

# **An Archaeological and Geomorphological Perspective of the Solverson Site (47VE1252), Vernon County, Wisconsin**

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## **ABSTRACT**

In archaeology geomorphic principles and analysis are helpful in site interpretation. The Solverson site is located on a shoulder position of a hillslope in an upland setting of the Driftless Area of southwestern Wisconsin. Excavations in 2000 located a prehistoric quarry that produced several hundred flakes, cores, and debitage of Prairie du Chien (PdC) chert that appeared to be in situ. Analysis of two soil profiles revealed a profile sequence of A, E, Bt, and C horizons directly above dolomite bedrock. A prehistoric surface detected at 20-25cm below ground surface showed an increase in clay percentage and a decrease in silt and sand percentages. A similar pattern in artifact concentrations is also present from that investigation. Excavation continued in 2001 with the placement of another 1m x 2m unit and new research questions involving site formation processes, prehistoric quarrying activities, and an estimated date of occupation. This project addresses those topics.

## **INTRODUCTION**

The archaeological record holds many keys to the past but there are also many gaps and unanswered questions. Through research and constant testing and retesting of hypotheses, archaeologists are filling in the gaps and answering the questions. Archaeological research involves the interpretation of sites in order to piece together the past activities of humans. Each site is unique with it's own story to tell. The Solverson Site (47VE1252) is without exception. The Solverson site is a prehistoric Prairie du Chien (PdC) chert quarry site located in the Driftless Area of southwestern Wisconsin, east of the town of Viroqua (Figure 1). The site lies on a west facing slope of an upland ridge approximately 1180ft above sea level at a 7.5% slope. The area is now a grassy pasture with a few patches of oak trees nearby. Cook Creek valley is directly to the north connecting the Kickapoo River system to the east and the Bad Axe River system to the West. Bedrock geology in the area of the site consists of outcroppings of weathered St. Peters sandstone capping Shakopee formation dolomite bedrock, part of the Prairie du Chien group (Martin 1965; Klawiter 2001). Both formations are Lower Ordovician in age (Klawiter 2001). The chert at Solverson is present at the boundary of the St. Peters sandstone and the Shakopee Dolomite in the form of nodules. The site rests in a matrix of reddish residual clay, formed from the weathered dolomite (Slota 1969). Peoria loess caps the residual clay.

Archaeological quarry sites are known throughout southwestern Wisconsin. These sites have been utilized by prehistoric peoples for the exploitation of raw materials used in stone tool production. Such sites show information in the archaeological record by the extent of the

removal of material. Some quarry sites, such as Silver Mound (47JA21) in Jackson County, have been intensively used over many cultural periods of time and contain high quality raw material that is brought as exotics to locations hundreds of miles from the quarry (Julig *et al* 1987; Tankersley 1988; 1989). Others such as the Bass (47GT25) site located in Grant County were only intensively used for a short period of time (Stoltman *et al.* 1984). The Bass site is of importance to this study because of its similarities to the Solverson site. Both sites are located on upland ridges in the Driftless area less than one hundred miles apart and at both sites prehistoric peoples were exploiting raw material from the same geologic formation.



The Solverson site was initially discovered during a highway corridor survey for the Wisconsin Department of Transportation during the summer of 2000 by the Mississippi Valley Archaeology Center (MVAC) during a Phase I archaeological field survey. Because of the amount of PdC chert recovered from shovel tests it was recommended that further testing be completed. In the fall of 2000 a Phase II survey was conducted with the placement of two 1x2 meter test units (Twinde 2001). Both units yielded PdC artifacts including cores, flakes, and shatter but regrettably no diagnostics. This made dating the site difficult and speculative. Part of the focus of this investigation and return to Solverson was an attempt to recover any diagnostics in hopes of securing a means to produce an absolute date.

