The Arbor Gardens Site: A Probable Early Holocene Site in Northwestern Vermont

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Abstract

This paper discusses the Arbor Gardens site (VT-CH-885) located in Colchester, Vermont, identified by the University of Vermont Consulting Archaeology Program (UVM CAP) in October, 2001. Though the site did not produce radiocarbon dates or unequivocally diagnostic artifacts, various other lines of evidence suggest that it likely was occupied during the Late Paleoindian or Early Archaic Period ca. 8000-5500 B.C. The recovery of exotic raw materials including highly weathered examples of Mt. Jasper rhyolite (New Hampshire), Mt. Kineo rhyolite (Maine), and Onondaga chert (New York), the form and type of lithic tools recovered, the high proportion of artifacts recovered from deep contexts within the non-depositional soil profile, and the site’s geographical location, all suggest that the Arbor Gardens site dates to the early Holocene epoch. Analysis of the tool assemblage also reveals striking similarities with other Paleoindian and/or Early Archaic sites elsewhere in Vermont and the broader Northeast.

Introduction

This paper contextualizes data collected from the Arbor Gardens site, located in the town of Colchester, Chittenden County, Vermont (Figure 1). Though the site did not produce any dateable features or temporally diagnostic artifacts per se, it is suggested here that the site is Late Paleoindian to Early Archaic in age based on three separate lines of evidence. First, a high proportion of artifacts were recovered from a relatively deep stratigraphic context in a non-depositional environment, suggesting the assemblage is quite early. Second, the range of exotic raw materials, the types of lithic tools and debitage recovered and their highly weathered condition are characteristic of Late Paleoindian/Early Archaic sites in the Northeast. Third, the location of the site on a high, sandy outwash terrace on the margins of the late Pleistocene/early Holocene Champlain Sea suggests that the Arbor Gardens site occupies an ancient landform that would have been both available and attractive for occupation during the earliest periods of Vermont's prehistoric past.

A detailed account of the site’s cultural and geographic setting is presented below along with information on other significant archaeological sites in the near area. Also included are a short history of excavations, a description of the site’s soil stratigraphy, a full description of the site’s diverse lithic artifact assemblage, and an analysis of its horizontal and vertical distribution. Finally, these details are presented in the context of similar finds throughout Vermont and the broader Northeast.
The Arbor Gardens site is situated at an elevation of approximately 61 meters (200 feet) above mean sea level (a.m.s.l.) on an elevated sandy terrace within the Champlain Lowlands. Important waterways near the Arbor Gardens site include the Lamoille River and Allen Brook, a tributary of Mallets Creek which drains into the Mallets bay portion of Lake Champlain. All three of these drainages are archaeologically significant as measured by the high density of recorded sites associated with them. Allen Brook is especially relevant to the Arbor Gardens site, forming its eastern and western border. The terrace upon which the Arbor Gardens site is located is late Pleistocene in origin and would have been available and attractive for habitation when people first entered Vermont during the late Pleistocene and early Holocene epoch (Stewart and MacClintock 1969; Klyza and Trombulak 1999). Landforms such as this were well suited for occupation because they were level, well-drained and conveniently located adjacent to and above naturally productive streams and wetlands. It is also possible, though it remains an unresolved question for geologists, that the landform and contour interval at the site represents an ancient boundary related to the retreating shore of the Champlain Sea during the late Pleistocene-Holocene transition or, minimally, the Lake Champlain shoreline may have been closer at the time of occupation (Davis and Jacobson 1985; Davis et. al. 1980). This would have placed the site in an excellent location for exploiting marine and or lacustrine resources (e.g., Loring 1980; Keenlyside 1985). The relative close proximity of the site to locally available sources of workable lithic material would have further enhanced the attractiveness of the Arbor Gardens site location. Less than five kilometers north of the Arbor Gardens site is an outcrop of the Clarendon Springs Formation which would have provided an easy source of chert. Another close source of black chert can be found just over seventeen kilometers north of the Arbor Gardens site in St. Albans Bay. Based on sites typologically dated to the Paleoindian period, Vermont's earliest occupants exploited these and other Champlain Valley sources of lithic raw material in addition to material from elsewhere that they brought with them or received via exchange (Haviland and Power 1994).

As the transition from the Pleistocene to the Holocene gave way to increasingly closed forest cover in Vermont, local populations adjusted by employing a less nomadic subsistence strategy that utilized a wide array of locally available natural resources. Wetland environments that developed during this period improved habitat for birds, animals, and a wide variety of plants. Following the retreat of the Champlain Sea, this resource rich landscape included newly exposed, previously inundated landforms in areas like those adjacent to the Arbor Gardens site.

Numerous precontact Native American sites have been identified in the vicinity of the Arbor Gardens site and are summarized here based largely on unpublished information from the Vermont Department of Historic Preservation (VDHP) site files. A combination of surface finds and professional excavation has revealed the location of several sites within a short distance from the Arbor Gardens site (Figure 2). These sites have been dated to several different prehistoric periods and are located in both low lying and more elevated environments. The location and dates for these sites attest to the increased occupation of the area over time and the shift in settlement patterns as lower elevations closer to the modern lakeshore became habitable.

