *Petun to Wyandot: The Ontario Petun from the Sixteenth Century*. Mercury Series Paper No. 174. Canadian Museum of History and University of Ottawa Press, Ottawa.

Glencross, Bonnie, Gary Warrick, and Beatrice Fletcher

2021 In Search of Carhagouha: The Archaeological Identification of Two Early Seventeenth-Century Huron-Wendat Villages. *Canadian Journal of Archaeology* 45:158–180.

Hamell, George R.

1983 Trading in Metaphors: The Magic of Beads. Another Perspective upon Indian-European Contact in Northeastern North America. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes III, pp. 5–28. Research Records No. 16. Rochester Museum and Science Center, Rochester, New York.

Hancock, Ronald G. V., Anne Chafe, and Ian Kenyon

1994 Neutron Activation Analysis of Sixteenth- and Seventeenth-Century European Blue Glass Trade Beads from the Eastern Great Lakes Area of North America. *Archaeometry* 36(2):253–266.

Hancock, Ronald G. V., Jason McKechnie, Susan Aufreiter, Karlis Karklins, Mima Kapches, Martha Sempowski, Jean-François Moreau, and Ian Kenyon

2000 Non-Destructive Analysis of European Cobalt Blue Glass Trade Beads. *Journal of Radioanalytical and Nuclear Chemistry* 244:567–573.

Karklins, Karlis

1974 Seventeenth Century Dutch Beads. *Historical Archaeology* 8(1):64–82.

Karklins, Karlis, and Adelphine Bonneau

2019 Evidence of Early 17th-Century Glass Beadmaking in and around Rouen, France. *BEADS: Journal of the Society of Bead Researchers* 31:3–8.

Kenyon, Ian T.

1969 Glass Beads: A Technique for Dating Historic Neutral Sites. On file at Sustainable Archaeology, McMaster University, Hamilton.

1972 The Neutral Sequence in the Hamilton Area. On file at Sustainable Archaeology, McMaster University, Hamilton.

1984 Sagard's "Rassade Rouge" of 1624. *KEWA* 84(4):2–14.
1985 A Preliminary Report on the Misner Cemetery Glass Beads. *KEWA* 85(5):14–20.

Kenyon, Ian T., and William Fox
1982 The Grimsby Cemetery: A Second Look. *KEWA* 82(9):3–16.

Kenyon, Ian T., and Thomas Kenyon
1983 Comments on Seventeenth Century Glass Trade Beads from Ontario. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes III, pp. 59–74. Research Records No. 16. Rochester Museum and Science Center, Rochester, New York.

Kenyon, Walter A.
1982 *The Grimsby Site: A Historic Neutral Cemetery*. Royal Ontario Museum, Toronto.

Kidd, Kenneth E.
1949 *The Excavation of Ste. Marie I*. University of Toronto Press, Toronto.
1953 The Excavation and Historical Identification of a Huron Ossuary. *American Antiquity* 18(4):359–379.

Kidd, Kenneth E., and Martha A. Kidd
1970 A Classification System for Glass Beads for the Use of Field Archaeologists. Canadian Historic Sites: Occasional Papers in Archaeology and History No.1, pp. 45–89. Ottawa.

Lennox, Paul A.
1984 *The Hood Site: A Historic Neutral Town of 1640 A.D.* Mercury Series Paper No. 121. Archaeological Survey of Canada, National Museum of Man, Ottawa.

Lennox, Paul A., and William R. Fitzgerald
1990 The Culture, History and Archaeology of the Neutral Iroquoians. In *The Archaeology of Southern Ontario to A.D. 1650*, edited by Christopher J. Ellis and Neal Ferris, pp. 405–456. Occasional Publication No. 5, London Chapter, Ontario Archaeological Society, London.

MacDonald, Robert I.
1986 The Coleman Site (AiHd-7): A Late Prehistoric Iroquoian Village in the Waterloo Region. Master's thesis, Department of Anthropology, Trent University, Peterborough.

Mannen, Douglas A.
1983 Description of European Trade Goods Found on Four Proto-historic Neutral Sites. *Arch Notes* 74(1):5–6.

Noble, William C.
1972 The Cleveland Neutral Village (AhHb-7): A Preliminary Statement. On file at the Department of Anthropology, McMaster University, Hamilton.

Ridley, Frank
1961 *Archaeology of the Neutral Indians*. Etobicoke Historical Society, Islington, Ontario.

Schoolcraft, Henry R.
1851 *The American Indians, Their History, Conditions and Prospects, from Original Notes and Manuscripts: Together with an Appendix, Containing Thrilling Narratives, Daring Exploits, etc. etc*. George H. Derby, Buffalo, New York.

Sempowski, Martha L., and Lorraine P. Saunders
2001 *Dutch Hollow and Factory Hollow: The Advent of Dutch Trade among the Seneca.* Charles F. Wray Series in Seneca Archaeology No. 3, Research Records No. 24. Rochester Museum and Science Center, Rochester, New York.

Smith, Harlan I.
c. 1923 The Archaeology of Wentworth County, Ontario. Manuscript on file in the Wintemberg fonds, Canadian Museum of History Archives, Gatineau.

Smith, Rutherford, and Robert Murphy
1939 *A Report of the Excavations of the Dwyer Ossuary by Rutherford Smith and Robert Murphy 1938–1939. Drawings by Ethel L. Smith.* On file at Sustainable Archaeology, McMaster University, Hamilton.

Steele, John
1944 Report on: "Excavations from May to October, 1944 'Walker Site' Brant County, Ont. Township of Onondaga, Con. III, Lot 10." On file at Sustainable Archaeology, McMaster University, Hamilton.

Walder, Heather
2013 Stylistic and Chemical Investigation of Turquoise-Blue Glass Artifacts from the Contact Era of Wisconsin. *Mid-continental Journal of Archaeology* 38(1):119–142.
2018 Small Beads, Big Picture: Assessing Chronology, Exchange, and Population Movement through Compositional Analyses of Blue Glass Beads from the Upper Great Lakes. *Historical Archaeology* 52(2):301–331.

Warrick, Gary A.
1979 *1978 Archaeological Investigation of the Fonger Protohistoric Neutral Village Site (AhHb-8): Preliminary Results*. On file at the Ontario Heritage Foundation, Toronto.
1983 *A Report on the Archaeology of the Cooper sites (AgHb-18 and AgHb-19)*. On file at the Ontario Heritage Foundation, Toronto.

Waugh, Frederick W.
1903 Attiwandaron or Neutral Village-Sites in Brant County. *Annual Archaeological Report 1902. Being Part of Appendix to the Report of the Minister of Education Ontario*: 70–79. L. K. Cameron, Toronto.

Wray, Charles F.
1983 Seneca Glass Trade Beads c. A.D. 1550–1820. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes III, pp. 41–49. Research Records No. 16. Rochester Museum and Science Center, Rochester, New York.

Wray, Charles F., and Harry L. Schoff
1953 A Preliminary Report on the Seneca Sequence in Western New York, 1550–1687. *Pennsylvania Archaeologist* 23(2):53–63.

Wray, Charles F., Martha L. Sempowski, Lorraine P. Saunders, and Gian C. Cervone
1987 *The Adams and Culbertson Sites*. Charles F. Wray Series in Seneca Archaeology No. 1. Research Records No. 19. Rochester Museum and Science Center, Rochester, New York.

Wright, Gordon K.
1963 *The Neutral Indians: A Source Book*. Occasional Paper No. 4. New York State Archaeological Association, Rochester, New York.

Wright, Milton J.
1981 *The Walker Site*. Mercury Series Paper No. 103. Archaeological Survey of Canada, National Museum of Man, Ottawa.

Les chronologies des sites iroquoiens post-contact de l'Ontario ont été établies à l'origine à partir de la présence ou de l'absence de biens européens spécifiques, en particulier de types de perles de verre. Nous examinons ici les tendances stylistiques des perles de verre du milieu du XVIIe siècle des villages Sealey et Walker en nous basant sur définies pour la séquence bien établie des sites Seneca dans l'État de New York. Ces deux sites représentent la dernière occupation ontarienne d'une population qui s'est déplacée vers le sud-est dans la région de Brantford sur une période de deux siècles. De plus, les collections détenues jadis au XIXe siècle par l'ancien Musée provincial (Ontario) sont utilisées pour modifier les fréquences des perles tubulaires en verre rouge qui ont été calculées précédemment sur la base des collections du XXe siècle. Nous réaffirmons la valeur des marchandises commerciales européennes comme source d'informations chronologiques fiables pour le début du XVIIe siècle.

Date submitted: August 5, 2022. Date accepted: December 20, 2022.

William Fox
Department of Anthropology, Trent University
1600 West Bank Drive
Peterborough, Ontario K9L 0G2
Canada
williamfox@trentu.ca

James Conolly
Department of Anthropology, Trent University
1600 West Bank Drive
Peterborough, Ontario K9L 0G2
Canada
jamesconolly@trentu.ca

April Hawkins
Department of Archaeology of the Americas, Royal Ontario Museum
100 Queen's Park
Toronto, Ontario M5S 2C6
Canada
aprilh@rom.on.ca

From Grey to Print

Archaeological Investigations of the Lightfoot Site (AjGw-5): An Early Iroquoian Village on the Credit River[1]

Dana R. Poulton

The Lightfoot site was subject to test and salvage excavations in 1988–1989 as part of a subdivision assessment in Mississauga, Ontario. While several components at the site were detected, the main one was an unpalisaded Early Iroquoian village (c. 1150–1250 CE) consisting of five houses and associated refuse deposits. Four of the houses were clustered in a core area which also contained a substantial midden deposit; a fifth house and a small associated midden lay 60 m to the east. The relationship between the two occupation areas is unknown.

Introduction

This paper presents a summary of the results of the investigations of the Lightfoot site carried out during the 1987 to 1989 program of archaeological survey and mitigative excavations within the eastern portion of the Meadow Ridge East Subdivision, City of Mississauga, Regional Municipality of Peel (D. R. Poulton & Associates 1996).

The site was located on tableland overlooking a major bend in the Credit River Valley (Figure 1). It was centred on a very slight knoll neatly bounded by the 180 m topographic contour line.

This tableland may have been ploughed for as much as a century or more, possibly extending as far back as the 1830s, when the nearby Wilson homestead was first established. The soils are Fox sandy loam, and given their light nature, it may be assumed that the mechanical disturbance associated with ploughing was accompanied by some amount of deflation caused by wind erosion from the nineteenth century onward. During the 1960s and 1970s, agricultural land use gave way to commercial operations and the land containing the site formed part of a sod farm. The annual harvest would have entailed the removal of some portion of the topsoil as well as the removal of artifacts adhering to the root mass. In the latter part of the 1970s, a tree nursery operation was established on the property and the area was subjected to new and different impacts for a period of a decade or more. The semi-annual planting and harvesting of trees and shrubs entailed excavations at intervals along rows transecting the fields, creating subsurface pits that impacted cultural remains; localized landscaping by bulldozer

[1] The intent of the From Grey to Print section of *Ontario Archaeology* is to publish significant studies/papers that, for whatever reason, were not previously published. They are being presented here largely in their original form, without peer review. They have, however, been edited to conform to the journal's house style. This contribution comprises extensive excerpts from the consulting firm's license report, as well as most of the figures and tables.

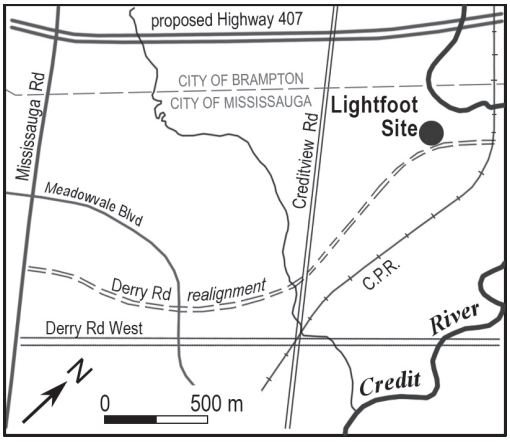


Figure 1. *Location of the Lightfoot site.*

and the installation of drainage tiles entailed some further disturbance.

The northern limit of the site was defined by a steep break-in-slope which dropped 10 to 12 m to the valley floor. The headwaters of a relic stream course were situated approximately 100 m to the south of the site; it flowed southward and formed a tributary of Levi Creek, itself a tributary of the Credit River. A permanent spring is located just below the top of bank approximately 150 m northwest of the site, and another spring issued from the base of the slope below the site.

Lightfoot was a multicomponent archaeological site, the principal component of which was an Early Ontario Iroquoian village, c. 1150–1250 CE. This component was represented by five house structures and associated midden deposits. The structures were designated Houses 1–5, and the middens were designated Middens A–C (Figure 2). Other, earlier occupations of the site were represented by less substantial chipped lithic traces; as described below, these were all contained within the Late Woodland occupation.

Previous Archaeological Investigations

The Lightfoot site was registered under that name by Victor Konrad, during his 1971–1973 archaeological survey and inventory of the Metropolitan Toronto Planning Area (Konrad 1973). He defined it as a 1.2 to 2.5 ha precontact Iroquoian habitation or village site.

In 1984–1985, the author made an unsuccessful attempt to locate the site again during an archaeological assessment of the 50 m width of the preferred alignment of the proposed Village of Meadowvale–Derry Road Bypass. The available locational data on file at the Ministry of Culture placed the village somewhere in the general vicinity of the proposed bypass, but the data were inconsistent and insufficient to pinpoint its location, and the survey found no evidence of the village. The salvage excavations later revealed that at its closest point to the village, the proposed bypass was 20 m south of the residential structure that was designated House 1 (Figure 2).

Useful data on the location of the Lightfoot site subsequently proved to be contained in the project archive from the 1971–1973 Metro study. In 1985 and 1986, the author was conducting background research components for archaeological master plans of the towns of Markham and Vaughan. He contacted Victor Konrad, who by then was teaching at the University of Maine at Orono, Maine, and Dr. Konrad kindly transferred to him the project archive to assist him in his research. In the spring of 1986, an examination of the Metro study archive succeeded in pinpointing the location of the Lightfoot site.

The Metro study archive included the 1972 fieldnote book of Richard Hazzard, one of Konrad's surveyors, and it provided details on the site. Hazzard's fieldnote entry for August 17, 1972, reveals that the existence of the site came to light during an interview with the landowner, Tom Lightfoot, who operated a sod farm on the property. Mr. Lightfoot reported that he had found arrowheads and pottery along the slope when the sod was lifted. A field check of the location noted by Hazzard revealed a small midden on the northern slope of the Credit River Valley. A sketch map in the notebook indicates that the tableland containing the site was in "lawn" at the time of the investigations; it depicts the midden, on the slope, and a lone conifer in the field to the west of the site. A sample of artifacts was collected on that occasion.

During the interview, Lightfoot informed Hazzard that Ilsa Kraemer had been collecting from the site since 1970, a fact Kraemer

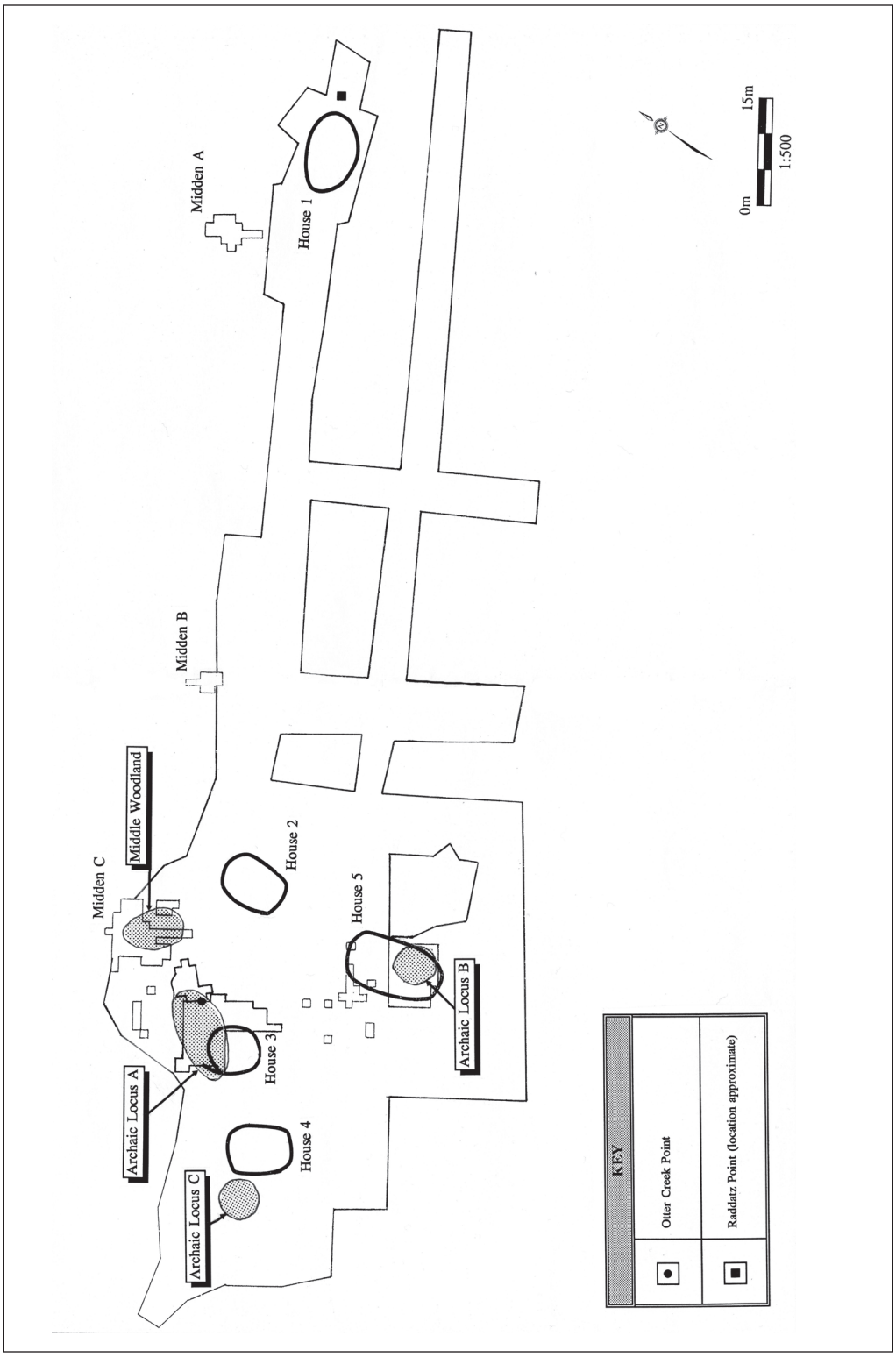


Figure 2. *Lightfoot site plan.*

confirmed when she was contacted by Konrad's survey personnel.[2]

Additional background information on amateur excavations at the site came to light during the 1985–1986 archaeological investigations of a proposed natural gas pipeline: the Parkway Belt West Pipeline. That assessment was directed on behalf of Consumers Gas by the author. It involved a survey of the proposed easement, followed by mitigative excavations. The main focus of that assessment was the excavations of two pre-contact Huron-Wendat villages discovered by the survey: the Pengilley site (AjGw-66), located on the tableland on the western edge of the valley, and the River site (AjGw-68), located within the valley, on the east side of the Credit River. Both sites were situated less than half a kilometre north of Lightfoot (AjGw-5) (Mayer, Pihl, Poulton and Associates Incorporated [MPP] 1985, 1986a, 1986b; Mayer, Poulton and Associates Incorporated [MPA] 1991). The 1986 Parkway Belt investigations immediately followed the receipt and review of Konrad's Metro study archive and afforded an opportunity to carry out more in-depth research on the complicated history of past archaeological investigations in this area.

Interviews with local residents conducted in the context of the Parkway Belt project incidentally established that three other individuals had carried out amateur excavations on the Lightfoot site. These included James Wilson and a Mr. Falconer (both deceased), as well as a teacher in Cooksville, Rollo MacDonald. All were amateur artifact collectors. The information supplied by the informants suggested that the focus of all these excavations was a midden which the locals considered the richest location for Indigenous artifacts in the area.

The discovery of Richard Hazzard's 1972 map of the Lightfoot site was followed in the spring of 1986 by a field check of the area in question by the author. A cursory examination confirmed the presence of a light scatter of artifacts on the surface of the field northeast of the pine tree depicted on Hazzard's map. These consisted of several pieces of chert debitage and fire-cracked rock (FCR) scattered over the northern part of the field adjacent to the Credit River Valley. No collection was made at that time. As modest as the finds were, they did serve to confirm the location of the Lightfoot site.

In summary, the various archaeological investigations described above have established the locations of two Iroquoian village sites on the western edge of the Credit River Valley, in Concession 3W of the northern part of Toronto Township. One of them was the Lightfoot site, an Early Iroquoian village located at the bend in the valley within the northwest quadrant of Lot 12. The other was the Pengilley site, a Late Iroquoian village situated 375 m to the north, in the southwest quadrant of Lot 13.

Both sites may correlate with two sites originally recorded in a 1967 survey of the area by Peter Ramsden, then a graduate student at the University of Toronto. No report on the 1967 survey was available, but Victor Konrad, who consulted Ramsden for information, registered several sites which had been documented by him, including two Iroquoian villages on the western edge of the Credit River Valley. These were registered in 1972 as the G&K Wilson site (AjGw-2) and the Davidson site (AjGw-4). According to the site record form compiled by Konrad, Ramsden's G&K Wilson site represented an Early Iroquoian village situated in the southwest quadrant of Lot 13, the same quadrant known to contain the Late Iroquoian Pengilley site. Similarly, the site record form compiled by Konrad indicates that Ramsden's Davidson site represented a Late Iroquoian village situated in the northwest quadrant of Lot 13, north of the Late Iroquoian Pengilley site.

The questions in the foregoing discussion of past archaeological investigations in this area reflect the fact that site locational data in the

[2] In 2021 the family of the late Ilsa Kraemer bequeathed her artifact collection and related records to the Museum of Ontario Archaeology in London. Kraemer had designated Lightfoot as Site 42 on her copy of the 1964 1:50,000-scale topographic map of Brampton (30M/12E). Her collection from the site numbers only nine specimens.

reports and site record forms of the 1960s and 1970s were often incomplete and lacking in detail; also, they were sometimes incorrect in certain respects. In the present case, Lots 12 and 13 of Concession 3W were subjected to systematic and extensive archaeological survey during the Parkway Belt West project and the assessment of the Markborough lands, and the confirmed Iroquoian village sites are Lightfoot, Pengilley, and River, all three of which were known to local collectors. In consideration of this fact, the evidence suggests that the Early Iroquoian G&K Wilson site equates with the Lightfoot site, and that the Late Iroquoian Davidson site equates with the Pengilley site.

1987–1989 Archaeological Investigations

Stage 3 Assessment

The Lightfoot site became an immediate concern for a more detailed archaeological assessment in 1987, when the firm of which the author was a principal was contracted by Markborough Properties Inc. to conduct an archaeological assessment of several contiguous proposed developments. They spanned the lands from Mississauga Road east to the Canadian Pacific Railway and the Credit River Valley and from Highway 401 north to the Parkway Belt West Pipeline; the latter abuts the easement of Highway 407, which was constructed in 1995. The Lightfoot site was located in the 314 ha parcel of the easternmost of these proposed developments (Figure 1) (D. R. Poulton & Associates 1996).

A five-metre interval pedestrian survey of part of the site was conducted in 1987, and detailed Stage 3 investigations followed in the spring of 1988. The latter included controlled surface collections of the arable portions of the site at an interval of 1 m and systematic shovel test pitting of non-arable areas at the intervals described below. Surface artifact locations and positive test pits were recorded by transit, stadia rod, and tape, and all excavated soils were screened through 6 mm mesh.

For the purposes of the investigations, the site was divided into four survey units defined by land use. One area (Area 11), which encompassed the western extremity of the site, consisted of a large field that was planted in rows of young trees during the period of the investigations (it is what was examined in 1987). The site extended no more than 35 to 40 m into this area, but it contained all of House 4 and part of House 3 (Figure 2).

The second survey unit consisted of a rectangular-shaped grassy strip that was not actively worked by the nursery operation. It covered an area measuring 35 to 40 m east to west by about 100 m north to south. A single large pine tree stood near the eastern edge of this unit. The pine tree corresponded to the "conifer" drawn on the sketch map made by Hazzard in his fieldnote book from Konrad's survey; his sketch map indicated the site as lying to the east of that tree. As the excavation evolved, this grassy area proved to contain all of House 5, half of House 2, and part of House 3 (Figure 2).

A third unit (Area 12) was immediately east of the grassy area; it consisted of a large field used for nursery purposes. The nursery personnel reported they had bulldozed the soils in this area to form low, 24 foot [7.3 m]-wide terraces for the nursery operation, and subsequent archaeological salvage excavations revealed that it had also been disturbed by tiling. This area of the site was planted in nursery trees at the time of the initial Stage 3 investigations but was not planted during the period of the subsequent Stage 4 mitigative excavations. A light surface scatter of artifacts covered the better part of this field, extending approximately 160 m eastward from the edge of the grassy area. The only structure in this field was House 1 (Figure 2).

The fourth survey unit consisted of the uncultivated northern fringe of the tableland and the cultural deposits on the upper slope of the adjacent Credit River Valley. The slope was steep and covered in a mature deciduous forest with little undergrowth. The break-in-slope was paralleled by a laneway which extended east–west across the northern edge of the site; it separated the adjacent fields from the wooded fringe of the valley edge. The upper slope contained one relatively undisturbed hillside refuse deposit; it was designated Midden A and is the midden that is depicted on

Richard Hazzard's sketch map of the site. The level, uncultivated fringe of tableland adjacent to the valley contained two other deposits. One was a modest, undisturbed concentration of chipped lithics, designated Midden B. The other was an artifact-rich refuse deposit, designated Midden C; it had been subjected to extensive looting in the past (Figure 2).

Artifacts were observed to extend into the field designated Area 12 at least as far as 100 m south of its northern wooded edge. Nine pieces were recovered, comprising a biface, two scrapers, two utilized flakes, and four pieces of chipping detritus.

Area 12 was cultivated and was surface examined on a two-metre interval one day, then again, the next day after a night of heavy rain. Although conditions for surface observation were good, the initial efforts produced far fewer finds than expected, and the site was then re-examined intensely on hands and knees. In all, 62 artifact stations were recorded, encompassing an area nearly 160 m east to west by 110 m north to south. Distinct but rather diffuse concentrations were seen in two places along the northern margin of the field. The first concentration was located approximately 75 m east of the western edge of the field. It measured 20 m east to west by 30 m north to south and comprised 18 individual artifact stations. Subsequent investigations showed that this second diffuse artifact concentration was centred just west and southwest of House 1, and south of Midden A.

The second diffuse surface scatter was in the northwest corner of the field. It was situated roughly 10 m east of the western edge of the field and comprised 19 individual artifact stations within a maximum area measuring approximately 20 m east to west by 30 m north to south. In all, 65 artifacts were recovered, including 1 fragmentary rim sherd, 3 fragmentary sherds, 2 projectile points, 5 bifaces, 2 scrapers, 8 utilized flakes, 1 core, 33 pieces of chipping detritus, 4 faunal remains, and 6 pieces of FCR.

The wooded area along the break-in-slope immediately north of the field, where Hazzard's map indicated that the hillside midden was located, was also examined. Test pits were excavated at five- and two-and-a-half-metre intervals along the top of the bank and the upper slopes of the Credit River Valley along the north margin of Area 12. These efforts were supplemented by a surface examination of the exposed ground surface. The slope throughout this area generally had little or no ground cover and was relatively steep, with an angle of 30 to 45 degrees. A total of 38 test pits were excavated, of which 8 produced artifacts. Depths were 10 to 20 cm. The richest test pit was expanded to a one-metre square.

The investigations on the upper slope yielded 388 artifacts, including 5 from the surface, 51 from the positive shovel test pits, and 332 from the expanded test pit. The collection comprised 5 rim sherds, 14 fragmentary rim sherds, 5 neck-shoulder sherds, 24 body sherds, 331 fragmentary sherds, 3 sherds from juvenile vessels, 1 scraper, 3 pieces of chipping detritus, and 2 faunal remains. While this work confirmed the location of the midden mapped by Konrad's survey, it was evident that this midden was not likely the artifact-rich deposit that had been mined by looters in the area.

Another small cluster of positive units was found along the top of the bank located to the west of Midden A. This was represented by a surface find and three consecutive test pits in a line spaced at two-and-a-half-metre intervals, all of which yielded chipped lithic artifacts. This deposit was designated Midden B. It was located on the edge of the slope beside the second, or western, artifact concentration recorded by the surface examination of the adjacent Area 12.

The Stage 3 investigations of the site resumed in the fall of 1988 with the detailed assessment of areas extending westward from the previously examined lands. The grassy strip to the west of Area 12 was test pitted at five-metre intervals and northward to the edge of the break-in-slope. A total of 23 positive test pits, yielding 74 artifacts, were identified as a result.

Thirteen of the positive test pits clustered together in a 100 m^2 area immediately north of the lane, which was heavily overgrown with weeds and wild grape vines. This group of test pits yielded 57 artifacts, including 1 rim sherd, 2 neck-shoulder

sherds, 9 body sherds (1 decorated), 33 fragmentary sherds, 1 sherd from a juvenile vessel, 1 lump of fired clay, 6 pieces of chipping detritus, 2 faunal remains, and 2 pieces of charcoal. This area was designated Midden C. Subsequent excavations of this deposit revealed evidence of looting, confirming that it is the midden that had been the focus of past excavations by artifact collectors.

The remaining 10 positive test pits encountered in the assessment of the grassy area clustered in a 15 m by 15 m area, 20 m south of Midden C. These test pits produced 17 artifacts, including 1 fragmentary sherd, 1 utilized flake, 8 pieces of chipping detritus, 6 faunal remains, and 1 piece of charcoal. While this area was not interpreted as a midden, it was thought to represent either a house floor or an activity area external to a house. Subsequent investigations demonstrated that these remains were associated with House 5, although only two of the positive test pits were located within the structure; 7 of the 9 test pits which proved to be located within House 5 were sterile.

In summary, significant archaeological remains were confined to two discrete areas within the northwestern portion of the surface scatter. These two areas included all the houses and associated midden deposits and, collectively, were considered as the Lightfoot site proper. Both areas were adjacent to the northern edge of the Credit River Valley.

The first of the two areas was designated as Lightfoot East. It contained House 1, together with an associated hillside midden (Midden A) (Figure 2). In addition, a diffuse concentration of artifacts was situated adjacent to the structure. House 1 was situated 120 m west of the bend in the edge of the Credit River Valley. Based on measurements by planimeter, this eastern area covered a total surface area of approximately 0.086 ha (0.21 acres), including a five-metre buffer around the house.

The second area of the site was designated Lightfoot West. It was situated 40 m to the west and comprised the core of the village. It contained four of the five houses, Houses 2–5, together with two designated midden deposits (Middens B and C) (Figure 2). A somewhat diffuse surface concentration associated with Midden B was also noted. As measured by planimeter, this western cluster covered a total surface area of approximately 0.279 ha (0.69 acres), including a five-metre buffer around the houses. House 1 and the nearest structure in the western cluster, House 2, were separated by 95 m.

The land between the eastern and western clusters of the site included a slight rise in elevation to the east, but there was no marked physiographic break that would explain the separation between the two areas. This intervening area covered a surface area of approximately 0.019 ha. With this area included, the combined size of the site was 0.383 ha. Only three artifacts were found on the surface between the two areas. Moreover, it was later determined that no subsurface remains were present within this area, which, with the virtual absence of surface remains, precluded any firm link between the occupations of the two areas.

Stage 4 Excavations

The Stage 4 mitigative excavations of the site were conducted in the fall of 1988 and spring of 1989. The initial tasks were to investigate the northern portions of Area 12, where artifact concentrations had been observed, and to investigate Middens A and B. Excavations were also initiated with the use of a Gradall to clear the disturbed overburden from four test trenches. Each trench was approximately 5 m wide north to south and 40 m long east to west. Two trenches were placed in Area 12 south of Midden B. These trenches were parallel, spaced approximately 10 m apart, with their western ends adjacent to the grassy strip at the western end of Area 12. The other test trenches were placed in Area 12 south of Midden A. These trenches were spaced approximately 10 m apart and their west ends were located 20 to 25 m east of the east ends of the trenches south of Midden B.

The overburden consisted of a light grey-brown sandy soil 25 to 30 cm deep from surface to subsoil. A great deal of subsoil was observed mixed into the topsoil, demonstrating extensive disturbance of the site due to agricultural and nursery activities. The subsoil was very sandy and light-yellow brown. There were many deep and well-defined plough scars.

These trenches were shovel shined and examined for subsurface remains. A small pit feature was observed in the west end of the northwest trench, in the area adjacent to Midden B. However, the main find was a house structure observed in the east end of the northeastern test trench. This was designated House 1. To better define these subsurface remains, both eastern test trenches were extended eastward by 15 m. In addition, the northeastern trench was expanded in width north to south to expose all of the house structure (Figure 2).