In addition to the archeological field survey, a geomorphological survey was completed during the fall of 2000. Two soil columns were removed from the east (upslope) walls of both units. Soil particle size analysis was performed and located a probable prehistoric surface at approximately 20-25 centimeters below ground surface (cmbgs). This was marked by a sudden change in soil texture by the increase in clay percentage and a decrease in sand and silt percentages. Also, a sudden increase in artifact concentrations at this same depth found by the 2000 MVAC survey correlates with the evidence of human occupation. The second purpose of the 2001 investigation was to learn more about the geomorphology of the site specifically site formation and disturbance processes.

## METHODS

The methods used in this project involved systematic field research, laboratory sorting and analysis of all material recovered, and a literature review of similar sites and

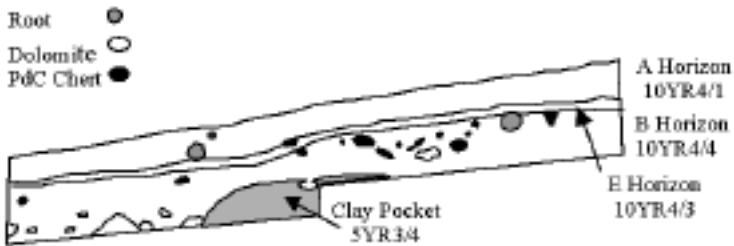


Figure 2. Profile for North Wall of Unit 3.

other quarry sites. During the fall of 2001 a 1x2 meter unit was placed on an east-west axis between the two previously excavated units. Unit 3 (Figure 2) was placed in accordance with the previous Phase II excavation completed during the fall of 2000 by MVAC. The unit was excavated in 5 cm levels below ground surface to a total depth of 45 cmbgs in the west half and 35cm in the east. All material was screened for artifacts using a standard 1/4" screen.

A 50cm x 50cm square was removed as matrix from the southeast corner of each level for lithic microanalysis. All PdC chert from the screen was removed and brought back to the MVAC laboratory for analysis. Soil descriptions follow standardized USDA soil nomenclature (Soil Survey Staff 1993). The north wall profile and soil profile description are shown in Figure 2 and Table 1.

All lithic material was washed and sorted by size grading (Ahler 1986; Andrefsky 1998). Size grading was done using a series of nested screens through which all material was sifted. Screen sizes (in mm) of 6.3, 9.52, 12.5, 16.0, 25.0, 31.7, and 63.5 were used to size grade the material into seven size grades (in mm); >63.5, 63.5-31.7, 31.7-25.0, 25.0-16.0, 16.0-12.5, 12.5-9.52, 9.52-6.3.

**Table 1: Soil Profile Description For North Wall of Unit 3**

Depth (cmbgs)	Horizon	Color	Structure	Consistence	Texture	Boundaries
0-19	A	10YR4-1 Dark Grey	Moderate; Granular	Nonsticky; Nonplastic; Friable;	Sandy Loam	Gradual Wavy
19-25	E	10YR4-3 Brown	Moderate; Granular	Nonsticky; Nonplastic; Friable;	Sandy Loam	clear Wavy
25-30	B1t	10YR5-4 Yellowish Brown	Moderate; Subangular Blocky	Slightly Sticky; Slightly Plastic; Friable;	Sandy Clay Loam	clear Clear
30-39	B2t	10YR4-4 Dark Yellowish Brown	Moderate; Angular Blocky	Slightly Sticky; Slightly Plastic; Friable;	Sandy Clay Loam	Diffuse Wavy
39-45	C	5YR3-4 Dark Reddish Brown	Moderate; Angular Blocky	Slightly Sticky; Slightly Plastic; Friable;	Sandy Clay Loam	

The size grading was accomplished in an attempt to show the possible vertical displacement of lithic material based on size differentiation within the matrix of the site after use ceased and caused by the effects of pedoturbation. After size grading all size grades were sorted into cultural material and material that displayed no cultural attributes. This was discerned based upon the presence of culturally derived lithic production flakes, cores and/or bifaces attributes (Andrefsky 1998; Callahan 1979). The attributes used were the presence/absence of a bulb of percussion and/or compression rings, a visible striking platform, identifiable ventral or dorsal flake surfaces, identifiable flake terminations, and any macroscopically visible edging. This material is considered to be culturally utilized and was separated and counted separately from the material that displayed none of the above-mentioned attributes.