In the late 1960s, the Allen Brook site (VT-CH-21) was identified based on surface finds by Ken Varney and Gordon Neilson on behalf of the Vermont Archaeological Society (VAS) and the University of Vermont (UVM). This site lies along the gently sloping margins of a wetland to the northwest of the Arbor Gardens site at an elevation of 52 to 60 meters (170-196 ft) a.m.s.l., slightly lower than the Arbor Gardens site. Artifacts were located near an intermittent stream that drains the wetland into the Allen Brook. Several different artifact types were collected from this site likely dating from several different time periods (VDHP site files). At least eight projectile points ranging from the Late Archaic to the Middle and Late Woodland periods, ca. 4000 B.C. – A.D. 1600, were recovered along with several concentrations of lithic debitage.

Four quartzite projectile points, resembling the Orient Fishtail type, were reportedly collected. Three of these were made of quartzite while the fourth was made from a black chert of unknown origin. Several concentrations of quartzite and black chert debitage were also noted at the site. Along with these transitional Archaic points, two brown chert Susquehanna type broad spears and a single quartzite Levanna projectile point also were collected. In addition, one yellow-brown chert scraper, possibly "yellow jasper", was collected. Finally, a single broken ground slate pendant was collected during a surface inspection at the Allen Brook site by Varney and Neilson.

In 1974 Gordon Nielson, then of the VAS, reported the location of the Catamount I site (VT-CH-54). This
site is located on the western edge and upslope area adjacent to an intermittent tributary of the Allen Brook. Like the Allen Brook site described above, the Catamount I site is situated at an elevation roughly between 55 and 59 meters (180 - 192 ft) a.m.s.l. and was identified on the basis of low-density scatters of lithic debitage within a plowed-field context. Along with the debitage, Nielson collected several broken quartzite Levanna-like projectile points and at least two gray-chert scrapers. The site was estimated to be approximately 2,323 m² (25,000 ft²) in size based on the broad scatters of artifacts collected.

In the same year, Gordon Nielson reported yet another site, the Catamount II site (VT-CH-101). The Catamount II site is situated in the same geographical location as the Allen Brook site and the Catamount I site. Like the former sites, the Catamount II site was identified based on the surface collection of several projectile points and scatters of lithic debitage from cultivated fields. According to the original site records, the artifact inventory includes a “slightly stemmed” quartz point that is 1 ¼ inches long and lanceolate shaped, a “thick black” chert point, and two triangular quartzite points, likely of the Levanna type. These artifacts date this site to a range between ca. 4000 B.C. and A.D. 1600.

Recently, the UVM CAP conducted systematic work at these three sites in advance of an industrial park development project. Additional evidence of multiple occupations dating between the Late Archaic and Late Woodland periods was identified (Mandel and Crock 2006). In addition, a Late Paleoindian period, parallel flaked point was identified in the Gonyeau collection, attributed to one of the sites on the former Gonyeau property, presently owned by Catamount Industrial Park. Collectively these three sites, the Allen Brook site (VT-CH-21), the Catamount I site (VT-CH-54), and the Catamount II site (VT-CH-101), comprise an area of intense prehistoric Native American activity likely related to the plant and animal resources concentrated around the low-lying wetlands that help form the headwaters of the Allen Brook.

In 1971 Anne Stensrud reported the location of two sites in the greater Mallets Bay area, to the southwest of the Arbor Gardens project area. The first location reported was the Doug Wright #1 site, also known as the Mallets Creek site (VT-CH-34). This site is situated along the sandy shore of Mallets Creek at the point where the creek empties into the narrow strait connecting Mallets Bay to Lake Champlain. This site likely includes the location of the Bill Ross “find spot” (VT-FS-67) and also may be the same site recorded by George Perkins and discussed in an article published in the American Anthropologist (Perkins 1909). VDHP records of the Mallets Creek site state that it may have been a “campsite” and contained “unusual artifacts,” including bone artifacts, likely tools. It is also believed that this location may be the site where the Colchester Jar was originally collected as early as 1825 (Perkins 1909; Petersen and Toney 2000).

The second site reported by Stensrud was the Rice Swamp Knoll site (VT-CH-36) on the east side of Mallets Bay. This site is situated in a low lying swamp and was identified based on the collection of several scrapers and lithic debitage. The site had previously been identified by Tom Vogelmann who retains a personal collection of artifacts from the site. Little is known regarding this site’s size and density and no temporally diagnostic artifacts were reported.

More recently, two clusters of sites were reported by the Archaeology Consulting Team (ACT) based on
surface inspections in two locations to the north of the Arbor Gardens site. The first cluster is comprised of three sites, VT-CH-527, VT-CH-530, and VT-CH-531, all of which are associated with the Allen Brook and were identified by the presence of low density quartzite flake scatters. The second cluster of sites, VT-CH-541, VT-CH-549, VT-CH-550, VT-CH-551, and VT-CH-552, were all located during Phase I and II studies conducted by the ACT in advance of a housing development, Petty Brook Estates, in 1992. All of the Petty Brook Estate sites are located on a terrace overlooking the Allen Brook and a section of the Clarendon Springs Formation (chert) outcrop. Site VT-CH-541 was initially identified on the basis of several quartzite flakes collected during a surface inspection. Further evaluation of the site revealed at least one hearth feature near the edge of the terrace. This feature contained four Levanna-like quartzite projectile points and produced a radiocarbon date of 820 ± 80 B.P. (A.D. 1130 ± 80). Each of the other four sites were also identified during surface inspections. These sites contained both quartzite flakes and Clarendon Springs chert flakes. Site VT-CH-549 also produced the mid-section of a quartzite projectile point. The close proximity of these lithic scatters to site VT-CH-541, the similarity of the materials recovered, and the single radiocarbon date, suggest that a Late Woodland encampment comprising several activity areas is likely present at this location just north of the Arbor Gardens site.