Middens A and B were excavated in one-metre square units removed by shovel and trowel, with all fills passed through 6 mm mesh. Twenty units were excavated in Midden A and 10 in Midden B. Midden A produced a variety of artifacts, but Midden B produced only limited quantities of chipped lithics.

The investigations of the lands west of Area 12 were carried out using a combination of techniques. Manual excavations of one-metre square units were used to test and salvage the two areas where positive test pits had been encountered. The balance of the area was examined using a Gradall to remove the plough zone. As the excavations progressed, mechanical topsoil stripping was eventually expanded outward until the limit of the site had been confirmed.

The initial test trench in this area was oriented east–west and followed the lane. It was excavated immediately south of Midden C. This trench revealed most of a second house structure, designated House 2. The trench across this structure was then expanded north and south to expose the entire house. Ten metres to the west of this house, topsoil stripping also revealed an artifact-rich basal deposit. This deposit was associated with Midden C, which lies just 3 m to the northeast.

Manual excavations of Midden C followed. The excavations of one-metre square units rapidly confirmed that this deposit was the largest and most productive midden on the site. Eventually, a total of 72 complete and 9 partial units were excavated, the majority in the originally defined area of the midden and the balance in the spatially discrete basal deposit revealed by the test trench 3 m to the southwest.

The initial test trench, which revealed House 2, was eventually expanded to the west and southwest. In the process, two other house structures were identified. One of the new structures was designated House 3. It was situated 5 m southwest of Midden C. As illustrated in Figure 3, topsoil stripping in and around House 3 revealed basal deposits beneath the plough zone encompassing an area of approximately 75 m^2. They overlapped the northern end of the house and extended beyond to the north and east for 5 m. These basal deposits were reserved for manual excavation, although artifact counts proved to be relatively modest, with most units producing less than half a dozen artifacts. To the northeast, these deposits merge with the basal midden deposit associated with Midden C. Whether they pertain to exterior house activities or represent peripheral midden deposits could not be determined.

The other structure identified by topsoil stripping west of Midden C was House 4 (Figure 4). It was situated 8 m west of House 3 and represented the westernmost structure identified on the site.

Manual excavations were also used to examine the 10 m by 15 m area of possible living floor deposits in the grassy area some 20 m to the south of Midden C. This area was subjected to more detailed testing involving the excavation of one-metre square excavation units at three-metre intervals throughout the area where two-and-a-half-metre interval test pitting had identified nine positive pits. A cluster of more productive units was then expanded into a small block excavation covering a total surface area of 10 m^2. Altogether, 17 units were excavated within this part of the grassy area, of which 15 together yielded 86 artifacts. Given the limited returns, the balance of the site was investigated through topsoil removal, resulting in the exposure of the north half of House 5; the south half was reserved for later manual excavations, in order that a sample from the interior of the house could be maximized.

Eventually, a site area was exposed of 70 m east to west and 60 m north to south. Altogether, the 1988–1989 investigations entailed the manual excavation of 277 individual one-metre square units from middens (111), house exterior areas (90), and house interiors (76). A total of 39

Figure 3. *House 3, view northeast.*

Figure 4. *House 4, view northwest.*

individual flotation samples, with a combined volume of 730 L, were taken from middens and subsurface features.

No evidence of human remains was encountered during the excavations or as a result of subsequent systematic probing of the site area.

Palaeo and Early Archaic Components

The earliest components of the site were represented by two isolated finds from the surface of the site probably representing stray losses during hunting. These include a Hi-Lo projectile point (Figure 5a; Table 1) and a Nettling point (Figure 5i; Table 1). They attest to the presence in the Credit River Valley of peoples during the Late Palaeo (c. 8300–7900 BCE) and Early Archaic (c. 7700–6900 BCE) periods.

The Hi-Lo point is of Onondaga chert. It has convex blade edges and a concave basal margin. The entire margin of the haft element is ground. The blade has been extensively reworked, with the result that the overall dimensions of the specimen have been reduced.

The Nettling point is corner notched and has suffered damage to the haft element and is missing the base. It has convex blade edges and well-developed shoulders with prominent barbs. One blade margin has unifacial collateral flaking, which has created a slightly serrated edge.

Middle Archaic Component

The first evidence of an actual occupation of the site dates to the succeeding Middle Archaic period (c. 3500–3000 BCE). Three Otter Creek and two Raddatz Side Notched projectile points were recovered (Figure 5d–f, b–c; Table 1).

That the Otter Creek points are made of Haldimand chert and that no Iroquoian lithic tools were manufactured from this material suggest that most or all the Haldimand chert recovered from the site may pertain to this occupation. Except for the projectile points, the incidence of Haldimand chert at the site was limited to chipping detritus, most of which was recovered in proximity to two of the three Otter Creek points and a few other discrete areas or loci (Figure 2).

The first of these (Locus A) overlaps the north end of House 3 and extends to the northeast (Figure 2). It has a maximum dimension of 12 m east to west by 5 m north to south. One of the Otter Creek projectile points (Figure 5f) and one of the Raddatz Side Notched projectile points made of Onondaga chert (Figure 5b) were recovered from this locus. The excavations in and around House 3 also yielded 7 pieces of Haldimand chert debitage, all found within 3 m of one another. These 7 pieces consist of 2 secondary flakes and 5 flake fragments.

The second Middle Archaic occupation area (Locus B), encompassing an area of approximately 25 m^2, overlaps the southeast corner of House 5, 25 m to the southeast of Locus A. One of the Otter Creek points (Figure 5e) and 4 pieces of Haldimand chert debitage were found within this locus.

A third Middle Archaic activity area (Locus C) was situated 5 m west of House 4, and 20 m west of Locus A and consisted of a pit (a so-called "ghost feature") defined by the presence of undiagnostic chipped lithics within apparently clean subsoil. This feature had a length, width, and depth of 228 cm, 71 cm, and 40 cm, respectively. Hand-trowelling and flotation of 39 L of pit fill produced a total of 392 artifacts, including 385 pieces of chert debitage, 1 biface, 1 scraper, 3 utilized flakes, 1 core, and 1 piece of carbonized plant remains. It is a measure of the quantitative richness of this feature that it produced 30% of all the chipping detritus recovered from the site. While most of the material is of Onondaga chert (97.7%), 9 pieces of Haldimand chert debitage (2.3%) were also recovered.

The other Middle Archaic diagnostics recovered from the site were far removed from any associated material. The Otter Creek projectile point was found on the southern fringe of the site, 80 m southeast of Locus B (Figure 5d), while the Raddatz Side Notched point was found near the eastern end of House 1, 120 m to the east of Locus A (Figure 5c). These isolated finds may well relate to one or more of the defined loci but do not appear to represent discrete occupation or activity areas.

All three of the Otter Creek points feature shallow side notches, squared tangs, and a straight to convex base and have continuous grinding of the margins of the haft element. Two of them

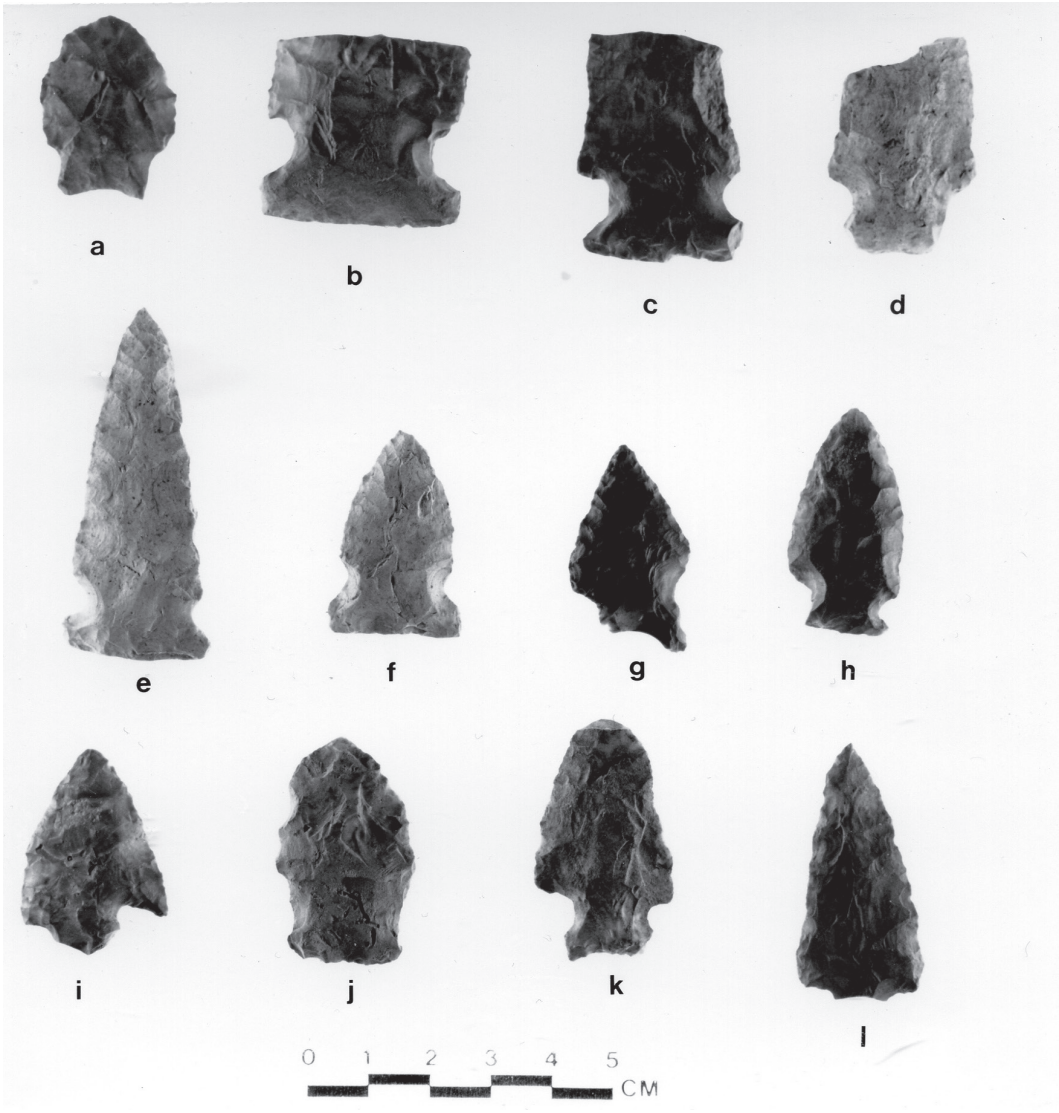


Figure 5. *Lightfoot site projectile points: (a) Hi-Lo type (cat. 97); (b) Raddatz Side Notched type (cat. 1271); (c) Raddatz Side Notched type (cat. 433); (d) Otter Creek type (cat. 33); (e) Otter Creek type (cat. 1320); (f) Otter Creek type (cat. 462); (g) untyped side notched (cat. 1205); (h) untyped side notched (cat. 312); (i) Nettling type (cat. 1265);(j) untyped stemmed (cat. 14); (k) untyped side notched (cat. 1191); (l) untyped side notched (cat. 1314).*

are complete, although one of these appears to have been heavily reworked and is relatively short (Figure 5f). It has convex blade edges and a straight basal margin. This specimen was recovered from excavation of topsoil within the northern part of House 3 within the Middle Archaic Locus A. The second complete Otter Creek point has a trianguloid blade with straight lateral margins and a convex basal margin (Figure 5e). It was recovered while trowelling the subsoil within House 5, in Middle Archaic Locus B. The third Otter Creek point is missing the distal half of the blade and has suffered damage to one of the tangs (Figure 5d). It appears to have had a lanceolate

Table 1. *Lightfoot site projectile points.*

				Dimensions			
Cat. No.	**Type**	**Description**	**Chert Type**	**L**	**W**	**T**	**Figure 5**
1320	Otter Creek	side notched	Haldimand	56	25	8	e
462	Otter Creek	side notched	Haldimand	33	22	7	f
433	Raddatz	side-notched base	Onondaga	36+	29+	6	c
97	Hi-Lo	corner removed	Onondaga	30	22	6	a
312		side-notched point	Onondaga	36	19	6	h
1205		side notched	Onondaga	34	20	6	g
14		stemmed	Onondaga	37	23	6	j
1191		side notched	unidentified	40	23	5	k
1265	Nettling	corner-notched blade	Onondaga	33+	24	6	i
1242		blade fragment	Onondaga	24+	21	6	
1314		blade fragment	Onondaga	42	21	5	l
33	Otter Creek	side-notched base	Haldimand	35+	25	7	d
1271	Raddatz	side-notched base	Onondaga	30+	33	9	b
1129		base fragment	Onondaga				
972		tang fragment	Onondaga				

Note: L = length; W = width; T = thickness
Dimensions are in mm.

blade with recurvate blade margins and a slightly convex basal margin.

Two fragmentary side-notched points are tentatively assigned to the Raddatz Side Notched type (Figure 5b and c). Both are of Onondaga chert, and both are represented by proximal fragments of medium- to large-sized points. The notches are heavily ground on each specimen, with continuous grinding along the margin of the haft element. The larger of the two specimens (Figure 5b) terminates distally in a hinge fracture. It features finely serrated blade edges, with 5–6 teeth per cm. This specimen has squared tangs, with a slightly convex basal margin. The other Raddatz point also terminates distally in a hinge fracture (Figure 5c). It appears to have had a lanceolate blade. One tang is slightly damaged; the other is pointed in form. This specimen was burnt.

Otter Creek points are diagnostic of the Vergennes phase of the Laurentian Tradition, radiocarbon dated to between 3500 and 3000 BCE, although this point type does have analogs in other contemporary cultural manifestations elsewhere in the Lower Great Lakes region and the Midwest. As defined by William Ritchie (1969:79–83), the Laurentian Archaic was characterized by a constellation of traits which included broad-bladed, side-notched projectile points in association with ground and polished stone tools, among them slate points, bayonets, semi-lunar knives, plummets, and gouges.

Raddatz points are one of several point types which fall into the Large Side Notched cluster, a group which includes points of the Big Sandy, Graham Cave Side Notched, and Kessel Side Notched types (Justice 1987:60–70). Characteristic traits of the Raddatz Side Notched type include prominent U-shaped notches with square tangs; fine edge serration occurs in low frequencies (Justice 1987:67–68). This point type was named for the Raddatz Rock Shelter in Wisconsin. There is some morphological overlap between points of the Raddatz type and the Otter Creek type, and it has been noted that Raddatz points are probably contemporary with the Laurentian Archaic in southern Ontario (Ellis et al. 1990:85).

Wright (1962) long ago noted that the distribution of select ground stone traits tended to be a distinguishing characteristic of Archaic peoples in southern Ontario and that the distributions indicated a broad cultural distinction between sites located east of the Nottawasaga River and

the Niagara Escarpment and those to the west. Ellis and colleagues (1990:85) have noted that the key Laurentian ground stone traits are absent from Middle Archaic sites in the southwestern part of the province and have argued that the term Laurentian Archaic should be reserved for sites in southeastern Ontario that contain the full suite of traits.

The evidence from the site tends to suggest affiliations with populations to the west rather than the east. This was apparent in the fact that the raw material used in the manufacture of the Otter Creek points is Haldimand chert, which derives from the Hagersville area west of the Grand River. The western orientation of the material culture also tends to be supported by the presence of Raddatz Side Notched type projectile points and the absence of classic Laurentian ground stone tools.

Middle Woodland Component

Definitive evidence for the Middle Woodland occupation of the site is limited to fragments of two ceramic vessels from the main, or northern, portion of Midden C (Figure 2). These vessels were recovered from the excavation of five separate one-metre square units covering a maximum area measuring 8 m north to south by 4 m east to west. While some rodent and looting-related disturbance was present, the recovery of this material in situ at the topsoil–subsoil interface suggests that the Middle Woodland component was stratigraphically sealed by the Early Iroquoian midden.

One of the two vessels has pseudo-scalloped shell obliques and most closely resembles pottery of the Point Peninsula complex of upper New York State, Quebec, and southeastern Ontario (300 BCE–500 CE) (Figure 6c). The other vessel was manufactured by coil technique and has linear stamped obliques over push-pull horizontals (Figure 6a and b). It has greater affinities with vessels of the contemporaneous Saugeen complex of southwestern Ontario. These are Vessels 37 and 38, respectively. Both are collarless, and both are from Midden C.

The settlement patterns and artifact analyses of the main, Early Iroquoian component of the site are described in the balance of the paper.

Early Iroquoian Component

Settlement Patterns

The five house structures were small, averaging just under 10 m in length and just over 7 m in width. All but House 5 had internal hearth and pit features. In addition, there were seven subsurface features and four postmoulds exterior but adjacent to the houses in the western grouping. All the Lightfoot site houses pertain to the Early Iroquoian village component of the site.

House 1. This house was in the eastern portion of the site, approximately 10 m southeast of Midden A (Figures 2 and 7). It was 11 m long and 7.5 m wide and had an internal area of 66.5 m^2. No exterior features or postmoulds were found in association with this structure.

House 1 had 75 wall posts spaced on average at 2.4 posts per metre. There were several small gaps in the outer wall. One, located at the west end of the structure, was just over 1 m wide and was almost certainly an entrance. It was well situated along the central axis of the house and was of a reasonable size with well-defined wall sections on either side. Another gap, located centrally in the north side wall was 2 m wide and may also have been an entrance. It would have provided easy access to Midden A. The walls on either side of this gap were also well defined, but a problem with preservation cannot be ruled out. The northeast end of the house had a three-metre section along which only one postmould was observed. Given that the internal layout of the house was symmetrical, it may be logical to assume there had been one door in each end of the house, suggesting that some portion of the northeast end of the house was lost due to poor soil conditions but that a door had been present.

Four features and five postmoulds were located within the interior of the house; except for two postmoulds, these were aligned along its long axis. Two of the features were hearths, and the other two were small refuse pits. The two pit features were symmetrically located, each about 1 m from a house end. The long axis of each of the pit features was aligned perpendicular to the long axis of the house. The hearths were also symmetrically located, each about 4 m from a house

Figure 6. *Lightfoot site Middle Woodland vessels: (a) Vessel 37, lower rim and body segment (cat. 733, 852–854); (b) Vessel 37, linear stamped and push-pull rim sherd (cat. 844–845, 848); (c) Vessel 38, pseudo-scallop shell rim sherd, untyped (cat. 187, 975).*

end; they were spaced 2.75 m apart from centre to centre. Their long axes were aligned along the length of the house. The interior posts were in the west half of the house.

Feature 1, the eastern pit, was 40 cm long, 20 cm wide, and 15 cm deep. It had an elliptical plan and a basin profile. Its fill consisted of light sandy topsoil with subsoil mottles and flecks of charcoal. No artifacts were recovered from the feature. Feature 2, the eastern hearth, was 100 cm long, 65 cm wide, and 7 cm deep. It was elliptical in plan shape, and it had a somewhat irregular

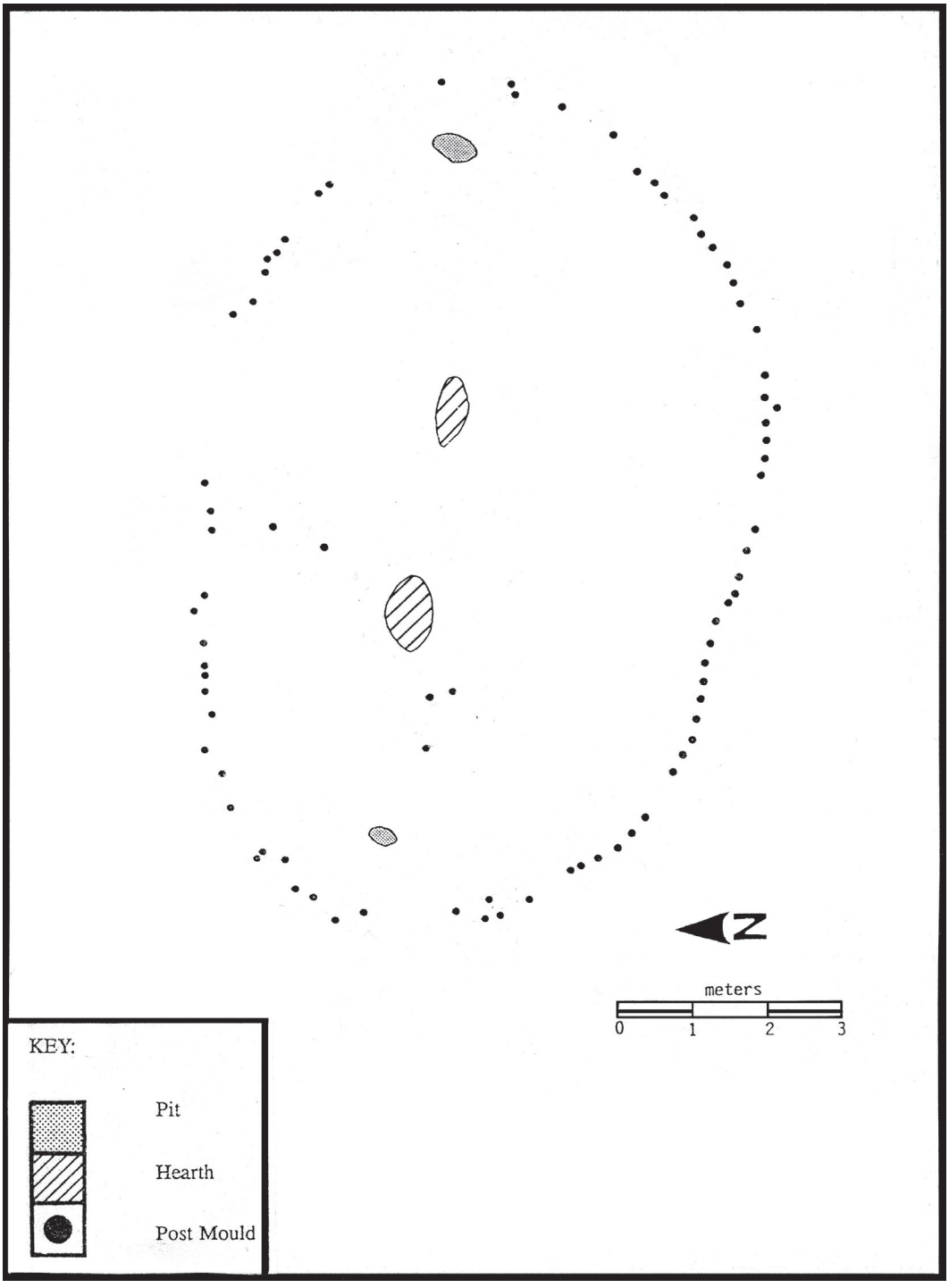


Figure 7. *House 1 plan.*

basin profile. Its fill consisted of plough-disturbed fire-reddened soil. No artifacts were recovered from the hearth.

Feature 3, the western hearth, was not as well preserved as the eastern hearth. It was 100 cm long, 45 cm wide, and 10 cm deep. In all other respects, it was identical to the eastern hearth. Feature 4 was 60 cm long, 35 cm wide, and 15 cm deep. It was identical to the western pit in all other respects, although it produced a total of 18 artifacts. These comprised 12 fragmentary sherds, 3 pieces of chipping detritus, 2 faunal remains, and 1 piece of charcoal.

With respect to refuse disposal patterns, Midden A was situated 10 m northwest of House 1. Based on proximity, it was assumed that this midden represents the principal refuse deposit used by the residents of the house.

As stated earlier, the intensive surface examination of the field identified a diffuse artifact cluster associated with House 1. None of the artifacts recovered from this cluster were situated over the house, but 9 of the specimens were located within 10 m of the western end of the structure. Whether this deposit pertains to exterior house refuse disposal or other activities is unknown, although it may be noted that the doorway in the west wall of the structure would have provided direct access to that area.

Several factors suggest that the occupants of House 1 kept the interior of the structure relatively clean. These include the relative distribution of artifacts on the surface of the field, notably the lack of material overlying the structure, the lack of basal living floor deposits, and the presence of nearby Midden A. However, it must also be acknowledged that the low frequency of artifacts may be a factor of the degree of disturbance to this area—from ploughing and sod farming and from the bulldozing, planting, and harvesting associated with the operation of the nursery.

House 2. This house was in the northeast corner of the western cluster of houses (Figures 2 and 8). It was located just 7 m southeast of Midden C. The house was 9.2 m long and 7.3 m wide, with an internal area of 56.7 m².

There were 93 wall posts spaced on average at 3.4 posts per metre. Gaps a little over 1 m wide appear in both house end walls. Except for the southeast corner of the house, the postmoulds were very regularly and evenly spaced. As there was no obvious disturbance, these two gaps were interpreted as representing entranceways.

House 2 contained 2 interior features and 12 interior postmoulds. The features were both hearths aligned along the long axis of the house. The two hearths were symmetrically located, each 3 m from a house end and spaced approximately 1.85 m apart from centre point to centre point. The northern hearth was stratigraphically superimposed on one of the interior posts.

Two exterior features were associated with House 2. One was a small pit with a cylindrical profile. This pit, designated Exterior Feature 16, was located less than 1 m outside the southwest wall of the house. The second feature was a small, refuse-filled depression located about 2.5 m to the southwest of the house. It was designated Exterior Feature 17.

With respect to refuse disposal patterns, the proximity of Midden C to the northwest indicates that it functioned as the principal refuse deposit for the occupants of House 2. Access to Midden C would have been provided by the entrance in the north wall of House 2. Concurrently, the southern entrance to the house would have provided access to the secondary refuse disposal area, represented by the small, refuse-filled depression designated Exterior Feature 17.

With respect to the interior of House 2, no artifacts were observed on the surface of the lane that transected the structure, nor did any of the test pits in this area yield any cultural material. These results may suggest that the interior of House 2 was kept relatively clean.

Feature 1, the northern hearth, was 83 cm long, 70 cm wide, and 7 cm deep. It had an ovate plan and a basin profile. A 23 cm round pocket in the centre was almost pure fire-reddened soil with some charcoal flecks, while the surrounding area of the feature was a mixture of subsoil and fire-reddened soil. Three pieces of chipping detritus were recovered from this feature.

Feature 2, the southern hearth, was 130 cm long, 54 cm wide, and 8 cm deep. In plan it was elliptical and in profile it was basin shaped. Fill

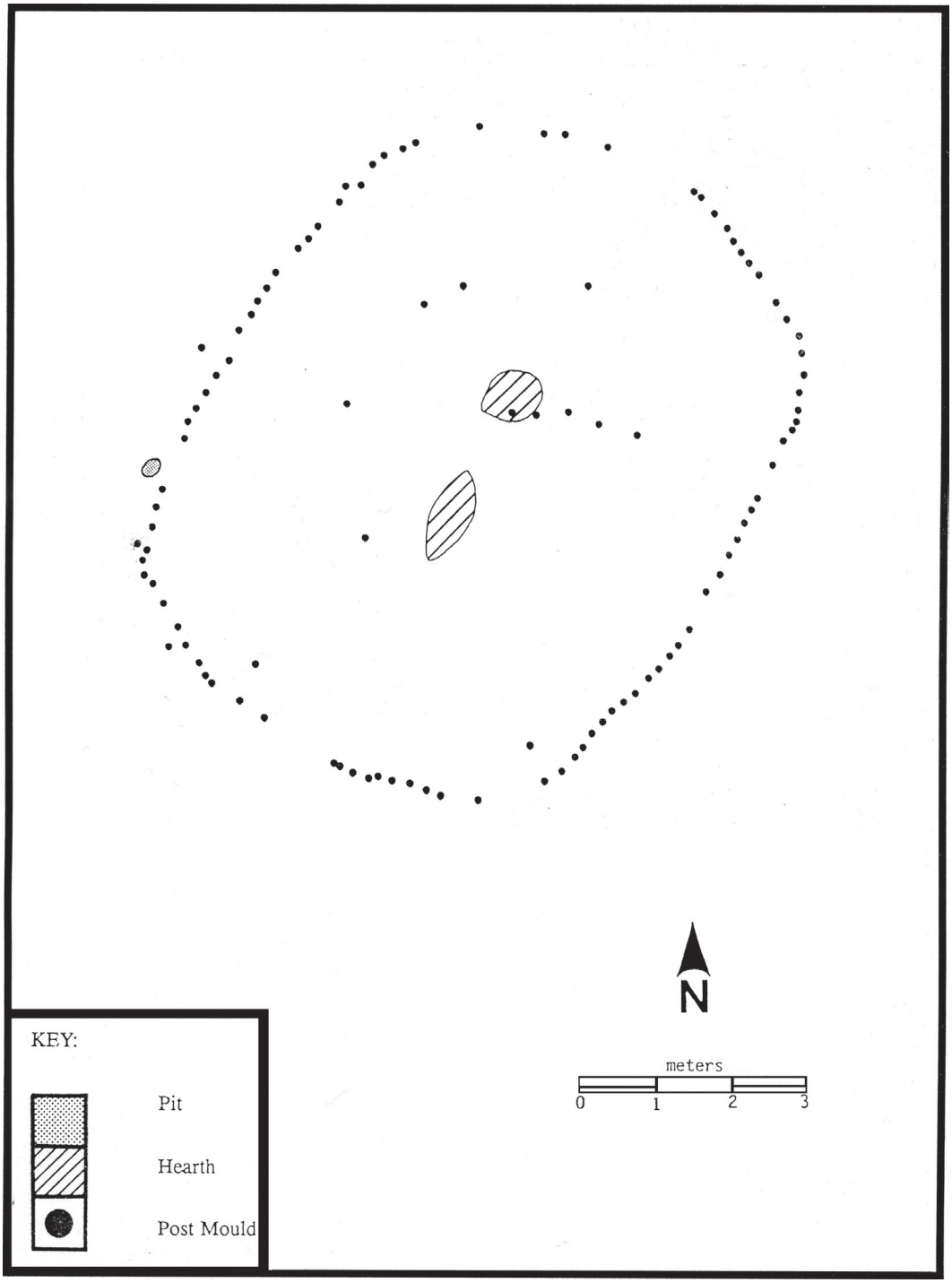


Figure 8. *House 2 plan.*

consisted of fire-reddened soil with a few pieces of charcoal. Four pieces of chipping detritus were recovered from the hearth.

House 3. This house was in the north-central portion of the western portion of the site (Figures 2, 3, and 9). It was located 12 m southwest of the main, or northern, part of Midden C and only 4 m southwest of the peripheral artifact concentration which forms the southern portion of Midden C. The house was 7.2 m long and 6.2 m wide, an internal area of 38.6 m².

House 3 was outlined by 88 posts with an average spacing of 4.1 posts per metre. A gap approximately 1 m wide appears in the northeast corner of the house. As the postmould pattern was quite regular and well preserved, this gap was interpreted as an entrance. A 2 m long section of the northwest end wall was represented by only five postmoulds. If any one of these was non-contemporaneous, a gap suitable for an entrance could be inferred.

There were 13 postmoulds exterior to the house. Three of these were scattered just outside the northeast entryway, one was isolated 1.5 m northwest of the northwest end of the house, while the remaining nine form a line attached to the northwest corner of the house. This line of faint posts curves slightly around to the north. It may represent some sort of windbreak or other ancillary feature. It is also possible that this line once curved around connecting the other exterior postmoulds, forming an extension to the house. The postmoulds in this line were faint, and there may have been a problem with preservation. If the exterior postmoulds relate to a hypothetical arc representing a house extension, House 3 would have had a maximum estimated length of 8.5 m and been comparable in length with Houses 1, 2, and 4.

Seven subsurface features were recorded within House 3. They were aligned approximately along the long axis of the house.

Two of the interior features were support posts. One was in the northwest quarter of the house, 2 m in from the west wall and 1.5 m south of the north wall. The other was in the southeast quarter of the house, 2.2 m in from the east wall and 2.4 m north of the south wall. In both cases the upper portions of these postmoulds appeared disturbed.

Three features with fire-reddened soil were interpreted as hearths. Two of them were in the north half of the house, and one was in the south half. The southern hearth was centrally located, with its centre point 2.5 m from the southeast end of the house. The two northern hearth features were only 15 cm apart. The southernmost of this pair of features is symmetrical, with the southern hearth being centrally located and its centre point 2.5 m from the northwest end of the house. The other northern hearth was similar in plan and profile but was smaller and not as well defined. Its centre point was somewhat east of the central axis of the house, 2 m from the northwest end. It seems unlikely that two contemporaneous hearths would be located so close together, and these two features may be a single hearth which has been plough disturbed. Alternatively, it may be a slight relocation within the house, perhaps related to the possible extension of the northwest house end.

The two remaining interior features were pits. One was in the north half of the house, and one was in the south half. In both cases, the pits were centrally located north of a hearth feature.

