Historic American Indian Maple Sugar and Syrup Production: Boiling Arches in Michigan and Wisconsin

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ABSTRACT The archaeological remains of boiling arches associated with historic American Indian maple sugar and syrup making activities are a distinct, but often overlooked, feature of Western Great Lakes forests. Occurring as single features or in multiple localities in close proximity to both current and abandoned Indian settlements, boiling arches are important components in the cultural landscape of Indian people, marking the transition from boiling maple sap in kettles to boiling sap in large metal flat pans. This paper describes the archaeological remains, context, and distribution of American Indian maple production boiling arches along with in-depth descriptions of two significant concentrations of arches at the Upper Peninsula Ojibwe community of Lac Vieux Desert in Michigan, and the Potawatomi/Ojibwe community of McCord in northern Wisconsin. Lastly this paper examines the historical significance of boiling arches and what they represent within American Indian communities in the Upper Peninsula and adjacent northern Wisconsin.

The archaeological remains of pre-contact American Indian maple sugaring sites have eluded and confounded archaeologists, while more recent historic archaeological examples of American Indian maple production have largely been ignored. A common, but easily overlooked, historic feature of twentieth century American Indian maple production activity is the boiling arch. Boiling arches are the built-up U-shaped rock and earth berms that enclosed a fire or firebox and supported the large, shallow, rectangular metal flat pan in which maple sap was boiled to make sugar and syrup (Figure 1). These twentieth century maple sugaring features offer a rare opportunity for understanding the context in which Indian people replaced sugaring kettles with the more efficient flat pan. This is a particularly interesting question because the shift occurred more than 40 years after Euro-Americans in the same region adopted flat pans.

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Figure 1 Use of a flat pan and boiling arch at the Johnson and Rice family sugarbush near Partridge Lake in northern Wisconsin in 1952. Photograph by Theodore Peterson (Courtesy of the Lac du Flambeau Tribal Historic Preservation Office).

This paper describes the archaeological remains, context, and distribution of American Indian maple production boiling arches along with in-depth descriptions of two significant concentrations of arches at the Upper Peninsula Ojibwe community of Lac Vieux Desert in Michigan and the Potawatomi/Ojibwe community of McCord in northern Wisconsin. Lastly this paper examines the historical significance of boiling arches and what they represent within American Indian communities in the Upper Peninsula of Michigan and adjacent northern Wisconsin.

Background

Throughout the eighteenth and nineteenth centuries, American Indians in the Lake Superior region produced thousands of pounds of maple sugar by boiling the sap of the maple tree each spring (Henry 1901). Carried out primarily by women, sap was collected in birchbark baskets and wood troughs and boiled in a series of kettles over an open air fire until the watery sap was reduced to a thick, molasses-like consistency that could be cooled and hardened into sugar cakes or worked into a granulated sugar (Wheeler 1844; Schoolcraft 1975 [1851]; Smith 1932). Dozens of large and small boiling

kettles were hung on hooks and chains from a heavy frame over a fire in a camp in the heart of the maple grove or sugarbush. At the end of the season, the boiling kettles and sugaring equipment were cached under birchbark and left in the sugarbush (Densmore 1974, 1979).

With resettlement of Indian populations on reservations in the latter half of the nineteenth century, the spatial distribution of Indian maple production saw greater pressure and restriction as former sugaring locations were no longer available and formerly independent bands were relocated and consolidated (Thomas 1999, 2004). In spite of these changes and limitations, the volume of American Indian maple production did not necessarily decline in this region. In fact, the opposite occurred. The arrival of non-Indian loggers and settlers in the ceded territories precipitated the development of a frontier market for maple sugar, leading to an increase in production by many Indian producers. For example, in the 1860s and 1870s, the Indian Agents at La Pointe reported that the six reservations under his jurisdiction were producing well over 100,000 pounds of maple sugar a year (Baird 1879; Whittlesey 1868). By the 1890s, the Lac du Flambeau Reservation alone reportedly produced an average of 40,000 pounds of maple sugar in a season (Mercer 1896). Even with a production volume of this magnitude, Indian maple producers continued to employ the same basic technology of open air kettles into the beginning of the twentieth century.

In contrast, as early as the 1820s Euro-American maple producers in New England began to abandon the use of kettles in favor of large metal flat pans. Flat pans are large, shallow, rectangular pans that are raised off the ground and out of the fire by being set upon what is referred to as an "arch" (Mather 1823:396–397; New England Farmer 1823:255). Flat pans were recognized as a more efficient replacement to boiling sap in a series of kettles because they increased the surface area, allowing steam to escape more easily. The arch exposed the boiling container to a greater amount of heat from the fire and provided better protection and control of the fire and draft, thus leading to a hotter fire. As an example, the early agricultural magazine *The Cultivator*, recommended in 1839, that metal flat pans be used to boil sap and that one "erect an arch of free stone or brick with grates to lay the wood upon and a good iron door to give a draught, so that the air passing through the arch shall be heated before it touches the bottom of the pan" (*The Cultivator* 1839:12).

Among Western Great Lakes Euro-Americans, particularly commercial producers, flat pans became increasingly common from the 1880s to the 1920s during which production began to shift from making maple sugar to

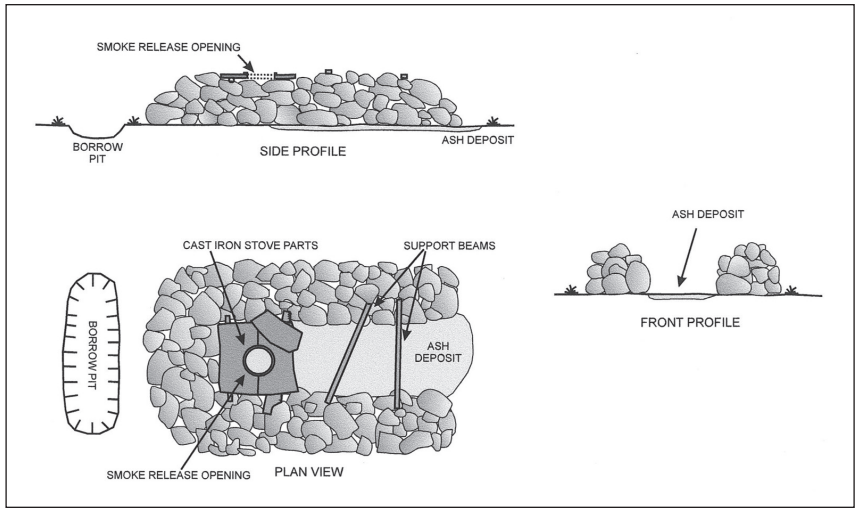

Figure 2 Idealized image of a typical boiling arch with associated material remains and features.

making maple syrup (Thomas 2004). After the turn of the century, and especially in the 1930s, Euro-American producers in the Western Great Lakes began to replace their flat pans with larger and very efficient commercial evaporators and fire brick lined metal arches. However, the Euro-American use of kettles and flat pans never entirely disappeared, particularly among noncommercial, hobbyist producers.