## RESULTS

The results of this project are divided into two sections, 1) results of the archaeological fieldwork and 2) results of the geomorphological fieldwork. A large amount of PdC chert was recovered from the entire excavation and excavation was ceased when only dolomite cobbles were being recovered at approximately 35 cmbgs. Table 2 shows the amount of lithic material by excavation level. There is a sharp increase from level 4 to level 5 then the lithic totals begin to decrease. Only 41 total lithic pieces, 63.5mm and larger, were recovered from the entire unit. This is a marked contrast to the 21,735 pieces recovered from the 9.52-6.3mm size grade.

**Table 2: Total PdC Chert by Level & Size.**

Provenience Level: cmbgs	Size in mm							Total
	>63.5	63.5-31.7	1.7-25.0	25.0-16.0	16.0-12.5	12.5-9.52	9.52-6.3	
L1: 0-5	2	12	11	43	33	36	44	181
L2: 5-10	0	12	14	102	81	134	329	672
L3: 10-15	2	23	38	117	181	282	705	1348
L4: 15-20	11	30	40	313	187	539	1573	2693
L5: 20-25	14	161	179	916	897	2082	7048	11293
L6: 25-30	10	142	108	638	892	1713	6289	9796
L7: 30-35	2	55	63	479	566	1635	5747	8547
<b>Total</b>	1	435	453	2608	2837	6421	21735	34530

From the 34,530 pieces of PdC chert collected from Solverson only 1053 pieces displayed the characteristics described above as being culturally derived (see Table 3). That accounts for only 3.05% of the total sample population as displaying culturally derived attributes.

**Table 3: Total Cultural PdC Chert by Level & Size.**

Provenience Level: cmbgs		Size in mm							Total
		>63.5	63.5-31.7	1.7-25.0	25.0-16.0	16.0-12.5	12.5-9.52	9.52-6.3	
L1: 0-5	cultural	0	1	3	8	10	10	12	44
L2: 5-10	cultural	0	2	2	10	3	4	17	38
L3: 10-15	cultural	0	1	4	10	16	23	29	83
L4: 15-20	cultural	1	2	5	17	11	37	45	118
L5: 20-25	cultural	3	2	10	40	35	73	135	298
L6: 25-30	cultural	2	5	6	28	21	40	155	257
L7: 30-35	cultural	0	2	2	20	25	54	112	215
<b>Total Cultural</b>								<b>1053</b>	

Again, there is a sharp increase from level 4 to level 5 and then a subsequent decrease in totals from all other size grades from levels 5-7. Of the culturally derived material there were four flakes found with heat-treating altering their color and texture. They were found in levels 5 (20-25 cmbgs) and 7 (30-35 cmbgs). They had a shiny red luster to them characteristic of heat-treated PdC chert.

At the base of level 7 (35cmbgs) a reddish stain was noticed along the north wall and in the floor. The stain was approximately 60 cm in diameter and appeared redder than the sur-

rounding soil. The texture, determined in the field, indicated higher clay content. This stain was thought to be a feature and was excavated as such. It was then decided to investigate further. The feature was bisected on a north-south axis and the west half of the stain was removed in two levels to a depth of 45 cmbgs. At the base of the each level of the stain, the remaining west half of the floor of the unit was excavated to bring the depths equal. Excavation ceased on the west half at 45 cmbgs.

The geomorphological results concern site forming processes and disturbance processes. In the unit there was significant disturbance to the ground due to bioturbation. A large root extended almost completely across the unit at a nearly north-south axis. This occurred from Level 2 to Level 4 (10-20 cmbgs) and may have affected the context of the immediate surroundings. Other smaller roots were present at other depths also. This would affect site integrity by displacing contents of the unit in a path of least resistance effectively moving them from *in situ* context. Also, much of the chert is frost fractured. Frost fracturing destroys chert by putting stress on it in a shearing manner. This is evidenced by the size grade analysis. Not many pieces were found in the larger sizes (Tables 2 and 3). This may be due to the shattering effect of frost breaking down larger pieces into smaller ones. The combination of these two disturbance processes was taken into account while excavation was taking place and will be discussed further in the discussion section.