One exterior feature was associated with House 3. It consists of an irregular feature located about 5 m to the northeast. It was interpreted as representing the basal portion of a small midden deposit. It was directly opposite the gap that was presumed to represent an entrance to House 3.

Although initial test pitting in the immediate area of House 3 did not recover any cultural remains, subsequent stripping of the plough zone revealed a relatively extensive deposit, which did contain varying quantities of material. The mitigation of this basal deposit entailed the excavation of nine one-metre square units within House 3, excluding the possible northern extension. One of these units produced 77 pieces. Artifact counts for the remaining eight units had a range and mean of 3–14 and 6.8, respectively. The fact that basal deposits were preserved below the plough zone would tend to rule out any significant level of disturbance by the agricultural and commercial operation in the immediate vicinity of House 3.

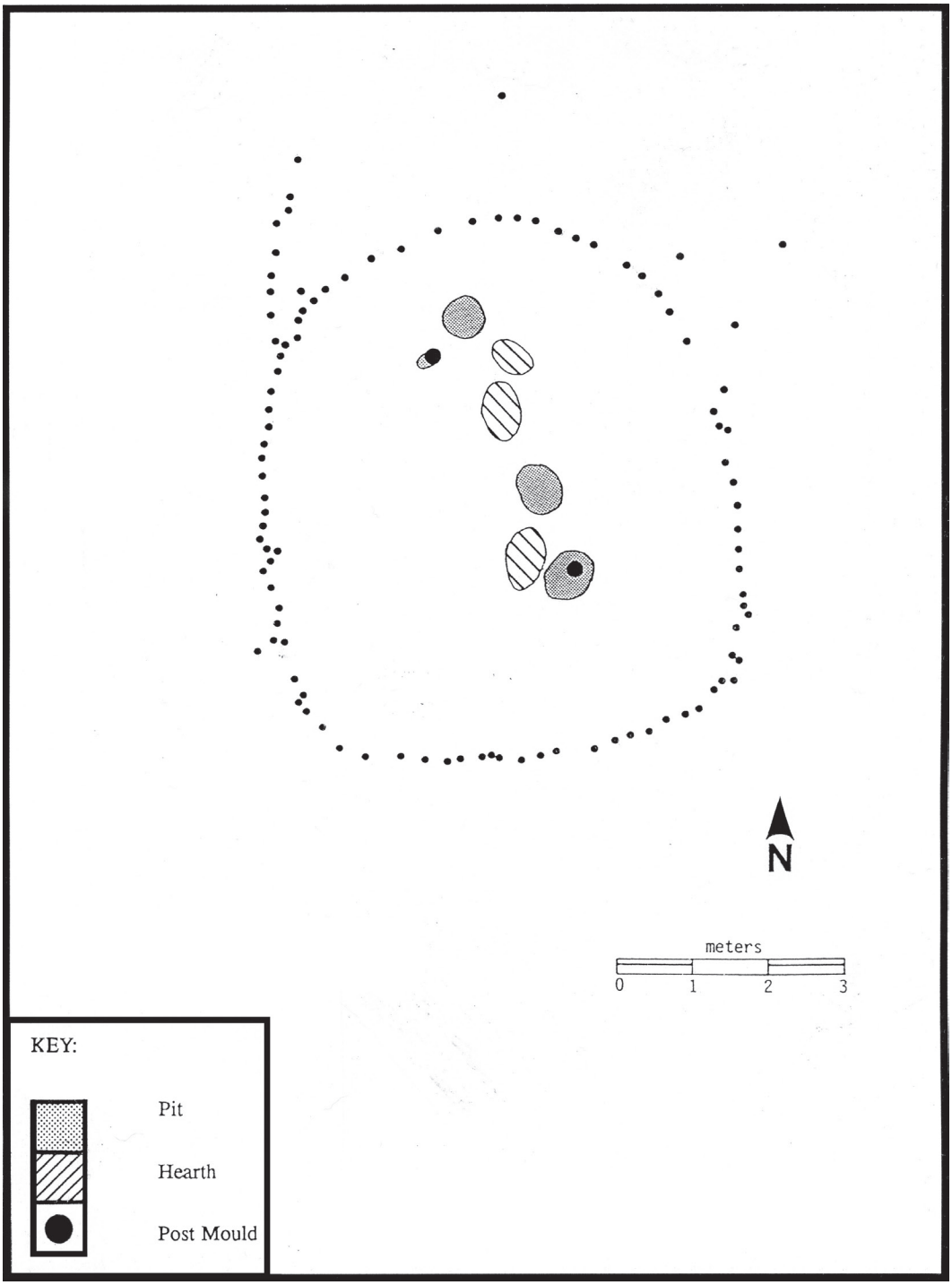


Figure 9. *House 3 plan.*

Therefore, the relative paucity of cultural remains recovered from the excavation of basal deposits within the structure, combined with the negative results of the original test pitting, suggest that the interior of House 3 was maintained relatively clean.

As noted above, the two contiguous deposits subsumed by Midden C were situated near House 3. Given the proximity of these deposits to the house and the quantity of refuse they contained, it was assumed that both served as refuse disposal areas for the occupants of House 3.

Feature 1 was the northernmost pit feature and had an ovate plan, 58 cm long north to south, and 48 cm wide east to west. In profile, it was basin shaped and had a maximum depth of 28 cm. The pit fill consisted of a uniformly mottled mix of subsoil and topsoil with flecks of charcoal.

Including material from flotation, this pit yielded 307 artifacts, including 6 rim sherds, 7 fragmentary rim sherds, 10 neck-shoulder sherds, 35 body sherds, 198 fragmentary sherds, 1 sherd from a juvenile vessel, 1 scraper, 2 utilized flakes, 46 pieces of chipping detritus, and 1 ground stone artifact.

Feature 2, the northwestern support post feature, had an ovate plan 36 cm long by 20 cm wide. In profile, it revealed an upper and a lower portion. The upper portion was a shallow, basin-shaped layer of very light brown topsoil with subsoil mottles. The fill in the lower portion was a darker brown topsoil. It had a round-bottomed, cylindrical profile, which was not as long as the upper portion. It extended to a depth of 33 cm below the excavated surface. Including material from flotation, this support post yielded 19 artifacts, including 8 body sherds, 9 fragmentary sherds, 1 biface, and 1 piece of chipping detritus.

Feature 3 was the northernmost of the northern pair of hearth features and measured 55 cm long, 40 cm wide, and only 6 cm deep. It had an ovate plan and an irregularly shaped profile. The edges of this feature were not well defined. Fill consisted of fire-reddened soil. The feature contained one neck-shoulder sherd and two body sherds.

The southernmost of the northern pair of hearth features, Feature 4, was elliptical in plan and basin shaped in profile. It was 81 cm long, 58 cm wide, and 9 cm deep. It was a well-defined feature containing fire-reddened soil but no artifacts.

Feature 5, the southern pit feature, had an ovate plan 70 cm long and 56 cm wide. It had a basin-shaped profile with a maximum depth of 24 cm. The pit fill was very ashy, with topsoil mottles and charcoal flecks. Including material from flotation, this pit yielded 465 artifacts. These included 2 fragmentary rim sherds, 8 body sherds, 65 fragmentary sherds, 19 sherds from juvenile vessels, 13 lumps of clay, 1 pipe fragment, 55 pieces of chipping detritus, 2 abraders, and 79 faunal remains.

The southern hearth, Feature 6, was elliptical in plan with a basin-shaped profile. It measured 83 cm long, 56 cm wide, and 4 cm deep. Fill was fire-reddened soil. Four pieces of chipping detritus and five faunal remains were recovered.

The southeastern support post, Feature 7, was located within an area of white sand, which appeared to be a disturbance of some sort. The surface of this area of sand was ovate, measuring 70 cm long and 60 cm wide. The support post was in the north end of this area but was difficult to discern on the surface. In profile, the post was cylindrical with a rounded bottom. Its maximum depth below the excavated surface was 47 cm. Fill in the postmould was dark brown topsoil with some subsoil mottles and flecks of charcoal. Three pieces of chipping detritus were recovered from the postmould.

House 4. This house was in the northwest corner of the western area of the site (Figures 2, 4, and 10). It was situated 8 m west of House 3 and roughly 20 m southwest of Midden C. The house was 9.4 m long and 7.3 m wide, with an internal area of 60.3 m².

House 4 had 124 wall posts, with an average spacing of 4.5 posts per metre. There were no gaps in the house outline large enough to suggest an entrance. The inference is that one or more entrances were present, but that over time they changed and were enclosed by new wall segments. That may explain why the post density of

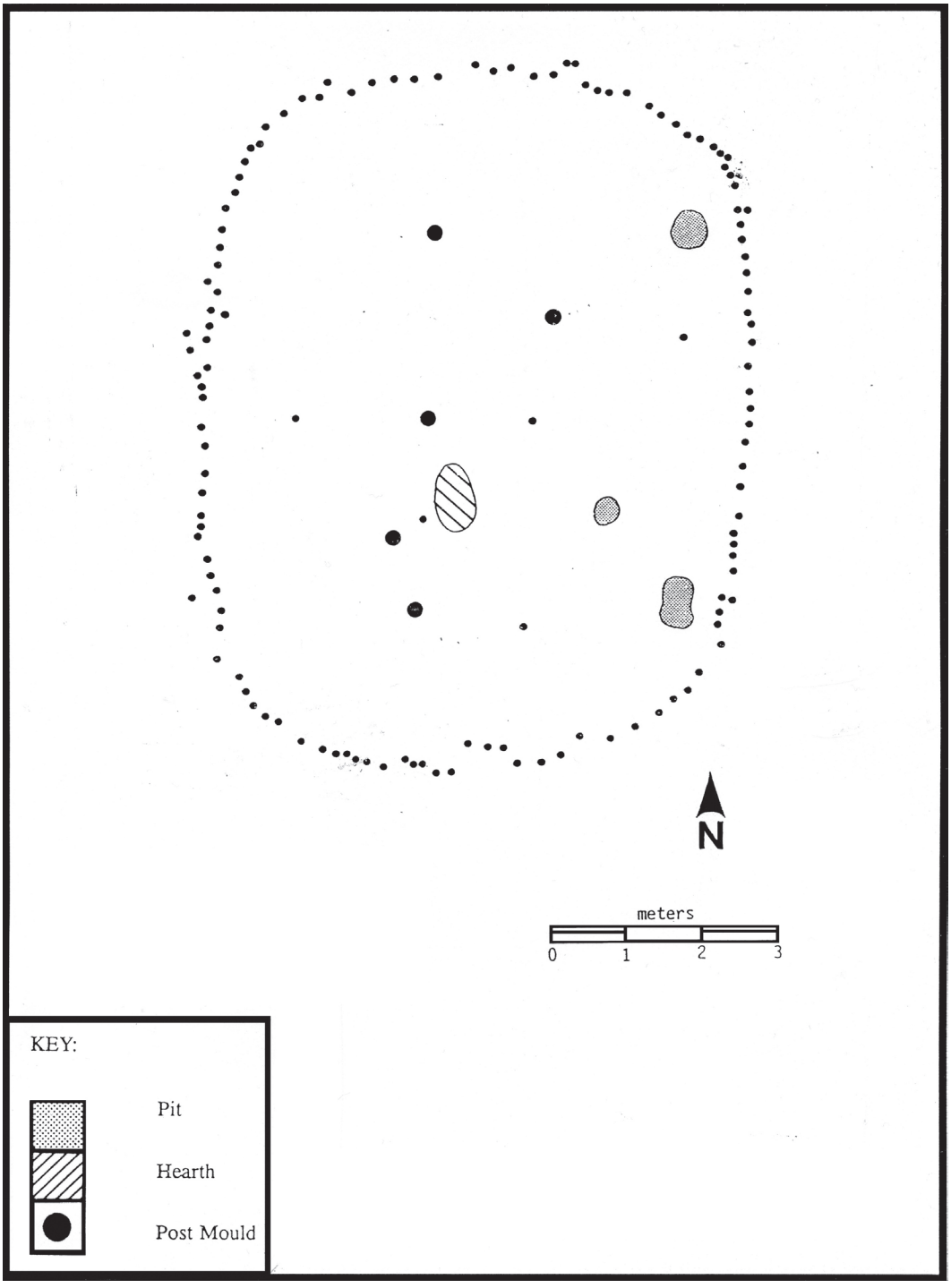


Figure 10. *House 4 plan.*

this house was the highest on the site. It has 1.9 times as many posts per metre of house wall as House 1, the least dense house.

There was a misalignment of the postmoulds of the southeast end of the house. Three of the postmoulds were as much as 40 cm north of their expected positions. This may indicate that there once was an entranceway in this location or that it was screened.

The House 4 interior contained four subsurface features and 10 postmoulds. Five of the postmoulds were small and were scattered through the southern two thirds of the house. The remaining five postmoulds were larger and were interpreted as support posts. These were arranged symmetrically along the long axis of the house. They occupy the central 5 m of house length and were never more than 1 m from the house centre line. Four were west of the centre line and one was east. One of the four features was a hearth. It was in the southern half of the house, with its centre point approximately 3.5 m from the end wall. Houses 1, 2, and 3 all had two symmetrically placed hearths. Arguing by analogy to the pattern in these other houses, it may be that another hearth existed in the northern part of this house at approximately the same distance from the northwest end wall. There was no obvious evidence of disturbance in the house; however, given the shallowness and faintness of other hearth features on the site, it may be that there was a second hearth in House 4, which did not survive. The other three features contained within the house were refuse pits located in the northeast and southeast quarters of the house.

There were three exterior features located within 5 m of House 4. The first of these, designated Exterior Feature 1, consisted of a medium-sized pit located 4 m west of the structure. It has tentatively been ascribed to the Middle Archaic occupation of the site. The second feature, designated Exterior Feature 2, was located 3 m northwest of House 4 and consisted of a refuse-filled depression. The remaining feature, designated Exterior Feature 3, was located less than 1 m outside the east wall of the structure and consisted of a small pit.

House 4 was situated within the eastern part of the field designated Area 11, a fact that should have facilitated the identification of any associated midden deposits. Despite this, there was no identifiable refuse deposit associated with the structure. Midden C, the closest midden, was situated a minimum of 20 m to the northeast. Also, no artifact concentrations were observed during the surface examination of the area, and no basal midden deposits were identified during the removal of the plough zone. The reason for the absence of significant quantities of cultural remains, especially for a house that appears to have been occupied for some length of time, is unknown.

Feature 1 was in the northeast corner of the house, unlike most features that are situated along central house corridors. The pit had a circular plan 43 cm in diameter. In profile, it had straight sides leading down to a basin-shaped bottom 60 cm deep. Pit fill was a very light brown sandy soil with mottles of black topsoil and flecks of charcoal. Including flotation, this pit contained only 15 pieces of chipping detritus. The feature had been disturbed by tree nursery activity, likely a tree excavation, as it consisted of a modern pit intrusion with distinctively sharp edges and full of dark black topsoil.

Feature 2, the sole hearth, was in the south half of the house on the midline. It was ovate in plan, 97 cm long by 56 cm wide. Its long axis was oriented along the length of the house. It had a basin-shaped profile 10 cm deep at maximum. Fill was fire-reddened soil. Including flotation, the hearth yielded 6 pieces of chipping detritus.

Feature 3 was located 2 m east of the centre point of the hearth. It was circular in plan, with a diameter of 29 cm. In profile, it had slightly in-sloping sides leading down to a basin-shaped bottom 55 cm deep. Pit fill was a very light brown sandy soil with some darker topsoil mottles and charcoal flecks. The pit had been disturbed by burrowing. Including flotation, 1 scraper and 4 pieces of chipping detritus were recovered.

Feature 4 was in the extreme southeast corner of the house. In plan, it was peanut shaped, 59 cm in length and 17 cm wide. Like Feature 3, it had gently in-sloping sides leading down to a

basin-shaped bottom with a depth of 55 cm. Pit fill was a very light brown sandy soil. Neither screening nor flotation recovered any artifacts from this pit.

House 5. This house was in the south-central portion of the western portion of the site (Figures 2 and 11). It was located 12 m southwest of House 2 and 15 m southeast of House 3. An artifact concentration was found by test pit survey immediately to the northwest of this house. The house was 12.7 m long and 7.8 m wide and had an internal area of 89.6 m².

House 5 was outlined by 121 continuous and well-defined wall posts with an average spacing of 3.2 posts per metre. The exception was the south end of the house, where as much as 7 m of house perimeter was defined by only 9 postmoulds. Along this end of the house there was a 2 m long gap with no postmoulds. It may be that there was a problem with preservation, as posts were sparse in this area. However, there was no obvious disturbance and, given the central location of the gap, it was interpreted as an entranceway.

No subsurface features were discovered within the house, though one small feature was located 7 m to the west. However, there were a total of 22 interior postmoulds, 13 of which were support posts. The absence of hearth features was puzzling. It was unlikely that there were no hearths in this house. There was no evident soil disturbance in the house to account for the absence of features. Given that the hearths were generally quite shallow and given the number of examples which showed plough damage, however, it may be that deep ploughing has obliterated all traces of hearths in this house.

While the nine small interior postmoulds were scattered across the central third of the house interior, the support posts were arranged in three groups. Five were in the northern third of the house, six were in the central third, and two in the southern third. The five northern support posts were centred about 3 m south of the north end of the house and spread over an east to west distance of 3.5 m. Two were located more or less on the central axis of the house, two were to the east, and one was to the west. There was a maximum distance of 1 m between nearest neighbours in this group. The six central support posts were centred just south of the exact centre of the house and span 3.5 m east to west. One was located on the centreline of the house. The remainder were arranged in two tight clusters, with three to the west and two to the east of the house centreline. Again, the maximum distance between nearest neighbours was 1 m. The final two support posts were located 1.75 m north of the south end of the house. They were spaced 3.25 m apart, symmetrically placed either side of the central axis of the house.

Given the pattern for the other site houses and the symmetrical arrangement of the large interior support posts within House 5, it was conjectured that two hearths were located along the long axis of the house in the two blank areas between the three sets of support posts.

A total of 79 one-metre square units were excavated by hand within and adjacent to the house. Sixty-three of them were entirely or partially within the house; the remaining 16 units were located outside the structure. Twenty of the 79 units, 18 of which were partially or entirely within the house, did not contain any cultural material.

The 59 productive units yielded a collection of 256 pieces, with an average of just over four artifacts per productive unit. The collection consisted of 1 rim sherd, 1 fragmentary rim sherd, 2 neck-shoulder sherds, 3 body sherds, 13 fragmentary sherds, 1 pipe fragment, 2 projectile points, 5 bifaces, 1 drill, 7 scrapers, 34 utilized flakes, 2 wedges, 181 pieces of chipping detritus, 2 faunal remains, and 1 piece of FCR.

Exterior House Settlement Patterns

Exterior house settlement patterns were generally rare at the site. Except for the postmoulds appended to the exterior of House 3, only six exterior house posts were encountered, and four of those six consisted of large historic fence posts. Exterior house features were somewhat more common, with 18 recorded. All the exterior house post moulds and features were in the western portion of the site. Descriptions of the exterior house features are presented below, and counts of artifacts include those recovered from the fractions of flotation analyses.

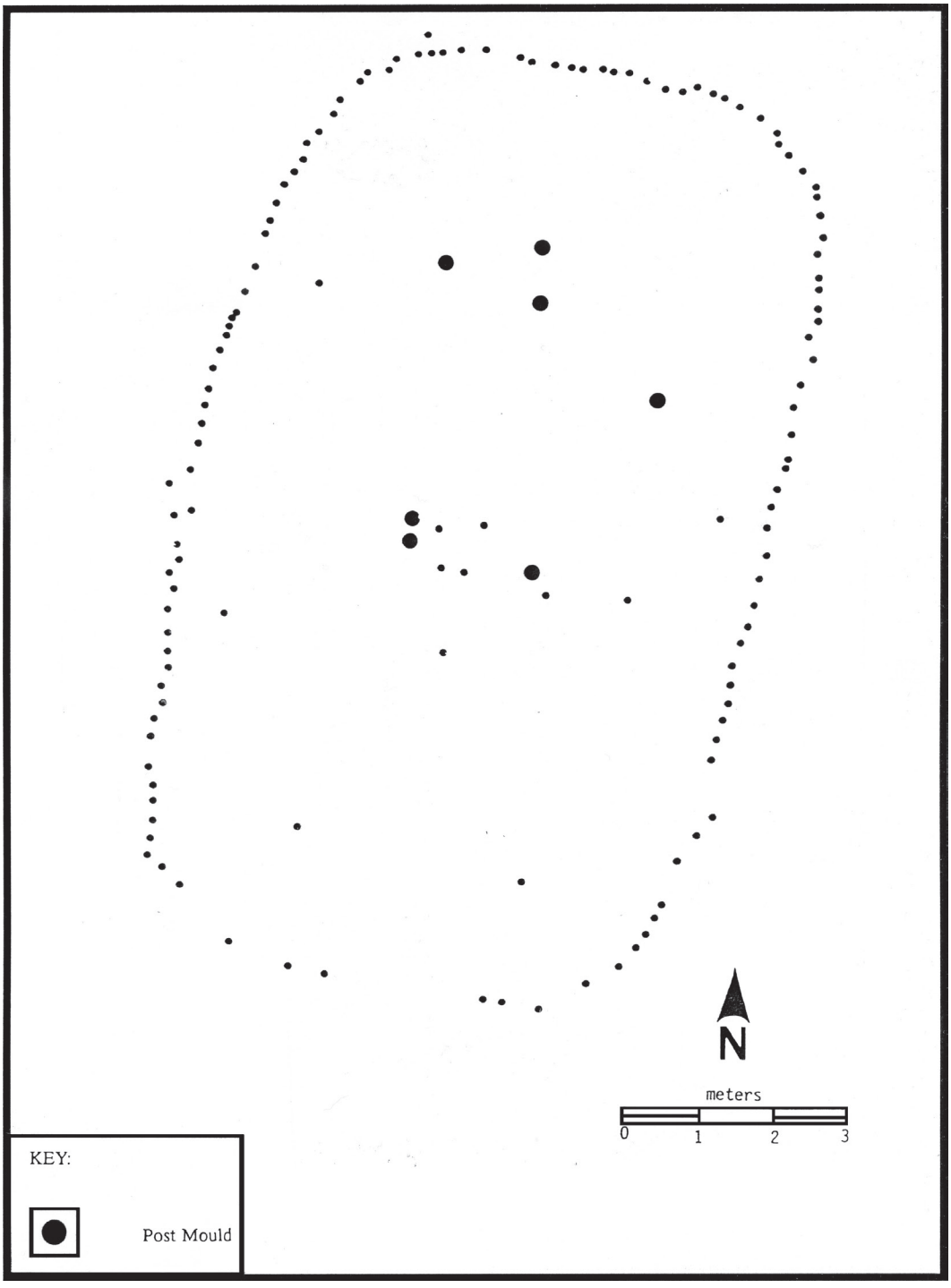


Figure 11. *House 5 plan.*

Exterior Feature 1 was located 4 m west of the west wall of House 4. It had an irregular plan shape 228 cm long and 71 cm wide. In profile, it had an irregular basin shape with a maximum depth of 40 cm. The feature was extremely faint, with a fill consisting of an orange-coloured soil mottled with darker topsoil and faint charcoal flecks; it had a rodent burrow running through it. The feature yielded 353 chipped lithic artifacts, including 1 biface, 2 scrapers, 6 utilized flakes, 1 core, and 343 pieces of chipping detritus. The degree of faintness of this feature was not typical of subsurface features encountered at the site, and it was considered most likely that it was not associated with House 4. Based on the presence of Haldimand chert, this feature was tentatively attributed to the Middle Archaic occupation of the site (Archaic Locus C) (Figure 2).

Exterior Feature 2, a small refuse pit, was located 3 m northwest of the north end of House 4. It was ovate in plan, with a maximum length of 135 cm and a maximum width of 74 cm. In profile, it was basin shaped, with a maximum depth of 42 cm. The feature had two distinct layers. The upper layer was 14 cm thick, consisting of dark black topsoil with mottles of fired soil. The lower layer was a grey-brown sandy soil. The feature had disturbance from a rodent burrow and ploughing. The feature yielded 26 artifacts, including 1 neck-shoulder sherd, 17 fragmentary sherds, 5 pieces of chipping detritus, and 3 pieces of nineteenth-century Euro-Canadian material.

Exterior Feature 3 was a small pit feature located less than 1 m east of the east wall of House 4. It was circular in plan, with a diameter of 28 cm, and had a basin-shaped profile with a maximum depth of 11 cm. Pit fill was a mix of topsoil and subsoil with small flecks of charcoal. No artifacts were recovered, and its function and relationship with House 4 are unknown.

Exterior Feature 4 was located 7 m west of the west wall of House 5. It was a pit feature with an approximately circular plan, between 28 and 30 cm in diameter. In profile, it had steeply sloping sides with a basin-shaped bottom at a maximum depth of 20 cm. Fill was light topsoil. This small pit contained 1 neck-shoulder sherd, 1 fragmentary sherd, 1 utilized flake, and 2 pieces of chipping detritus.

Exterior Feature 5 was one of five subsurface features associated with the southern area of Midden C (Exterior Features 5–9 inclusive). These appear to have been refuse-filled depressions or basal midden deposits and were located within a five-metre radius, 5 to 10 m to the northeast of House 3. Feature 5 was irregular in plan, long, narrow, and somewhat curved in shape. It had maximum dimensions of 302 cm in length and 85 cm in width and had an irregular profile. Its basin-shaped centre was 45 cm deep, while its north and south ends were between 10 cm and 20 cm deep. The upper 10 cm of the feature fill consisted of a very dark brown to black topsoil. The remainder was lighter brown topsoil. The feature contained 5 rim sherds, 7 fragmentary rim sherds, 17 neck-shoulder sherds, 15 body sherds, 85 fragmentary sherds, 1 lump of clay, 1 utilized flake, and 4 pieces of chipping detritus. The Iroquoian domestic refuse in this feature likely came from the occupants of House 3.

Exterior Feature 6 was located 1 m east of Exterior Feature 5 and 7 m northeast of the northeast corner of House 3. It, too, was interpreted as a portion of basal midden deposit. In plan, it was a very irregular shape, somewhat trianguloid. Its maximum dimensions were 255 cm north to south and 173 cm east to west. In profile it was also very irregular, with several evident burrows or root stains. Its maximum depth was 48 cm. The feature fill was divided into upper and lower strata. The upper layer was a dark black sandy topsoil with mottles of light subsoil and flecks of charcoal. The lower layer was present only in the northern half of the feature. It consisted of a lighter-coloured brown-black sandy topsoil with mottles of light subsoil. The feature yielded 4 rim sherds, 2 fragmentary rim sherds, 15 neck-shoulder sherds, 28 body sherds, 295 fragmentary sherds, 1 sherd from a juvenile vessel, 9 pieces of chipping detritus, 2 faunal remains, and 2 carbonized plant remains.

Exterior Feature 7 was located close to Exterior Feature 6, about 10 m northeast of House 3 and 10 m northwest of House 2. It was interpreted as basal midden. In plan, it was an irregular form

with several lobes running out from a central area. Its maximum dimensions were 200 cm north to south and 200 cm east to west. It had a basin-shaped profile with a maximum depth of 36 cm. The feature fill consisted of dark sandy topsoil. A total of 23 artifacts were recovered from the feature, including 1 rim sherd, 5 fragmentary rim sherds, 4 neck-shoulder sherds, 6 body sherds, 5 fragmentary sherds, 1 pipe fragment, and 1 piece of chipping detritus.

Exterior Feature 8 was located near Exterior Feature 7, 8 m east of House 3 and 7 m west of House 2. It, too, was interpreted as basal midden. In plan, it was an irregular shape, squarish but with several protruding lobes. It had maximum dimensions of 220 cm north to south and 220 cm east to west. Its profile was irregular, with a rodent burrow disturbing the bottom. It had a maximum depth of 40 cm. The feature fill was layered. The upper stratum was a dark black sandy topsoil, while the lower stratum was an orangey sand subsoil with mottles of dark topsoil and flecks of charcoal. This feature produced 7 rim sherds, 10 fragmentary rim sherds, 34 neck-shoulder sherds, 57 body sherds, 172 fragmentary sherds, 3 gaming discs, 4 utilized flakes, 15 pieces of chipping detritus, and 2 carbonized plant remains.

Exterior Feature 9 was located immediately north of Exterior Feature 8. It was interpreted as a small pit. It was ovate in plan with maximum dimensions 29 cm long and 25 cm wide. It had a basin-shaped profile and was only 9 cm deep. The pit fill consisted of dark black sandy topsoil. No artifacts were recovered from this feature.

Exterior Features 10–15 inclusive were all situated within the northern part of Midden C. These six features included one pit, two basal midden deposits, and three natural disturbances.

Exterior Feature 10 was in the southwest corner of the northern area of Midden C. It was determined to be a natural disturbance with an irregular shape. It was 112 cm long, 65 cm wide, and 46 cm deep. It had an irregular, basin-shaped profile, with the southern side much more steeply pitched than the northern side. There was an obvious rodent burrow extending out of the south side of the profile. The feature fill was banded, alternating between dark topsoil with rotted wood and lighter-coloured sandy subsoil. No artifacts were recovered from within the pit, although 50 artifacts were recovered from its surface, including 1 fragmentary rim sherd, 1 neck-shoulder sherd, 4 body sherds, 43 fragmentary sherds, and 1 piece of chipping detritus.

Exterior Feature 11 was in the north-central portion of the northern area of Midden C and was interpreted as basal midden. It had an irregular-shaped plan. Its maximum dimensions were 52 cm long, 50 cm wide, and 30 cm deep. It also had an irregular-shaped profile, with a fill matrix of dark topsoil mottled with lighter subsoil. It contained a quantity of FCR and a total of 120 artifacts, including 1 rim sherd, 1 fragmentary rim sherd, 4 neck-shoulder sherds, 17 body sherds, 76 fragmentary sherds, 7 sherds from juvenile vessels, 1 biface, 1 utilized flake, 10 pieces of chipping detritus, 1 piece of non-chert detritus, and 1 fragment of bone.

Exterior Feature 12, another basal midden deposit, was in the north-central portion of the northern area of Midden C. It had an irregular-shaped plan with several protrusions from a central area. Its maximum dimensions were 260 cm long, 230 cm wide, and 20 cm deep. It had an irregular, basin-shaped profile. The feature fill consisted primarily of dark brown sandy topsoil but contained pockets of ashy soil, fired soil, and subsoil. Though many artifacts were found on the surface of this feature, its fill contained only 2 body sherds, 10 fragmentary sherds, 1 sherd from a juvenile vessel, and 5 pieces of chipping detritus.

Exterior Feature 13 was in the northeastern portion of the northern area of Midden C and was thought to be a natural disturbance. It had an ovate plan 44 cm long north to south and 30 cm wide east to west. Its profile was irregular, somewhat funnel shaped but with the bottom twisted to the south. It had a maximum depth of 26 cm. Fill was a loose dark topsoil with numerous roots and rotted wood. No artifacts were recovered from the feature fill itself, though 1 neck-shoulder sherd, 3 body sherds, and 4 fragmentary sherds were recovered from the surface of the feature.

Exterior Feature 14 was in the northeastern portion of the northern area of Midden C and

was also a natural disturbance. It was ovate in plan with a prominent burrow extending north from its northern end. Its maximum dimensions were 40 cm north to south and 35 cm east to west. No artifacts were recovered from the feature fill.

Exterior Feature 15 was a small pit situated in the small, separate block of five one-metre squares southeast of the main excavation in the northern area of Midden C. It had an ovate plan and was 120 cm long north to south and 104 cm wide east to west. In profile it was basin shaped, with a maximum depth of 22 cm. Fill was a light brown sandy soil with flecks of charcoal. Only five artifacts were recovered from the pit, including 1 neck-shoulder sherd, 3 body sherds, and 1 fragmentary sherd.

Exterior Feature 16 was located just beside the south end of the west wall of House 2. It was circular in plan and had a deep, basin-shaped profile. Its maximum dimensions were 25 cm in diameter and 12 cm in depth. Fill was topsoil mottled with subsoil. No artifacts were recovered.

Exterior Feature 17 was located 3.5 m southwest of House 2. It was 125 cm long, 63 cm wide, and 17 cm deep. It had an elliptical plan and a somewhat irregular, basin-shaped profile. The feature had a core of dark black topsoil mottled with charcoal flecks, surrounded by a paler grey topsoil. The darker core measured 93 cm long, 42 cm wide, and 10 cm deep. The feature contained a total of 56 artifacts, including 1 fragmentary rim sherd, 6 neck-shoulder sherds, 16 body sherds (1 decorated), 30 fragmentary sherds, 2 gaming disks, and 1 piece of chipping detritus. This feature, given its location outside the south entrance of the house, was interpreted as the basal portion of a small midden.