American Indian maple producers in the Upper Peninsula and adjacent northern Wisconsin began replacing kettles with flat pans in the 1920s and 1930s. At this time, maple production within Indian communities was beginning a period of decline as seasonal food procurement and production activities were being abandoned in favor of store bought foods, and new standards of labor and a wage economy were taking hold. Maple production continued to decline through the middle and late twentieth century, and in some communities was completely discontinued.

The primary evidence for the transition from the kettle to the flat pan in Western Great Lakes Indian communities is recorded in the archaeological remains of the boiling arches that supported these pans. More than a dozen former Indian sugarbushes in the Upper Peninsula of Michigan and across the central portion of northern Wisconsin contain the remnants of boiling arches.

Description

No two boiling arches are exactly the same, although their basic construction, morphology, and materials show limited variability. An idealized boiling arch emphasizes the most common elements of earth and stone construction, smoke release openings, support beams, borrow pits, ash and charcoal deposits, as discussed below (Figure 2).

Very few arches (American Indian or Euro-American) have been subject to professional archaeological excavation in the Western Great Lakes. One of the most thorough excavations occurred at 47Ir027 in Iron County, Wisconsin near the Bad River Reservation. Through a complete excavation designed to mitigate the effects of a proposed pipeline development, this arch was found to have been built primarily of stone with a soil matrix (Murray 1990). Other excavations have occurred at FS 09-10-05-358 on the Hiawatha National Forest in the eastern Upper Peninsula and along the south shore of Lac Vieux Desert in Wisconsin (Great Lakes Research Associates, Inc. 1995; Oerichbauer 1996).

Arch Construction

Most American Indian maple sugaring arches are constructed of soil with small boulder and large cobble size stones that are mounded up on the existing ground surface as shown in a generalized schematic of arch construction and elements in Figure 2. Examination of arches in the region does not suggest that any particular type of stone was preferred; rather arch builders used what was readily available. The soil is packed between the stones like a mortar, and occasionally the interior trench or firebox is lined with un-mortared brick. In one instance on the Chequamegon-Nicolet National Forest in Wisconsin (FS 09-06-05-296), the interior was plastered with cement. Some arches appear to be constructed almost entirely of mounded up earth with few stones visible on the surface of the feature as illustrated in the arch from the McCord Village, 47On221 (Figure 3). In a number of cases, the outer elevations or side and rear walls of the arch were reinforced with horizontally stacked logs, held in place by smaller posts driven vertically into the ground (Figure 1). A more rare form of boiling arch was formed by excavating a trench for the firebox into the ground, hillside or a large tree fall. Figure 4 shows an example of such an arch recorded by the Lac du Flambeau Tribal Historic Preservation Office as site number LDF-089. Arches usually occur as single features, although double or paired arches have been recorded (Tables 2 and 3). The built-up sides and rear of the arch

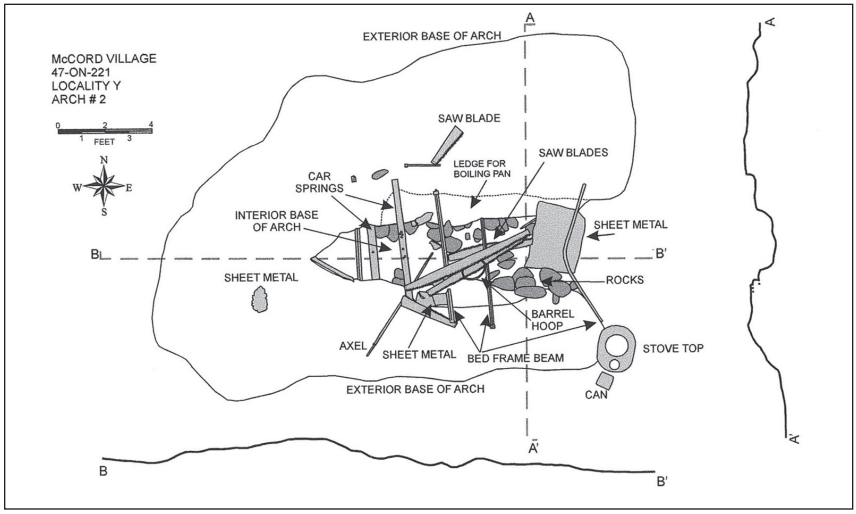

Figure 3 Detailed plan view of the surface features of boiling Arch # 2 at Locality Y of the McCord Village (47On221).

form a distinct U-shape. Although rare, arches occasionally consist of only two side walls and no rear enclosing wall. The resulting set of parallel berms is illustrated in the arch at Lac du Flambeau (LDF-081) shown in Figure 5.

In almost all arches, larger corner stones are placed around the front interior corners flanking the opening to the firebox (Figures 1–3). The larger stones helped maintain the shape of the arch during firing and "hardened" the wall, simplifying the removal of ash and charcoal from previous fires. Large pieces of sheet metal or doors from cast iron stoves are often found at or near the front opening, where they served as makeshift doors to protect the fire and control the draft in the firebox such as shown in Figures 1 and 3.

As an indication of the variability of arch dimensions and orientation, Tables 2 and 3 display the attributes of 39 arches recorded from the sugarbushes at the Lac Vieux Desert and McCord Villages. The exterior dimensions of arches range in size from 1.83 m (6 ft) to as much as 4.88 m (16 ft) in length and from 1.22 to 2.74 m (4 to 9 ft) in width with most arches averaging 3.05 to 3.35 m (10 to 11 ft) long and 1.83 or 2.13 (6 or 7 ft) wide with a height of about .31 m (1 ft) above the ground surface. The interior dimensions of the firebox range from 1.22 to 3.35 m (4 to 11 ft) in length and .46 to 1.22 m (1.5 to 4 ft) in width. No consistent spatial orientation to the long axis or opening to the arches occurs. Arches that are found on a hillside have been built perpendicular to the slope with the opening facing down slope.