Soil probe coring was attempted to determine the depth of residual red clay weathered from the dolomite bedrock. The depths of the red clay decrease from east (upslope) to west (downslope). This is due to the weathering of the St. Peters sandstone and exposing the sedimentary layer of dolomite. Once the dolomite was exposed the sandstone continued to weather from west to east exposing more of the dolomite and thus the PdC chert resources utilized by prehistoric peoples. remnants of this weathering process can be seen just to the east of the site where an outcropping of St. Peters sandstone still exists. The sediment from the weathered sandstone crept downslope and with the help of eolian loess covered the site.

The presence of an E horizon strongly supports the hypothesis that this site has never been plowed. An E horizon forms when organic material is leached from the A horizon by water (Birkeland 1984). The E horizon is lighter in color because of this leaching. The feature that was described in level 7 (30-35cmbgs) as being a reddish stain may be a residual clay pocket formed from the weathering dolomite. According to Froelking (1982) clay bodies can appear below the surface through fine cracks in the dolomite. The continued percolation of water and transportation of clay dissolves the dolomite and will enlarge over time. Red clay formation comes from the weathering dolomite and replaces the dolomite as it weathers (Froelking 1982). This is most likely what happened at Solverson. The red clay stain is a pocket of residual clay from the weathering of the dolomite. The circular shape comes from the enlarging of a once small crack in the dolomite bedrock.

## DISCUSSION

When an artifact is deposited on the ground it is set into motion by a number of processes with the help of gravity (Michie 1990). Size grade analysis shows an uneven distribution of lithic material by level and size. This may be in part due to pedoturbation processes such as bioturbation and cryoturbation. Artifacts are in a constant state of motion evidenced by the number of artifacts in different levels throughout the entire depth of Unit 3. The displacing upward and downward is through the effects of pedoturbation. The surface identified as the paleosurface is at a depth of 20-25 cmbgs and according to the size grade analysis there is a sharp increase in all artifact sizes from Level 4 (15-20 cmbgs) with 2963 total pieces, to

Level 5 (20-25 cmbgs) with 11, 293 total pieces. This is an increase by 8600 pieces of chert , a greater than 300% increase from Level 4 to Level 5. This is the largest increase recorded from the data analysis. From Level 5 to Level 6 (25-30 cmbgs) with 9796 total pieces there is a decrease in all size grades by 1497 pieces. This is only a decrease of approximately 13%.

The cultural material also illustrates a similar pattern. From Level 4 to Level 5 the cultural material increases from 118 to 298, a greater than 150% increase. Level 5 to Level 6 is similar also with a decrease in cultural material from 298 to 257 pieces, which is a decrease of approximately 14%. The explanation of why more artifacts seem to be below what is considered the prehistoric surface is from the effects of pedoturbation (Rowlett and Robbins 1982; Michie 1990; Wood and Johnson 1978). Processes like cryoturbation, which is the displacement due to the action of frost, effectively move artifacts slowly over time (Hole 1960; Wood and Johnson 1978).

Since no diagnostic projectile points, scrapers, or any other form of extracting a date was recovered from Solverson, only an estimated age of the site can be determined. The Solverson site location and raw material extraction mirrors that of the Bass site (47GT25) located in Grant County, Wisconsin (Stoltman *et al.* 1984). The Bass site is a Hardin projectile point quarry and manufacture workshop exploiting PdC chert. Hardin points were not thought common this far north until this site was discovered (Stoltman *et al.* 1984). Hardin people were Early Archaic hunter-gatherers traveling in small bands following resources. The early Archaic period, which follows the Paleoindian period from 12,000 years BP, began around 10,000 years BP lasting until 6000 years BP (Stoltman 1997). The Hardin points date to roughly 8000 years BP, which puts the Bass site as an Early Archaic quarry site. The Solverson site is located not more than 50 miles from the Bass site. This could have put it in reach of the Hardin people looking for a suitable raw material to extract. When it was found that the Solverson PdC chert was too low of grade or not sufficient in quantity they may have moved on, possibly to the Bass site. Also, the Solverson site PdC chert is being exploited from the same geologic formation. People traveling in the uplands could have seen the exposure of PdC chert at Solverson and recognized it's potential as being similar to that of the Bass site and utilized it. Whatever the case may be the characteristics of the Solverson site to the Bass site are undeniably similar. This supports a hypothesis of an Early Archaic occupation of the site ending around 8000 years BP.