Finally, Exterior Feature 18 was a small pit feature located 7.5 m southeast of Midden B. It was circular in plan, with a diameter of 40 cm. It was basin shaped in profile, with a maximum depth of 15 cm. Pit fill was dark black sandy topsoil with charcoal inclusions. It did not produce any artifacts.

Midden A

Midden A was located near the northeast corner of the site, 60 m east of Midden B. The nearest house was House 1, 10 m to the southeast. The midden was situated on the upper part of a steep slope leading down to the Credit River. A dirt bike trail had caused part of the midden to erode, and some artifacts were visible on the surface. The location of this midden was consistent with the midden described and illustrated by Richard Hazzard, as described above.

Twenty one-metre square units were excavated, with combined maximum dimensions of 8 m north to south and 5 m east to west. Five of these units did not produce any artifacts. The average depth in these units was 13 cm. Where undisturbed, the soil profile consisted of three layers. The upper 5 cm on average consisted of fine, dark, sandy topsoil with a very large proportion of organic material, much of which was only partially decomposed. Below this was an average of 10 cm of light grey sandy topsoil. This was the artifact-bearing stratum. Beneath this layer was a light yellow to yellow-brown sandy subsoil.

The 15 productive excavation units yielded 1,055 artifacts, including 25 rim sherds, 12 fragmentary rim sherds, 34 neck-shoulder sherds, 111 body sherds, 751 fragmentary sherds, 7 sherds from juvenile vessels, 27 pieces of chipping detritus, 30 pieces of faunal remains, 5 pieces of charcoal, and 53 pieces of FCR. Over half the artifact sample ($n = 602$, or 57.1%) came from two adjacent units in the centre of the excavation.

Midden B

Midden B was located near the centre of the northern edge of the site. It was 60 m west of Midden A and 30 m east of Midden C. The closest associated subsurface remains consisted of a small, isolated pit feature immediately southeast of the midden. The nearest structure was House 2, 25 m to the southwest. Like Midden A, these deposits were situated on the upper part of the steep bank leading down to the floor of the Credit River Valley.

Ten one-metre square units were excavated, covering an area 5 m north to south and 3 m east to west. The average depth of these units was just over 17 cm. The soil profile was identical to that described for Midden A.

All ten of these units produced artifacts. The assemblage included 1 scraper, 3 utilized flakes, 91

pieces of chipping detritus, 1 abrader, and 1 piece of charcoal. Though clearly an artifact concentration, this area was not really a midden in the sense of organic and inorganic domestic refuse. The collection was almost entirely chipping detritus (n=91, or 93.8%). This suggests that Midden A may have constituted an activity area.

Midden C

Midden C was located on the uncultivated northwestern edge of the site. It consists of two contiguous deposits. During Stage 3, test pits over the southern area of the midden were sterile, and that portion of the midden was only discovered when topsoil stripping by Gradall under archaeological supervision identified a basal deposit containing cultural material.

The northern area of Midden C had maximum dimensions of 12 m north to south and 13 m east to west. It was located 30 m west of Midden B, 12.5 m northeast of House 3, and 5.5 m northwest of House 2. Unlike Middens A and B, much of Midden C was on the relatively level ground adjacent to the top of the slope leading down to the Credit River Valley.

In all, a total of 60 one-metre square units were excavated in the northern part of Midden C. The average depth of these units was just under 22 cm, considerably deeper than Midden A or Midden B. The original soil profile was not at all apparent, as this midden was extensively disturbed. The surface of the area was hummocky and uneven. This was in part due to natural disturbances, such as tree throws and rodent burrows, and, in part, to previous excavations by local collectors. There was a thin surface layer of organic material poorly incorporated into the soil. Below this was a rich black sandy topsoil mixed with various amounts of rotting organic material, sandy yellow brown subsoil, charcoal, ash, and fired soil. Pockets of this material extended to greater depth than usual in six areas. These deeper pockets extended into the subsoil and were treated as features. The subsoil was a light yellow-brown sandy soil.

This part of the midden was relatively rich despite the disturbance by looters. Fifty-two of the 60 excavation units and 5 areas designated as features produced artifacts.

The material recovered from these units included 10 rim sherds, 65 fragmentary rim sherds, 107 neck-shoulder sherds, 261 body sherds, 1,264 fragmentary sherds, 26 sherds from juvenile vessels, 1 pipe fragment, 5 gaming discs, 9 lumps of clay, 1 projectile point, 4 bifaces, 4 scrapers, 10 utilized flakes, 3 wedges, 1 core, 122 pieces of chipping detritus, 2 abraders, 3 hammer/anvils, 3 ground stone fragments, 1 modified bone fragment, 63 faunal remains, 6 pieces of charcoal, and 8 twentieth-century Euro-Canadian objects. Over two-thirds of the artifacts came from just seven contiguous units and the two features within them. These units and features were in the north-central portion of the excavations.

The southern area of Midden C encompassed an area 7 m north to south by 6 m east to west. It was located 3 m to the southwest of the northern area. It was 5 m northeast of House 3 and 8 m northwest of House 2, on level ground, well back from the top of the bank.

Twelve complete and 9 partial one-metre square excavation units were excavated in this area. The average depth of these units was just over 20 cm. The intact stratigraphy consisted of a sod layer over a uniform dark brown-black sandy plough zone over a yellow-brown sandy subsoil. Four pockets of dark topsoil extended into the subsoil below the general level of the topsoil–subsoil interface, all of which were treated as features.

Two of the partial units and one of the features were sterile. The rest of the units and three of the four features yielded 14 rim sherds, 78 fragmentary rim sherds, 91 neck-shoulder sherds, 220 body sherds, 1,373 fragmentary sherds, 2 sherds from juvenile vessels, 1 pipe fragment, 5 gaming discs, 11 lumps of clay, 1 biface, 1 drill, 1 scraper, 10 utilized flakes, 2 wedges, 1 core, 112 pieces of chipping detritus, 1 celt, 1 net sinker, 3 ground stone fragments, 22 faunal remains, 7 fragments of carbonized plants, 9 pieces of charcoal, and 1 twentieth-century Euro-Canadian artifact. Over half of the artifacts came from four contiguous units and a single feature underlying those units.

Artifact Analysis

The precontact material culture remains recovered from the site are summarized in Table 2.

Table 2. *Lightfoot site artifact assemblage.*

Artifact Class	Artifact Category	Frequency	%
Ceramics			
	rim sherds	86	1.06
	fragmentary rim sherds	279	3.43
	neck-shoulder sherds	332	4.08
	body sherds	887	10.90
	fragmentary sherds	4,482	55.05
	gaming discs	12	0.15
	juvenile vessels	68	0.84
	pipe fragments	9	0.11
	lumps of clay	40	0.49
Subtotal, Ceramics		**6,195**	**76.10**
Chipped stone			
	projectile points	15	0.18
	bifaces	30	0.37
	drills	4	0.05
	wedges	9	0.11
	scrapers	56	0.69
	utilized flakes	85	1.04
	cores	15	0.18
	chipping detritus	1,255	15.42
Subtotal, Chipped Stone		**1,469**	**18.04**
Ground and rough stone			
	celts	4	0.05
	hammerstones	2	0.02
	hammer–anvilstone	1	0.01
	anvil–abrader	1	0.01
	abraders	6	0.07
	miscellaneous ground stone	2	0.02
	net sinker	1	0.01
	ground stone fragments	8	0.10
	non-chert debitage	2	0.02
Subtotal, Rough and Ground Stone		**27**	**0.33**
Bone tools	modified bone fragment	1	0.01
Subtotal, Bone Tools		**1**	**0.01**
Faunal remains		402	4.94
Subtotal, Faunal Remains		**402**	**4.94**
Floral remains			
	carbonized plant remains	8	0.10
	charcoal	39	0.48
Subtotal, Floral Remains		**47**	**0.58**
Total		**8,141**	**100.00**

A total of 8,141 specimens were recovered. The sample was dominated by ceramics ($n = 6{,}195$, or 73.1%) and chipped stone tools and debitage ($n = 1{,}469$, or 18.0%).

In addition to the above, the excavations also produced a modest quantity of nineteenth- and twentieth-century material pertaining to Euro-Canadian presence in the area. This recent material comprised 14 individual artifacts as well as a horse burial.

Ceramics

Adult Vessels. Fragments of adult vessels form the bulk of the ceramic collection ($n = 6{,}066$, or 97.9%). The adult vessel sample was subjected to a rigorous vessel sort, resulting in the identification of 37 vessels (Figures 6 and 12–18).[3]

[3] Throughout these tables, + means "and," X means "crossed by," and > means "over."

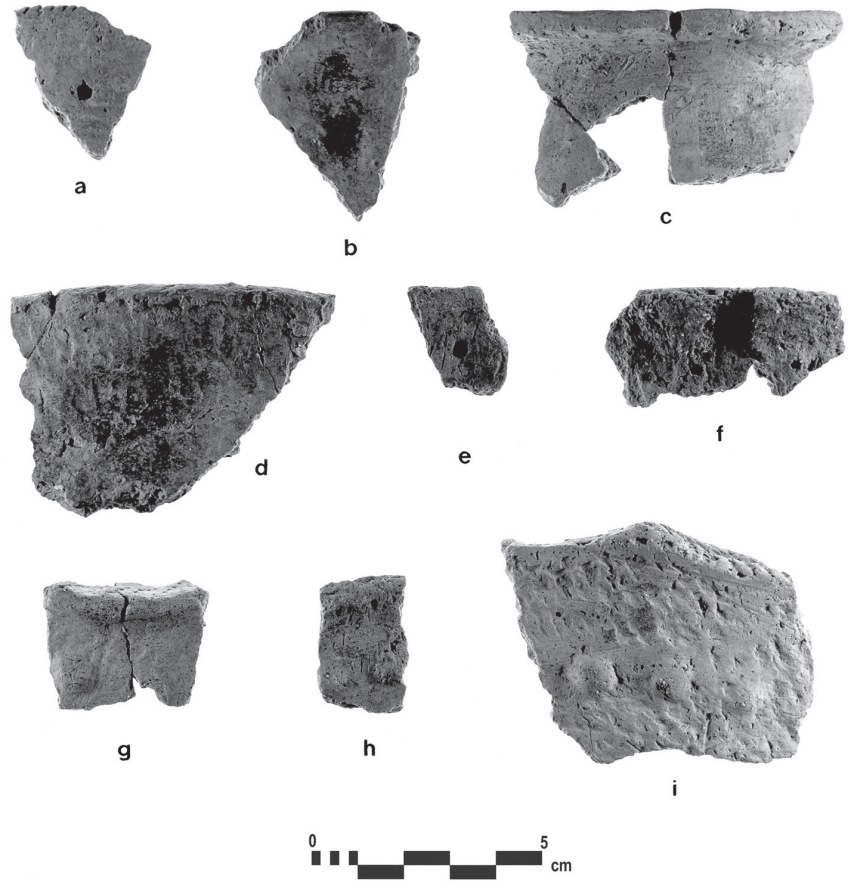


Figure 12. *Lightfoot site miscellaneous Late Woodland vessels: (a) Vessel 1, plain rim sherd, untyped (cat. 506); (b) Vessel 2, plain rim sherd, Ripley Plain type (cat. 668); (c) Vessel 3, plain rim sherd, untyped (cat. 187, 975); (d) Vessel 26, cord-malleated rim sherd, Woodsmen Corded type (cat. 898); (e) Vessel 27, cord-malleated rim sherd, Woodsmen Corded type (cat. 694); (f) Vessel 28, cord-malleated rim sherd, Woodsmen Corded type (cat. 805); (g) Vessel 29, cord-malleated rim sherd, Woodsmen Corded type (cat. 247); (h) Vessel 30, cord-malleated rim sherd, Woodsmen Corded type (cat. 261); (i) Vessel 31, cord-malleated castellation, Woodsmen Corded type (cat. 550).*

Figure 13. *Lightfoot site miscellaneous Late Woodland vessels: (a) Vessel 15, incised rim sherd, Glen Meyer Necked type (cat. 870, 872); (b) Vessel 33, linear stamped rim sherd, Ontario Oblique type (cat. 405, 892, 894); (c) Vessel 13, push-pull rim sherd, Iroquois Linear type (cat. 113, 118, 120, 125).*

Figure 14. *Lightfoot site Vessel 14: (a) vessel segment, Stafford Dentate type (cat. 870–872); (b) castellation (cat. 870–871); (c) decorated body segment (cat. 702, 762, 802).*

Figure 15. *Lightfoot site Vessel 7: vessel segment, Goessens Necked type (cat. 687, 689, 763, 792).*

Thirty-three of the 37 vessels could be assigned to types based on MacNeish (1952) and Wright (1966). Twelve different types are represented (Table 3). Four different types constitute two-thirds of the sample: Glen Meyer Necked, Woodsmen Corded, Ontario Oblique, and Middleport Criss-Cross.

Two of the vessels are attributed to a Middle Woodland occupation of the site (Figure 6; see descriptions above). The remaining 35 vessels are attributed to the Late Woodland period. It is possible that all of these pertain to the Early Iroquoian component, although some of the vessels feature constellations of attributes that are more

Figure 16. *Lightfoot site miscellaneous Late Woodland vessels: (a) Vessel 21, linear stamped and incised rim sherd, Middleport Oblique type (cat. 4489, 1228, 1334, 1337); (b) Vessel 22, linear stamped rim sherd, Glen Meyer Necked type (cat. 295); (c) Vessel 23, linear stamped rim sherd, Middleport Oblique type (cat. 1329); (d) Vessel 24, linear stamped rim sherd, Stafford Stamped type (cat. 973a); (e) Vessel 25, linear stamped rim sherd, Glen Meyer type (cat. 709); (f) Vessel 19, linear stamped rim sherd, Middleport Criss-Cross type (cat. 640).*

indicative of the Middle Iroquoian period, such as those typed as Middleport Criss-Cross, Middleport Oblique, and Iroquoian Linear.

Physical characteristics observed for the Lightfoot vessels include rim form and orientation, exterior and interior profile, lip form, width and angle, collar height, and basal collar thickness.

The majority of the 37 vessels are represented by upper rim and neck portions of the vessel (78.4%) (Table 4). All are grit tempered.

Tables 5–7 provide surface texture information for vessel interior, lip, and exterior surfaces, respectively.

Upper rim form was observed for the entire sample (Table 8), the vast majority of which is collarless. All three of the collared vessels have poorly developed collars. Collar heights for these specimens are 12 mm ($n = 2$) and 10 mm ($n = 1$). The basal collar thickness for the collared specimens is 7 mm, 8 mm, and 9 mm, respectively.

Castellations are a minority trait in the sample. Only 6 of the 37 vessels are castellated. Four of these have simple pointed forms. The remaining two feature multiple castellations.

Rim orientation was observed for 24 vessels (Table 9), with most being outflaring.

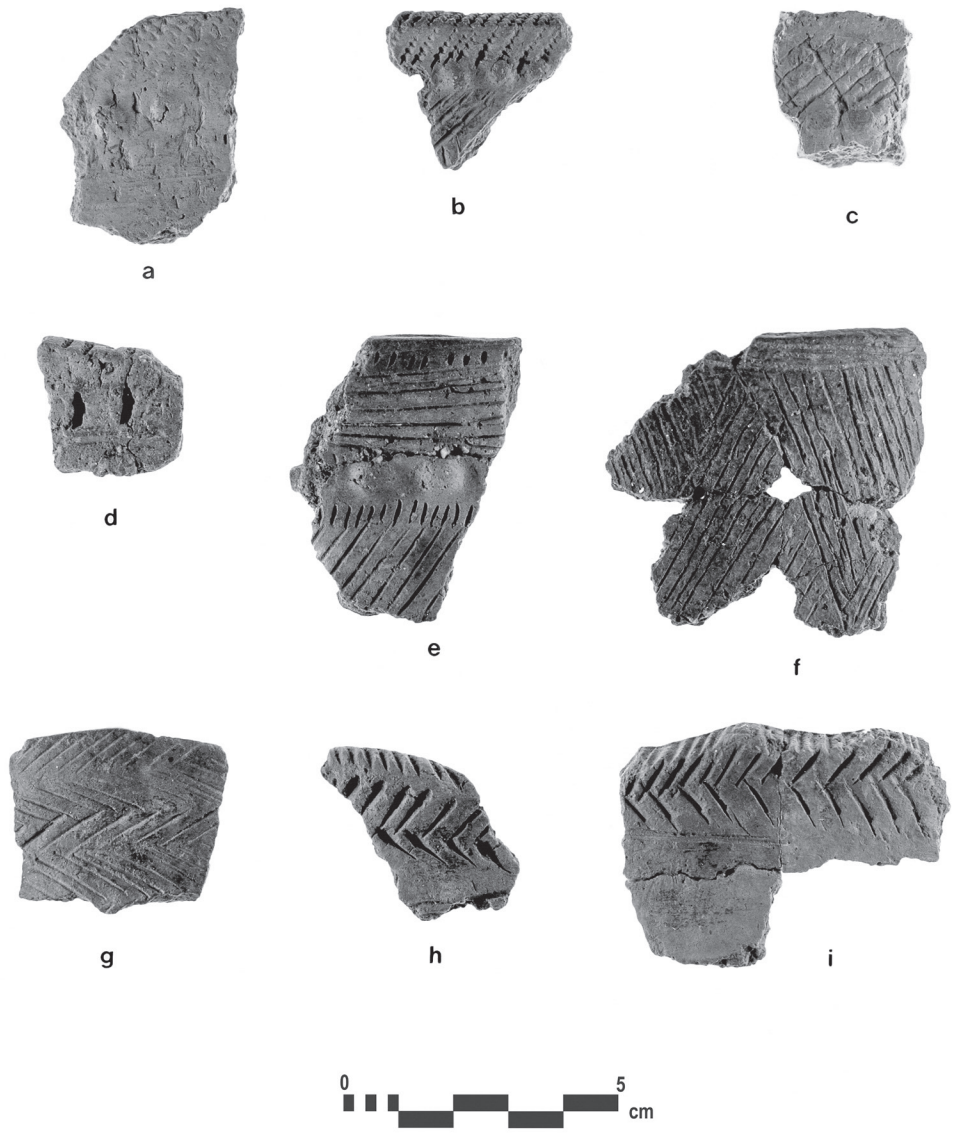


Figure 17. *Lightfoot site miscellaneous Late Woodland vessels: (a) Vessel 4, cord-wrapped stick rim sherd, Glen Meyer Oblique type (cat. 1329); (b) Vessel 5, cord-wrapped stick rim sherd, Goessens Necked type (cat. 204); (c) Vessel 34, linear stamped rim sherd, Middleport Criss-Cross type (cat. 957); (d) Vessel 35, linear stamped and incised rim sherd, Glen Meyer Necked type (cat. 973b); (e) Vessel 6, incised rim sherd, Glen Meyer Necked type (cat. 1354-1355); (f) Vessel 36, incised rim sherd, Glen Meyer Necked type (cat. 597, 604, 865); (g) Vessel 16, incised castellation, Ontario Oblique type (cat. 1166); (h) Vessel 17, linear stamped rim sherd, Glen Meyer Necked type (cat. 915); (i) Vessel 18, linear stamped castellation, Ontario Oblique type (cat. 260, 710, 832).*

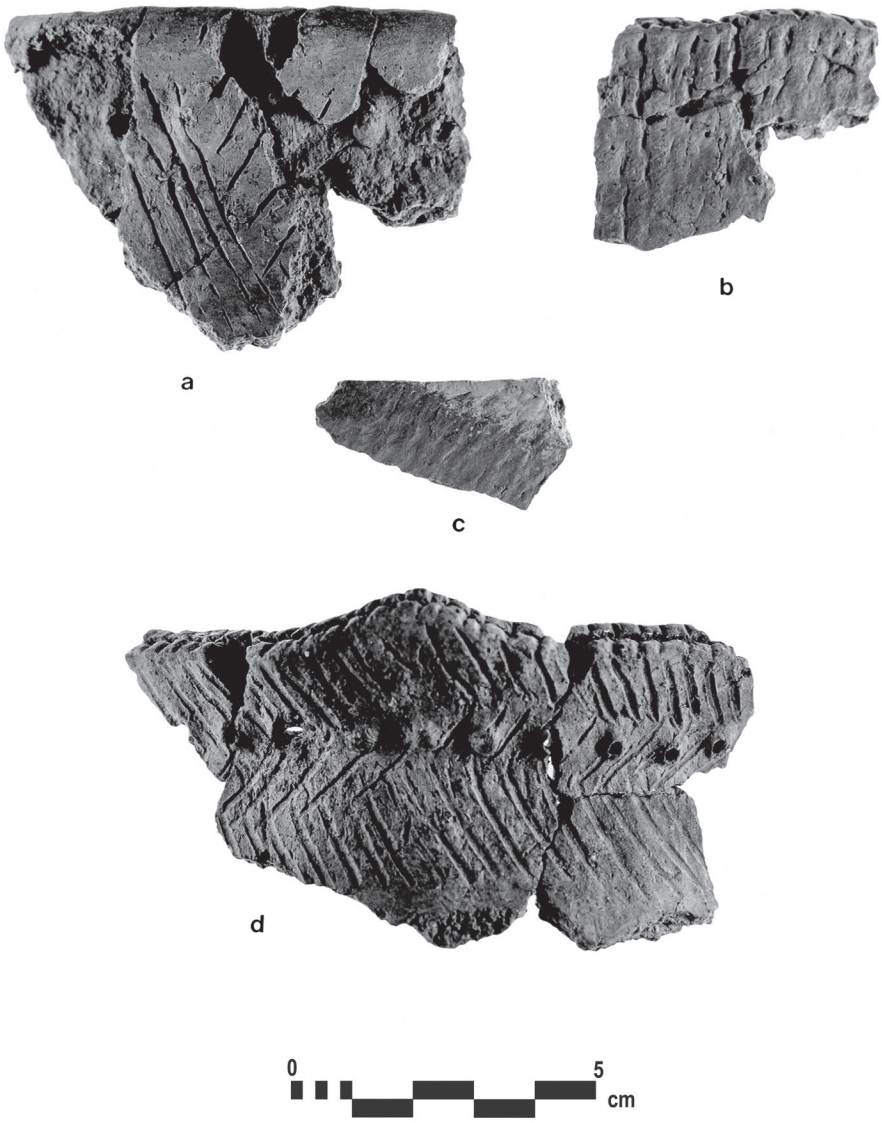


Figure 18. *Lightfoot site Midden A vessels: (a) Vessel 10, plain rim sherd with bosses, Glen Meyer Necked type (cat.115); (b) Vessel 11, cord-malleated rim sherd, Woodsmen Corded type (cat. 86); (c) fragmented cord-malleated rim sherd, untyped (cat. 100); (d) Vessel 9, incised rim sherd, Ontario Oblique type (cat. 58, 130, 132, 152).*

Table 3. *Lightfoot site ceramics, vessel pottery types.*

Type	Frequency	%
Middleport Oblique	2	6.1
Middleport Criss-Cross	3	9.1
Ontario Oblique	4	12.1
Iroquoian Linear	1	3.0
Ripley Plain	2	6.1
Glen Meyer Oblique	1	3.0
Stafford Stamped	1	3.0
Woodsmen Corded	7	21.2
Glen Meyer Linear Stamped	1	3.0
Glen Meyer Necked	8	24.2
Goessens Necked	2	6.1
Stafford Dentate	1	3.0
Total	**33**	**99.9**

Table 4. *Lightfoot site ceramics, nature of specimen.*

Segment	Frequency	%
Upper rim + neck	29	78.4
Upper rim + neck + castellation	6	16.2
Upper rim + neck + shoulder	2	5.4
Total	**37**	**100.0**

Table 5. *Lightfoot site ceramics, interior surface texture.*

Texture	Frequency	%
Smooth	30	85.7
Wiped	5	14.3
Total	**35**	**100.0**

Table 6. *Lightfoot site ceramics, lip surface texture.*

Texture	Frequency	%
Smooth	33	89.2
Rough	1	2.7
Wiped	2	5.4
Cord roughened	1	2.7
Total	**37**	**100.0**

Table 7. *Lightfoot site ceramics, exterior surface texture.*

Texture	Frequency	%
Smooth	16	43.2
Wiped	6	16.2
Cord paddled	1	2.7
Cord roughened	13	35.1
Cord wiped	1	2.7
Total	**37**	**99.9**

Data on interior rim profiles are provided in Table 10. Interior rim profiles vary widely, but most of the sample have convex, straight, or concave interior profiles.

Exterior rim profiles are dominated by concave specimens, followed by straight, convex, and straight and concave (Table 11).

The variable of lip form and angle to vessel interior could be observed for all 37 vessels. The sample was dominated by bevelled lips, followed by flat, and then rounded (Table 12). The angle of lip to interior was most commonly right-angled or acute (Table 13). Data on vessel lip thickness are summarized in Table 14. Most of the sample have lips with a thickness in the 4 to 8 mm range.

Data on the attribute of interior carbon encrustation are summarized in Table 15. A minority of the vessels feature carbon encrustation representing food residue from use as cooking vessels.

In terms of decorative motifs and techniques, Tables 16–28 present statistical data for the various portions of the vessels.

Bossing is present on over half of the 37 vessels (Table 16). They occur most frequently in the form of exterior bosses formed by interior punctates. Several vessels have interior bosses formed by exterior punctates, and one vessel features both exterior bosses formed by interior punctates and interior bosses formed by exterior punctates.

The attributes of interior rim decorative motif and technique could be observed for 36 vessels (Tables 17 and 18). Most of the vessels (83.3%) have interior decoration.

Interior decorative motifs are varied. Almost half of the vessels feature a single band of interior decoration, such as single rows of circular or elliptical punctates, obliques or verticals, and opposed obliques. The remaining vessels feature more than one band of decoration, mostly two simple bands of obliques or verticals over encircling rows of punctates or opposed obliques over punctates.

Nine separate interior decorative techniques are represented, including incising, linear stamping, dentate stamping, suture stamping, cord-wrapped stick impressions, single cord impressions, notching, bossing, and punctation. While 15 vessels are decorated using single

Table 8. *Lightfoot site ceramics, upper rim form.*

Texture	Frequency	%
Collarless	33	89.2
Collarless + thickened lip	1	2.7
Collared	3	8.1
Total	**37**	**100.0**

Table 9. *Lightfoot site ceramics, rim orientation.*

Orientation	Frequency	%
Vertical	1	4.2
Outflaring	21	87.5
Insloping	2	8.3
Total	**24**	**100.0**

Table 10. *Lightfoot site ceramics, interior rim profile.*

Profile	Frequency	%
Straight	8	21.9
Concave	7	18.9
Straight + concave	2	5.4
Convex	13	35.1
Straight + convex	3	8.1
Convex + convex	2	5.4
Extra convex	1	2.7
Straight + extra convex	1	2.7
Total	**37**	**99.9**

Table 11. *Lightfoot site ceramics, exterior rim profile.*

Profile	Frequency	%
Straight	6	16.2
Concave	16	43.2
Straight + concave	5	13.5
Extra concave	1	2.7
Straight + extra concave	1	2.7
Convex	5	13.5
Straight + convex	2	5.4
Concave + convex	1	2.7
Total	**37**	**99.9**

techniques, 12 have two techniques, and 1 has three techniques. The most common interior decorative techniques are punctation and linear stamping.

Lip decorative motifs and techniques could be observed for 36 of the 37 vessels. Relevant data are summarized in Tables 19 and 20, respectively. Almost two thirds of the sample had decorated lips, with obliques alone representing over two-thirds of all lip motifs. Lip techniques are dominated by linear stamping, which accounts for over

Table 12. *Lightfoot site ceramics, lip form.*

Form	Frequency	%
Flat	14	37.8
Rounded	4	10.8
Bevelled	19	51.4
Total	**37**	**100.0**

Table 13. *Lightfoot site ceramics, angle of lip to vessel interior.*

Form	Frequency	%
Acute	16	43.2
Right	17	46.0
Obtuse	4	10.8
Total	**37**	**100.0**

Table 14. *Lightfoot site ceramics, vessel lip thickness.*

Thickness	Frequency	%
3 mm	1	2.7
4 mm	7	18.9
5 mm	5	13.5
6 mm	8	21.6
7 mm	7	18.9
8 mm	4	10.8
9 mm	2	5.4
10 mm	1	2.7
12 mm	1	2.7
13 mm	1	2.7
Total	**37**	**99.9**

Table 15. *Lightfoot site ceramics, vessel carbon encrustation.*

Presence/Location	Frequency	%
Absent	22	59.5
Interior encrustation	8	21.6
Interior colour black	4	10.8
None + interior colour black	1	2.7
Exterior colour black	1	2.7
Interior + exterior colour black	1	2.7
Total	**37**	**100.0**

half of the vessels with lip decoration. Six vessels had cord-wrapped stick–impressed motifs.

Data for upper rim exterior decorative motifs and techniques are presented in Tables 21 and 22, respectively. All but seven of the vessels have exterior decoration on the upper rims, including one or some combination of punctates, obliques, horizontals, verticals, and superimposed obliques (criss-cross). The predominant upper

Table 16. *Lightfoot site ceramics, vessel bossing.*

Special Feature	Frequency	%
None	15	40.5
Exterior boss + interior punctate	16	43.2
Exterior punctate + interior boss	4	10.8
Exterior punctate/boss + interior punctate/boss	1	2.7
Subtotal, Punctates/Bosses	**21**	**56.8**
Coil Breaks	1	2.7
Total	**37**	**100.00**

Table 17. *Lightfoot site ceramics, interior rim motif.*

Motif	Frequency	%
Plain	6	16.7
Subtotal, Plain	**6**	**16.7**
Vertical	1	2.8
Right oblique	3	8.3
Elliptical punctate	1	2.8
Right oblique X left oblique	1	2.8
Vertical dominant X right oblique	1	2.8
Plain > circular punctate	5	13.9
Plain > elliptical punctate	1	2.8
Vertical > vertical	1	2.8
Left oblique > right oblique	1	2.8
Vertical > circular punctate	3	8.3
Right oblique > circular punctate	3	8.3
Left oblique > circular punctate	1	2.8
Right oblique > elliptical punctate	2	5.6
Circular punctate > circular punctate	1	2.8
Vertical dominant X right oblique > circular punctate	1	2.8
Right oblique X left oblique > circular punctate	1	2.8
Right oblique X left oblique > elliptical punctate	1	2.8
Right oblique X circular punctate > horizontal	1	2.8
Right oblique X left oblique > right oblique	1	2.8
Subtotal, Decorated Interiors	**30**	**83.3**
Total	**36**	**100.0**

Table 18. *Lightfoot site ceramics, interior rim technique.*

Technique	Frequency	%
Plain	6	16.7
Subtotal, Plain	**6**	**16.7**
Incised	1	2.8
Incised + punctate	2	5.6
Linear stamped	5	13.9
Linear stamped + punctate	3	8.3
Linear stamped + boss	1	2.8
Linear stamped + notch	1	2.8
Linear stamped + single cord + punctate	1	2.8
Dentate stamped + punctate	1	2.8
Cord-wrapped stick	1	2.8
Cord-wrapped stick + punctate	2	5.6
Cord-wrapped stick + boss	1	2.8
Single cord	1	2.8
Suture stamped	1	2.8
Suture stamped + boss	1	2.8
Punctate	7	19.4
Punctate + boss	1	2.8
Subtotal, Decorated	30	83.3
Total	**36**	**100.0**

Table 19. *Lightfoot site ceramics, vessel lip motif.*

Motif	Frequency	%
Plain	13	36.1
Subtotal, Plain	**13**	**36.1**
Vertical	3	8.3
Right oblique	11	30.6
Left oblique	5	13.9
Elliptical punctate	1	2.8
Right oblique X horizontal	1	2.8
Left oblique X horizontal	1	2.8
Left oblique > plain	1	2.8
Subtotal, Decorated	23	63.9
Total	**36**	**100.0**

Table 20. *Lightfoot site ceramics, vessel lip technique.*

Technique	Frequency	%
Plain	13	36.1
Subtotal, Plain	**13**	**36.1**
Linear stamped	12	33.3
Linear stamped + single cord	1	2.8
Dentate stamped	1	2.8
Cord-wrapped stick	6	16.7
Cord-wrapped stick + single cord	1	2.8
Suture stamped	1	2.8
Punctate	1	2.8
Subtotal, Decorated	23	63.9
Total	**36**	**100.0**

Table 21. *Lightfoot site ceramics, upper rim motif.*

Motif	Frequency	%
Plain	7	18.9
Subtotal, Plain	**7**	**18.9**
Right oblique	3	8.1
Left oblique	1	2.7
Horizontal	2	5.4
Circular punctate	1	2.7
Elliptical punctate	1	2.7
Vertical X horizontal	1	2.7
Right oblique X circular punctate	1	2.7
Left oblique X circular punctate	1	2.7
Plain > circular punctate	5	13.5
Right oblique > right oblique	1	2.7
Right oblique > left oblique	2	5.4
Right oblique > horizontal	1	2.7
Left oblique > horizontal	1	2.7
Right oblique > circular punctates	2	5.4
Vertical > circular punctate	1	2.7
Horizontal > circular punctate	1	2.7
Right oblique X left oblique	1	2.7
Right oblique > left oblique X circular punctate	1	2.7
Right oblique X left oblique > circular punctate	2	5.4
Right oblique > horizontal X circular punctate > horizontal	1	2.8
Subtotal, Decorated Upper Rims	30	81.1
Total	**37**	**100.0**

Table 22. *Lightfoot site ceramics, upper rim decorative technique.*

Technique	Frequency	%
Plain	7	18.9
Subtotal, Plain	**7**	**18.9**
Incised	2	5.4
Linear stamped	8	21.6
Punctate	3	8.1
Incised + linear stamped	1	2.7
Linear stamp + punctate	4	10.8
Cord-wrapped stick + punctate	1	2.7
Push-pull	1	2.7
Boss	4	10.8
Incised + boss	2	5.4
Dentate stamped + boss	1	2.7
Cord-wrapped stick + boss	2	5.4
Linear stamped + single cord	1	2.7
Subtotal, Decorated	30	81.1
Total	**37**	**100.0**

rim decorative technique was linear stamping, appearing alone or in combination, mainly punctates and bosses, on almost half of the sample of the vessels with decorated rims.