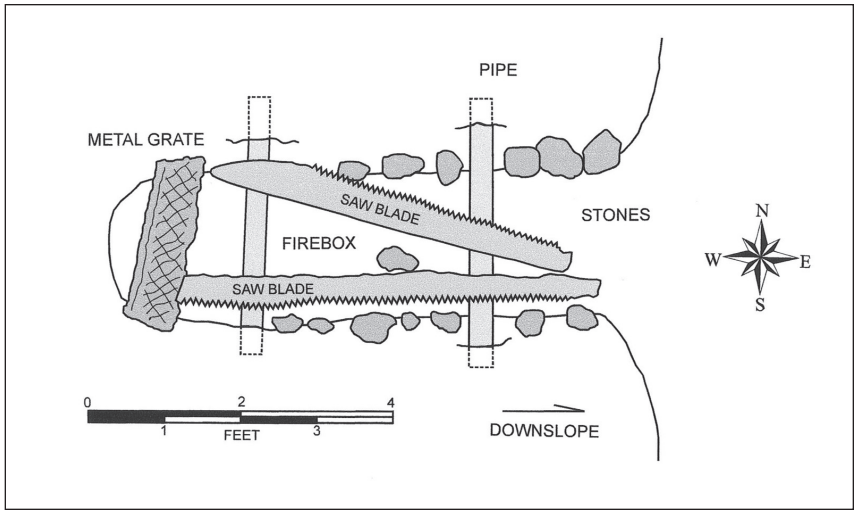

Figure 4 Plan view of a trench-style arch constructed in a hillside at site LDF-089 on the Lac du Flambeau Reservation.

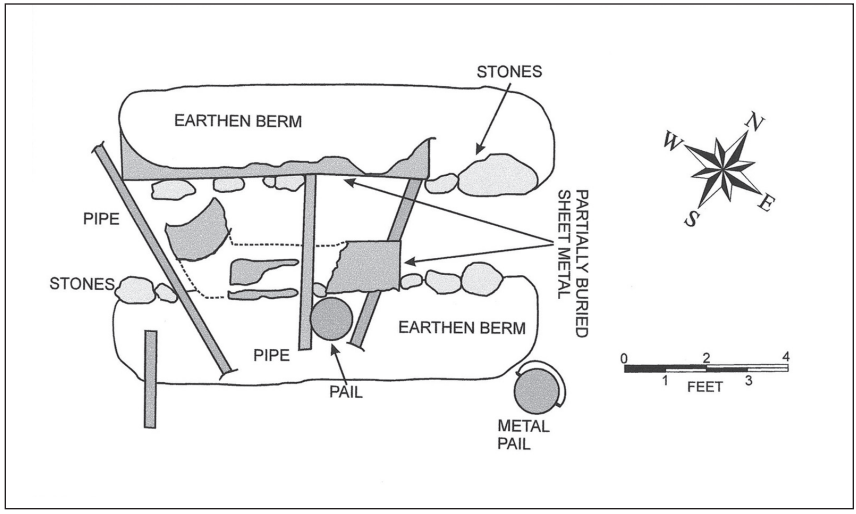

Figure 5 Plan view of a parallel wall-style arch at site LDF-081 on the Lac du Flambeau Reservation.

Smoke Release Opening

An opening for the release of smoke was located at the rear of the central trough or firebox (Figures 1–3 and 5). In many instances, sections of tubular metal smoke stack were found scattered around the sides and rear of an arch (Figure 6), having once been inserted vertically in the opening to direct

Table 1. Details of American Indian boiling arches recorded in Wisconsin and the Upper Peninsula of Michigan.

#	Locality	County, State	No. Arches	Arch Shape	Tribal Affiliation	Site Numbers
1	Lac Vieux Desert[a]	Gogebic, MI	29	U-Shaped	Ojibwe	See Table 2
2	McCord Village	Oneida, WI	10	U-Shaped & Ojibwe	Potawatomi See Table 2	
3	Lac du Flambeau	Vilas & Iron, WI	4	Parallel /Trench /U-Shaped	Ojibwe	LDF-083, LDF-081, LDF-089 (2)[b]
4	Hiawatha National Forest	Alger & Mackinac, MI	3	U-shaped	Probable	FS 09-10-03-691,
				Ojibwe	FS 09-10-03-1010,	
					FS 09-10-05-358	
5	Chequamegon-Nicolet National Forest	Forest, WI	2	U-Shaped /Parallel	Probable Potawatomi	FS 09-06-03-110, FS 09-06-05-296
6	Chequamegon-Nicolet National Forest	Bayfield, WI	1	Trench	Probable Ojibwe	FS 09-02-04-077
7	Ottawa National Forest	Iron, MI	1	Parallel Ojibwe	Probable	FS 09-07-03-163
8	Bad River	Iron, WI	1	U-Shaped	Ojibwe	47Ir-027
9	Skunk Hill	Wood, WI	1	U-Shaped Ho-Chunk	Potawatomi &	47Wo-002
10	Ford Forestry Center	Baraga, MI	1	U-shaped Ojibwe	Probable	unassigned
11	Partridge Lake	Vilas, WI	Exact # Unknown	U-shaped	Potawatomi & Ojibwe	unassigned

[a] For the purposes of this table Lac Vieux Desert is treated separately from the Ottawa National Forest

[b] Lac du Flambeau site LDF-089 contains two boiling arches

smoke and ash away from the boiling pan and facilitate the drawing of a stronger draft through the firebox as seen in Figure 1. The openings at the rear of the arch were sometimes closed tightly around the smoke stack by miscellaneous pieces of sheet metal or by broken sections from the tops of cast iron stoves.

Support Beams

Heavy, narrow pieces of metal were often laid across the width of the firebox to support and level the flat boiling pans, that were especially heavy when full of sap (Figures 1–5). A range of recycled and salvaged materials were used for the metal supports, including sections of pipe, sheet metal, railroad rails, cross cut and band saw blades, side angle irons from bed frames, and car parts such as springs and axles. In a 1982 interview, the late Henry Polar, Sr. [age 80], a Lac Vieux Desert tribal member and former maple sugarer, told a Forest Service archaeologist that he recalled salvaging metal items, such as saw blades, from old logging camps for use in the family sugarbush (Franzen and Dinsmore 1983). Sheet metal was also used in some arches to line the interior firebox, supported by metal stakes driven vertically into the ground.

Borrow Pits

Because arches are usually built up on the existing ground surface, it is necessary to obtain fill for their construction. As a result, small, round to oblong depressions representing borrow pits are often found around the side and rear walls of an arch (see Figures 2 and 6). The diameters of these borrow pits range from .31 to .91 m (one to three ft) in diameter and from .15 to .45 m (.5 to 1.5 ft) in depth.

Ash and Charcoal Deposits

Deposits of ash and charcoal are sometimes found in the interior of the firebox and in a zone around the opening of the arch (Figure 2). Likewise, a concentration of ash and charcoal is sometimes located in close proximity to the arch, a result of the periodic cleaning of the firebox.

Location

Boiling arches are invariably found among the remains of a sugaring camp in current or former stands of maple trees. The remains of the sugaring

Table 2. Attributes of boiling arches from the Lac Vieux Desert Village.