A third cluster of sites is located directly to the west of the Arbor Gardens site and was first identified in 1980 by the University of Vermont Department of Anthropology during Phase I studies associated with East Georgia Hydroelectric Project. Little data regarding this site has been recorded and the site is based solely on a quartzite “flake scatter in a plowed field on nearly level land west of Allen Brook,” according to the VDHP site form. More recently two other sites on this landform were located by the University of Maine at Farmington Archaeological Research Center, numbered VT-CH-837 and VT-CH-838.

In summary, materials recovered from sites near the Arbor Gardens site suggest that this portion of the Champlain Lowlands was occupied by Native Americans during much of the prehistoric period from at least the Late Archaic period to the Late Woodland period. Much of the research near the project area has been at elevations lower than 61 meters (200 ft) a.m.s.l., however, in locales associated with finer-grained soils nearer existing wetlands. These sites all date mainly to the latter portion of the Late Archaic period or the more recent Woodland periods. During earlier periods of time these landforms may not have existed, or may have been completely inundated by the Champlain Sea or early stages of Lake Champlain, or otherwise unsuitable for habitation. The Arbor Gardens site has revealed that high sandy areas likely provided ideal campsites not only because of their commanding views of the surrounding topography and the dry, well-drained nature of the soils, but also because they were some of the closest landforms to the lake that were habitable during early periods of prehistory.

A detailed description and assessment of the site soils is presented here using information gathered during all episodes of archaeological investigations at the Arbor Gardens site. Soil stratigraphy is described using conventional terminology regarding formation and classification (Brady 1990). Soils in the project area are classified as Adams and Windsor loamy sands with 30-60% slopes (USDA 1989). The soil stratigraphy across the topographically homogenous site consists of a relict agricultural plow zone (Ap) underlain by a severely weathered Bs horizon, a less weathered B horizon, and a very sandy and slightly iron stained C horizon (Figure 3). The weathered Ap horizon ranges from 16-22 centimeters in thickness with minor variations across the site and consists of dark brown (10YR 3/3) medium sandy loam with little to no gravel or other inclusions. The depth of this horizon ranges according to the minor inconsistencies of the site where rotting tree stumps and other ground disturbance from the surrounding vegetation have caused depressions in the natural surface. Extreme leaching from the Ap to the Bs horizon is evident based on the uneven and wavy boundary between the Ap and Bs soil horizons. The Bs horizon ranges from 10-24 centimeters in thickness and consists of a dark yellowish brown (10 YR 4/6) medium sandy loam. This soil horizon appears reddish in color as a result of the admixture of elements (e.g., iron) from the Ap soil horizon that have leached down into the Bs horizon. The underlying B and C soil horizons consist of a dark yellowish brown (10YR 4/6) fine sand (B horizon) which fades gradually into an olive brown (2.5Y 4/4) fine sand mixed with limited iron staining (C horizon).

The elevated loamy sands of the project area are associated with glacial outwash deposited at least 12,000 years ago (Steward and MacClintock 1969). Given that little in the way of soil has been naturally deposited in this area since its formation, cultural materials were ex-
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Figure 3. Schematic drawing and photograph showing the north wall profile of Phase III excavations at N385 E608-613.

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Expected relatively close to the elevation at which they were deposited, that is, relatively close to the modern ground surface. However, approximately 88% of all lithic debitage recovered from the site was located in the deepest portions of the soil matrix, which includes the Bs, B, and C soil horizons. Only 12 percent of all lithic debitage was found within the Ap soil horizon and almost 50% of all lithic debitage was recovered from the deepest portions of the B and C soil horizons. This high proportion of deeply positioned artifacts within a non-depositional soil profile suggests that these artifacts migrated to this depth over thousands of years as has been recorded for similar settings elsewhere in Vermont (cf. Thomas and Robinson 1980).

Forces responsible for drawing cultural materials downward from the ground surface include gravity, bioturbation, the freeze-thaw cycle, and permeating precipitation (e.g. Thomas and Robinson 1980). Over time, the cumulative effect of these processes is to draw cultural materials downward in the profile. Because these forces do not influence the position of all artifacts equally and consistently, artifacts deposited at the same time on the surface thousands of years ago are eventually spread throughout the soil profile. It is the contention of this article, however, following the suggestion of those such as Thomas and Robinson (1980), that mean depth of materials and their pattern of vertical distribution can be useful relative dating tools.