Upper rim decorative motifs and techniques are correlated in Table 23. Within the sample of decorated vessels, obliques and verticals occur on 20 vessels and are almost invariably executed by linear stamping; the only exceptions are 3 vessels with cord-wrapped stick obliques and 1 vessel each with incised and dentate stamped obliques. Horizontals, present on 7 vessels, are executed by incising, followed by push-pull, cord-wrapped stick, and single cord impression.

Upper rim secondary decorative motifs are present on 5 vessels, 3 of which consist of a primary decorative motif over circular punctates. The remaining two consist of a narrow band of obliques over the primary decoration (Table 24).

Data on neck decorative motifs and techniques are presented in Tables 25 and 26. Almost two-thirds of the vessels feature decorated necks with motifs, the most popular of which are combinations consisting of opposed obliques and/or horizontals or simple horizontals. The main neck technique is incising, alone or in combination. Linear stamping is also common.

Tables 27 and 28 present data on the decorative motifs and techniques for the six vessels with castellations. Five of the vessels have decorated castellations, 4 of which involve oblique motifs: 2 as single bands and 2 as multiple bands forming a herringbone motif. The techniques used in decorating the castellations varied.

Pipe Fragments. Nine fragments of ceramic smoking pipes were recovered, comprising 7 bowl fragments (2 of which mend), 1 complete stem, and 1 stem fragment. Examples are illustrated in Figure 19.

The bowl represented by the two fragments is barrel shaped (Figure 19e). It has a flattened lip. The lip-to-interior angle is a right-angle and the lip-to-exterior angle is obtuse. The lip has a thickness of 3 mm. This specimen features complex decoration. The main decorative technique consists of lines of cord-wrapped stick impressions applied in oblique or vertical rows. The upper portion of the bowl has a series of vertical

Table 23. *Lightfoot site ceramics, upper rim decorative motif and technique.*

Motif and Technique	Frequency	%
Plain	7	18.9
Subtotal, Plain	**7**	**18.9**
Right oblique (linear stamped)	3	8.1
Left oblique (linear stamped)	1	2.7
Horizontal (incised)	1	2.7
Horizontal (push-pull)	1	2.7
Boss (circular punctate)	1	2.7
Elliptical punctate	1	2.7
Right oblique X left oblique (linear stamp)	1	2.7
Vertical (linear stamped) X horizontal (single cord)	1	2.7
Right oblique (dentate stamped) X bosses (circular punctate)	1	2.7
Left oblique (incised) X bosses (circular punctate)	1	2.7
Plain > circular punctate	2	5.4
Plain > bosses (circular punctate)	3	8.1
Right oblique > right oblique (linear stamp)	1	2.7
Right oblique > left oblique (linear stamped)	2	5.4
Right oblique > horizontal (incised)	1	2.7
Left oblique (linear stamped) > horizontal (incised)	1	2.7
Vertical (linear stamped) > circular punctate	1	2.7
Right oblique (cord-wrapped stick) > boss (circular punctate)	2	5.4
Horizontal (incised) > boss (circular punctate)	1	2.7
Right oblique > left oblique (linear stamped) X circular punctate	1	2.7
Right oblique X left oblique (linear stamped) > circular punctate	2	5.4
Right oblique > horizontal (cord-wrapped stick) X circular punctates > horizontal (cord-wrapped stick)	1	2.7
Subtotal, Upper Rim Decoration	**30**	**81.1**
Total	**37**	**100.0**

Table 24. *Lightfoot site ceramics, secondary rim decorative motif.*

Motif	Frequency	%
Plain	32	86.5
Subtotal, Plain	**32**	**86.5**
Right oblique > primary	1	2.7
Left oblique > primary	1	2.7
Primary > circular punctate	3	8.1
Subtotal, Secondary Decoration	**5**	**13.5**
Total	**37**	**100.0**

Table 25. *Lightfoot site ceramics, neck motifs.*

Motif	Frequency	%
Plain	14	37.8
Subtotal, Plain	**14**	**37.8**
Right oblique	1	2.7
Left oblique	1	2.7
Horizontal	6	16.2
Vertical X horizontal	1	2.7
Right oblique/left oblique	4	10.1
Right oblique/horizontal	1	2.7
Right oblique/horizontal/left oblique	1	2.7
Circular punctate > circular punctate	1	2.7
Horizontal > vertical X linear dash	1	2.7
Horizontal > right oblique/left oblique	1	2.7
Horizontal > right oblique/left oblique/horizontal	2	5.4
Right oblique/left oblique > horizontal	1	2.7
Right oblique > left oblique > right oblique	1	2.7
Left oblique > right oblique: repeated five times	1	2.7
Subtotal, Decorated Necks	**23**	**62.2**
Total	**37**	**100.0**

to slightly oblique parallel lines executed by this technique. Below these are a series of similar lines executed at a more oblique angle, oriented left to right. Superimposed are a series of widely spaced oblique incised lines oriented left to right. This specimen was recovered from the exterior of House 3.

The second pipe bowl is also barrel shaped (Figure 19d); it was recovered from the interior

Table 26. *Lightfoot site ceramics, neck decorative technique.*

Technique	Frequency	%
Plain	14	37.8
Subtotal, Plain	**14**	**37.8**
Incised	9	24.3
Linear stamped	6	16.2
Incised + linear stamped	1	2.7
Push-pull	3	8.1
Incised + push-pull	1	2.7
Punctate + boss	1	2.7
Single cord	1	2.7
Linear stamped + single cord	1	2.7
Subtotal, Decorated	**23**	**62.2**
Total	**37**	**100.0**

Table 27. *Lightfoot site ceramics, vessel castellation motifs.*

Motif	Frequency
Plain	1
Subtotal, Plain	**1**
Plain > circular punctates	1
Right oblique X circular punctates	1
Left oblique X circular punctates	1
Right oblique > left oblique X circular punctates	1
Left oblique > right oblique > left oblique	1
Subtotal, Decorated Castellations	**5**
Total	**6**

Table 28. *Lightfoot site ceramics, castellation decorative technique.*

Technique	Frequency
Plain	1
Linear stamped	1
Linear stamped + punctate	1
Dentate stamped + punctate	1
Boss	1
Incised + boss	1
Total	**6**

of House 5 and has a rounded lip, with an acute lip-to-interior angle and an obtuse lip-to-exterior angle. The lip has a thickness of 4 mm. Most of the exterior of this pipe bowl is covered by a continuous application of small, circloid punctates; also present is an encircling of small, circloid punctates just below the lip. The small punctates on the bowl exterior serve as background for two punctated human effigy faces, both of which are located immediately below the punctated line that encircles the top of the bowl (Figure 20). The simpler of the two effigies, to the right of the pipe bowl fragment, consists of three large and more regular round punctates; they form an inverted triangle, representing the two eyes and the mouth. The more elaborate effigy to the left is fragmentary and is in an otherwise undecorated part of the bowl that lacks the field of smaller, less regular punctates that is present on the remainder of the exterior bowl. It retains all of the left eye, one corner of the right eye, and most of the mouth; each has been executed using a triangular punctate. The pupil of the complete eye and the mouth each have one larger and more regular, round interior punctate, which was likely executed by the same tool as the other effigy face; they represent the pupil of the eye and what is inferred to be an open mouth.

The third pipe bowl fragment is cylindrical and is undecorated (Figure 19c). It has a flat lip with a right-angled lip-to-interior and -exterior junctures.

The remaining 3 portions of ceramic pipe bowl are too fragmentary to warrant description. All are plain.

The complete pipe stem retains a portion of the bowl (Figure 19b). It has an obtuse stem-to-bowl juncture. The stem is circular in cross-section and the end of the mouthpiece is slightly flattened.

The other stem fragment also retains the mouthpiece. This specimen is crude has an incipient hole; it is inferred to be part of a juvenile pipe.

Juvenile Vessels. Juvenile vessel fragments were separated from adult ceramics based on relative size and crudity. These specimens are believed to have been made by children learning the art of pottery manufacture. A total of 68 juvenile sherds were recovered from the site.

The juvenile pottery was not analyzed. However, it may be observed that these ceramics tend to display a similar range of decorative techniques and motifs to those evident on the adult vessels. One example is illustrated, a near-complete vessel (Figure 19a). This specimen, from Midden C, has

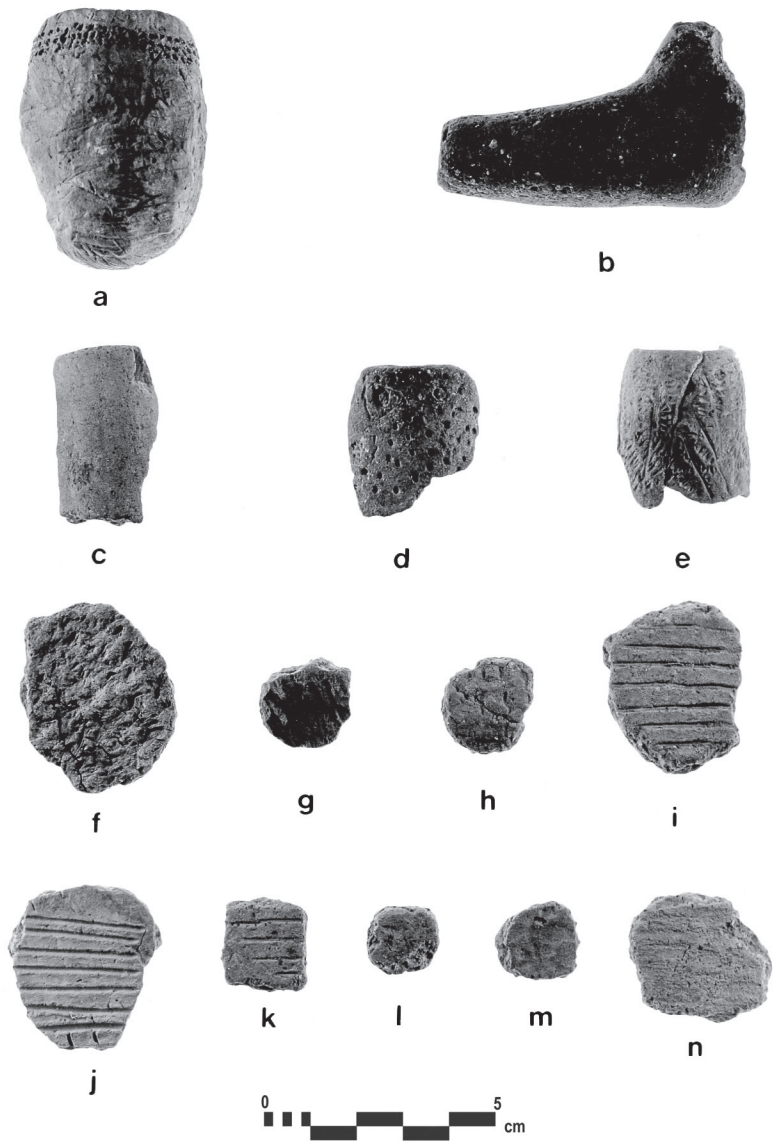


Figure 19. *Lightfoot site miscellaneous ceramic artifacts: (a) juvenile vessel (cat. 271); (b) pipe stem and bowl fragment (cat.571); (c) pipe bowl fragment, Cylindrical Plain type (cat. 602); (d) pipe bowl fragment, Decorated Barrel type with incised human effigy (cat. 384); (e) pipe bowl fragment, Decorated Barrel type (cat. 1121); (f) gaming disc on a cord-malleated body sherd (cat. 799); (g) gaming disc on a cord-malleated body sherd (cat. 839); (h) gaming disc on a cord-malleated body sherd (cat. 281); (i) gaming disc on a decorated body sherd (cat. 367); (j) gaming disc on a decorated body sherd (cat. 303); (k) gaming disc on a decorated body sherd (cat. 944); (l) gaming disc on a cord-malleated body sherd (cat. 878); (m) gaming disc on a cord-malleated body sherd (cat. 1101); (n) gaming disc on a ribbed-paddle body sherd (cat. 878).*

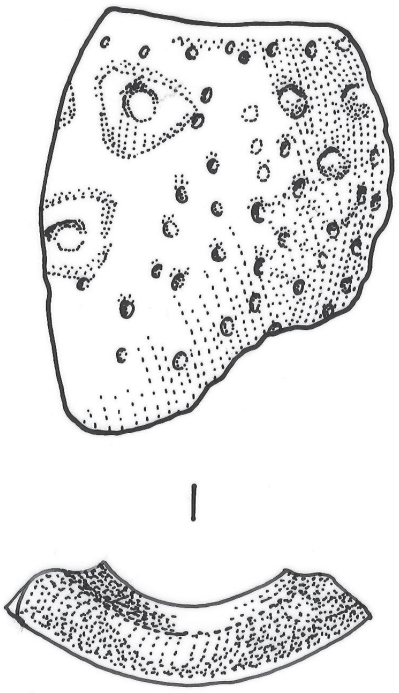


Figure 20. *Drawing of pipe bowl fragment, Decorated Barrel type with incised human effigy (cat. 384).*

a height of 51 mm and a vessel orifice diameter of 27 mm. Interior decoration consists of an encircling row of circular punctates just below the lip. Lip decoration is present in the form of oblique lines executed by fingernail. Exterior decoration consists of three horizontal lines forming a band of crude punctates which encircle the vessel. The body of the vessel has a scarified treatment.

Gaming Discs. A total of 12 ceramic gaming discs were recovered from the site. All consist of body sherds from adult vessels that have been shaped. Most of the specimens are illustrated in Figure 19.

All of the specimens are more or less round, with the exception of one that is roughly square (Figure 19k). The maximum diameter of the specimens has a range of 16 to 40 mm, with a mean of 25.4 mm.

Three of the gaming discs derive from decorated body sherds. One of these has exterior decoration consisting of parallel incised lines (Figure 19i). The second features a band of incised obliques over horizontals over smoothed-over cord (Figure 19j). The third has an incised opposed motif consisting of horizontals and obliques (Figure 19k).

The remaining 9 gaming discs are undecorated, except for the surface treatment accorded to the respective vessels. The surface treatments represented included plain ($n = 1$), smoothed-over cord ($n = 4$), cord-malleated ($n = 1$), ribbed-paddle ($n = 1$), and indeterminate malleated ($n = 2$).

With respect to distributions, the gaming discs tended to cluster in and around Midden C. Seven of the specimens were recovered from the northern part of the midden, while the remaining 5 were recovered from nearby, 2 from topsoil excavations in the southern part of the midden, 2 from a basal midden feature located beneath the southern portion of the midden, and 1 from the exterior of House 3.

Chipped Lithics

A chipped lithic industry is relatively well represented at the site: 1,469 specimens were recovered, representing 18% of the entire artifact assemblage (Table 2). Formal and informal tools comprise 199 specimens, or 13.5% of the chipped lithic collection, with the balance of the material consisting of cores and debitage. The tools are dominated by utilized flakes ($n = 85$, or 42.7%), followed by scrapers ($n = 56$, or 28.1%), bifaces ($n = 30$, or 15.0%), projectile points ($n = 15$, or 7.5%), wedges ($n = 9$, or 4.5%), and drills ($n = 4$, or 2.0%).

Seven different chipped lithic raw materials were visually identified in the sample, in addition to an indeterminate category (Table 29). Most of the sample is of Onondaga chert, from the lower Niagara Peninsula and the north shore of Lake Erie. Also present is Haldimand chert, from the Hagersville area west of the Grand River; Selkirk chert, from the area north of Long Point; and Trent and Balsam Lake cherts, which derive from Simcoe County and Victoria County, respectively; they are also present in small quantities in glacial drift along the north shore of Lake Ontario. Four pieces of Flint Ridge chalcedony, from central Ohio, were also recovered; they may be related to the Middle Woodland component of the site.

Table 29. *Lightfoot site chipped lithics, raw materials.*

	Raw Materials (n)								
	Onondaga	Haldimand	Trent	Collingwood	Balsam Lake	Selkirk	Flint Ridge	Unknown	Total
Projectile points	11	3						1	15
Bifaces	24			1		1		4	30
Drills	4								4
Scrapers	53							2	55
Wedges	9								9
Utilized flakes	81		1			1		2	85
Cores	9	1	2					3	15
Debitage	10	26	1	1	1	2	4	206	1,256
Total	**1,206**	**30**	**4**	**2**	**1**	**4**	**4**	**218**	**1,469**
%	**82.1**	**2.0**	**0.3**	**0.1**	**0.1**	**0.3**	**0.3**	**14.8**	**100.0**

Projectile Points. Fifteen projectile points were recovered. Pertinent data are presented in Table 1 and examples are illustrated in Figure 5. Eleven of the points are of Onondaga chert, 3 are of Haldimand chert, and 1 is of indeterminate chert. Those projectile points identified as pre-Iroquoian are described above.

One additional side-notched point fragment is untyped (Figure 5g). This specimen is made of Onondaga chert. It features a trianguloid blade with straight edges. The haft element is damaged, and one tang and most of the basal margin are missing. This specimen was recovered from topsoil excavations in a unit overlapping the southeast wall of House 3, within the Archaic concentration designated Locus B. It is unknown if it pertains to the Archaic component or the Late Woodland component.

Three fragmentary points were recovered from the vicinity of the north end of House 3. All are of Onondaga chert. They consist of the tang of a side-notched point from a subsurface pit within the north end of the house, a blade fragment from a one-metre square unit overlapping the north wall of the house, and the base of a notched point from topsoil excavations 3 m to the northeast of the house. All three specimens were found within the limits of Locus A, but they are non-diagnostic in their fragmentary forms.

The only projectile point recovered from Midden C is complete (Figure 5h). It is relatively small and thick, with convex lateral blade margins, shallow side notches, and a straight base. The haft element is very short. This specimen has basal grinding.

The only stemmed projectile point in the sample was recovered in the controlled surface collection of the field designated Area 12 (Figure 5j). It was found 18 m southeast of House 1. This specimen has been considerably reworked. It features convex lateral blade margins with rounded shoulders, an expanding stem, and a slightly convex base. The material is Onondaga chert.

The remaining two projectile points lack precise provenience. One is complete except for a damaged tip (Figure 5k). It is side notched and features a trianguloid blade with slightly convex lateral margins, well-developed shoulders, squared tangs, and a concave base. This specimen is of an unknown chert. It is tentatively attributed to the Early Iroquoian occupation of the site. The other is of Onondaga chert (Figure 5l). It consists of a distal fragment of a side-notched point with a trianguloid blade.

Drills. Four complete drills were recovered, all made of Onondaga chert. Two of the specimens are formal tools on bifaces, while the remaining two are informal tools.

One of the bifacial drills is finely made (Figure 21f). It is bipointed, with straight to slightly convex lateral edges. This specimen has a length, width, and thickness of 38 mm, 9 mm, and 5 mm, respectively. It was recovered from topsoil excavations in House 5, within the limits of the Archaic Locus B. This artifact closely

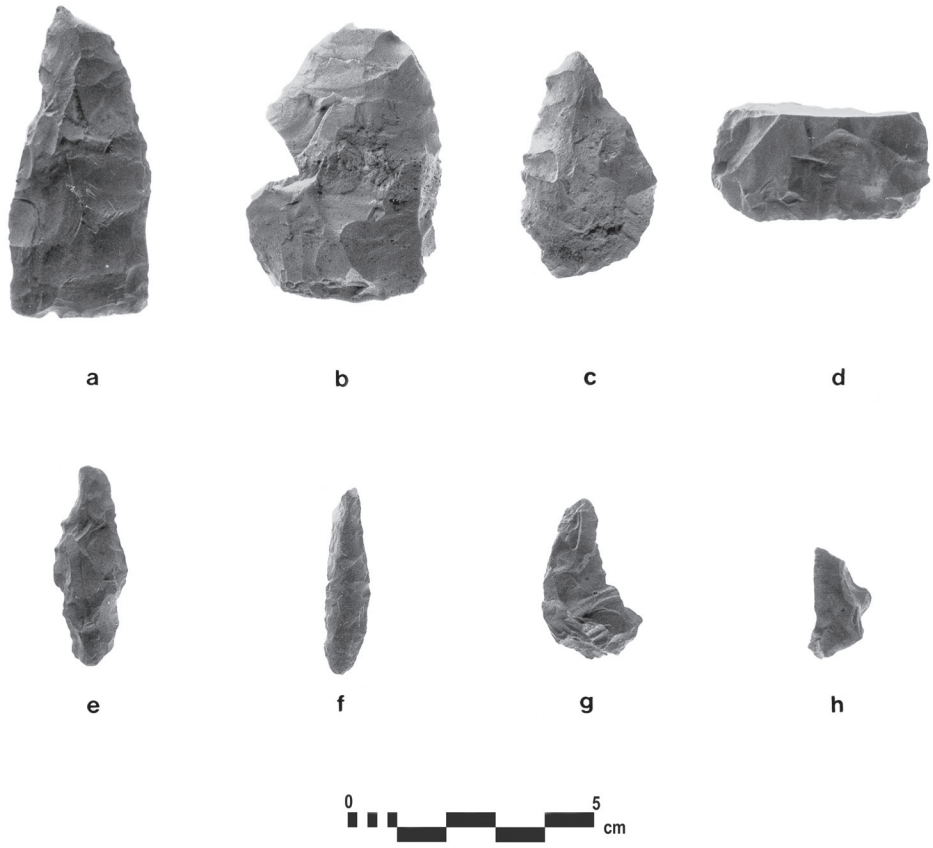


Figure 21. *Lightfoot site bifaces and drills: (a) biface preform (cat. 1127); (b) biface preform (cat. 677); (c) biface preform (cat. 34); (d) biface preform (cat. 291); (e) bifacial drill (cat. 577); (f) bifacial drill (cat. 1181); (g) drill on a bipolar core (cat. 1407); (h) drill on a biface fragment (cat. 545). Tools are all made of Onondaga chert, except (b), made of Collingwood (Fossil Hill) chert, and (c), made of Selkirk chert.*

resembles drills recovered from the Early Archaic Kassel site, a Bifurcate Base Tradition component in Waterloo Regional Municipality (Lennox 1993).

The remaining three drills were recovered in and around House 3. The other bifacial drill is somewhat cruder (Figure 21e). It features slightly concave lateral margins and a contracting stemmed base. Very heavy wear is evident at the slightly bulbous distal end. This specimen has a length, width, and thickness of 40 mm, 15 mm, and 8 mm, respectively. It was recovered from topsoil excavations to the northeast of House 3, on the fringe of Archaic Locus A.

The third drill was formed on what appears to be the shoulder fragment of a notched biface (Figure 21h). It has a length, width, and thickness of 18 mm, 16 mm, and 7 mm, respectively. Heavy wear is evident at the tip, formed by the distal end of the lateral edge of the blade fragment. This specimen was recovered from topsoil excavations in House 3, within Archaic Locus A.

The fourth drill was formed on a bipolar core of the ridge-point variety (Figure 21g). It has a

length, width, and thickness of 32 mm, 20 mm, and 10 mm, respectively. Heavy wear is evident on the point end of the core. This specimen was also recovered from topsoil excavations in House 3, in the adjacent unit to the biface fragment drill described above, within Archaic Locus A.

In summary, three of the four drills were found within a 10 m diameter area associated with House 3; the remaining specimen was found in House 5. Each of the areas producing drills corresponds to the location of both an Iroquoian house and a Middle Archaic camp or activity area. The cultural affiliation of the drills is not clear. However, the distribution of the artifacts does indicate that there was a concentration of activities involving the use of drills in the area containing House 3 and Archaic Locus A.

Bifaces. Thirty bifaces were recovered (Table 30). A sample is illustrated in Figures 21 and 22. The specimens comprise 9 preforms, 2 blanks, and 19 miscellaneous fragments. All but four of the specimens are of Onondaga chert. The exceptions are an ovate preform of Collingwood (Fossil Hill) chert (from Midden C) (Figure 21b), a preform fragment of indeterminate chert, and two miscellaneous fragments of indeterminate chert.

Table 30. *Lightfoot site bifaces.*

				Dimensions			Figure 21
Cat. No.	**Type**	**Description**	**Chert Type**	**L**	**W**	**T**	
1127	preform	sub-triangular	Onondaga	62	29	8	a
34	preform	lanceolate	Onondaga	45	27	9	c
677	preform	ovate	Collingwood	56	28	12	b
1159	blank	rectanguloid	Onondaga	40+	42	11	
47	blank	ovate	Onondaga	33+	44	10	
44	fragment	tip and mid-section	Onondaga	27+	27	5	
291	preform	rectangular	Onondaga	43	25+	10	d
913	fragment	mid-section	Onondaga			8	
31	fragment	tip and mid-section	Onondaga	18+	27	6	
460	preform	tip fragment	Onondaga	12+	18+	10+	
790	fragment	badly burned fragment	Onondaga	25+	24+	7	
1273	fragment	mid-section	Onondaga	14+	19+	5	
767	fragment	lateral edge	Onondaga	17+	12+	3+	
1110	fragment	lateral edge	Onondaga	11+	24+	3+	
1245	fragment	lateral edge	Onondaga	11+	9+	3+	
530	fragment	lateral edge	Onondaga				
1072	fragment	lateral edge	Onondaga				
215	fragment		Onondaga				
279	fragment		Onondaga				
1394	fragment		Onondaga				
1091	fragment		Onondaga				
859	fragment		Onondaga				
371	preform	lateral edge	Onondaga				
1194	preform	fragment	unidentified				
452	fragment		Onondaga				
1157	fragment	tip	unidentified				
398	fragment	tip	unidentified				
244	preform	fragment	Onondaga				
496	preform	lateral edge	unidentified				
1111	fragment	lateral edge	Onondaga				

Note: L = length; W = width; T = thickness
Dimensions are in mm.

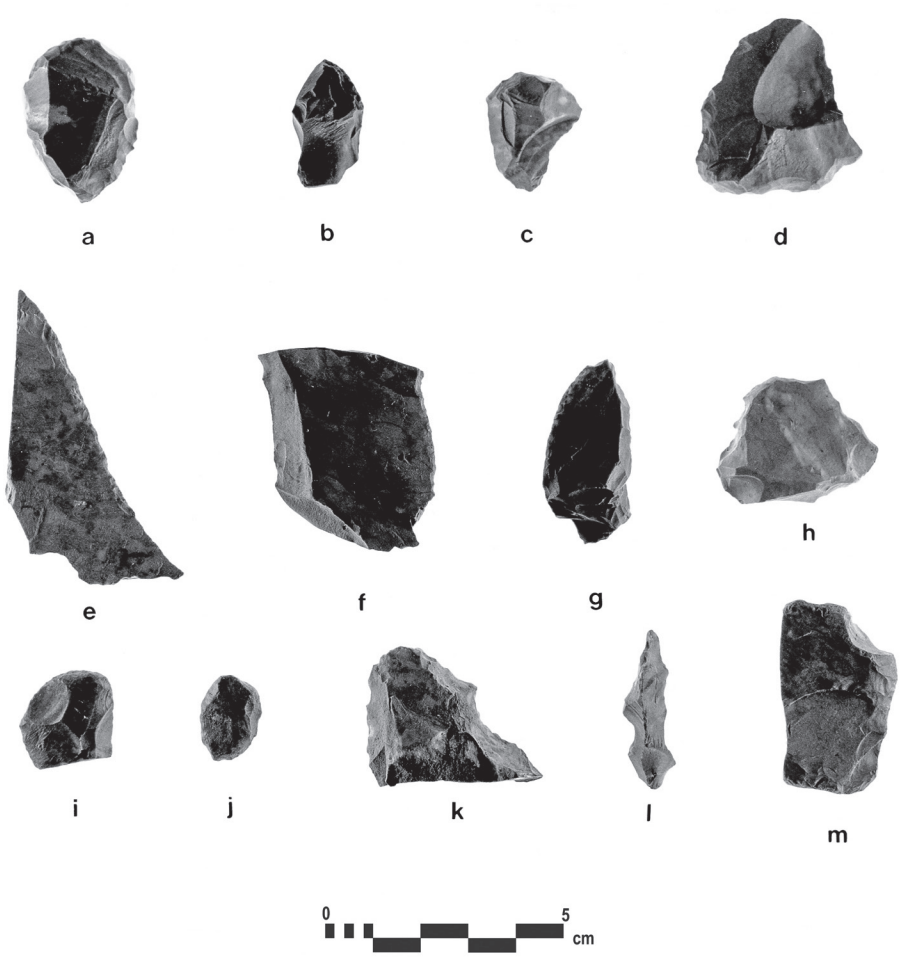


Figure 22. *Lightfoot site scrapers: (a) end scraper (cat. 594); (b) end scraper (cat. 1390); (c) end scraper (cat. 16); (d) end scraper (cat. 1175); (e) side scraper (cat. 454); (f) side scraper (cat. 361); (g) side scraper (cat. 62); (h) random flake scraper (cat. 502); (i) thumbnail scraper (cat. 821); (j) thumbnail scraper (cat. 1128); (k) spokeshave scraper (cat. 1106); (l) spokeshave scraper (cat. 364); (m) strike-a-light on a scraper (cat. 983).*

The 9 preforms comprise 4 specimens complete enough to determine form, as well as 1 tip fragment, 2 lateral edge fragments, and 2 miscellaneous fragments. The complete or nearly complete preforms include 1 subtriangular specimen, 1 lanceolate specimen, 1 rectangular specimen, and 1 ovate specimen. Of the various preforms, the tip fragment is the only finely made piece, perhaps representing the distal end of a medium- or large-sized projectile point.

One of the 2 blanks is rectangular in form while the other is ovate in form. The 19 fragments include 2 distal tips, 2 tip and midsection fragments, 6 lateral edge fragments, 2 midsections, and 7 miscellaneous fragments.

Scrapers. Fifty-six scrapers were recovered. Data on the sample are provided in Table 31, and a representative sample is illustrated in Figure 22.