Locality	Orientation/Opening	Internal Dimensions, m(ft)	External Dimensions, m(ft)	Reference
FS 09-07-06-083	SW-NE / SW	2.74 x .91 (9.0 x 3.0)	3.66 x 2.29 (12.0 x 7.5)	Franzen & Densmore 1983
FS 09-07-06-085	N-S / N	2.74 x .61 (9.0 x 2.0)	3.66 x 2.13 (12.0 x 7.0)	Franzen & Densmore 1983
FS 09-07-06-086	1) W-E / W 2) W-E / W	1) 2.13 x .61 (7.0 x 2.0) 2) 2.13 x .61 (7.0 x 2.0)	1) 2.74 x 1.52 (9.0 x 5.0) 2) 2.74 x 1.52 (9.0 x 5.0)	Franzen & Densmore 1983
FS 09-07-06-088	SW-NE / SW	3.05 x .61 (10.0 x 2.0)	3.66 x 1.52 (12.0 x 5.0)	Franzen & Densmore 1983
FS - I	—	—	—	Franzen & Densmore 1983
FS - K	—	—	—	Franzen & Densmore 1983
FS 09-07-06-274	1) S-N / S 2) SW-NE / SW	1) 1.22 x .46 (4.0 x 1.5) 2) 1.22 x .46 (4.0 x 1.5)	1)1.83 x 1.22 (6.0 x 4.0) 2) 1.83 x 1.22 (6.0 x 4.0)	Franzen & Densmore 1984
FS 09-07-06-275	1) N-S / N 2) NW-SE / NW	1) 2.13 x .61 (7.0 x 2.0) 2) 2.74 x .61 (9.0 x 2.0)	1) 3.35 x 2.13 (11.0 x 7.0) 2) 3.66 x 1.83 (12.0 x 6.0)	Franzen & Densmore 1984
FS 09-07-06-276	NW-SE / NW	2.44 x .61 (8.0 x 2.0)	3.05 x 1.83 (10.0 x 6.0)	Franzen & Densmore 1984
FS 09-07-06-279	SE-NW / SE	2.13 x 1.22 (7.0 x 4.0)	2.74 x 2.44 (9.0 x 8.0)	Franzen & Densmore 1984
LVD Tribe D-3	—	—	—	Martin 1992
LVD Tribe D-4	NW-SE /—	—	—	Martin 1992
LVD Tribe D-5	N-S /—	—	3.96 x — (13.0 x —)	Martin 1992

Locality	Orientation/Opening	Internal Dimensions, m(ft)	External Dimensions, m(ft)	Reference
LVD Tribe D-7	N-S /—	—	2.90 x — (9.5 x —)	Martin 1992
LVD Tribe D-8 / FS 09-07-06-656	NE-SW / NE	2.29 x .61 (7.5 x 2.0)	3.05 x 1.83 (10.0 x 6.0)	Martin 1992 Thomas 2001a
LVD Tribe D-9	S-N / S	—	2.90 x — (9.5 x —)	Martin 1992
LVD Tribe D-10	W-E / W	—	—	Martin 1992
FS 09-07-06-654	SW-NE / SW	2.13 x .61 (7.0 x 2.0)	3.05 x 1.83 (10.0 x 6.0)	Thomas 2001a
FS 09-07-06-655	W-E / W	2.74 x .91 (9.0 x 3.0)	3.66 x 2.13 (12.0 x 7.0)	Thomas 2001a
FS 09-07-06-657	SE-NW / SE	2.44 x .91 (8.0 x 3.0)	3.35 x 2.13 (11.0 x 7.0)	Thomas 2001a
FS 09-07-06-658	E-W / E	2.29 x .61 (7.5 x 2.0)	3.05 x 1.83 (10.0 x 6.0)	Thomas 2001a
FS 09-07-06-660	S-N / S	1.52 x .46 (5.0 x 1.5)	2.44 x 1.52 (8.0 x 5.0)	Thomas 2001a
FS 09-07-06-661	S-N / S	1.52 x .61 (5.0 x 2.0)	2.44 x 1.52 (8.0 x 5.0)	Thomas 2001a
FS 09-07-06-662	SW-NE / SW	2.13 x .76 (7.0 x 2.5)	3.05 x .76 (10.0 x 2.5)	Thomas 2001a
FS 09-07-06-663	S-N / S	2.13 x .91 (7.0 x 3.0)	3.05 x 2.74 (10.0 x 9.0)	Thomas 2001a
FS 09-07-06-670	SW-NE / SW	1.52 x .76 (5.0 x 2.5)	2.74 x 1.83 (9.0 x 6.0)	Thomas 2001a

Table 3. Attributes of boiling arches from the McCord Village.

Locality	Orientation/Opening	Internal Dimensions, m(ft)	External Dimensions, m(ft)	Reference
U	SE – NW / SE	2.13 x .61 (7.0 x 2.0)	3.44 x 2.50 (11.3 x 8.2)	Holliday 2000
W	NW – SE / NW	2.60 x .76 (8.5 x 2.5)	3.51 x 2.29 (11.5 x 7.5)	Broihahn and Thomas 2003
X	NW – SE / NW	3.35 x .91 (11.0 x 3.0)	3.66 x 2.29 (12.0 x 7.5)	Broihahn and Thomas 2004
Y	1) NE – SW / NE 2) NE – SW / NE	1) 3.35 x .91 (11.0 x 3.0) 2) 3.35 x .91 (11.0 x 3.0)	1) 5.33 x 3.05 (17.5 x 10.0) 2) 4.88 x 3.05 (16.0 x 10)	Broihahn and Thomas 2004
Z	SE – NW / SE	2.74 x .61 (9.0 x 2.0)	2.74 x 1.83 (9.0 x 6.0)	Broihahn and Thomas 2004
AA	E – W / E	2.13 x .61 (7.0 x 2.0)	2.74 x 2.74 (9.0 x 9.0)	Broihahn and Thomas 2004
CC	S – N / S	2.13 x .61 (7.0 x 2.0)	3.05 x 2.13 (10.0 x 7.0)	Broihahn and Thomas 2004
GG	1) NE – SW / NE 2) SE-NW / SE	1) 1.52 x .61 (5.0 x 2.0) 2) 2.13 x .61 (7.0 x 2.0)	indeterminate	Broihahn and Thomas 2004