Research at the Arbor Gardens Site

In 2001, UVM CAP conducted a Phase I survey at the Arbor Gardens site in advance of the Arbor Gardens Apartments Development Project (AGDP). The initial AGDP area consisted of a 7.66 acre (30,999 m²) parcel on a terrace overlooking the Allen Brook. Two areas were investigated during the Phase I site identification survey in the northeastern portion of the AGDP project area on the west and east sides of a small tributary flowing into Allen Brook. One area is an approximately 1.04 acre (4,200 m²) clearing located on the west side of the tributary near its confluence with the Allen Brook. One lithic tool was located in this area and designated site VT-CH-886 in the Vermont State Site Inventory, however no further work was conducted at that location. Testing in the area on the eastern side of the small tributary resulted in the identification of the Arbor Gardens site (VT-CH-885). It is located on an approximately 1.11 acre (4,300 m²) clearing east of the small tributary and west of the Allen Brook just.
upstream from the confluence of these two waterways.

The Phase I site identification survey at the Arbor Gardens site included the excavation of 58 test pits 0.5 x 0.5 meters in size (Figure 4). These test pits were spaced at 5-meter intervals along six separate transects and three clusters across the archaeologically sensitive area. Closer interval test pits and a single 1.0 x 1.0 meter (3.28 x 3.28 feet) test unit were placed near the initial positive test pits. A total of seven of the test pits excavated (12%) contained prehistoric Native American artifacts. The excavation of the single test unit, which was excavated over positive test pit T2-1, also resulted in the recovery of additional prehistoric Native American artifacts. Overall, the artifacts recovered during the Phase I study at the Arbor Gardens site include lithic flakes and one bifacially flaked lithic tool, likely a projectile point or knife, described below (PN204-1 and 204-2). All artifacts were recovered from the intact B soil horizon beneath the upper, plow disturbed Ap horizon.

The Phase II site evaluation of the Arbor Gardens site began with the excavation of sixty-seven 0.5 x 0.5 meter (1.64 x 1.64 feet) test pits placed at 5-meter intervals on a horizontal grid established across the site on a magnetic north bearing of 99º (see Figure 4). The placement of the Phase II test pits was designed to further investigate the dimensions of the positive areas found during the Phase I survey and determine the nature of the relationship between the two possible discrete activity areas. The Phase II test pits also extended across the site into areas not investigated during the Phase I survey.

Of the 67 Phase II test pits excavated, only five (7%) contained prehistoric Native American artifacts. The cultural deposits identified were found in clusters of positive Phase I and Phase II excavations distributed across most of the 1.11 acre (4,300 m²) Arbor Gardens site. Based on the location and relationship of these clusters to one another, four discrete areas of prehistoric Native American activity were identified (see Figure 4).

Activity Area 1, which is roughly 98 m² (1,055 ft²) in size, is located in the central portion of the site and was first identified based on the recovery of lithic flakes and one lithic tool in test pit T5-4. Activity Area 2 is located on the southern boundary of the site and was first identified based on the recovery of lithic flakes in test pit T2-2. Two additional activity areas were identified during the Phase II excavations based on the recovery of small amounts of lithic flakes at N365 E605 (Activity Area 3) and N400 E600/N395 E605 (Activity Area 4). While the latter two activity areas help establish the size of the site, they were not explored further during the Phase II site evaluation based on the limited evidence of prehistoric activity in those areas.

As suggested by the positive test pits excavated during the Phase I and Phase II fieldwork, the Arbor Gardens site is spread across an area of over 2,200 m² (23,680.6 ft²) and includes at least four discernable activity areas. Activity Area 1, located in the central portion of the landform, contained some of the densest deposits of artifacts identified at the site during the Phase II evaluation. Given the high density of artifacts in Activity Area 1 and the numerous tools recovered from this area during excavation of the Phase II test units, the majority of the subsequent Phase III data recovery was completed in this portion of the site (see Figure 4).
The Phase III data recovery consisted of the block excavation of 32 excavation units, 1.0 x 1.0 meters (3.28 x 3.28 feet) in size, in an area roughly 7.0 x 16.0 meters (22.97 x 52.49 feet) encompassing much of the 98 m$^2$ (1,055 ft$^2$) of Activity Area 1. All units were excavated in 10 centimeter (4 inch) arbitrary levels with respect to soil horizons. All sediment was sieved through 0.64 milimeter (1/8 inch) mesh hardware cloth in the field. On the final day of field work, 10 additional 1.0 x 1.0 meters (3.28 x 3.28 feet) test units were excavated using more expeditious methods in an effort to recover a larger sample of the site, particularly a larger sample of stone tools. In addition, to further salvage the important archaeological deposits at the Arbor Gardens site, 17 additional 1.0 x 1.0 meter test units were excavated by volunteers on May 27th and May 28th, 2002. Altogether, a total of 59 m$^2$ (635 ft$^2$), or 60%, of the test units were excavated at the Arbor Gardens site as part of the Phase III data recovery study and the subsequent volunteer efforts (Figure 5).

Artifact Descriptions

Lithic artifacts dominate the inventory of precontact Native American artifacts recovered during all three phases of fieldwork at the Arbor Gardens site. A total of 31 flaked stone tools were recovered from the combined Phase I, II and III excavations. This total includes 34 tool fragments, several of which conjoin to form a single tool. The tool inventory includes one projectile point fragment, 12 bifacially flaked tools/tool fragments, 4 unifacially flaked tools, and 15 utilized flakes. A variety of local and exotic lithic materials are represented within this assemblage of tools, which are described in some detail here.