Many of the scrapers are formed on primary flakes ($n = 22$) or flake fragments ($n = 20$). A

Table 31. *Lightfoot site scrapers.*

			Flake Dimensions			Retouched Edge			Utilized Edge			Figure 22
Cat. No.	**Flake Type**	**Chert Type**	**L**	**W**	**T**	**Loc.**	**Shape**	**L**	**Loc.**	**Shape**	**L**	
361	primary	Onondaga	42+	34	9	LD	CV/CC	27+				f
548	secondary	Onondaga	34+	27	3	LP	S	7+				
789	secondary	Onondaga	32	22	5	LD	CV	32				
						LD	CV	22+				
329	fragment	Onondaga	28	26	4	LD	I	22	LD	S	16+	
						DD	I	12				
						DV	S	8+				
348	primary	Onondaga	51	25	8	DD	S	27	LD	CC	26	
									LB	CV	45	
1255	secondary	Onondaga	29+	27	6	LD	S	8+	LD	I	25+	
823	secondary	Onondaga	22+	17	4	LV	S	9+				
1223	primary	Onondaga	22	23	7	LD	CV	14+				
1198	primary	Onondaga	22+	12	3	LD	CV	18				
524	fragment	Onondaga	24+	13	4	LD	CV	15+				
245	primary	Onondaga	29+	17	4	LD	CV	25				
1172a	fragment	Onondaga	26									
1149	fragment	Onondaga	15+	16	3	LD	S	8+				
1172b	fragment	Onondaga	18+	18	3	LD	S	10+	LD	S	12+	
1269	fragment	Onondaga	14	14	6	L?		7+				
1088	fragment	Onondaga	15+	14+	2	LD	S	14				
594		Onondaga	34	24	10	LD	CV	27				a
						LD	CV	24				
						DD	CV	20				
16		Onondaga	25	20	8	DD	CV	20				c
						LD	CV	19				
						LV	CV	17				
1128		Onondaga	18	13	4	LD	CV	15				j
						LD	CV	15				
62	primary	Onondaga	37	18	6	LD	CV	26	LD	S	33	g
559	fragment	Onondaga	30+	20+	3	LD	I	28+				
1192a	primary	Onondaga	30	27	10	LV	I	13+	LD	CV	16	
821	fragment	Onondaga	19+	20	5	DD	CV	15	LD	S	15+	i
									LD	CV	10	
1091	primary	Onondaga	28+	46	10	LD	CV	20+				
						PD	CV	18				
391	primary	Onondaga	38	35+	8	DV	CC	15	DD	S	15	
1192b	fragment	Onondaga	40	25+	6	LD	CV	40	LD	CC	17	
983	primary	Onondaga	39	25	12	LD	S	26				m
1175	secondary	Onondaga	39	35	9	DD	DD	35				d
						LD	?					
454	primary	Onondaga	66	34	15	LD	CV	50				e
						LD	I	34				
1106	primary	Onondaga	29	35	12	LD	CV	26				k
						LD	I	40				
459	primary	Onondaga	40	38	6	DD	I	30				

Table 31 *continued.*

			Flake Dimensions			Retouched Edge			Utilized Edge			Figure 22
Cat. No.	**Flake Type**	**Chert Type**	**L**	**W**	**T**	**Loc.**	**Shape**	**L**	**Loc.**	**Shape**	**L**	
502	primary	Onondaga	33	27	8	DD	I	27				h
						LD	I	25				
8	fragment	unidentified	28+	28+	11	LV	S	21+				
						LV	CC	13				
17	fragment	Onondaga	24	24	9	LD	I	24+				
586	primary	Onondaga	22+	20	7	LV	D	20+				
1236	primary	Onondaga	22	18	6	DD	CV	18	LD	CV	12	
1384	primary	Onondaga	28	19	18	LD	S	15	LD	I	15	
3	fragment	Onondaga	19+	26	6	DD	S	24				
1195	fragment	Onondaga	18+	27	8	DD	CV	26				
470	primary	Onondaga	34	14	9	LD	CC	17				
982	primary	Onondaga	23+	18	5	LD	CV	19				
366	primary	Onondaga	26+	20	3	LD	S	18+				
403	primary	Onondaga	18	17	5	LD	S	13				
						LD	I	14				
658	fragment	Onondaga	7+	9+	4	LV	S	13+				
477	primary	Onondaga	16+	19	5	LV	CV	15				
25	secondary	Onondaga	29+	21+	5	LD	CV	11+	LD	CC	8	
									LD	CV	14	
1390	fragment	Onondaga	27+	16+	14	DD	CV	15+				b
1192a	fragment	unidentified	32	25	8	LD	S	16				
						DD	CV	21				
1072	fragment	Onondaga										
813	fragment	Onondaga										
1192b	fragment	Onondaga										
1215	fragment	Onondaga										
1301	fragment	Onondaga										
1410	fragment	Onondaga										
564	fragment	Onondaga	33	9	8	LD	CC	CC	10			l
544	fragment	Onondaga										

Note: L = length; W = width; T = thickness; Loc. = Location; DD = distal-dorsal; LD = lateral-dorsal; PD = proximal-dorsal; DV = distal-ventral; LV = lateral-ventral; CV = convex; CC = concave; S = straight; I = irregular
Dimensions are in mm.

minority of the specimens are formed on secondary flakes ($n = 5$) or shatter ($n = 9$). Virtually all the scrapers are of Onondaga chert ($n = 54$); 2 are of an unknown chert.

The sample includes a range of scrapers of different types based on the degree of modification and the location and configuration of the scraping margin, including end scrapers, thumbnail scrapers, side scrapers, random flake scrapers. As a rule, however, the assemblage consists of largely informal categories, many of which overlap.

Scraping retouch occurred on the dorsal surface in most cases ($n = 53$) and on the ventral surface in the minority ($n = 10$). With respect to the relationship to flake orientation, retouch occurred mostly on the lateral margin or margins ($n = 45$), followed by the distal margin ($n = 16$) and the proximal margin ($n = 2$). The retouch edge locations include lateral-dorsal ($n = 38$), lateral-ventral ($n = 7$), distal-dorsal ($n = 14$), distal-ventral ($n = 2$), proximal-ventral ($n = 1$), and proximal-dorsal ($n = 1$). Within the sample, the scraping edge configurations included convex

($n = 27$), straight ($n = 17$), concave ($n = 17$), and indeterminate ($n = 11$).

Scraper length could be observed for 21 specimens, with an average of 32.9 mm and a standard deviation of 11.3. Width could be observed for 36 specimens: it averaged 23.7 mm, with a standard deviation of 7.5. Thickness could be observed for 47 specimens: it averaged 6.9 mm, with a standard deviation of 3.5.

A total of 17 of the scrapers feature utilization retouch on one or more edges in addition to deliberate retouch. The locations of use wear include lateral-dorsal ($n = 14$), lateral-bifacial ($n = 1$), lateral-ventral ($n = 1$), and distal-dorsal ($n = 1$). Sixteen of the incidences occur on the lateral edges, with a sole exception occurring on the distal edge. Of the 17 cases of use wear, 15 occur on the dorsal margin and 1 on the ventral margin; 1 was bifacial.

The attribute of edge shape was observed for the 17 scrapers which also featured utilized edges. Of these, 6 had convex edges, 6 had straight edges, 3 had concave edges, and 2 had utilized edges of indeterminate shape.

One notable scraper that features additional modification is a strike-a-light (Figure 22m). It has a length, width, and thickness of 39 mm, 25 mm, and 12 mm, respectively. This specimen is of Onondaga chert and has a single straight, bevelled scraping margin. The artifact is heavily battered at each end. It was recovered from topsoil excavations just north of House 3, on the western fringe of Archaic Locus A.

Utilized Flakes. A total of 85 utilized flakes were recovered. Pertinent data are detailed in Table 32. Onondaga chert is the material for 95% of the sample. One specimen each of Selkirk and Trent chert were also identified. The remaining two utilized flakes are of unidentified chert. It is not surprising that Onondaga chert was most frequently selected for informal tools, as it comprises 82% of all chipped lithics recovered from the site.

Most utilized flakes have use wear or use retouch on one edge only, while 24% show evidence of use on two or more edges. In most cases (68%), it is the lateral edge of the dorsal surface that displays evidence of use retouch or wear. Utilized edge length averages 15 mm ($n = 39$, $\sigma = 6.1$). Utilized edge shape varies, and most edges are either straight ($n = 41$, or 37%) or convex ($n = 36$, or 32%).

Wedges. Data on the 9 bipolar wedges are presented in Table 33. They are all of Onondaga chert and include opposing ridge, ridge-area, ridge-point, and ridge varieties (Binford and Quimby 1963).

Cores. Data on the 15 cores are presented in Table 34. Most were of the bipolar or random type, made of Onondaga chert.

The bipolar cores include ridge-area, opposing ridge, opposing point, and other varieties. Four of the 8 bipolar and all of the random cores are of Onondaga chert. One of the cores retains tabular cortex.

Chipping Detritus. Data on chipping detritus are presented in Table 35. Most of the sample is of Onondaga chert (81%), although Haldimand, Trent, Balsam Lake, and Selkirk cherts were also identified, as was Flint Ridge chalcedony. Chert type could not be determined for 16% of the sample.

Most of the Lightfoot debitage assemblage comprises flake fragments lacking platforms (64%). The remaining debitage consists of secondary flakes (25%), primary flakes (8%), shatter (2%), and scraper retouch flakes (1%). There are approximately three times as many secondary flakes as primary flakes. This suggests that biface thinning and tool resharpening were more frequently preformed at the site than was the manufacture of tools from cores.

Ground and Rough Stone

Ground and rough stone specimens comprise a very small proportion of the overall site artifact assemblage (0.3%). Most are informal tools.

Celts. Four celts were recovered, all of which were made from amphibolite. One of the specimens is a large preform (Figure 23c). It has a length, width, and thickness of 197 mm, 73 mm, and 36 mm, respectively. Modification on this specimen is present in the form of flaking, discontinuous on one face of the specimen (illustrated) and continuous on the other. The celt preform was recovered from topsoil excavations within the interior of House 5.

Table 32. *Lightfoot site utilized flakes.*

			Flake Dimensions			Utilized Edge		
Cat. No.	**Flake Type**	**Chert Type**	**L**	**W**	**T**	**Loc.**	**Shape**	**L**
700	fragment	Onondaga	14+	14	4	DD	S	11
1177	fragment	Onondaga	15+	30	5	PV	I	11
1135	secondary	Onondaga	30	32	8	LD	CC	17
624	primary	Onondaga	27	26	9	LD	S	19
553	secondary	Onondaga	37+	34	6	LD	I	32
						DD	CV	9+
38	primary	Onondaga	44	53	14	DD	S	35
						DV	CC	7
887	secondary	Onondaga	28	16	6	LV	S/CC	24
						LV	CV	23
						DD	I	8+
75	primary	Onondaga	38	15	9	LB	CV	24
						LB	CV	28
615	fragment	Onondaga	16+	25	4	DV	CV	25
919	fragment	Onondaga	25+	12	8	LD	CV	21+
434	primary	Onondaga	43	18	5	LV	S	14
						LD	S	12
						PD	CC	17
879	fragment	Onondaga	39	28	3	LD	CV	28
						LV	CV	20
						DV	S	10+
1132	primary	Onondaga	28	18	10	PV	CV	16
1122	fragment	Onondaga	30+	21+	11	LD	CV	19+
246	primary	Onondaga	30	17	7	LB	S	16
						LB	S	26
676	fragment	Onondaga	34+	32	5	LD	I	33
1361	primary	Onondaga	21	27	6	LV	S	17
1294	fragment	Onondaga	12+	26	3	LD	CV	10+
1264	secondary	Onondaga	14+	19	3	LV	I	13+
1296	secondary	Onondaga	27+	15	3	LD	S	20+
1307	fragment	Onondaga	10+	13+	2	DD	S	7+
7	secondary	Onondaga	19+	20+	3	DV	S	13+
919	secondary	Onondaga	21+	23+	4	LD	S	14+
842	secondary	Onondaga	26	17+	4	LD	CV/S	26
						LD	CC	11+
1135	fragment	Onondaga	30+	17+	4	LV	S	13+
1078	fragment	Onondaga	30+	26	3	DL	CC	20
660	primary	Onondaga	27	17	4	LD	CV	18
						DV	I	25
1284	primary	Onondaga	29	19	8	LD	S	9
1093	fragment	Onondaga	22+	15	3	DD	S	12
1397	fragment	Onondaga	16+	14	2	DD	CV	9+
1403	secondary	Onondaga	14	10	2	LD	CC	9
						DD	S	5+
1284	fragment	Onondaga	18+	27	4	LV	S	14
1164	primary	Onondaga	23	14	5	LV	S	9+
1042	fragment	Onondaga	16+	16	4	LD	CC	8
589	primary	Onondaga	22+	28	5	LV	CV	18

Table 32 *continued.*

			Flake Dimensions			Utilized Edge		
Cat. No.	**Flake Type**	**Chert Type**	**L**	**W**	**T**	**Loc.**	**Shape**	**L**
1187	primary	Onondaga	21	12	4	LD	S	19
1294	secondary	Onondaga	13+	15	3	LB	S	11+
						LB	S	11+
718	fragment	Onondaga	22+	16	6	LD	S	21+
1260	primary	Onondaga	14	21	5	LV	CV	13
1287	primary	Onondaga	30	19	9	LD	CC	18
1090	fragment	Onondaga	15+	16	3	LD	S	14+
1218	primary	Onondaga	18	22	3	DD	CC	10
1269	primary	Onondaga	25	17	6	LD	CC	15
1240	fragment	Onondaga	20+	14+	4	LD	I	12+
814	secondary	Onondaga	13	13	2	DD	CV	11+
982	primary	Onondaga	11+	16	4	LD	CV	9+
						LD	S	10+
1332	fragment	Onondaga	25+	9+	5	DD	CV	6+
9	primary	unidentified	30+	25+	9	LV	CC	20
1090	fragment	Onondaga	28+	13+	4	LD	I	28+
1141	secondary	Onondaga	13+	15+	3	LV	CV	13+
1300	secondary	Onondaga	15	12	3	LD	CV	12+
919	primary	Onondaga	13+	13	5	LV	CC	7+
1282	fragment	Onondaga	10+	15	3	LD	S	8+
1257	fragment	Onondaga	8+	13	2	DD	S	9
991	fragment	Onondaga	13+	18+	1	DD	S	13
1240	fragment	Onondaga	23	10+	4	LV	CC	18
1257	secondary	Onondaga	15	14+	3	DD	CV	13
1212	fragment	Onondaga	11+	13+	4	DD	CV	8+
1105	fragment	Onondaga	10+	19+	2	LD	CV	11+
1251	primary	Onondaga	12+	12	3	LD	CV	10+
1139	fragment	Onondaga	19+	9+	3	LD	S/CV	15+
1144	secondary	Onondaga	14	9+	2	DD	S	8
1117	fragment	Selkirk	9+	16	2	LD	CV	7+
1199	primary	Onondaga	17+	18	5	DD	S	9+
1311	fragment	Trent	11+	8+	4	LD	S	7+
314	fragment	Onondaga	13+	12	3	LD	CC	11+
1240	fragment	Onondaga	16+	14+	3	LD	S	13+
1269	secondary	Onondaga	15	9	3	DD	S	8
1257	secondary	Onondaga	10+	10+	2	LV	S	8+
1316	fragment	Onondaga	16+	7+	3	LD	S	10+
1311	secondary	Onondaga	10	16	2	DV	S	15
1184	secondary	Onondaga	10+	11	3	LD	CC	10+
1324	fragment	Onondaga	8+	8+	1	LD	S	7+
30	fragment	unidentified	25+	35	7	DD	CV	16+
						LD	CC	26+
24	fragment	Onondaga	33+	17	5	LD	CV	7
						LD	CV	12+
10	secondary	Onondaga	22	19	2	LD	CC	16
32	primary	Onondaga	20	16	4	LD	CC	8+

Table 32 *continued.*

			Flake Dimensions			Utilized Edge		
Cat. No.	**Flake Type**	**Chert Type**	**L**	**W**	**T**	**Loc.**	**Shape**	**L**
11	secondary	Onondaga	21	10	2	LV	CC/S	16
						LV	S	15
37	secondary	Onondaga	11	12	1	DD	CV	11
						LV	S	10
20	primary	Onondaga	35	21	4	LD	I	32
						LV	S	8
21	secondary	Onondaga	29+	21	4	LD	CC	13
						LV	CV	7
						LD	CC	7
48	fragment	Onondaga	19+	31	6	LD	CV	12
						LD	S	15
						DD	CV	28
46	fragment	Onondaga	18+	8	6	LD	S	16+
53	primary	Onondaga	24	22+	3	LD	CV	14
23	fragment	Onondaga	17+	20	4	DD	CV	20
						LD	I	15+
						LD	CC	8+

Note: L = length; W = width; T = thickness; Loc. = Location; DD = distal-dorsal; LD = lateral-dorsal; PD = proximal-dorsal; DV = distal-ventral; LV = lateral-ventral; CV = convex; CC = concave; S = straight; I = irregular
Dimensions are in mm.

Table 33. *Lightfoot site wedges.*

			Dimensions		
Cat. No.	**Variety**	**Chert Type**	**L**	**W**	**T**
1138	opposing ridge	Onondaga	18	13+	5
1116	opposing ridge	Onondaga	15	19	5
756	ridge-area	Onondaga	20	20	6
569	opposing ridge	Onondaga	18	21	5
659	opposing ridge	Onondaga	16	13	8
1378	ridge?	Onondaga	20+	15	7
1207	ridge-point	Onondaga	19	18	8
1353	ridge-point	Onondaga	22	18	8
380	ridge-area	Onondaga	14	15	5

Note: L = length; W = width; T = thickness
Dimensions are in mm.

The other three celts are finished specimens, two of which are complete and relatively small.

One of the complete celts is rectanguloid in planar view, with a convex bit margin and straight poll (Figure 23a). The lateral margins are slightly constricted medially, presumably to facilitate hafting. This specimen is plano-convex in cross-section. The bit is also plano-convex in cross-section, indicating that it functioned as an adze. The poll is unfinished. Modification is present in the form of grinding over all but the inner portion of the flat face. The lateral margins and the base of the poll retain evidence of earlier modification by flaking. As with the preform, this celt was recovered from topsoil excavations within the interior of House 5.

The second complete celt (Figure 23b) has a length, width, and thickness of 78 mm, 43 mm, and 23 mm, respectively. In planar view, it has a convex bit and convex lateral margins. The lateral margins constrict toward a partially finished base. Grinding is present over the entire specimen

Table 34. *Lightfoot site cores.*

				Dimensions		
Cat. No.	**Type**	**Description**	**Chert Type**	**L**	**W**	**T**
318	bipolar	opposing ridge	Haldimand	31	11+	7
1138	bipolar	opposing point	Onondaga	22	13	8
717	bipolar	ridge-area	unidentified	31	24	8
22	bipolar	area-?	Trent	47	48	21
564	bipolar	ridge-area	unidentified	52	30	14
657	bipolar	ridge-area/ridge-area	Onondaga	24	28	11
13	bipolar	fragment	Onondaga	30	21	12
1231	bipolar	fragment	Onondaga	25+	14+	12+
1162	random	tabular cortex	Onondaga	34	26	17
1410	random	no cortex	Onondaga	59	24	18
1098	random	small fragment	Onondaga			
966		fragment	Onondaga	16+	15+	11+
1154		fragment	Onondaga	20+	16+	11+
469		small fragment with nodular cortex	Trent			
51		nodular cortex	unidentified	45	38	22

Note: L = length; W = width; T = thickness
Dimensions are in mm.

Table 35. *Lightfoot site chipping detritus.*

	Flake Type					Total	
Chert Type	**Primary**	**Secondary**	**Scraper Retouch**	**Shatter**	**Flake Fragments**	**Frequency**	**%**
Onondaga	94	281	10	15	614	1,014	80.8
Haldimand	1	9	1		15	26	2.1
Flint Ridge		2			2	4	0.3
Trent					1	1	0.1
Collingwood					1	1	0.1
Balsam Lake					1	1	0.1
Selkirk		2				2	0.2
Unidentified	7	18	3	5	173	206	16.4
Total	**102**	**312**	**14**	**20**	**807**	**1,255**	**100.1**

except for part of the base. The base consists of an oblique fracture plane. The bit element is biconvex in cross-section, indicating that this artifact functioned as an axe. The nature of the modification on the poll suggests that this specimen may have been fashioned from the bit end of a larger celt that was broken in use. This specimen was recovered from Midden C.

The remaining celt fragment appears to represent a portion of the body of a larger specimen. It retains portions of one ground lateral edge and one ground face. This specimen was recovered from topsoil excavations just north of House 3.

Ground Stone Fragments. Eight ground stone fragments were recovered. These consist of fragments of larger artifacts which retain ground stone surfaces. Six of the 8 are small shards of amphibolite and probably pertain to celts. Three of these were recovered from topsoil excavations immediately north of House 3, while the other 3 were recovered from Midden C.

The remaining 2 ground stone fragments are from the same general area. Both consist of fragments of cobbles of igneous rock which retain ground surfaces. They may represent fragments of artifacts, such as manos.

Figure 23. *Lightfoot site rough and ground stone tools: (a) celt, amphibolite (cat. 1400); (b) celt, amphibolite (cat. 408); (c) celt preform, amphibolite (cat. 1386); (d) hammer–anvilstone, metamorphic (cat. 347).*

Hammerstones. Two hammerstones were recovered. One consists of an elongated siltstone cobble. It has a length, width, and thickness of 84 mm, 48 mm, and 40 mm, respectively. This specimen features discontinuous pitting around its entire circumference. It was recovered from topsoil excavations within House 5.

The second hammerstone is fragmentary. It is of amphibolite and features a single zone of pitting. It may represent a fragment of an anvilstone. It was recovered from Midden C.

Hammer–Anvilstone. One dual-function tool is a hammer–anvilstone (Figure 23d). It consists of an irregularly shaped cobble exhibiting

discontinuous zones of pitting at six different locations, including anvil pitting on flat surfaces and hammer pitting at points or ridges formed by the juncture of two or more surfaces. This specimen has a length, width, and thickness of 78 mm, 57 mm, and 54 mm, respectively. It, too, was recovered from Midden C.

Anvil–Abrader. Another dual-function tool consists of a combined anvilstone and abrader. The specimen consists of a triangular-shaped slab of siltstone with a length, width, and thickness of 175 mm, 78 mm, and 28 mm, respectively. One face, the centre of which features a zone of pitting, was ground smooth and flat. This artifact was recovered from House 2.

Abraders. Six siltstone abraders were recovered, 5 of which are fragments of larger specimens of indeterminate shape. The sixth has an elongated form, with straight lateral sides and a rectanguloid cross-section, with a length, width, and thickness of 112 mm, 40 mm, and 28 mm, respectively. It was recovered from Midden B.

Netsinker. The lone netsinker consists of a medium-sized piece of siltstone. It is roughly rectangular in plan view and cross-section and has a length, width, and thickness of 102 mm, 75 mm, and 18 mm, respectively. Modification was present in the form of shallow, bilaterally ground notches.

Miscellaneous Ground Stone. Two miscellaneous ground stone artifacts were recovered. One is made of siltstone and is rectanguloid in plan view and slightly plano-convex in cross-section, with a length, width, and thickness of 128 mm, 70 mm, and 28 mm, respectively. The ventral margin of this specimen has been slightly nibbled by discontinuous flaking. This specimen may represent the early stage in the manufacture of an artifact of unknown type. It derives from topsoil excavations exterior to House 3.

The second artifact consists of a fragment of a rounded cobble of igneous rock. It has a smooth exterior and may represent a portion of a mano. This artifact derives from topsoil excavations within House 3.

Non-chert Debitage. Two shards of amphibolite were also recovered, both of which probably represent debitage generated in the manufacture of celts. One was recovered in topsoil excavations overlying the east wall of House 5, while the other was recovered from the southern part of Midden C.

Worked Bone

Only 1 of the 403 pieces of faunal remains recovered from the site shows evidence of deliberate modification. This specimen is a mid-section of an incomplete artifact formed on a splinter of a longbone tentatively identified as a deer metapodial. The fragment retains grinding on the lateral margins. The nature of the specimen suggests that it formed part of an awl. To this, it may be added that moose is only represented in the sample by three unmodified toe bones; they may have been transported to the site with the intent that they would or could be modified.

Floral Remains

Floral remains were confined to a mere 47 specimens. While these were not analyzed, they include corn kernels and 39 pieces of wood charcoal.

Faunal Remains

Unmodified faunal remains are represented by 402 specimens. The sample excludes the bones recovered from a horse burial encountered during the excavations.

An analysis of the faunal remains from the Lightfoot site was undertaken by Rosemary Prevec (1989) and is available from the University of Toronto Mississauga's digitized collection of her faunal reports. As detailed in the analysis, fish accounted for 145 of the elements identified. The only fish identified to species was Atlantic salmon; three elements of sucker (Catostomidae) were also noted, along with salmonid vertebrae.

A wide variety of mammal species were identified among the 81 mammal elements, including snowshoe hare, chipmunk, red squirrel, grey squirrel, muskrat, beaver, racoon, porcupine, domestic dog, black bear, white-tailed deer, and moose. Identified birds were limited to grouse and blue jay.

Interpretation and Conclusions

Several factors suggest that the Lightfoot West structures were contemporary with one another,

perhaps resulting from community-wide planning. These include the relative consistency of the size and orientation of the houses and the absence of overlapping structures. Granting the comments about the lack of an obvious entrance for House 4, the general absence of evidence for rebuilding and the limited number and low density of subsurface features all suggest that the occupation of Lightfoot West was of somewhat limited duration, at least compared to certain other Early Iroquoian sites, where village and house extensions or contractions have been documented and/or where the density and overlapping nature of interior house features attest to an intensive and long-term occupation (Williamson 1990).

The single structure in Lightfoot East resembles the other houses in size and the relative emptiness of the interior features. Differences, however, were apparent in some respects. One was the orientation of House 1 (east–west), which varies markedly from the other structures on the site. A second was the absence of any interior pits or hearths. The third was the fact that the walls of House 1 seem more sinuous, with wider and more frequent gaps; this was reflected in the density of wall posts, which, at 2.4 posts per metre, was the lowest of any of the five structures on the site.

The virtual absence of cultural remains between the two areas of the site strongly suggests that the eastern and western portions of the site represent discrete occupations; their relationship remains unknown. It may be that they were contemporary and that House 1 is a special-purpose structure, such as a visitors cabin (see, e.g., Kapches 1984). It is equally possible that Lightfoot East and Lightfoot West were not contemporary and that House 1 pertains to an earlier or later presence in the area which bears no direct relationship to the other four houses. More detailed intra-site analyses, especially comparisons between Midden A and Midden C, could potentially succeed in shedding light on these questions.

Any attempts to place the site in a local developmental sequence were hampered by the fact that it was the only confirmed Early Iroquoian site in the entire Credit River drainage system. The site is situated at the southern end of an extensive pocket of Fox sandy loam; it extends along the west side of the Credit River Valley, from Meadowvale northwest to Huttonville and Norval. This is the kind of light soil preferred by Early Iroquoian agriculturalists, and it is possible that the site was but one village in an as-yet-unidentified local sequence. Detailed archaeological surveys in the area have so far been limited to the southern extremity of this small sand plain, in the area south of Steeles Avenue. If the hypothesis of an Early Iroquoian population sequence in the Upper Credit is correct, it may be expected that additional Early Iroquoian sites will be discovered as more survey is conducted to the northwest.

More detailed comparisons would be required to fully explore the nature and significance of the Lightfoot occupation and its relationship to other Early Iroquoian manifestations in Ontario. The material culture and settlement patterns together suggest a twelfth- to thirteenth-century occupation of the site, although radiocarbon dates would be necessary to further refine this estimate.

Acknowledgements. The archaeological investigations within the proposed Meadow Ridge East subdivision spanned a period of almost a decade, from the inception of the field work, in 1987, to the completion of the final report, in 1996. As with any major endeavour, this project could not have been accomplished without the cooperation and assistance of several individuals and agencies. Mark D. Borland, Christine F. Dodd, and David G. Smith helped with the preparation of the report on this site and helped author sections of the report. Rosemary Prevec completed the faunal analysis (Prevec 1989); her report has been summarized here. Jeff Bursey kindly assisted David Smith in the coding of the Lightfoot site rim sherds.

I also thank Ron Williamson for his editorial assistance in the preparation of this From Grey to Print manuscript, Andrea Carnevale and John Howarth for their digital assistance in the enhancement of original figures and plates, and Andrew Stewart for his preparation of a new Figure 1. In addition, Heather Hatch, Collections Manager of the Ontario Museum of Archaeology,

kindly provided information on materials the late Ilsa Kramer had collected from the Lightfoot site, which are now housed with that institution as part of the Kramer collection.

Most notable among those who rendered material assistance to the study are Markborough Properties Inc. and its personnel. I would like to thank Rupen K. Tokmak, Director of Operations, Ontario Land Development Division; Dennis R. Flood, M.C.I.P General Manager, Mississauga Properties; and A. Dwight Lawrence, Director of Engineering and Construction, Markborough Properties Inc. Without their patience and continuing support, this study could never have been completed.

Note. The author sought permission from the descendant community to publish the photos of the smoking pipes. The Huron-Wendat Nation, via Louis Lesage, Directeur du Bureau du Nionwentsïo, was contacted about reproducing certain of the images in this article. Louis Lesage responded that he confirms that the Huron-Wendat agree to publication of the photos of the smoking pipes. The OAS is continuously working with descendant Indigenous communities and individuals to learn which items (particularly sacred items) are appropriate to publish in *Ontario Archaeology.* We welcome feedback on those ideas.

References Cited

Binford, Louis, and George Quimby
1963 Indian Sites and Chipped Stone Materials in the North Lake Michigan Area. *Fieldiana: Anthropology*, 36:277–307.

D. R. Poulton & Associates Inc.
1996 *The 1987–1989 Archaeological Investigations of the Meadow Ridge East Subdivision, Draft Plan 21T-91020, City of Mississauga, Ontario.* On file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

Ellis, Chris J., Ian T. Kenyon, and Michael W. Spence
1990 The Archaic. In *The Archaeology of Southern Ontario to A.D. 1650*, edited by Christopher J. Ellis and Neal Ferris, pp. 65–124. Occasional Publication No. 5. London Chapter, Ontario Archaeological Society, London.

Justice, Noel D.
1987 *Stone Age Spears and Arrow Points of the Midcontinental and Eastern United States*. Indiana Press, Bloomington.

Kapches, Mima
1984 Cabins in Ontario Iroquois Sites. *North American Archaeologist* 3(1):63–71.

Konrad, Victor A.
1973 *The Archaeological Resources of the Metropolitan Toronto Planning Area: Inventory and Prospect*. Discussion Paper No. 10. York University, Department of Geography, Toronto.

Lennox, Paul A.
1993 The Kassel and Blue Dart Sites: Two Components of the Early Archaic Bifurcate Base Projectile Point Tradition, Waterloo County, Ontario. *Ontario Archaeology* 56:1–32.

MacNeish, Richard S.
1952 *Iroquois Pottery Types: A Technique for the Study of Iroquois Prehistory*. Bulletin No. 124. Anthropological Series No. 31. National Museum of Canada, Ottawa.

Mayer, Poulton and Associates Incorporated (MPA)
1991 *Report on the 1985–1986 Mitigative Excavations of the River and Pengilley Sites, City of Brampton, Ontario.* On file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.

Mayer, Pihl, Poulton and Associates Incorporated (MPP)
1985 *An Archaeological Resource Assessment of the Proposed Parkway Belt West Pipeline in Halton, Peel and York Regional Municipalities, Ontario.* On file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.
1986a *Report on the 1985 Mitigative Excavations of Three Archaeological Sites on the Parkway Belt West Pipeline.* On file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.
1986b *An Interim Report on the 1986 Mitigative Excavations of the Pengilley and River Sites, City of Brampton, Ontario.* On file at the Ontario Ministry of Tourism, Culture and Sport, Toronto.
Prevec, Rosemary
1989 *The Lightfoot Site AjGw-5 Faunal Report.* On file at the University of Toronto Mississauga, Mississauga, Ontario.
Ritchie, William A.
1969 *The Archaeology of New York State.* Rev. ed. Natural History Press, Garden City, New York.
Williamson, Ronald F.
1990 The Early Iroquoian Period of Southern Ontario. In *The Archaeology of Southern Ontario to A.D. 1650*, edited by Christopher J. Ellis and Neal Ferris, pp. 291–320. Occasional Publication No. 5. London Chapter, Ontario Archaeological Society, London.
Wright, James V.
1962 A Distribution Study of Some Archaic Traits in Southern Ontario. In *Contributions to Anthropology 1960, Part I*, pp. 124–172. Bulletin No. 180. Anthropological Series No. 57. National Museum of Canada, Ottawa.
1966 *The Ontario Iroquois Tradition.* Bulletin 210. National Museum of Canada, Ottawa.

Le site de Lightfoot a fait l'objet d'essais et d'excavations de sauvetage en 1988-1989 dans le cadre d'une évaluation de lotissement à Mississauga, en Ontario. Bien que plusieurs composantes du site aient été détectées, la principale était un village iroquoien (vers 1100-1200 de notre ère) non palisé composé de cinq maisons et de dépôts de déchets associés. Quatre des maisons étaient regroupées dans une zone centrale qui contenait également un important gisement de midden; une cinquième maison et un petit midden associé se trouvaient à 60 m à l'est. La relation entre les deux zones d'occupation est inconnue.

Dana R. Poulton
D. R. Poulton & Associates Inc.
69 Langarth Street W.
London, Ontario N6J 1P5
Canada
drpoulton@rogers.com

Book Review

Bones at a Crossroads: Integrating Worked Bone Research with Archaeometry and Social Zooarchaeology

(edited by Markus Wild, Beverly A. Thurber, Stephen Rhodes, and Christian Gates St-Pierre)

Bones at a Crossroads: Integrating Worked Bone Research with Archaeometry and Social Zooarchaeology, edited by Markus Wild, Beverly A. Thurber, Stephen Rhodes, and Christian Gates St-Pierre. 317 pages, 92 figures (44 b&w + 48 colour), 35 tables. 2021. Sidestone Press, Leiden. ISBN: 978-94-6427-006-8 (softcover), €45.00; ISBN: 978-94-6427-007-5 (hardcover), €145.00; ISBN: 978-94-6427-008-2 (PDF e-book), free. Digital access: https://www.sidestone.com/books/bones-at-a-crossroads (free).