The geomorphologic evidence of formation exposure further supports this date. The Solverson site may have been exposed during the end of the Wisconsinan stage of the Pleistocene. During that time it was found that accelerated mass wasting exposed upland geologic formations (Mason and Knox 1997). This would have exposed the site around 18,600 to 12,000 years BP based on colluvial footslope interpretations from sites in the Driftless Area and surrounding areas of southeastern Minnesota, northeastern Iowa, and northwestern Illinois (Mason and Knox 1997). This suggests exposure earlier than people were here in southwestern Wisconsin and left the site open and exposed to weathering that explains how the outcropping may have been initially exposed. The site may have been covered during the Altithermal period which began about 8000 years BP. At that time temperatures were warmer and drier than previously which led to much hillslope erosion due to run off and downslope soil creep. Also, due to the warmer, drier climate vegetation was limited and this led to more wind blown sediment deposited outside of river valleys (Bettis and Hajic 1995). This further supports the Solverson site being exposed until roughly 8000 years BP. At that time erosion and loess began covering the site sealing it off from other people. Also another explanation of

site termination is because of the Altithermal fauna may have been no longer abundant in the uplands because of the diminished water table forcing them and people subsisting on them into the lowland areas (Stoltman 1997). This would force people out of the uplands and away from the Solverson site.

The Solverson Site is a unique site for several reasons. First, it is a quarry site used for the exploitation of poor quality Prairie du Chien chert. The PDC chert is brittle, has high amounts of inclusions and frost fracturing, and finding a workable piece is almost an exercise in futility. Yet when a good piece is found it is quite remarkably nice to work with. This is what prehistoric people were after. The PDC chert is a localized raw material that was utilized by local people perhaps because they were not tied into a larger trade network, which would successfully bring them better raw materials.

Second, they may have utilized this resource because they were forced to. Silver Mound in Jackson County is over 100 miles to the north. This may have been out of reach for the people exploiting this resource. Also, they may have not been granted access to the quarries at Silver Mound by another band in the area effectively forcing them to seek out other localized sources of raw materials like the PDC chert at Solverson.

Third, the people using this resource may have not cared about the quality of the material. If the people exploiting the PDC chert were simply a hunting group of a few men they may have stopped to knap out some scrapers or just find suitable pieces to take with them for later use. The lack of diagnostics and bifacial thinning flakes supports this hypothesis.

In conclusion, the Solverson site holds many clues to the past and many more to be discovered. More research for datable material could place this site within an absolute context and give archaeologists more pieces to the puzzle of prehistoric behavior. Because of the presence of heat-treated PdC chert a fire hearth has to be present, finding it of course is the key to the mystery of dating the site.

## ACKNOWLEDGEMENTS

I would first off like to acknowledge Rondi and Mark Solverson for giving me permission to excavate on their property. Thank you very much. I next would like to acknowledge in alphabetical order all those who helped me suffer through the fieldwork; Jonathan Baker, Danielle Bendon, Dillon Carr, Erik Gjesfeld, and Laura Jankowski. Finally, I would also like to acknowledge those who forced me to think when I was all out of ideas; Jonathan Baker, Ernie Boszhardt, Dillon Carr, Dr. James Theler, Vicki Twinde, and Dr. Dean Wilder. Without them I never would have accomplished this project. Thank you.

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