Projectile Point Fragment

A single projectile point base (PN 712-1) was recovered during the Phase II archaeological testing at the Arbor Gardens site (Figure 6). The fragment is made from gray-black chert likely originating from the Onondaga Formation found in New York State or possibly another
locale outside of Vermont. The tool is broken at its basal inflection, making the analysis of the flaking and overall shape of the original tool very difficult to assess. Despite the fragmentary nature of the artifact, it is morphologically comparable to diagnostic lithic materials from the broader Northeast that date to the Paleoindian and Archaic period. In southeastern Quebec, the La Martre and Mitis Late Paleoindian sites contain elongated “Plano” type points of a similar dark brown chert material, exhibiting expanding bases with similar basal thinning (Dumais 2000:89). In extreme eastern Quebec, the Late Paleoindian Rimouski site also contained points with bases similar to the one found at the Arbor Gardens site (Chapdelaine 1994:181). Additionally, the Varney Farm site in western Maine contains projectile points with bases similar to the fragment discussed here (Petersen et al. 2000). However, other tools recovered from sites in western Vermont may suggest that this base fragment dates to the Early Archaic period, ca. 7000 – 5500 B.C. For example, the Bessette 2 site located along the Missisquoi River near Highgate, Vermont, contained projectile points with bases somewhat similar in form to the one found at the Arbor Gardens site both in shape, length, and thickness (Thomas 1992, Thomas et al. 1996). Thomas notes that one of these Early Archaic points “was made from a gray-black chert that bears a strong macroscopic similarity to chert found at the Paleoindian period Reagan site” (Thomas 1992:190). Similar early “side-notched” points are known from across eastern Canada with a suggested date as early as 8500 B.P. (7000 B.C.) (Wright 1978, 1979), though the basal inflections on the Arbor Gardens piece do not fit the description of a notch.

**Bifacially Flaked Stone Tools and Tool Fragments**

A total of 12 bifacially flaked stone tools/tool fragments were recovered from the Arbor Gardens site, representing a total of 10 separate tools after several fragments were articulated. These 10 tools are made from a variety of local and exotic lithic raw materials, including a weathered, banded rhyolite, which likely was quarried at Mt Jasper in Berlin, New Hampshire, or a geologically related source in the eastern White Mountains (Boisvert 1992); Hathaway Formation chert, a locally available black chert; and Cheshire quartzite, a material found throughout the western face of the Green Mountains and common in archaeological sites of most time periods in Vermont and the Northeast. These tools are discussed by raw material below.

**Mudstone (Argillite?).** The first bifacial tool (PN 204-1 and PN 204-2) recovered from the site was found during the Phase I excavation of test pit T5-4, approximately 30 cm (11.81 in) below the ground surface within the intact B horizon (Figure 7). This tool is likely made from a mudstone, possibly argillite, but extreme weathering has made its material type difficult to discern. Weathering on this tool is so severe that its edges are rounded erasing any evidence of use-wear along its margins, making analysis of its function very difficult. This tool has an extremely gradual, irregular, and shallow indentation, possibly a notch, along one side of the base, which is not matched on the other side of the tool. While this tool is not necessarily diagnostic of any specific time period, its resemblance to tools found at Late Paleoindian and Early Archaic sites across the broader Northeast is striking (e.g., Dumais 2000; Petersen et al. 2000; Dillon et al. 1985:145).
**Hathaway Chert.** Two bifaces and two biface fragments made from locally available black Hathaway chert were also recovered from the Arbor Gardens site during the Phase III excavation. The two tools were excavated from the Bs soil horizon deep below the Ap soil horizon. The first Hathaway chert tool (PN 1426-1) was recovered from N385 E610 and is a heavily used, excursive, single edge scraper. The heavy stepping and crushing exhibited on its single utilized edge suggests that this tool was used on a medium-hard surface such as wood (Figure 8). The second Hathaway chert tool (PN 1331-2 and PN 3000-4) was recovered from N387 E 612 and is a small, lightly used scraper. The pieces of this tool nearly conjoin but are missing a midsection, which was not recovered during any of the excavations. The nature of the break is unclear and may have occurred during sharpening of the tool or, alternatively, during use. This tool does not exhibit the heavy use-wear of the other bifacial tools at the site (Figure 9).

The first of two black Hathaway chert biface fragments (PN 1414-2) was recovered from the Bs soil horizon of unit N386 E610. The broken biface has a heavily worked excursive edge that exhibits small stepping and heavy rounding, which could have been caused by use or platform preparation during its initial manufacture (see Figure 9).
The second biface fragment (PN 3005-4) was recovered deep within the B soil horizon of test unit N388 E612. This small fragment is a broken piece of an intermediate stage bifacial tool exhibiting heavy stepping, crushing, and rounding, likely the result of platform preparation created during its manufacture. One flake that was recovered from a nearby context articulates with this biface fragment and suggests that this tool was very likely broken during manufacture and discarded. This is also supported by the absence of use-wear along the worked edges of this biface fragment (Figure 9).