Bones at a Crossroads stems from the 13th meeting of the International Council for Archaeozoology (ICAZ) Worked Bone Research Group (WBRG), hosted in October 2019 at the Université de Montréal. This volume represents partial proceedings from the meeting, including chapters based on 14 of the 48 communications presented at the conference. As noted by the editors in the Introduction to the volume (Gates St-Pierre et al.), both the conference and this volume aim to promote an approach that is increasingly integrative, combining multiple methodologies and diverse perspectives. The subtitle of the volume also highlights a focus on social zooarchaeology, explicitly considering the social dimensions of the groups under study rather than just the biological or technological aspects of osseous objects themselves. Both these foci are clear in the majority of the chapters included in the volume. In keeping with the nature of ICAZ more broadly, the meeting also aimed to take a global perspective, including participants from around the world, and this volume encompasses a wide geographic representation, although certainly not all global regions are represented.

The editors and authors are to be commended for producing a beautiful, well-structured volume full of fascinating case studies in the analysis and interpretation of worked bone research. Given the prevalence of worked bone in the Ontario archaeological context, particularly in the Late Woodland period, Ontario archaeologists should find numerous sources of inspiration here to stimulate further research with Ontario worked bone collections. Beyond the content, the production quality of the softcover version of the book that I was sent for review was very high, with almost 50 full-colour images and more than 40 additional greyscale images, which greatly added to the overall appeal of the volume. The image quality is exceptional, which is a huge benefit in a subject that is inherently tied to subtleties in the shape, colour, and manufacturing traces of osseous artifacts. While I highly recommend a physical copy of the volume for those with a strong interest in worked bone research, the beauty of the Sidestone

Press approach to publishing is that the volume is completely open access and is available to read freely online, making this work broadly accessible.

So, what does this volume have to offer to those with an interest in Ontario archaeology? Geographically, the volume is diverse. Central and South America are particularly well represented (Buc et al., Argentina; Freiwald et al., Guatemala; Gilson and Lessa, Brazil; Klokler, Brazil; Martínez-Polanco et al., Panama; Rojas, Chile), while several chapters consider research in Europe (Březinová and Hrnčiarik, Slovakia; Vitezović, Serbia) and Asia (Richardson et al., Israel; Shankar et al., India; Vinayak, India). The remaining three chapters consider North American contexts, and while none explicitly address material from Ontario, all three will likely be of some interest to Ontario archaeologists. To our immediate north, Siebrecht and colleagues examine Dorset bone needles and harpoon heads from three sites in the Foxe Basin region of arctic Canada that span the Early/Middle to Late Dorset periods. In contrast to previous suggestions that Dorset toolkits reflect a high degree of standardization across much of arctic Canada and Greenland, the authors demonstrate that, while these artifacts are superficially similar, they were made and used in very different ways across these three sites. To the south, Waselkov and colleagues examine a bone tool assemblage from a Late Woodland–period (c. 700–1000 cal CE) site located on the coast of Alabama. Broad similarities in environment and cultural adaptations across the Eastern Woodlands, as well as a heavy emphasis on white-tailed deer (*Odocoileus virginianus*) elements for bone tool manufacture, make this chapter of particular comparative interest for those working in Ontario. Perhaps the most directly relevant chapter, from a cultural and geographic perspective, is that by Boisvert, St-Germain, and Gates St-Pierre. Building on their previous work, much of which is likely familiar to readers of *Ontario Archaeology*, Boisvert and colleagues draw on their extensive, ongoing analysis of the faunal and worked bone assemblages from the McDonald, Droulers (now referred to as Droulers-Tsiionhiakwatha [see https://www.sitedroulers.ca/site-en/]), and Mailhot-Curran sites, Late Woodland–period St. Lawrence Iroquoian occupations within the St. Anicet Cluster of southern Quebec that likely represent a single community occupation sequence dating from the mid-fourteenth to mid-sixteenth centuries CE.

One common theme in the chapters by Waselkov and colleagues and Boisvert and colleagues is an emphasis on white-tailed deer as a source of preferred elements for the manufacture of worked bone tools. Given the pan-American distribution of this species, it is perhaps not surprising that several of the Latin American chapters also emphasize the importance of white-tailed deer, among other deer species. As white-tailed deer hold similar importance as a raw material for bone tool manufacture in the Ontario context, these chapters will be of considerable comparative interest. Buc and colleagues, for example, consider the use of deer antler as a raw material among hunter-gatherer groups across the Argentinian Pampas. In addition to their specific case study, the authors provide an overview of deer and antler that is much more widely relevant. Similarly, Martínez-Polanco and colleagues provide a broad consideration of basic aspects of the zooarchaeology of deer (and other taxa), including a detailed analysis of worked white-tailed deer remains from a 500–700 CE workshop feature at an extensive village site in Panama. Other deer-focused contributions are Freiwald and colleagues' consideration of Mayan production of needles from white-tailed deer, in Guatemala, and Březinová and Hrnčiarik's examination of a red and roe deer antler workshop dating from the late second to early fourth centuries CE, in Slovakia.

Another way in which this volume may be relevant for the Ontario context is as a source of case studies of the application of diverse and often cutting-edge methodologies that could be very productively applied to Ontario assemblages. Several of the chapters, for example, highlight the importance of an integrated analysis of both worked and unworked faunal remains as part of a cohesive analytical and interpretive process. Boisvert and colleagues advocate strongly for such an approach and outline a systematic methodology for integrating the work of both bone tool specialists and faunal specialists, arguing that such an integrative approach gives a more nuanced interpretation of

technology, subsistence, and related social aspects. In a consideration of an assemblage from a shell midden site in Brazil, Klokler notes that modified archaeofauna in the region is broadly under-studied, in part due to a typical separation of worked and unworked fauna in the assemblages. Similarly, Richardson and colleagues present a study of an assemblage from an Early Bronze Age domestic building in Israel, in which all bone tools were analyzed along with the larger faunal assemblage. This is, they note, unusual, as typically bone tools are treated separately and "whisked off to museums," often without being seen or interpreted by zooarchaeologists. Such approaches can lead to misinterpretations and biased analyses of only the more complete examples of worked bone artifacts. As Boisvert and colleagues demonstrate, a more complete, integrated analysis of both worked bone and unworked fauna can greatly increase the identification of examples of worked bone, particularly examples of preforms and production waste (cf. Klokler). Such an integrated approach to the analysis of faunal items can also help to untangle the complexity of understanding whether animals were targeted for food, for raw materials, or for both (e.g., Shankar et al.; Waselkov et al.). Given that the norm in Ontario has typically been for worked bone to be analyzed separately from the unworked fauna, there is much that we might learn from the more integrated approaches exemplified by these various chapters.

Experimental archaeology is also well represented in several of the chapters in this volume, an approach that can be of critical importance in interpreting manufacturing processes and function of worked bone items and an approach to technology that has also been largely lacking in Ontario. Shankar and colleagues employ an experimental approach to recreate bone points and arrowheads from a site in India dated between roughly 2300 and 600 BCE. In this case, the aim was to better understand the "choices and procedural details" that went into the manufacture of these artifacts. Similarly, Waselkov and colleagues used an experimental approach to understand the reduction technique and manufacturing process used to make deer metapodial tools in coastal Alabama. Rojas uses bone tools as indirect indicators for textile working in the Early Ceramic (c. 400–1000/1100 CE) and Late Ceramic (c. 1000/1100–1550 CE) periods in Chile, by comparing the morphologies and use-wear traces on archaeological bone tools with those of experimental bone tools used for sewing and weaving. Gilson and Lessa's experimental approach to understanding how shark teeth were extracted for use in subsequent tool manufacture demonstrates that heating of shark jaws greatly eases the removal of teeth. While shark teeth are common in coastal archaeological sites globally, and certainly in the Brazilian shell mounds that these authors are considering, it is difficult to find a direct relevance for this chapter in the Ontario context. Regardless, this is an interesting contribution; who isn't fascinated by sharks?

Various other methodological approaches explored in the volume may also serve as useful examples for future worked bone research in the Ontario context. Typologies of worked bone items, while far from new, remain a useful means of understanding and interpreting variability in artifact assemblages. Vinayak, for example, provides a detailed, well-defined typology for categorizing and describing osseous arrowheads from Iron Age sites in the Upper Ganga Plains of India that may well be applicable to such items from other areas. Vitezović considers the range of types of osseous items recovered from burial contexts from the Bronze Age Maros culture necropolis at Ostojićevo, in northern Serbia, providing insight into social relations and symbolic worldviews. Numerous chapters also systematically consider production sequences or the *chaîne opératoire* of the manufacture of various worked bone tool types (Březinová and Hrnčiarik; Freiwald et al.; Martínez-Polanco et al.; Siebrecht et al.; Waselkov et al.). Several examples, often those closely integrated with the experimental approaches outlined above, employ various forms of microscopy to aid in the classification and analysis of manufacturing and use-wear traces (Freiwald et al.; Rojas; Siebrecht et al.) or to distinguish between natural and anthropogenic modifications (Buc et al.). Richardson and colleagues use ArcGIS to analyze bone tool distributions within a single stratum of the Early Bronze Age III house that forms the focus

of their chapter, with the integration of spatial and architectural data providing a broader understanding of behaviour and activities in domestic spaces. Waselkov and colleagues, in their consideration of deer metapodial tools from the coastal plain of the northern Gulf of Mexico, employ isotopic analysis to distinguish between deer obtained locally and those obtained via exchange from farther afield and also employ gas chromatography mass spectrometry to explore whether bitumen is present as a hafting agent within sockets of bone points. All of these approaches and methods may be productively applied to Ontario collections in the future, building on the examples outlined in this volume. I would particularly emphasize that these approaches, along with numerous others, may be very usefully applied to reanalyses of the vast existing collections held by diverse institutions in Ontario (see the paper by Orchard, Dunlop, and Hatch in this volume of *Ontario Archaeology*), a point that is similarly emphasized by Klokler in the volume being reviewed here.

The final major theme that I will highlight, and another approach from which Ontario archaeologists might draw inspiration, is in the application of social zooarchaeology, or an interpretation of the social dimensions of the worked bone assemblages under consideration. As noted above, this was an explicit focus of both the WBRG meeting and of this volume (Introduction; Gates St-Pierre et al.) and is addressed to some extent by almost all of the chapters in the volume. Several of the chapters, for example, examine assemblages that appear to reflect specialized bone tool production workshops and consider the social and interactional implications of such focused, and possibly specialist, production (Březinová and Hrnčiarik; Freiwald et al.; Martínez-Polanco et al.). Vitezović, in a Serbian context, and Klokler, in a Brazilian context, both explore aspects of the symbolic and socio-economic variations of items associated with funerary contexts. And perhaps one of the most well-developed and interesting examples comes from Rojas's consideration of bone tools as indirect indicators of textile production during the Ceramic period on Mocha Island, in Chile. Given the social and economic importance placed on textiles in historic and contemporary times, even indirect evidence for wool processing and use has important social implications for the inhabitants of the island.

There were very few areas of this volume where I would have liked to see slightly more attention or content. The chapters are highly diverse, which may suggest a lack of clear focus throughout, although all are tied to the common theme of worked bone, and almost all of the chapters do an excellent job of considering social aspects of bone tool technology. Despite a broad geographic representation, several major global regions are not represented, including East Asia, Western Europe, and Africa, although, as the editors note in the introduction, papers on those regions were presented at the WBRG meeting, and no single volume could ever reasonably cover all aspects, geographic and otherwise, of the archaeology of bone tools. Several of the chapters, although certainly not all, reflect somewhat preliminary, incomplete studies and analyses, but such is neither surprising nor overly concerning in a conference proceedings volume. These are all very minor concerns, at worst. While there is no direct Ontario content in the volume, there is plenty here of interest and relevance for Ontario archaeologists, and many of the chapters in this volume may well stimulate new research directions for those working in the province. And while the volume may be geographically and methodologically diverse, I thoroughly enjoyed reading it all. All of the chapters had something to teach me, all were well written, and all were edited and produced in such a way as to create a high-quality, informative, and highly enjoyable final product. As a whole, this is an excellent, well-produced volume that should be well received by anyone with an interest in the archaeology of bone tools, the diversity of methods and approaches for analyzing and interpreting bone tool assemblages, and the social dimensions of the manufacture and use of bone tools in the past.

Trevor J. Orchard
University of Toronto Mississauga
3359 Mississauga Road
Mississauga, Ontario L5L 1C6
Canada
trevor.orchard@utoronto.ca

Book Review

Origins of the Iroquois League: Narratives, Symbols, and Archaeology

(by Anthony Wonderley and Martha L. Sempowski)

Origins of the Iroquois League: Narratives, Symbols, and Archaeology, by Anthony Wonderley and Martha L. Sempowski. xiv + 221 pages, 15 figures, bibliographic references, 5 maps, 7 tables. 2019. Syracuse University Press, Syracuse, New York. $75.00US (hardcover), $29.95US (paper and e-book). ISBN: 978-0-8156-3660-1; ISBN (paper) 978-0-8156-3667-0; ISBN (e-book) 978-0-8156-5492-6.

Ontario archaeologists who study the Late Woodland period in Ontario have, no doubt, contemplated the foundations, evolving structures, and internal workings of the Huron-Wendat, Tionontaté, and Neutral confederacies. While not much is known about the latter two, the Huron-Wendat informed early Europeans about their early political history, noting that the Attignawantan (Bear) and Attigneenongnahac (Cord) allied in the mid-fifteenth century in Wendake, while the Arendarhonon (Rock) and Tahontaenrat (Deer) nations joined in the late sixteenth and early seventeenth centuries, respectively.

I suspect, however, that most archaeologists who study the period have found the various oral traditions of the origin of the Iroquois (Haudenosaunee) Confederacy (League) both complex and, at times, contradictory—that is certainly true for me. There are also various archaeological narratives, both past ones and those presented in this volume, concerning the signals that can be found in material culture, settlement patterns, mortuary ceremonies, and even the sky world (i.e., a solar eclipse) to help date the founding of the League.

This volume provides a roadmap on how to approach those complex oral traditions and illuminates the latest archaeological evidence of village coalescence, village clustering, and tribal formation for the various Haudenosaunee nations (with the exception of the Cayuga). The authors employ, in their own words, "mythic narratives" as well as archaeological evidence from the eastern and western ends of the territory that they believe helps explain the origins and process of League formation.

The importance of the League is not in question, as it has for two centuries dominated the experiences of inter-Indigenous and Indigenous–colonizer interactions in the Great Lakes region. As outlined in the volume, the earliest documentary record appears to be in 1635, when Dutchman Harmen Meyndertsz van den Bogaert was told that the Five Nations (Seneca, Cayuga, Oneida, Onondaga, and Mohawk) were the "Iroquois League." The first reference to the League as one cabin or one house since time immemorial was in a Jesuit relation, in 1654. The authors point out that this description of the League was meant to impress, but the documentary record is clear that in the first half of the seventeenth century, the constituent nations acted independently at times. While the League is often described as

having been adjourned in 1777 because of the American Revolutionary War, two League councils later reconvened, one in New York and the other in Ontario, both of which remain vital today.

The volume begins with Anthony Wonderley asking a key question: to what extent is the Deganawida myth, which explains League origins, reflected in the archaeological record? He argues that the myth needs to be contextualized in great detail in historical, comparative, and socially functional terms in order to use the epic. He notes that details of the formation of the League are not commented on until 1743—after a century and a half of comprehensive European observation of Haudenosaunee life. In reviewing all of the historical accounts, he notes that the Deganawida myth is a series of many different versions, some contradictory, and argues that perhaps the oldest version, the 1743 account by Moravian missionary John Christopher Pyrlaeus, should be seen as the most reliable. According to Wonderley, there is thereafter a 60-year tradition, up to and including the account of Joseph Brant in 1801, during which Mohawk accounts dominate. In these versions, it is the Mohawk who founded the League and who are the eldest, with the highest rank. In 1816, John Norton fuses together the earlier Mohawk story with that of the Onondaga as firekeepers and introduces new mythic elements, all of which are embellished in the Victorian era. Until the contextualization of these accounts in this volume, I had not realized, for example, that the virgin birth of Deganawida near the Bay of Quinte and his journey across Lake Ontario in a stone canoe appear for the first time in the 1900 version as told by John Arthur Gibson at Six Nations Reserve. I also had not realized that all of the versions between 1743 and the 1940s fail to mention a solar eclipse related to League formation; the authors, consequently, dismiss an eclipse as being a reliable indicator of the time of its founding.

It was Henry Morgan (1962[1851]), in the mid-nineteenth century, who laid out the basic structure of the League, in that the individuals who were "headmen" originally were the ancestors of all successive headmen. He explained that the main communicative device was strings of wampum with records "talked into them," all based on the principles of family relationships, as embodied in the longhouse, binding them together in an indissoluble brotherhood. The nations were said to be divided into two units (moieties) of Mohawks, Onondagas, and Seneca (the fathers) and the Oneida, Cayugas and, later, Tuscaroras, brothers to each other but children to the first three. The glue holding all this together was the matrilineal clans that facilitated intertribal linkages. Also crucial was the internal ritual, especially the raising up of new leaders thereby resuscitating the deceased. This roll call of the chiefs, or founders, has come down many generations to the present. It was Gibson and Seth Newhouse who, living at Six Nations at the turn of the twentieth century, provided detailed instructions on how to operate the League handed down by Deganawida.

In one of their chapters, the authors explore in more detail the longhouse as the primary symbolic metaphor of the Haudenosaunee, noting that William Fenton (e.g., 1998) described the League as a longhouse across central New York accommodating five family fires with two moieties. The work of Fenton is considered by the authors (and most others) as formative and highly influential. Fenton asserted that the rites and ceremonial structures of the Haudenosaunee were the bedrock of Haudenosaunee culture, in which clues to the League's origin might be found. They note that he used the documentary record to look for the origins of the League in the elements of League ceremony. Fenton concluded that while the Deganawida myth originated in the mid-eighteenth century, the League's formation was a gradual affair occurring over a century between the mid-fifteenth and mid-sixteenth centuries.

The authors also note that the longhouse metaphor helped integrate large social units that were forming as a result of gradual coalescence and eventual affiliation in the League. The familial metaphor evoked kin-like relationships, gift-giving, and wider acts of condolences coincident with the appearance of and demand for exotic goods. They note that mortuary ceremonialism increased with village size and became a socially

integrative mechanism linked to the longhouse metaphor. This led to tribal alliance and eventually membership in the League. The lesson is that as social complexity grew, so too did ceremonialism and the nature and frequency of social obligations.

The other important thread in the volume is the authors' thoughts concerning the archaeological evidence of the processes that led first to village growth and clustering, tribal formation and alliances, and eventually to the founding of the League. The process in New York was similar to that of the coalescence of small villages into larger ones in Ontario for the ancestral Huron-Wendat Draper (AlGt-2) and Parsons (AkGv-8) sites, for example (Birch 2012), but with pairs of villages and clustering of several villages occurring instead. Dean Snow (1994) had already argued that by the early sixteenth century, large, fortified Mohawk villages with earthworks and palisades appeared, and as villages clustered, some sense of political and linguistic unity must have emerged. The same was argued by Pratt (1976) for the Oneida with the development of well-defended enormous villages with lots of scattered and altered human bone.

In particular, Wonderley argues that there was an early pre-League alliance among the eastern Haudenosaunee, based on the evidence of shared use of distinctive effigy pipes—figure-in-arch, figure-in-crescent, and Dougherty—all featuring themes of emergence from the earth and the story of the snake that swallowed a village. Wonderley believes these symbolically charged items linked Mohawk, Oneida, Onondaga, and Jefferson County communities together with a common origin myth. He assumes that this resulted from engagement in presumably male diplomatic settings fostering notions of kinship and relatedness. This is all posited to have occurred in pre-Columbian times and to reflect the very earliest steps in League formation.

Martha Sempowski, in a separate chapter, notes that in the western Seneca region, two distinctive forms of human effigy smoking pipe—head-bowl and body-bowl—were also linked to emergence themes and also illustrated myths of tribal origin specific to their homeland. This linking of communities in the west later spread as a result of diplomacy, all of it occurring later than in the east, maybe in the early to mid-sixteenth century, preceded by a half century of violence. Concomitant with these developments was intensification of mortuary ritual, with the first inclusion of grave goods, especially marine shell and other exotic artifacts, which are linked to Seneca oral tradition about common origins, identity, and affiliation. As Wonderley argued for the east, Sempowski believes the catalyst for these developments was chronic warfare in the late fifteenth through early sixteenth centuries in the form of blood vengeance. She argues that the advantage afforded to larger groups led to the need for alliances among smaller groups. The appearance of Mohawk pipes in the Seneca region and their heightened use in the early 1600s perhaps signals Seneca entry into the expanding League, the nations having developed identities as nations in the previous generation.

In a chapter devoted to the role of warfare in uniting the Five Nations, the authors channel the work of earlier scholars, such as Dean Snow (1994), William Fenton (1998), and James Bradley (1987, see also 2020). They further develop their notions around heightened violence, thought to be an endemic aspect of Iroquoian life, as a catalyst to forming alliances, noting that eastern Haudenosaunee groups were at war with St. Lawrence Iroquoians (SLI) in the early to mid-sixteenth century, although they eventually developed a peaceful relationship through diplomacy. They argue that the evidence for this local violence is SLI-style ceramics on eastern sites of this period. They consider these early contemporaneous communities to have been rivals who "challenged" each other into forming nations, but in the context of a set of alliances leading to the League. They also point to a notion of "contentious confederacies," in which tribes in alliance extend their hostility outward rather than among their alliance members.

The timing and directions of this hostility are crucial. In Ontario, warfare seems to have similarly intensified in the early to mid-sixteenth century, as demonstrated by exceptional quantities of scattered, butchered human bone and artifacts

made of human bone on ancestral Wendat sites (e.g., Parsons [AkGv-8], Keffer [AkGv-14], Damiani [AlGv-231], Draper [AlGt-2], Lite [BbGi-1]) as well as western SLI sites of that period (e.g., Roebuck [BeFv-4], Glenbrook [BgFp-5], Salem [BgFp-4]). These phenomena are undoubtedly linked with warfare (Jamieson 1983, 2016; Jenkins 2016; Lesage and Williamson 2020; Williamson 2007; Williamson 2023; see Birch and colleagues [Birch et al. 2021; Manning et al. 2018] for the revised chronological placement to this period of the Wendat sites they examined). The remains from Lite suggest that hostilities began in the late fifteenth century and are coincident with remains reported from the mid- to late fifteenth-century St. Lawrence site (NYSM 3499) in Jefferson County (Abel 2019). The authors explore further the notion that the Jefferson County communities were assimilated by the Onondaga in the early sixteenth century.

Interaction between SLI in Jefferson County and ancestral Wendat along the north shore of Lake Ontario, however, started even earlier, in the mid-fifteenth century, as evidenced by substantial assemblages of steatite beads, which were quarried from Jefferson County, that have been found at the Hidden Springs site (AlGu-368), in the Don drainage, and the Joseph Picard (AlGs-376) and Yatsihsta (AlGs-452) sites, in the Lynde Creek drainage, on the north shore of Lake Ontario (Jones et al. 2018). The initial appearance of Haudenosaunee ceramics in the first half of the sixteenth century on many ancestral Wendat sites along the north shore of Lake Ontario (Trigger 1976:158–162; Williamson and Ramsden 2019) supports the notion that violence more broadly and community coalescence in Ontario specifically occurred in response to hostilities with the Haudenosaunee. Within a few decades, Oneida and Onondaga castellation effigies appear at the Jean-Baptiste Lainé (formerly known as Mantle) (AlGt-334) site (Birch and Williamson 2013), although the frequencies of scattered human bone and human bone artifacts on sites had diminished considerably by the late 1500s. It is interesting to note that Wonderley and Sempowski comment that late sixteenth-century Haudenosaunee villages also have decreased signs of hostility.

They also note that marine shell and European items, along with many more beaver remains, occur during the second quarter of the sixteenth century and suggest that the European fur trade became a dominant motivating factor for Haudenosaunee outward aggression, while new ritual practices were designed to dampen internal hostility among the allied nations. They further argue that mutual gift-giving becomes an important element of maintaining and navigating relationships within the League.

This shift to an alliance of tribal nations and, eventually, League formation and the dampening of internal hostility while turning hostility outwards followed by economic expansion on the part of the confederacy is a pattern documented across the world (Birch 2022). In the cases Jennifer Birch discusses in a global survey of the formation of confederacies, the most common strategic aim of confederation was organization for joint military action. In some cases, this was due to aggressive or expansive neighbours, while in others, forming a joint military alliance served to reduce conflict between members of the confederacy. She further notes that the second most common strategic objective was furthering economic gain, noting that some confederacies formed in order to facilitate trade and exchange by lowering transaction costs among members, thus providing an institutional framework that supported trade, exchange, and markets among its constituent parts. In some cases, both military and economic objectives were achieved, either intentionally or as a consequence of one or the other. Once the League had formed, the Five Nations were allied, especially the Mohawk and Seneca, in their attempts to remove all competition in southern Ontario, both Iroquoian and Algonquian (Trigger 1976:725–729).

In summary, Wonderley and Sempowski present a fascinating story of multiple, evolving versions of the Deganawida epic, all representing a parable of achieving alliance to avoid endemic warfare and the use of integrative mechanisms like condolence ceremonies and gift-giving to dampen those internal hostilities. Shell beads known as wampum were developed as a medium to facilitate diplomatic and ceremonial relations.

Belts and strings of wampum were used in summoning members of the confederacy to council, functioned as a medium of ritual exchange, as gifts and forms of currency, and served as a physical reminder of the Great Law and its lessons. In order to ensure their individual and collective security, the Haudenosaunee had to conquer their neighbours' territories and assume the leading role in the beaver trade. In terms of chronology, it would appear that the Seneca joined and completed the League around the turn of the seventeenth century, analogous to the Huron-Wendat when the Arendarhonon (Rock) and Tahontaenrat (Deer) completed their confederacy between 1590 and 1610. Simply, this volume is an essential addition to Iroquoian literature and is a must read for all students of the Ontario Iroquoian record.

References Cited

Abel, Timothy J.
2019 New Radiocarbon Dates for the Iroquoian Occupation of Northern New York. *Archaeology of Eastern North America* 47:23–38.

Birch, Jennifer
2012 Coalescent Communities: Settlement Aggregation and Social Integration in Iroquoian Ontario. *American Antiquity* 77(4):646–670.
2022 Premodern Confederacies: Balancing Strategic Action and Local Autonomy. *Frontiers of Political Science*.4:807239. DOI:10.3389/fpos.2022.807239

Birch, Jennifer, Sturt W. Manning, Samantha Sanft, and Megan Anne Conger
2021 Refined Radiocarbon Chronologies for Northern Iroquoian Site Sequences: Implications for Coalescence, Conflict, and the Reception of European Goods. *American Antiquity* 86(1):61–89.

Birch, Jennifer, and Ronald F. Williamson
2013 *The Mantle Site: An Archaeological History of an Ancestral Wendat Community*. AltaMira Press, Lanham, Maryland.

Bradley, James W.
1987 *Evolution of the Onondaga Iroquois: Accommodating Change 1500–1655*. Syracuse University Press, Syracuse, New York.
2020 *Onondaga and Empire: An Iroquoian People in an Imperial Era*. Bulletin No. 514. New York State Museum, Albany, New York.

Fenton, William N.
1998 *The Great Law and the Longhouse: A Political History of the Iroquois Confederacy*. University of Oklahoma Press, Norman.

Jamieson, J. Bruce
1983 An Examination of Prisoner Sacrifice and Cannibalism at the St. Lawrence Iroquoian Roebuck Site. *Canadian Journal of Archaeology* 7(2):159–176.
2016 Bone, Antler, Tooth and Shell: A Study in Iroquoian Technology. PhD dissertation, Department of Anthropology, McGill University, Montreal.

Jenkins, Tara
2016 Contexts, Needs, and Social Messaging: Situating Iroquoian Human Bone Artifacts in Southern Ontario, Canada. In *Theoretical Approaches to Analysis and Interpretation of Commingled Human Remains*, edited by Anna Osterholtz, pp. 139–184. Springer, New York.

Jones, Travis, Jennifer Birch, Ronald F. Williamson, Timothy Abel, Robert J. Speakman, and Louis, Lesage
2018 Steatite Characterization Using X-ray Fluorescence and Insights into Northern Iroquoian Interregional Interaction. *Journal of Archaeological Science: Reports* 20:506–515.

Lesage, Louis, and Ronald F. Williamson
2020 When and Where Did the St. Lawrence Iroquoians and the North Shore of Lake Ontario Iroquoians Go and Why? The Huron-Wendat Perspective. *Ontario Archaeology* 100:34–61.

Manning, Sturt W., Jennifer Birch, Megan Anne Conger, Michael W. Dee, Carol Griggs, Carla S. Hadden, Alan G. Hogg, Christopher Bronk Ramsey, Samantha Sanft, Peter Steier, and Eva M. Wild
2018 Radiocarbon Re-dating of Contact-Era Iroquoian History in Northeastern North America. *Science Advances* 4(12):eaav0280.

Morgan, Lewis Henry
1962 [1851] *League of the Iroquois*. Reprinted. Citadel Press, Secaucus, New Jersey. Originally published as *League of the Ho-De'-No-Sau-Nee or Iroquois*, Sage and Brother, Rochester, New York.

Pratt, Peter
1976 *Archaeology of the Oneida Iroquois,* Vol. 1. Occasional Publications in Northeastern Anthropology. Man in the Northeast, George's Mills, New Hampshire.

Snow, Dean
1994 *The Iroquois*. Blackwell, Cambridge, Massachusetts.

Trigger, Bruce G.
1976 *The Children of Aataensic: A History of the Huron People to 1660*. 2 vols. McGill-Queen's University Press, Montréal and Kingston.

Williamson, Ronald F.
2007 "Ontinontsiskiaj ondaon" ("The House of Cut-Off Heads"): The History and Archaeology of Northern Iroquoian Trophy-Taking. In *The Taking and Displaying of Human Body Parts as Trophies*, edited by Richard J. Chacon and David H. Dye, pp. 190–221. Springer, New York.
2023 Introduction. In *The Seventeenth Century Iroquois du Nord: History, Archaeology, and the Search for the Villages*, edited by Robert von Bitter and Ronald F. Williamson, pp. 1–29. National Museum of History and University of Ottawa Press, Ottawa.

Williamson, Ronald F., and Peter Ramsden
2019 Time, Space and Ceramic Attributes—the Ontario Iroquoian Case. Paper presented at the 84th Annual Meeting of the Society for American Archaeology, Albuquerque, New Mexico.

Ronald F. Williamson
Archaeological Services Inc.
528 Bathurst St.
Toronto, ON M5S 2P9
Canada
rwilliamson@asiheritage.ca

Book Review

Kruger 2 : Un site du Paléoindien récent à Brompton

(edited by Claude Chapdelaine and Éric Graillon)

Kruger 2 : Un site du Paléoindien récent à Brompton, edited by Claude Chapdelaine and Éric Graillon. xii + 293 pages, 143 colour figures, 53 tables, bibliographic references. 2020. Paléo-Québec 39. Recherches amérindiennes au Québec, Montréal. $30.00 (paper), $18.00 (PDF e-book). ISBN: 978-2-920366-54-1; ISBN (PDF): 978-2-920366-55-8.

The work represents a detailed description and analysis of Kruger 2 (BiEx-23), an ancient site discovered in 2013 in the St. François River Valley, near Sherbrooke, Québec. The compilers classify it as Late or Recent Paleo or, essentially, a site with unfluted, lanceolate to slightly stemmed stone points that date, as a whole, to c. 11,600–9,000 years ago. The site is significant from a number of perspectives. Paleo sites are very rare overall, and this example was one of the first documented in this specific area. It is also quite large as such sites go, being distributed over 800 m^2 and yielding a large artifact inventory of over 190,000 objects. Amongst the recoveries—and extremely rare for sites of this age—are almost 10,000, albeit very fragmentary and almost entirely calcined, faunal remains. Moreover, the site seems to be almost solely a Paleo component(s), with little evidence of subsequent use, unlike, in this reviewer's experience, most other early sites, where later occupation debris confounds interpretation. As well, three convincing Paleo features were delineated, features that are quite difficult to find or detect on these sites. These feature contexts and the calcined bone offer an opportunity to get absolute dates for the occupation, something it has proven difficult to do throughout eastern North America.

In the first chapter, Chapdelaine and Graillon describe the fieldwork at the site and the cultural framework they will employ. The fieldwork work involved excavations from 2015 to 2018 and, from the beginning, used a multidisciplinary approach that included specialists in geology and absolute dating. In Chapter 2, Richard provides a valuable, detailed synthesis of the geologic and environmental history for all of the northern Appalachian area from 13,000 to 7,000 years ago, stressing the spatial variability of the setting and environments over time across this vast area. In the St. François area, the vegetation cover is seen in Late Paleo times as initially a more open spruce forest, transitioning to a greater dominance of balsam fir over time. By 10,000 years ago, the area had a more closed forest cover, dominated by balsam fir, sugar maple, and red oak.