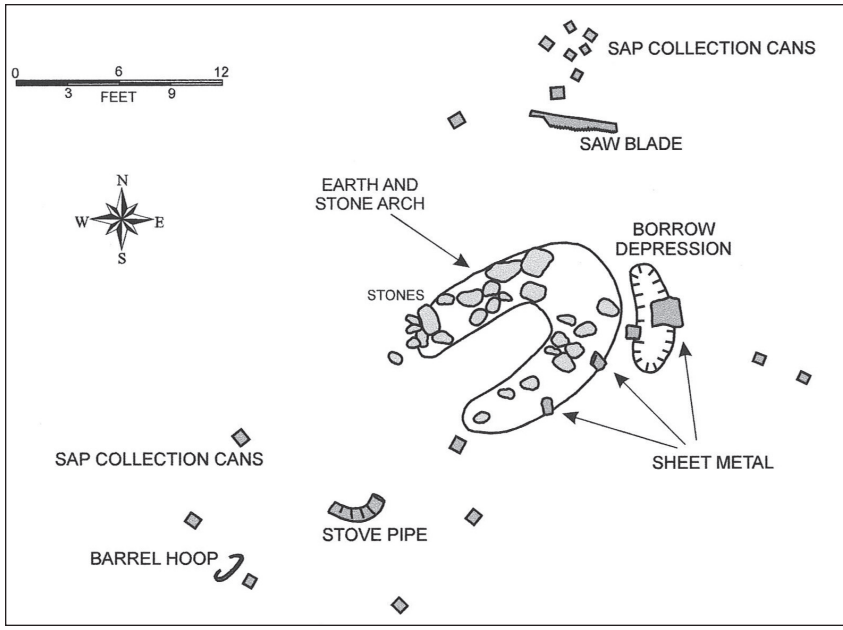

Figure 6 Boiling camp with arch and surrounding artifacts and features associated with maple production at Ottawa National Forest Service site FS 09-07-06-670 in the Lac Vieux Desert sugarbush.

camp may include a surface scatter of sugaring related artifacts like sap collection cans and gathering pails. Arches have also been found in association with mature maple trees with basal thickening from years of tapping. The arch may be located at the edge or center of an opening or clearing. Many, but not all, arches are found within .4–3.22 km (.25–2 miles) of current or former Indian villages and communities. For example, Figure 8 indicates the location of the boiling arches and sugaring camps in relation to the settlement area at the McCord Village. When arches are located more than .4 km (.25 miles) from a residential area, they are almost always situated alongside or very near an overland transportation feature and are seldom directly associated with access to water.

Distribution

American Indian maple sugaring boiling arches are located in maple forests adjacent to or within a few kilometers of early to mid-twentieth century settlements. As Figure 7 and Table 1 indicate, sugarbushes with multiple

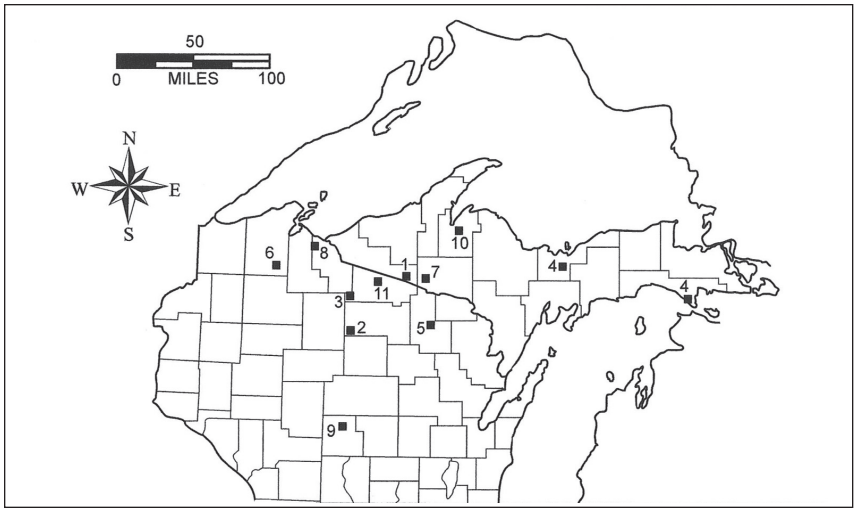

Figure 7 Distribution of American Indian boiling arches recorded in Wisconsin and the Upper Peninsula of Michigan. Lac Vieux Desert—1; McCord Village—2; Lac du Flambeau—3; Hiawatha National Forest—4; Chequamegon-Nicolet National Forest (Forest County)—5; Chequamegon-Nicolet National Forest (Bayfield County)—6; Ottawa National Forest (non-Lac Vieux Desert)—7; Bad River—8; Skunk Hill—9; Ford Forestry Center—10; Partridge Lake—11.

boiling arches have been recorded in the central region of northern Wisconsin and the adjacent western Upper Peninsula of Michigan at four localities associated with current and abandoned settlements, most notably the Lac Vieux Desert Village and the McCord Village. In addition, isolated arches have been identified as either definitely or likely to be of American Indian origin at nine other locations. Travel, interaction, and intermarrying regularly occurred between many of these communities, facilitating the diffusion of both the concept and the technology of the flat pan and boiling arch. Remnants of additional arches likely exist in similar settings near American Indian communities across the northern portions of Minnesota, Wisconsin, the Upper Peninsula of Michigan and northern Lower Michigan.

Lac Vieux Desert Village

The traditional village of the Lac Vieux Desert Ojibwe community is located on the northern side of the lake Lac Vieux Desert on the border between Wisconsin and the Upper Peninsula of Michigan (Figure 7). Ojibwe people have lived on Lac Vieux Desert since at least the mid-1700s, with village settlements shifting between islands in the lake and various places along the

north shore. The French name, Lac Vieux Desert, is often translated to mean the old planting grounds or old gardens, itself a translation of the Ojibwe name Katikitegon or Kategitegoning, referring to the numerous gardens established by the Ojibwe on the islands and mainland. Today, the majority of the most recent village is on tribally owned land, while the surrounding forests are under federal ownership and managed by the Ottawa National Forest.

The extensive maple stand tapped by the Lac Vieux Desert Ojibwe has been identified as a sugarbush since as early as 1792 when Northwest Company fur trader Jean Baptiste Perrault and his men wintered at the location (Perrault 1909). In the spring of 1792, Perrault's men tapped the sugarbush producing seven kegs of sugar from boiling sap in kettles they had yet to trade. Later surveyors and landlookers like Cram and Longyear also reported a sugarbush in this location (Cram 1840; Longyear 1983). A photograph of a maple sugaring equipment cache taken in the fall of 1888 by the Longyear party, now archived at the Marquette County Historical Society, indicates the Lac Vieux Desert Ojibwe continued to collect sap in birch bark containers and boiled it in kettles. Nineteenth century technology persisted into the early twentieth century, but by the 1930s flat pans had replaced kettles and re-used metal food cans had replaced birch bark for sap receptacles.