**Cheshire Quartzite.** One quartzite biface tool and three quartzite biface fragments were recovered from various parts of the site. The one bifacial quartzite tool (PN 1435-1) came from the western portion of the Phase III block excavation in unit N386 E611, also within the Bs soil horizon. This fragment is the upper portion of a large quartzite intermediate stage biface, also broken at its midsection. Like PN 1145-1 (described below), both margins of PN 1435-1 exhibit reduction, but only one edge exhibits characteristic signs of use such as stepping and crushing, through unequivocal evidence of its use remains very uncertain (Figure 10). This large tool, much like PN 1145-1, also resembles tools found at the Weirs Beach and Rimouski sites, as well as other Late Paleoindian sites in the Northeast (Chapdelaine 1994: 91; Petersen et al. 2000). Both of these bifacial tools from the Arbor Gardens site may have first served as cores from which small flakes were produced for use as expedient tools, a behavioral sequence that is common with the Paleoindian period. Alternatively, the tools may have been used as cutting implements based on the very slight wear found on their margins.

One quartzite biface fragment (PN 1331-1) was recovered within the Bs soil horizon of unit N387 E612. This intermediate stage biface was likely broken during manufacture and does not appear to have been utilized (see Figure 9).

The second and third biface fragments (PN 1442-1 and PN 1446-4) were recovered within the Ap soil horizon of unit N387 E609. The first of these two fragments (PN 1442-1) is a quartzite intermediate stage biface which likely broke during manufacture and does not exhibit any use-wear. The second of these two fragments is a small, thin fragment of a late stage biface that was likely broken during manufacture and also does not exhibit any use-wear (see Figure 9).
Mt. Jasper Rhyolite. One Mt. Jasper rhyolite biface (PN 1145-1) was recovered from the western portion of the Phase III block excavation within the Bs soil horizon of unit N385 E616. Although both edges are worked, only one edge of this tabular tool exhibits use-wear, perhaps as a side-scraper (Figure 11). A similar biface was recovered from the Weirs Beach site in New Hampshire with an associated radiocarbon date of 9615 ± 25 B.P. (7665 ± 25 B.C.) and is “considered to have a Plano technological affiliation” (Bolian 1980:124). Other analogs for this biface include large tool fragments recovered from the Late Paleoindian Rimouski site in eastern Quebec (Chapdelaine 1994:191) and tabular side scrapers from the Paleoindian period Reagan site in Highgate, Vermont (Petersen, personal communication 2004).

Unifacially Flaked Tools
A total of four unifacially flaked stone tools were recovered from the Arbor Gardens site. Three of the four unifacially flaked tools are manufactured from black Hathaway chert and the fourth is made of Mt. Jasper rhyolite. One unifacial tool (PN 114-2 and PN 301-1; Figure 12) was found during the Phase I excavation within Test Unit 1 in the eastern portion of the site. This artifact, a triangular scraper, was recovered in the Bs soil horizon and is made from a piece of Hathaway chert that has many impurities. This large triangular scraper was likely hafted judging from two notches found near one end of the tool. A break extending from one of the notches suggests that pressure during use likely caused it to break. The utilized edge, like other tools found at
Figure 13. Black chert uniface (PN 1465-3), left, and Mt. Jasper rhyolite uniface (PN 2008-4), right.

The site, exhibits heavy rounding, stepping and crushing. Recent comparison of this notched side-scraper with similar tools at Paleoindian sites in Vermont has led Robinson and others (2004) to conclude that it is a newly recognized tool form for the Paleoindian period.

The second unifacial tool (PN 2010-1) was recovered from unit N398 E610 within the Bs soil horizon. This severely weathered unifacial scraper is made from Hathaway chert and was likely hafted given the flake preparation on its distal end. The third unifacially flaked tool (PN 1465-3) was recovered within the Bs soil horizon of unit N387 E609 and is made of black Hathaway chert. Impurities run throughout the chert and are accentuated by the extreme weathering of the tool. The flake shows use-wear on an incurvate edge with a small notch created on the opposing edge. The utilized edge exhibits both rounding and micro-flaking likely employed during the initial modification of this flake tool (Figure 13). The fourth unifacially flaked tool (PN 2008-4) was recovered within the Bs soil horizon of unit N385 E609, is made from Mt. Jasper rhyolite, and exhibits severe weathering. Small flake scars along the dorsal working edge of this very fragile and small tool suggest that it may have been pressure flaked while part of a larger tool. This is supported by a lack of use-wear on any edge (see Figure 13).

Utilized Flakes
A total of 15 utilized, but not intentionally modified, flakes were recovered during the three phases of excavation at the Arbor Gardens site. All but one of these flake tools were recovered from within the Phase III excavation block; the one recovered outside the block came from the Phase II Test Unit located on the eastern edge of the site. Utilized flakes were found in distinct clusters based on their material type and will thus be described in these clusters.