In Chapter 3, Chapdelaine and Graillon describe the site setting on a high terrace on a rock spur overlooking the river. It consists of five discrete concentrations of material, of which three that were better preserved, in deeper sand deposits overlying depressions in the bedrock, were most extensively excavated, totalling about 164 m^2. Although they cannot rule out the possibility that the site represents multiple uses,

based on the density of material and its diversity in the main site area, as well as the presence of features, they argue that the site was a base camp and not a satellite camp or specialized activity camp. They posit an occupation by 10 to 20 people, based on the site's spatial extent, but such estimates are fraught with difficulties, as the site could have been used, for example, on multiple occasions and for different purposes, as is typical of ethnographically known foragers. The best defined of the three potential cultural features (Structure 1) included burned rocks stacked in two or three layers with pieces of calcined bone and flaking debris intermixed. The other two features were smaller and lacked fired rocks but did have reddened soil (Structure 2) or a calcined bone concentration (Structure 3). In Chapter 4, Courchesne uses pedology to understand and document these features as being of cultural origin and not due to natural mechanisms. Concentrations of smectite are noted within the features but not in the soils outside them. He attributes this pattern to post-depositional chemical changes within the features, dependent on them being originally filled with concentrated ash from localized human activities.

The next four chapters deal with the stone artifact recoveries. Tools (and preforms) are described by Chapdelaine; a geometric morphometric analysis of the points, *florets* (*tr.* drills), and other complete bifaces recovered is provided by Saule (covered in more detail in her subsequent Master's thesis [Saule 2021]); a c. 10% sample of the almost 190,000 pieces of flaking debris is provided with an exploratory analysis by Boisvert and colleagues; and Burke summarizes his detailed attempts to source the various lithics recovered. Unlike most relatively unspecialized earlier Paleo sites, these Late Paleo sites are dominated by bifaces. Chapdelaine recognizes two point types: 1) a lanceolate, more variably flaked and wider form that expands from the base and, so, has convex sides and 2), a narrow, parallel-sided form with well-executed parallel flaking. The former, far fewer of which were found, are compared with western Agate Basin forms, and the latter, which dominate the assemblage, are seen as a variant of the Eden type, just one of the point forms characteristic of the western Cody Complex. However, they have come to be called more locally Ste. Anne de Varney (hereafter SAV) points. For reasons that are unclear to me, the point sample is also dominated by distal or tip ends, which contrasts with this reviewer's experience on most earlier camp sites, where bases dominate. Another contrast with the earlier sites is that drills are also a very common recovery on this and other sites, with almost as many of them recovered at Kruger 2 as points. Saule's biface analysis reveals that the SAV points can clearly be distinguished morphometrically from other categories, as can the drills. However, the Agate Basin points could not be easily distinguished from other untyped biface forms in the assemblage, and she entertains the possibility that they represent, for example, preforms discarded in manufacture rather than a discrete temporal type. Of course, as is mentioned elsewhere in the volume, they could also represent a functional contrast with the SAV points, such as knives versus dart tips—or even to my mind, based on ethnographic examples where both weapon types are used, stabbing lances versus launched projectiles.

The flaking debris analyses suggest that later stages of manufacture were a primary on-site focus even for items on material sources found locally. Nonetheless, more exotic materials are represented by still smaller debris and more later stage bifaces, suggesting they were more reduced before being brought to the site area. Burke's analyses recognize a number of different stone raw materials, which he classifies as local (<20 km), regional (20–100 km), and extra-regional (>100 km away). He entertains several plausible explanations as to how each material arrived at the site but favours an explanation that the three sources that dominate the assemblage (>15% each), comprising two local ones plus the Mt. Kineo, Maine, rhyolite from about 200 km east of the site, were directly procured during settlement movements, whereas others, which occur in smaller amounts (<5%), such as Mt. Jasper rhyolites from New Hampshire or Cheshire quartzite from Vermont, represent mechanisms such as exchange. The most conservative interpretations suggest widespread interaction networks

and a relatively mobile lifestyle long thought to characterize the Paleo occupations. Associations between raw materials and certain artifact forms are also noted, which can be explained largely by their potential for refined flaking or by the size and nature of the original raw material pieces.

Chapter 9, by St-Germain and colleagues, provides a detailed analysis of the important faunal remains. They are dominated mainly by mammal bones with trace amounts of fish, turtles, and birds. Large mammal bone is present, but little could be more specifically identified. The mammals do include a few definitive beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), groundhog (*Marmota monax*), and black bear (*Ursus americanus*) and, at a higher taxonomic level, a mustelid and at least one cervid are also present. The fish include sturgeon *spp.*, pike *spp.*, and possibly fallfish (*Semotilus corporalis*). Among the birds are grouse (family *tétraoninés*). The authors note the absence of definitive caribou identifications and suggest this species may have been less important during Late Paleo times when compared with its often presumed greater importance earlier.

The next two chapters cover the attempts to date the site occupation using accelerator mass spectrometry (AMS) dating of the calcined bone by Bonneau and Armitage and optically stimulated luminescence (OSL) dating of the fired rocks by Forget Brisson and colleagues. Both chapters are notable for the detailed explanations of how these techniques work and the care with which the dated samples were selected; these chapters should be valuable to those unfamiliar with all of the ins and outs of the techniques. However, both chapters are also notable for the inconsistency of the various dates obtained, despite the care taken in sample selection and analyses. The four AMS dates range from c. 7000 to 9500 cal BP. The five OSL dates, on rocks in the best defined feature (Feature 1), range from c. 1,800 to 9,700 years ago. Bonneau and Armitage believe the oldest AMS date (calibrated to 9,258–9,430 years ago; all others are <8,100 years ago) best approximates the real site occupation age, because it correlates with the very few other dates on such occupations in the Northeast and is the only one comparable to two of the OSL dates of c. 9,700 years ago (all others were <4,100 years ago), albeit with large standard deviations of 700 years or more.

The final two chapters include a spatial analysis of the site by Chapdelaine and Saule and a concluding chapter by Chapdelaine. The former is notable for its great detail, with many extremely useful, GIS-generated, piece-plotted, density colour maps of almost every artifact category and of every raw material identified, which allow readers to evaluate many of the authors' claims and come up with alternatives. Notably, there is no spatial separation in the distribution of the two major point types recognized, which may support the view that the Agate Basin points are not associated with a separate site occupation/component. Various sub-concentrations are identified within the major areas (*secteurs*) of the site. Some appear to be more specialized work areas, but others have a wide range of domestic activities. I believe that some may even be areas where material was left as "site furniture" for future use upon return to the site. For example, in one area there is an abundance of cores and hammerstones but little flaking debris.

In the concluding chapter, Chapdelaine notes the rarity of faunal remains on such sites normally, as compared with Kruger 2, and the considerable diversity of different taxa recovered. He also believes that the closed forest of the time, with red oak and white pine, would render caribou less important in the diet. Undoubtedly, the site fauna will figure in future in broader debates about subsistence, but, of course, we still are a very long way from having adequate samples to objectively evaluate the importance of the fauna recovered in the overall diet of these ancient peoples. Chapdelaine also considers potential connections between point styles and the people and migration waves between western developments, such as Eden/Cody Complex, and SAV assemblages. I am not certain we can connect such resemblances to actual population movements. Yet, at a more basic level, based on my reading of the literature, if the actual dates from Kruger 2 indicate an occupation from after c. 9500 to 10,000 cal BP, that dating seems too recent. Dates of 10,000+ cal BP dominate the western record

of the Cody Complex as a whole, including even the few sites where Eden points seem to be the forms directly dated (see, e.g., Amick 2013). I do not think western Eden points are as long-lived as implied in this work. If so, the idea that there is a more direct connection between the western form and SAV points seems questionable, a position reinforced by the lack of good examples of such points in much of the intervening region. I admit, however, that the similarities in size, shape, cross-section, and surface flaking between Eden and SAV points seem more than coincidental. Hence, they are more likely to indicate some sort of connection, as compared with forms with relatively simple lanceolate outlines and surface flaking, such as Agate Basin, which could very easily be reinvented time and time again.

Overall, Chapdelaine, Graillon, and colleagues are to be congratulated for the production of this very informative, thorough, and handsomely produced report on Kruger 2—and so rapidly after the actual fieldwork. While I recognize that it is impossible to describe everything of potential interest in site reports and that all descriptions are based on what are often unstated theoretical and interpretive viewpoints, I consider such data-rich reports to be the basic building blocks of all archaeological research. In agreement with David Anderson (2003:116–117), I believe they have a utility that will outlast any of our more explicit theoretical musings, which come and go. However, such reports seemingly get undervalued in academic circles with, unfortunately, relatively few citations and few rewards for producing these reports as compared with the more overtly theory heavy and shorter journal articles that dominate written and cited works. It is my impression that, compared with those in Ontario, archaeologists in Québec have produced more detailed peer-reviewed site reports, especially in recent years. Claude Chapdelaine has led the way with at least eight substantial, monograph-length works as editor/author on everything from Paleo- to Archaic- to Woodland-age Québec sites over his career. I salute him for his dedication to such important endeavours and wish that more archaeologists, including those who work in CRM, would take or value more this plunge.

References Cited

Amick, Daniel S.
2013 Way Out West: Cody Complex Occupations from the Western Great Basin. In *Paleoindian Lifeways of the Cody Complex*, edited by Edward J. Knell and Mark P. Muniz, pp. 215–245. University of Utah Press, Salt Lake City.

Anderson, David
2003 Archaeology and Anthropology in the 21st Century: Strategies for Working Together. In *Archaeology Is Anthropology*, edited by Susan D. Gillespie and Deborah L. Nichols, pp. 111–127. Archaeological Papers No. 13. American Anthropological Association, Washington, DC.

Saule, Jolyanne
2021 *Bifacial Stone Tool Variability during the Late Paleoindian Period at Kruger 2 (BiEx-23), Eastern Townships, Québec*. Master's thesis, Department of Anthropology, Trent University, Peterborough, Ontario.

Chris Ellis
Sustainable Archaeology,
Museum of Ontario Archaeology
1600 Attawandaron Road
London, Ontario N6G 3M6
Canada
and
Department of Anthropology,
University of Western Ontario
cjellis@uwo.ca

Profile

Fritz Knechtel (1900–1975): Heritage Crusader of the Bruce Peninsula

Lisa K. Rankin and Peter Ramsden

In the mid-twentieth century, the archaeology of Ontario was largely the domain of a small group of dedicated avocational archaeologists (as well as a much smaller group of professionals) who championed the study, protection, and preservation of archaeological remains during a period of rapid suburban expansion and industrial development in the postwar era. Before the advent of professional practices and government oversight, this small network of amateurs recorded, excavated, interpreted, and reported on the province's archaeological record to the interested public and to the North American archaeological community. Working near their homes and summer cottages on weekends and holidays, they developed an expansive culture-historic record throughout Ontario. They brought to our attention a number of important sites and cultural complexes that remain key elements in our understanding of Ontario's past, and some of their publications still stand as pillars of Ontario's archaeological history (Ramsden 2017:131). At the same time, however, their enthusiasm sometimes brought them into conflict with other sectors of the community as they fought to document and preserve the rapidly disappearing archaeological record. Fritz Knechtel (Figure 1) was one of the primary figures in this group: he campaigned on behalf of the archaeological resources of the Bruce Peninsula (Figure 2) during a period, from the 1940s to the 1970s, when they seemed to be under repeated threat from action and inaction by both government and industry.

Figure 1. *Fritz Knechtel, at a furniture show in 1961. (Bruce County Museum & Cultural Centre, Southampton, Ontario. A2014.003.1-12-1)*

For more than three decades, Knechtel enthusiastically encouraged professional archaeologists at universities and museums as well as various government authorities to take measures to investigate and protect unique archaeological resources. On the one hand, he became a quite well-known thorn in the side of both the provincial Parks Department and the federal Nuclear Energy Commission, while, at the same time, he encouraged and guided several professional and student archaeologists in researching and

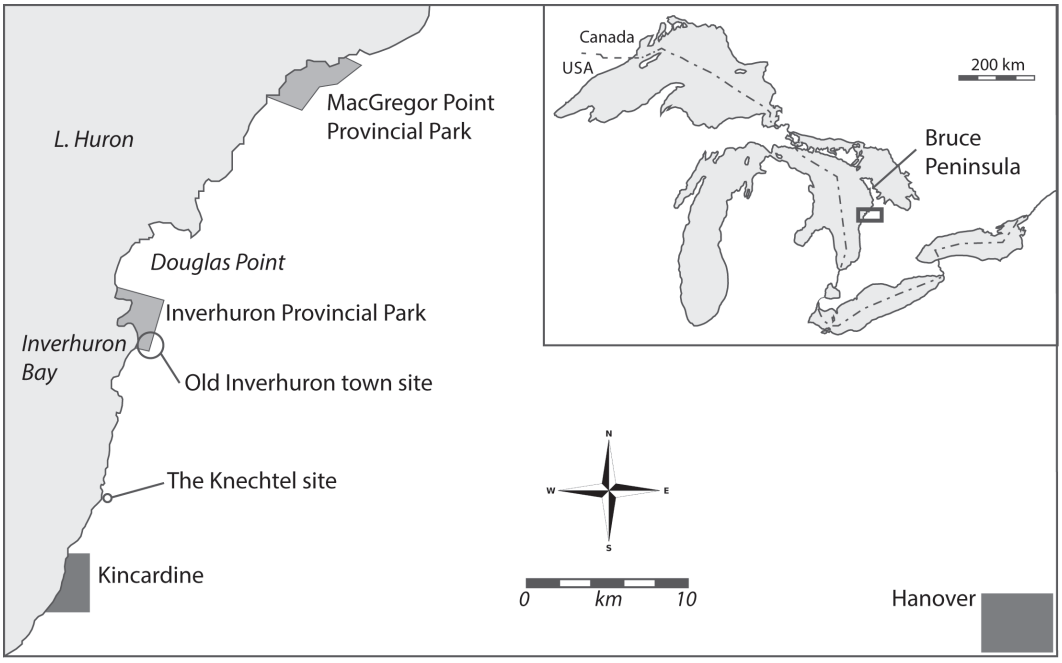


Figure 2. *Map showing places mentioned in the text, and the location of the Bruce Peninsula in the Great Lakes.*

publishing about the area's long and rich archaeological history. As a result of Knechtel's vigilance and vigorous crusading, the Bruce Peninsula became one of the best-known archaeological regions in Ontario (Wright 1975). However, the manner in which these and other archaeological resources were ultimately protected in the province was probably not what Knechtel or his colleagues might have expected. Instead, the rise of CRM as a means to document and conserve archaeological heritage produced masses of data and grey literature not easily accessible to those with general or academic archeological research interests. As a result, the work of Knechtel, and other key avocational archaeologists from that time, continues to play a significant role in the study of archaeology in the province today.

Who Was Fritz Knechtel?

Fritz Knechtel is best remembered as an enthusiastic avocational pioneer of the archaeology of the Bruce Peninsula in Ontario and as a dedicated campaigner for the conservation of archaeological sites. Knechtel was born in Hanover, Ontario, in 1900, to descendants of German immigrants who had created a thriving business building houses and making furniture for mid-nineteenth-century settlers carving farms out of the forests of Bruce County (Waterloo Region Generations 2018). The highly successful Knechtel furniture factory was founded in 1874 by Fritz's grandfather Daniel and is still widely talked about today in the context of Canadian furniture manufacturing, even though it closed its doors in 1983.

In 1937, the Knechtel family acquired a summer cottage on picturesque Inverhuron Bay (Kenyon 1959:2), on the shore of Lake Huron (Figure 2). This area of raised sandy beaches and extensive sand dunes had a rich archaeological history, encompassing all time periods from the Late Archaic (c. 1100 BCE) to remnants of the largely destroyed but once thriving nineteenth-century town of Inverhuron, and in places this was readily visible on the shifting surface. Knechtel had enough leisure time to devote a large portion of his summer months to locating, documenting, and surface collecting from these sites, and his passion for local history and for archaeology turned this casual pursuit

into a lifelong quest. When professional archaeologists began to show an interest in the area in the 1950s, Knechtel was credited with having one of the best documented, and most useful, regional collections in the province (Kenyon 1959; Lee 1952, 1960; Ramsden 1976; Wright 1972, 1975).

Fritz Knechtel's Archaeology

Fritz Knechtel's archaeological activities were never about collecting artifacts for their own sake. He was certainly aware of the existence of "curio-seekers" who would remove artifacts without regard to their context or historical significance, and he was, therefore, careful not to publicize the exact locations of sites that he found, so as to protect them from looting (Lee 1960:30). Knechtel's interest was in the contribution that his records and collections could make to "historical study and research of the area" (Knechtel 1959:61). In fact, over the years, Knechtel became known to residents of the region as the authoritative source on the area's Indigenous and settler history, as a result of his extensive study of the archaeological resources (McNab and McNab 2009).

From the late 1930s almost up until his death in 1975, Knechtel systematically walked the many acres of raised beaches and sand dunes stretching back from the shores of Inverhuron Bay, collecting artifacts that were eroding from the surface to document and culturally identify the dozens of sites that he located, as well as to preserve those materials for future study. Where he felt it was necessary in order to properly identify a site, he sometimes carried out small test excavations. Knechtel kept meticulous notes on where all of his artifacts came from, to the extent that his collection can still be used as a starting point for an inventory of archaeological sites in the region and the construction of a cultural history. When opportunity presented itself, he was eager to communicate his findings and his knowledge to any professional archaeologist who showed an interest in the area. Thus, when Thomas Lee of the National Museum of Canada was carrying out archaeological surveys in southwestern Ontario in the late 1940s and early 1950s (Lee 1952, 1960), he contacted Fritz Knechtel regarding sites in the area of Inverhuron and Kincardine. Knechtel welcomed Lee to his home in Hanover and allowed him free access to his entire collection and all of the accompanying documentation (Lee 1960:30). Lee accompanied Knechtel and his nephew W. Lucas to Inverhuron shortly afterwards and was given a guided tour of a large number of sites. These included inland Late Archaic localities eroding out of literally acres of shifting sand dunes (one dense concentration of material alone covered four acres) and traces of later Middle and Late Woodland occupations along the raised beaches and riverbanks close to the current shoreline. In that summer of 1950, Lee tested a Middle to Late Woodland site near the lakeshore, which he then excavated over parts of the following four field seasons (Lee 1960:29), and tested several other sites that Knechtel had shown him. As an indication of his admiration for Knechtel's work, and his gratitude for the help given by him and his family, Lee named the site he dug at Inverhuron the Lucas site (BbHj-3), after Knechtel's nephew; a large Archaic site at Inverhuron the Fritz site (BbHj-1); and a large Archaic to Middle Woodland site near Kincardine the Knechtel site (BbHj-2).

Lee was the first of several professional and student archaeologists to work on Knechtel's sites at or near Inverhuron. Others have included Jim Wright, as a student first at the University of Toronto and then at the University of Wisconsin and, later, as a staff member at the National Museum of Canada (Kenyon 1959; Wright 1956, 1972); Walter Kenyon, a curator at the Royal Ontario Museum (Kenyon 1959); Peter Ramsden, as a student at the University of Toronto (Ramsden 1970, 1976); William Finlayson, as a student at the University of Toronto (Finlayson 1977); and Lisa Rankin, as a student at McMaster University and then as a post-doctoral fellow at Pennsylvania State University (Rankin 2000; Rankin and Prince 1999). Those who were lucky enough to work at Inverhuron before Knechtel's death in 1975 enjoyed the benefit of his vast knowledge, his intellectual generosity, and his warm hospitality.

Issues and Outcomes

Through the 1940s and 1950s, Knechtel's main goals were, first, to record and try to preserve the

archaeological materials of the Inverhuron region and, second, to encourage professional archaeologists, as well as government departments and other relevant bodies, to take an interest in them and help to ensure their protection for posterity. Knechtel welcomed the provisions for site preservation enshrined in the Ontario government's 1953 *Archaeological and Historic Sites Protection Act* and lobbied on behalf of the Inverhuron sites. Besides the overarching issue of the continual destruction of sites of all periods by wind erosion, he was particularly anxious to draw people's attention to the seemingly unique lithic industry that characterized some of the Late Archaic sites in the area, dominated by minimally retouched cobble spalls. To that end he circulated to the archaeologists that he knew an unpublished, mimeographed typescript entitled, in characteristic Knechtel style, "Bastard Bust-offs of the Bruce."

The Ontario government's announcement in 1956 that they intended to create a provincial park at Inverhuron spurred Knechtel to even more energetic action. He foresaw that the construction of the park and its ongoing use by campers and day visitors would pose an unprecedented level of danger to the archaeological sites. But at the same time, he realized that this provincial government initiative might be turned into an opportunity for some systematic archaeological work in the area. Knechtel immediately embarked on what was to become, over nearly two decades, an unrelenting campaign of writing letters to the Parks Division head office in Toronto and badgering park officials closer to home, as well as any archaeologists that would listen, in an attempt to convince them that their lives could be much more tranquil if they would just take some simple steps to care for the threatened archaeological sites.

Almost entirely as a result of Knechtel's persistent appeals (Kenyon 1959:1), the Parks Division agreed to provide funds for the Royal Ontario Museum (ROM, also a provincial government agency) to conduct a survey of the archaeological resources of the park area and then to undertake whatever limited excavation was deemed necessary and could be completed before the park opened to visitors the following year. So, in 1956, Jim Wright, then a graduate student at the University of Toronto, accompanied Fritz Knechtel in a survey and assessment of the sites in and adjacent to the proposed park (Wright 1956). They tested some of the Archaic sites in the dunes, a partly disturbed Early Woodland burial mound, and some Middle Woodland and Iroquoian sites along the beaches of the bay. The following year, with Walter Kenyon as project director and Jim Wright as field director, the ROM fielded a crew to carry out more extensive excavations in the Archaic, Middle Woodland, and Iroquoian components. The result was the excavation of more than 186 m^2 of deposits to depths of up to 0.9 m and the first publication describing in detail some of the range of archaeological sites in the Inverhuron area (Kenyon 1959).

But Knechtel's campaigning on behalf of the sites in the park did not end there. Throughout the summer of 1958, with the aid of a student assistant provided at his request by the Parks Division, he constantly monitored the ongoing construction activities connected with the park (Knechtel 1959). In the course of this work, he was able to locate and salvage additional archaeological sites uncovered by construction activities and to expand some of the previous ROM excavations, as Keyon and Wright had recommended at the end of their 1957 field season. We are particularly fortunate that Knechtel went around during the construction and pointed out to the park's officials archaeological deposits that he felt were unique or of special research value and insisted that these needed to be avoided—and, if possible, covered over to preserve them from both wind erosion and human disturbance. To their credit, the Parks Division accommodated a number of those requests. In one case they agreed to realign a road and move a display facility, in order to avoid impacting a Late Archaic deposit that Knechtel had recently discovered and tested, and in which he had observed numerous Archaic pit features and large quantities of well-preserved faunal bone. Instead of being destroyed, the site was landscaped with topsoil; sod; juniper bushes; and two short, paved walkways and, thus, preserved for future research (Knechtel 1959:12, personal communication 1969; Ramsden 1976). There were, of course, a few mistakes that Knechtel

simply could not catch or prevent, such as the initiative to stabilize some of the Archaic-period raised beaches by mechanically digging a trench along the top of each one and planting rows of pine trees. Knechtel was still unable to speak of this calmly more than a decade later (Knechtel, personal communication 1969).

Knechtel was still engaged in monitoring the construction and development of Inverhuron Park when a new threat loomed on the horizon immediately to the north: the construction of a nuclear power facility at Douglas Point. The federal government gave its approval for this project in June of 1959, and the land on Lake Huron was immediately acquired (Whitlock 2005:2). Clearance and construction began almost right away, in February of 1960. Although Knechtel knew of one or two small Archaic occurrences on Douglas Point itself, he was more concerned for the much larger number of sites known in the surrounding area that he felt sure would be "impacted by access roads, construction camps and sand pit excavations" (Knechtel 1960:22). In this short note in *Ontario History*, as well as in numerous letters to the relevant government agencies, he made a plea for archaeologists to be allowed to work alongside the construction crews to salvage prehistoric archaeological material, and he particularly singled out the extensive Archaic period deposits "since the Archaic is the least studied period of Ontario's history" (Knechtel 1960:22). He went on to urge that "one or other of the archaeological groups in the province should include the Douglas Point project as part of their emergency salvage operations" (Knechtel 1960:23), a comment quite possibly aimed at Ontario institutions such as the University of Toronto, the Ontario Archaeological Society (which was developed in 1950), and the ROM—and, no doubt, also at the federal National Museum of Canada, since nuclear power was, in practice, a joint federal–provincial responsibility.

Moreover, Inverhuron Provincial Park itself was now in danger of being closed down, and the archaeological sites there of losing what protections they had gained (Parr 2010:147). The Heavy Water Plant Safety Advisory Committee established to oversee the construction of the power plant noted that dangers associated with an accidental and catastrophic release of hydrogen sulfide gas would be much more significant downwind, toward Inverhuron, than upwind (Parr 2010:146–155). Furthermore, the narrow roads and heavily treed grounds of Inverhuron Park would make the fast and safe evacuation of campers and visitors impossible. New lands were devoted to the construction of another provincial park at MacGregor Point, to the north of the plant, and Inverhuron Park was leased directly to Ontario Hydro for safety purposes. Once again, Knechtel took up his letter writing campaign, arguing along cultural lines that MacGregor Point was a poor substitute for Inverhuron (Parr 2010:155). Knechtel lived long enough to know that Ontario Hydro made the decision to keep the park open to daytime visitors, affording the archaeological sites therein some continued protection. Furthermore, just before he passed away, the 1974 *Ontario Heritage Act* was introduced in response to the demand for the preservation of archaeological resources through legislation (Birch 2006:12).

Unfortunately, the *Ontario Heritage Act* did not provide the type of site evaluation and protection that Knechtel and others in Ontario's small archaeological community had so vocally demanded. Its primary function was to regulate the practice of archaeology through a system of licensing and reporting, as well as to outline the role of bureaucratic officials and procedures (Birch 2006:12). If anything, it marginalized avocational archaeologists through the professionalization of the discipline, which gave rise to the now vast CRM industry (Birch 2006; Hlady 1977). Ironically, the *Ontario Heritage Act* offered only weak protection for the conservation of archaeological resources; in practice, it has done more to hamper responsible and enthusiastic avocational archaeologists, such as Fritz Knechtel was, than it has to discourage irresponsible looters. Ontario's CRM industry now undertakes the majority of archaeological excavation in the province, producing masses of data and reports in the process. Yet Ontario still fails to have a provincial repository for artifacts, and consultants are under no obligation to disseminate their generally technical reports to the public (Birch 2006:70; Ferris 1998:238). As a result,

much of the archaeology produced by CRM is inaccessible to many who have a genuine interest in the archaeological history of the province.

Conclusions

Fritz Knechtel and his avocational colleagues in mid-twentieth-century Ontario were staunch supporters of archaeological research and the protection of a rapidly disappearing archaeological resource for the public good. They worked closely with archaeologists and students from universities—and from provincial and federal museums—and reported on their work to all who were interested. Regardless of their professional credentials, these were the archaeological scholars of their day. The care they took with recording and archiving their collections and their willingness to share and disseminate their findings not only resulted in the development of a vast culture-historic record but also ensures that their work is as significant today as it was 70 years ago. It is Knechtel's work that researchers return to again and again to understand the archaeological record of Bruce County. It is with sadness that we realize that the history of these incredible archaeological figures is itself disappearing, alongside the stewardship and pursuit of public knowledge they supported.

Acknowledgments. We are grateful to the archaeological colleagues who kindly responded to our requests for information: Neal Ferris, Bill Finlayson, Holly Martelle, Pete Timmins, Gary Warrick, and Ron Williamson. We thank Keith Early, Park Superintendent with Ontario Parks, and Deb Sturdevant, Archival Assistant at the Bruce County Museum and Cultural Centre, for their help in locating archival material. And we are indebted to Deirdre Elliott of Memorial University, who assisted us with library resources.

References Cited

Birch, Jennifer
2006 Public Archaeology and the Cultural Resource Management Industry in Southern Ontario. Master's thesis, Department of Sociology and Anthropology, Carleton University, Ottawa.

Ferris, Neal
1998 "I Don't Think We Are in Kansas Anymore." The Rise of the Archaeological Consulting Industry in Ontario. In *Bringing Back the Past: Historical Perspectives on Canadian Archaeology*, edited by Pamela Jane Smith and Donald Mitchell, pp. 225–247. Mercury Series Paper No. 158. Canadian Museum of Civilization, Gatineau, Québec.

Finlayson, William David
1977 *The Saugeen Culture: A Middle Woodland Manifestation in Southwestern Ontario*. Mercury Series Paper No. 61. Archaeological Survey of Canada, National Museums of Canada, Ottawa.

Hlady, Walter M.
1977 The Role of the Amateur in Canadian Archaeology. In *New Perspectives in Canadian Archaeology, Proceedings of a Symposium Sponsored by The Royal Society of Canada,* edited by A. G. McKay, pp. 115–117. Royal Society of Canada, Ottawa.

Kenyon, Walter
1959 *The Inverhuron Site 1957.* Occasional Paper No. 1. Royal Ontario Museum Art and Archaeology Division, Toronto.

Knechtel, Fritz
1959 The Inverhuron Provincial Park, Season 1958. In *New Pages of Prehistory 1958*, edited by J. Norman Emerson, pp. 12–13. Ontario Archaeological Society, Toronto. (Reprinted from *Ontario History* 51(1):60–61.)
1960 Ontario Archaic and Our Nuclear Future. In *New Pages of Prehistory 1959*, edited by J. Norman Emerson, pp. 22–23. Ontario Archaeological Society, Toronto. (Reprinted from *Ontario History* 52(1):74–75.)

Lee, Thomas E.
1952 A Preliminary Report on an Archaeological Survey of Southwestern Ontario for 1950. In *Annual Report of the National Museum of Canada for the Fiscal Year 1950–51*, pp. 64–75. Bulletin No. 126. National Museum of Canada, Canada Department of Resources and Development, Ottawa.
1960 The Lucas Site, Inverhuron, Ontario. In *Contributions to Anthropology, 1958*, pp. 29–65. Bulletin No. 167. National Museum of Canada, Canada Department of Northern Affairs and National Resources, Ottawa.

McNab, David T., and Paul-Emile McNab
2009 Historical Report on Inverhuron and Inverhuron Park. Electronic document, www.inverhuronrate/history-inverhuron-1-main.html, accessed May 15, 2018.

Parr, Joy
2010 *Sensing Changes: Technologies, Environments and the Everyday, 1953–2003*. University of British Columbia Press, Vancouver.

Ramsden, Peter
1970 Report on an Archaeological Survey of Inverhuron Provincial Park, September 1970. On file at Parks Branch, Ontario Department of Lands and Forests, and Ontario Ministry of Natural Resources, Toronto.
1976 *Rocky Ridge: A Stratified Archaic Site Near Inverhuron, Ontario*. Research Report No. 7. Ontario Ministry of Culture and Recreation, Historical Planning and Research Branch, Toronto.
2017 J. Norman Emerson and Frank Ridley: Ontario Archaeology as We Know It. *Ontario Archaeology* 97:131–140.

Rankin, Lisa K.
2000 *Interpreting Long-Term Trends in the Transition to Farming. Reconsidering the Nodwell Site, Ontario, Canada.* BAR International Series Vol. 830. Archaeopress, Oxford.

Rankin, Lisa K., and Paul Prince
1999 Inverhuron Provincial Park Survey and Mapping Study. On file at Ontario Ministry of Tourism, Culture and Sport, Toronto.

Waterloo Region Generations
2018 Daniel Knechtel 1942–1936. Electronic document, http://generations.regionofwaterloo.ca/getperson.php?personID=I122625&tree=generations, accessed May 17, 2018.

Whitlock, Jeremy J.
2005 The Historical Significance of the Douglas Point Nuclear Power Plant. Report to the Ontario Heritage Trust. Electronic document, https://www.cns-snc.ca/media/history/DouglasPoint/DP_OHF_plaque_essay.pdf, accessed May 20, 2018.

Wright, James V.
1956 Comments on the Bruce. In *New Pages of Prehistory: Archaeological Researches in Ontario 1956,* edited by J. Norman Emerson, pp. 11–13. Ontario Archaeological Society, Toronto. (Reprinted from Ontario History 48(4):193–194.)
1972 *The Knechtel I Site, Bruce County, Ontario.* Mercury Series Paper No. 4. Archaeological Survey of Canada, National Museum of Man, Ottawa.
1975 In Memoriam. *Arch Notes* [newsletter of the Ontario Archaeological Society] 75(2):2.

Lisa K. Rankin
Department of Archaeology
Memorial University
St. John's, Newfoundland A1C 5S7
Canada
lrankin@mun.ca

Peter Ramsden
Department of Anthropology
McMaster University
Hamilton, Ontario L8S 4L9
Canada
ramsden@mcmaster.ca