With only one unimproved road to the village, residents traveled along foot trails from their homes to their family camps in the Lac Vieux Desert sugarbush. In an interview, tribal elder Rose (Polar) Martin, born in 1933, recalls her family sugaring camp having a canvas covered wigwam or waninogan. The family stayed in the lodge during the sugaring season even though their home was only a quarter mile away. According to Rose Martin, her mother Minnie (White) Polar and father Henry Polar, Sr. moved the camp every few years and boiled sap in a rectangular flat pan. Her father tapped the trees with an axe and inserted flat wood spiles that he had carved by hand. Sap was collected by Rose, her brother, and her sister in recycled coffee cans set on the ground. At the time, the Polar family made syrup, granulated sugar, sugar cakes, and maple taffy as a treat for the children (Rose Martin, personal communication 2003). Maple production in the Lac Vieux Desert sugarbush continued through the 1930s and early 1940s before being abandoned during World War II when all but one of the Ojibwe families living in the village moved to the nearby town of Watersmeet, Michigan (Densmore 1949; Humins 1982; Kinietz 1947).

Between 1980 and 1992, archaeologists conducting surveys for the Ottawa National Forest and the Lac Vieux Desert Band in the vicinity of the old village recorded the location of 17 individual maple sugaring camps

or features, containing a total of 20 arches (Franzen and Dinsmore 1983, 1984; Martin 1992). Supplemental surface survey conducted by the author for the Ottawa National Forest in 2001 identified an additional 10 sugaring camps and features, nine of which contained single boiling arches (Thomas 2001a). In total, there are at least 29 rock and earth boiling arches scattered across the approximately 140 acre Lac Vieux Desert sugarbush (Table 2) making this the largest and densest concentration of boiling arches so far recorded for any Western Great Lakes Indian community.

The Lac Vieux Desert arches are generally oriented in all directions (Table 2), and are evenly spaced across the sugarbush, with no apparent relationship to the location of transportation features such as the road or trail. The Lac Vieux Desert Tribal Historic Preservation Office, Tribal Cultural Committee, and Tribal Council have encouraged the discussion and investigation of these cultural resources, but they have requested that the specific location of these camps not be published in order to ensure their protection.

As noted above, maple sugaring activities essentially ceased in the sugarbush in the 1940s with the relocation of most of the village residents to the town of Watersmeet. Since that time, a few tribal members have tapped a small number of trees for a season or two. Sugaring equipment was often left behind, either no longer of use or having been replaced by newer items. As is indicated in Figure 6, reused metal coffee and food canisters and other pails used to collect sap are found scattered on the ground near the camps and at the base of maple trees throughout the sugarbush. In addition, other sugaring accoutrements, such as metal pointed and squared shovels, and barrel hoops are found on the surface at the camps. Recycled heavy metal pieces and salvaged saw blades are common at many of the arches as supports for the heavy sap filled flat pans. Other sites contain the remains of cast iron stoves where they were used as doors to the stone and earth fire box and to form an opening at the rear to support a metal smoke stack. In two locations at Lac Vieux Desert discarded rectangular metal flat pans were observed.

At first glance, the large number of arches suggests that dozens of families were using the sugarbush. However, as noted by Lac Vieux Desert elder, Rose Martin (personal communication 2003), it was common for the family to move the sugaring camp to a different location in the sugarbush every few years. As a result, over a 20 year period, five or six families moving every few years could have easily constructed the 28 known arches. It is likely that even more boiling arches and camps are present in the sugarbush but have yet to be identified.

Many of the maple trees exhibit basal scarring from years of tapping with an axe or large size drill bit. The largest and most scarred trees are found closest to the village in areas that have never been logged. Gathering of dead and down wood and select cutting for firewood to heat homes and boil sap along with the dense canopy of maples limiting regeneration of young maple trees, resulted in a very clean and park-like maple woods.

McCord Village

During the early development of Wisconsin, populations of Potawatomi Indians occupied much of the southeastern corner of the territory. Growing westward settlement and a federal Indian removal policy led to the forced relocation of many Potawatomi residents, first to Iowa and later to Kansas (Sasso and Wilder 1998). A number of Potawatomi resisted and never left, instead moving northward to Canada or carving homes and villages out of the forests of Wisconsin and the Upper Peninsula of Michigan (Clifton 1977; Tiedke 1951). In the late nineteenth and early twentieth centuries, with no reservation or lands to settle on, Potawatomi families known as the "landless refugees" or "stray bands" came together in the Indian communities of Skunk Hill/Powers Bluff, Big and Little Indian Farms, Indian Lake, and McCord. Along with a smaller mix of Ojibwe and Ho-Chunk families, these "stray bands" established multi-tribal communities on the cut over and abandoned lands in central and northern Wisconsin. Adding to their ranks were returning Potawatomi who were previously removed but became dissatisfied with the conditions of the reservations in Kansas (Edmunds 1978). Eventually, reservations and homes were established by the federal government for most of these families in Wisconsin and Michigan. Before that time, travel between these landless communities and reservation communities was common.

One of the longest-lived of the Wisconsin "stray band" communities was the McCord Village in southern Oneida County. First occupied around 1890 and abandoned in the 1950s, McCord residents were predominantly Potawatomi along with Ojibwe and a few Ho-Chunk and Menominee residents. Like Skunk Hill and Big and Little Indian Farms, McCord was home to practitioners of the Big Drum and Midewiwin religious societies (Amour 1992). Within the McCord Village as many as ten families were spread along two unpaved county roads adjacent to Little Somo Creek. Along with gardening, hunting, gathering, tanning hides, doing bead work, and sewing moccasins for sale, the village residents produced maple sugar and syrup (Talbot 1980).

In 1998, the Office of the State Archaeologist of Wisconsin began field investigations at the McCord Village (47On221) in partnership with Oneida County. This collaborative project led to the nomination and listing of the village on the National Register of Historic Places in 2001 (Holliday 2000). Initial investigations, along with supplemental surveys, identified nine distinct maple sugaring localities in the maple forest around the McCord Village (Figure 8). Eight of these localities contain a total of ten boiling arches. One locality (BB) did not include a boiling arch. Of the eight boiling arch localities, five are south of the village (X, Y, AA, CC, GG), two are to the west (U, Z), and one is to the north (W). Detailed attributes of the McCord boiling arches are found in Table 3. Currently, McCord Village contains the greatest concentration of archaeological remains of boiling arches at an American Indian community in Wisconsin, second only to Lac Vieux Desert for the Western Great Lakes region.

Initially identified in 2003, the presence of the northern sugarbush at Locality W was corroborated by Lee Batiste, who was born at McCord Village in 1933, and lived there until his family moved away in 1941 (Broihahn and Thomas 2003). Batiste recalled that each family had its own sugaring camp with wigwams where they slept at night. He also noted that they hung cans from hooks on taps in the trees and set cans on the ground to catch sap but did not use birch bark containers. As a young boy, Batiste was put to work gathering firewood and hauling sap, and fondly remembers sneaking a drink of sap when the adults weren't looking. Batiste only knew of sugaring activity "up the hill" on the high ground in the vicinity of Locality W, noting that it was the only place around to tap trees, as the rest of the land around the village was all cut over land.