The first cluster includes a total of five utilized flakes all made from a weathered greenish rhyolite, likely Mt. Kineo rhyolite, from a source near Moosehead Lake in central Maine. These tools were recovered from the northern portion of the Phase III excavation block from the Bs soil horizon of units N386-N387 E619-E621. All of them were utilized on only one edge and in each case exhibit stepping and rounding on the utilized edge (Figure 14). Two of the Mt. Kineo rhyolite utilized flakes (PN 2001-1 and PN 2201-1) exhibit crushing, light feathering and micro-flaking along the utilized edge and were possibly used in a cutting motion. The other three utilized flakes (PN 2004-1, PN 802-1, PN 1701-3)
The second cluster of utilized flakes was found in the southern portion of the Phase III excavation block. A total of four black Hathaway chert utilized flakes were recovered from the southern portion of the Phase III excavation block, with one additional black Hathaway chert utilized flake recovered from the Phase I Test Unit located in Activity Area 2. Two of these utilized flakes (PN 1441-1 and PN 1450-2) were recovered from the Ap soil horizon of units N387 E609-E610. Both of these tools exhibit feathering and rounding on their utilized edge and were likely used in the scraping of a light-medium hard surface (Figure 15). Two other Hathaway chert utilized flakes were recovered from the Bs soil horizon of units N385 E608 (PN 1081-1) and N386 E606 (PN 2103-1). Each of these two tools exhibits rounding on all edges, but their rounded appearance may be due to their extremely weathered condition (see Figure 15). The final Hathaway chert utilized flake (PN 116-1) for Activity Area 2 exhibits a denticulate, excursive, utilized edge and some visible rounding, also possibly due to weathering (see Figure 15).

The third cluster of utilized flakes was located in the central portion of the Phase III excavation block and is comprised of three quartzite tools. Each of these tools was recovered from the Bs soil horizon during the Phase III excavations. The first utilized flake (PN 1324-1) is made of medium grade quartzite and has two utilized edges. One edge shows moderate stepping, with light intermittent rounding, while the second edge shows only moderate stepping. Based on the condition of the first edge, the tool may have been used in a sawing or cutting activity on a medium hard surface (see Figure 15). The second quartzite utilized flake (PN 3001-2) was likely used as a scraper based on its steep utilized edge (see Figure 15). The third utilized quartzite flake (PN 1311-1) shows only light feathering and slight rounding, making its function more difficult to identify (see Figure 15).
Finally, a single utilized flake (PN 511-1) made from Mt. Jasper rhyolite was recovered from the Ap soil horizon of unit N388 E620 during the Phase II excavations. This very small utilized flake has only a small excurvate edge with very light stepping and no other signs of utilization (see Figure 15).

Lithic Debitage and Distribution
A total of 3,401 pieces of lithic debitage were recovered during all three phases of excavation at the Arbor Gardens site. Almost 25% of the total lithic debitage is of materials not local to Vermont while the remaining 75% is likely from local sources, though some of the black chert recovered may be exotic as well. Of the total, 64% of the debitage is black chert, the majority likely from the Hathaway Formation located in the Champlain Valley; 17.8% is Mt. Jasper rhyolite from the Berlin region of New Hampshire; 10.2% is Cheshire quartzite; 7.0% is likely Mt. Kineo rhyolite from the Moosehead Lake region of Maine; and 1.0% is quartz, probably of local origin. Of all the flakes and fragments recovered, 80.7% of the pieces are less than 1 centimeter in size, 18.8% are between 1 and 2 centimeters in size and only 0.5% are larger than 3 centimeters in size. This high proportion of small, likely tertiary reduction flakes, suggests that the main lithic-related activities conducted at the site involved late stage reduction of formal tools such as projectile points or retouch of more expedient tools such as scraping and cutting implements.

Analysis of the horizontal distribution of artifacts within Activity Area 1 at the Arbor Gardens site reveals several distinct concentrations generally separable by material type. The exact activity in each cluster has not been determined but the lithic tools described above generally were recovered from debitage clusters that match their lithic material type (Figure 16).

Conclusions
Archaeological investigations at the Arbor Gardens site (VT-CH-885) resulted in the identification of a discrete precontact Native American occupation with discernable activity areas represented. While the site cannot be firmly dated to any precontact period due to a lack of radio-carbon dates and unequivocally diagnostic artifacts, analysis of the total lithic assemblage from the site suggests that it may date to the Late Paleoindian period, or possibly the Early Archaic period, ca. 8000 – 5500 B.C. Inferences about the age of this site can be drawn from the wealth of contextual and material evidence recovered during the extensive excavations conducted by the UVM CAP. The vertical distribution of artifacts, the lithic raw materials used, and the lithic tool assemblage from the site all suggest that the site dates to these early precontact periods. A majority of the artifacts suggest an attribution on the earlier end of this range while the single projectile point base fragment recovered from the site could date to a more recent period, though this remains equivocal. The recovery of Mt. Jasper rhyolite, Onondaga chert, and Mt. Kineo rhyolite, as well as local Cheshire quartzite, combined with the deep profile and geographic position of the site, all suggest that the Arbor Gardens site is a rare and early site within the context of Vermont and the broader Northeast.

Several conclusions about the lithic artifacts can be elaborated on to support the antiquity of the Arbor Gardens site. Generally the presence of a variety of exotic lithic materials is correlated with the Paleoindian period in Vermont and, to a lesser extent, the Early Archaic period. The local occurrence of exotic lithic materials also is known during the Early and Middle Woodland periods, but the lithic tool assemblage from the Arbor Gardens site is not at all characteristic of the Woodland period in Vermont. On the lithic material evidence alone, the Arbor Gardens site would necessarily date to the Paleoindian period or Early Archaic period due to the absence of pottery at the site, artifact weathering, and the extreme depth of the artifacts, all of which speak to an earlier than Woodland period attribution. The absence of any ground stone tools further supports an early, possibly Late Paleoindian attribution of the Arbor Gardens site. Ground stone tools are much more characteristic of the Archaic and Woodland periods in Vermont. While the lack of such tools could certainly be related to the function of the site, their absence supports the other circumstantial evidence for the site’s antiquity.