Archaeological investigations in 1998, 2000, 2003, and 2004 identified recycled metal food cans used for sap collection laying on the surface in the vicinity of all the boiling arch localities. In addition, the southernmost camps included nested sets of commercially produced sap pails. At one locality a pail filled with commercial taps was noted, while at a different locality a small cache of homemade sheet metal taps was identified. One can find examples of all the artifactual elements common to American Indian boiling arch sites, such as stove parts, saw blades, barrel hoops, sheet metal and borrow pits.

The most significant sugaring camp at McCord is Locality Y, both for the size of the arches and for the associated material remains (Figure 8). Situated among the cluster of sugaring camps south of the main village, Locality Y centers on two enormous boiling arches 9.45 m (31 ft) apart. Both arches are over 4.88 m (16 ft) in length with interior fireboxes measuring

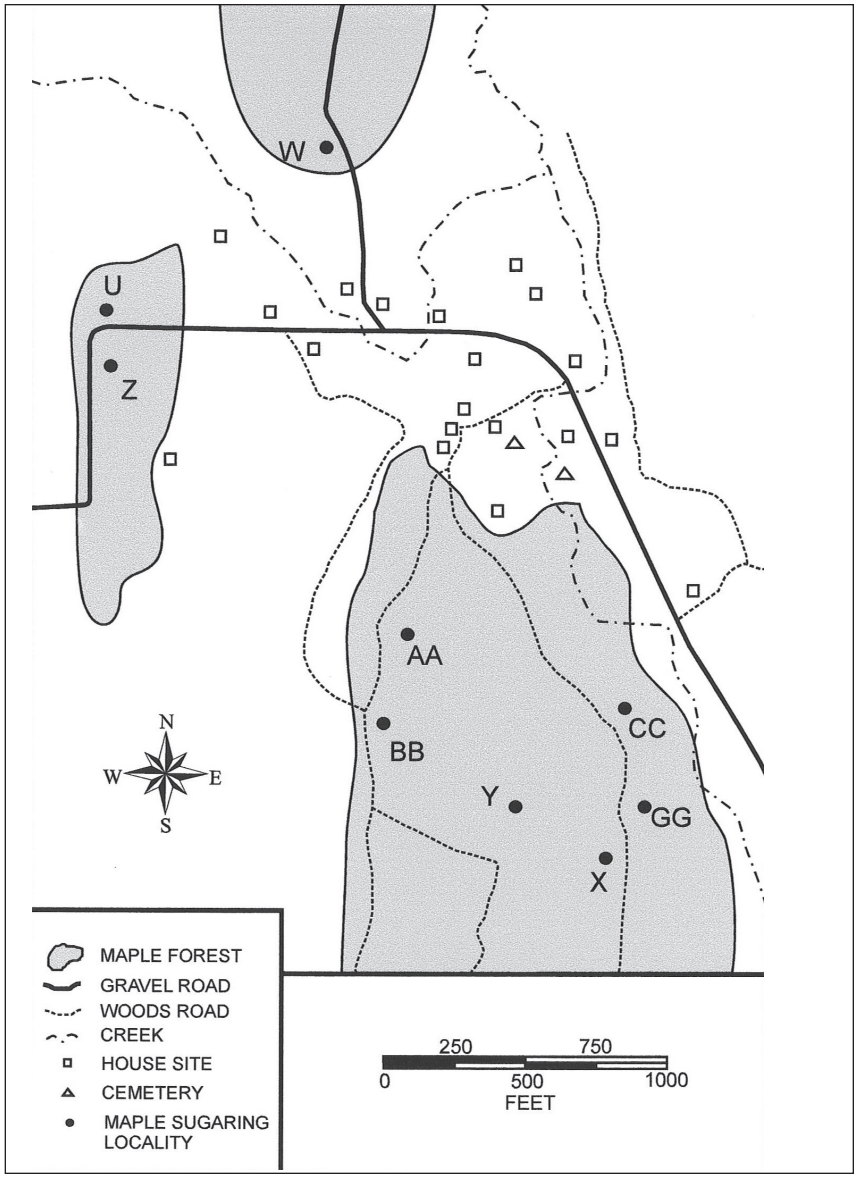

Figure 8 Distribution of boiling arch localities in relation to habitation and other landscape features at the McCord Village (47On221).

3.35 m (11 ft) long and .91 m (3 ft) wide with the top of the arch rising .61 m (2 ft) above the surrounding ground surface (Broihahn and Thomas 2004, Broihahn 2004). Although neither arch was excavated or disturbed, they each appear to be constructed primarily of dirt with rocks used to line the interior firebox. An abandoned flat pan was not identified at this locality, however the westernmost arch (Arch # 2) did contain a rich collection of metal cross beams in place across the firebox and a large piece of sheet metal at the opening (See Figure 3). Arch # 2 exhibited a low interior shelf or ridge along both the upper portion of the walls marking where the flat pan once sat. In contrast, the eastern arch (Arch # 1) contained only one partially buried piece of metal and a large ash and charcoal concentration near the arch opening. A comparison of the artifact abundance at Arch # 2 and the absence of artifacts at Arch # 1 suggest that Arch #2 was constructed as a replacement for Arch # 1.

Discussion

Boiling arches in the Lake Superior region have been recorded in sugarbushes associated with twentieth century Ojibwe and Potawatomi occupations on Tribal, National Forest, county, state, and private lands. The largest concentrations of arches have been recorded in association with the Lac Vieux Desert Ojibwe Band in the Upper Peninsula of Michigan and with the McCord Potawatomi and Ojibwe Village in northern Wisconsin. In American Indian communities in the Western Great Lakes, the use of stone and earth boiling arches and flat pans dates between the early part of the twentieth century to today, with the greatest period of use occurring between 1920 and 1950. Written accounts, oral histories, and photographs of American Indian sugaring in the region are sparse from this time period and generally do not depict the use of flat pans and boiling arches before the 1930s. Because those other forms of evidence are temporally restricted, archaeological remains are the best evidence for sugaring activities, with the primary artifact being sap collection cans. Sap collection cans most commonly found associated with boiling arches are reused number ten size roll-form sanitary cans with the exterior concentric rings on the body of the can, which were introduced in the early 1920s (Rock 1998). Smooth sided sanitary cans which date from around the turn of the century are also fairly common. Occasionally, a few hole-in-the top cans are present alongside smooth sided and roll form sanitary cans. The use of metal cans in the dating of these sites can be problematic due to the repeated and long term use of a sugarbush where a sequence of noncontemporary sap collection

containers may be present. All forms of sap collection containers—beginning with birch bark, then smooth sided sanitary cans, roll form cans, and finally pails or buckets—were curated from season to season before being abandoned and replaced.

Boiling arches resemble a number of other above ground features of similar size, shape and materials. Stone piles resulting from clearing fields, gardens, and roads are not uncommon surface features in the Western Great Lakes (Dunham et al. 1998). In addition, some stone piles have been interpreted, sometimes incorrectly, as American Indian grave markers and coverings. In one instance along the south shore of Lac Vieux Desert in Vilas County, Wisconsin, a group of such stone piles were reported by informants to be American Indian burials. Conflicting reports came from another informant who had resided in the vicinity for over 70 years and asserted that he remembers the construction of the rock piles, which were not burials but were made by Ojibwe for boiling maple sap in the early twentieth century (Oerichbauer 1996). Professional excavation of two of the stone piles under permission of the state burial sites office revealed no evidence of human burial. A similar question of identification exists on the north side of Lac Vieux Desert near the old village, where a cluster of stone cairns located adjacent to known boiling arches have been recorded as historic Ojibwe burials by Forest Service archaeologists, although elders from the Lac Vieux Desert Ojibwe community expressed no knowledge of burials or a cemetery at that location (Franzen and Dinsmore 1983).

One of the keys to recognizing the function of an apparent maple production boiling arch is to examine the landscape context in which it is found, namely its association with a sugar camp or sugarbush. Sugar camps where arches were used in American Indian communities usually include a surface scatter of materials related to gathering and processing maple sap (Thomas 1999, 2001b). As described above, in addition to the metal items that were a part of the structure of the boiling arch itself, boiling arches are often surrounded by a surface scatter of artifacts associated with the production process. On a few occasions, the metal flat pan that sat upon the arch to boil sap was found nearby, as recorded at sugar camps at Lac du Flambeau and Lac Vieux Desert. In addition, large metal cans and barrel hoops from sap storage containers have been recorded. Domestic trash not directly related to maple production is also occasionally recorded in association with boiling arches as a result of the continuous occupation of the camp during the sugaring season.

Alongside the associated material evidence, the forest context itself may provide another clue that the feature is associated with maple production.

Boiling arch features are almost always located in stands of maple trees. In some cases the once tapped maples have been logged and other deciduous trees like beech or aspen have taken over. If the maple trees have not been cut since the most recent episode of tapping, mature trees tapped for many years often show a thickening to the diameter of the lower .91 to 1.22 m (3–4 ft) of the tree. This basal scarring has built up in response to years of intensive tapping with an axe and chisel prior to the shift to tubular taps placed in holes drilled in the tree.

The number of arches present in a single Indian sugarbush should not be used as a measure of how many families were sugaring at any one time. While many sugarbushes were home to more than one family, it was common practice for a family to periodically use different parts of the sugarbush. As a girl growing up at the old village on Lac Vieux Desert, Tribal elder Rose Martin (age 80) recalled in a 2003 interview that the family sugar camp was moved every few years to give the recently tapped trees a rest. A similar process was reported by Potawatomi/Ojibwe elder Lillian (Johnson) Rice for her family sugarbush, shown in Figure 1, near Partridge Lake in Vilas County, Wisconsin (Lillian Rice, personal communication 2003). The result of this pattern of intra-sugarbush mobility was that a small number of families could have constructed a dozen boiling arches and sugaring camps in a single maple woods or sugarbush over a period of 20 or 30 years.

As important as the accurate interpretation and recognition of boiling arches is what they represent in American Indian cultural history. Arches and flat pans came into use in Western Great Lakes Indian communities during a period of massive cultural upheaval and readjustment as traditional food production activities were experiencing rapid abandonment. The adoption of flat pans and arches by American Indian maple producers can be viewed as a natural or expected occurrence as better technology became known and available. The timing of its introduction in the twentieth century is significant, since the technology was in use by non-Indian producers a half century earlier. The generation that began to adopt flat pans and arches in the 1920s was the first adult cohort to have gone through the government schools in the region. Thus, producers were more familiar with the broader American culture than earlier generations. It was also during this generation that men began to assume a greater role in the sugarbush. This shift in gender roles has been noted by other scholars and can be seen in photographs, written accounts, and oral histories of Indian maple production spanning the twentieth century (Meyer 1994:79; Paap and Paap 1998:250).

Accompanying the greater role of men in the sugarbush and the shift

from kettles to flat pans and arches was the beginning of a shift from production of maple sugar to the production of maple syrup. It is my contention that the changes from women to men and from sugar to syrup that accompanied the abandonment of kettles and adoption of flat pans were not coincidental, but related to a larger process of westernization and masculinization of the Indian sugarbush.

The arch also represents the continuation and adaptation of forest-based food production traditions and the use of those traditions as a means to obtain money. This was a time in history when the nation faced a severe economic crisis and many Indian people had yet to fully enter the wage labor and cash based economy of the dominant culture.

Conclusion

Because very little is written about American Indian maple production in the first half of the twentieth century, reconstructing the details can be difficult. As a result, the archaeological remains of boiling arches are a significant source of information on the technology and site-level spatial organization of American Indian maple production. It is likely that in past archaeological investigations boiling arches were not always recognized and are more abundant than previously thought or demonstrated from the sites listed in this study. Similarly, few archaelogical reports exist for Euro-American boiling arches in use during the latter half of the nineteenth and first half of the twentieth centuries. The structure, features and associated material remains of American Indian boiling arches are unmistakable when examined in their historical, cultural, and landscape contexts.

American Indians have arguably been producing maple sugar for hundreds of years and likely "invented" the process. But by the 1920s and 1930s, the long standing methods of Indian maple production had changed significantly. Indian maple producers had begun to employ technologies and equipment for sap collection and boiling whose origins were found in Euro-American society. In some cases, readily available items, like reused metal food cans, were adapted to sap collection, replacing birch bark receptacles. In other situations, improvements in efficiency, quality, and simplicity fueled the adoption of new technologies, such as the flat pan and boiling arch.

Why such adoption occurred when it did is important. Was it simply a case of critical mass whereby Indian people began a wholesale embrace of the ideas and technologies of dominant culture? Or was it a more com-

plex interplay of adaptation and acculturation? Essentially a Euro-American invention, these arches represent westernization of American Indian communities and the rapid adoption of Euro-American technology, norms, and foodways. Church and government worked diligently to break down and replace traditional cultural norms with those of western society. At the same time, these archaeological features demonstrate the continued use of forest resources for gathering and food production as Indian people struggled with poverty while working to maintain their traditions.

This period witnessed more than a change in maple production technology in Indian sugarbushes. Syrup began to be produced more than sugar and labor and expertise was increasingly provided by men as they worked alongside and eventually replaced women. Traditions, beliefs, and methods, like the increasingly mixed ancestry of Indian families, also became cultural amalgamations.

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