Raw material type and the absence of certain artifact classes, however, are not the only attributes of the lithic assemblage that suggest the site is Late Paleoindian in age. A careful analysis and macro comparison of the tools reveals many similarities with Late Paleoindian sites across the broader Northeast and Canada, as noted in the tool descriptions.

Analysis of the bifacially flaked stone tools from the Arbor Gardens site suggests that they have many similarities to tools found at Late Paleoindian sites across the northeastern United States and eastern Canada (Bolian 1980; Chapdelaine 1994; Doyle et al. 1985; Dumais 2000; Petersen et al. 2000; Robinson et. al. 2004;
Wright 1978, 1979). The clearest comparison can be made between the two large bifacially flaked and broken tools, PN 1145-1 and PN 1435-1. As discussed above, similar distal and proximal portions of large bifacially flaked tools have been identified at the Rimouski site in eastern Quebec, the Weirs Beach site in New Hampshire, the Reagan site in northern Vermont, and other sites across the broader northeastern United States and Canada. Their size, shape, and the absence or minimal evidence of any use-wear along their edges suggest that
they may have first served as cores where the debitage was used for expedient flake tools and the bifaces themselves were used more sparingly. This would be supported at the Arbor Gardens site by the large percentage of utilized flakes some of which likely originated from these larger pieces and the high percentage of small flakes less than three centimeters in size. Extensive curation of lithic materials and intensive use of the smallest flakes as tools is common in Late Paleoindian sites and has been used to explain the irregular nature of some pieces from the Reagen Paleoindian site in northern Vermont (Ritchie 1953; Thomas 1994).

Like the tools, the lithic debitage recovered from the Arbor Gardens site reveals much about the nature of the assemblage and those who created it. The small size of the debitage recovered and the virtual lack of primary reduction flakes suggests that only sharpening and retouching of tools took place at the Arbor Gardens site, with the earlier stages of lithic reduction having occurred elsewhere.

Given the relatively small size of the site at 1.11 acres (4,300 m²) and the concentration of artifacts within discrete areas, much of the densest portions of the site were extensively excavated, yielding excellent data related to the horizontal and vertical distribution of artifacts. The horizontal distribution of the lithic debitage is restricted to distinct clusters clearly discernable by lithic material type within the larger site area, another characteristic of sites dating to the extended Paleoindian period (Curran 1984; Thomas 1994). The distinct clustering of artifacts by raw material type suggests that each cluster minimally represents a separate task area where one or more persons were engaging in an activity that required the continuous production and use of lithic flakes. Activity Area 1 contains four distinct clusters of lithic debitage where each cluster is represented by a different lithic material (see Figure 16). Each lithic material, while clustered into distinct task areas horizontally, is distributed vertically, with the highest percentages found in the deepest excavated levels, or within the Bs and B/C soil horizons. The depth of distribution given the high percentage of small flakes further supports the age of the site since there is a propensity for larger flakes to migrate deeper into the soil matrix at a more rapid rate than the smaller flakes. This trend is certainly evident at the Arbor Gardens site where the largest flakes and tools were found in the deepest excavated levels (Figure 17).

While discrete activity areas characterize many precontact Native American sites throughout Vermont (Thomas 1994), the size and number of activity areas within the Arbor Gardens site, combined with their location and clear separation of exotic raw materials, suggest that these activity areas could demarcate some type of structure or at the very least one time processing areas. Additionally, many of the flakes found at the site are small secondary and tertiary flakes, suggesting that the material was not likely quarried nearby but rather it was carried from afar only to be re-sharpened at the Arbor Gardens site. The small flakes combined with the types of tools (e.g., modified flakes, utilized flakes) suggest that the occupants were attempting to find the most efficient use of a seemingly valuable material. This use of expedient tools is indicative of hunter-gatherer bands who are either not familiar with the local material or value the exotic material to such a degree that they are willing to use waste flakes as tools. This behavior is certainly very characteristic of the Paleoindian period in general, during which traveling bands of hunter-gatherers often found themselves in unfamiliar territory without knowledge of local lithic resources.

The Arbor Gardens site represents a rare glimpse at the earliest portion of precontact occupation in the Champlain Valley and the broader Northeast. This little studied period, occurring during the climatic transition between the Pleistocene and Holocene epochs, is often overlooked largely because its characteristically low density sites often elude archaeological surveys. Further, the necessity of diagnostic projectile points to assign relative dates to sites in the absence of radiocarbon dates leaves many probable early sites absent from the archaeological literature. Tool assemblages, along with archaeological and geographical context must be considered in assessing the relative age and importance of any archaeological site. Hopefully, with further work locally and regionally more sites like the Arbor Gardens site will be discovered, enabling us to better understand this intriguing and rarely noticed period in Vermont prehistory.

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Figure 17. Graph showing the distribution of lithic artifacts by size and depth.

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