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Twin Lakes Site: A Look into Prehistoric Minnesota

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Twin Lakes Site: A Look into Prehistoric Minnesota

by

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A Thesis

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Masters of Science

in Cultural Resources Management Archaeology

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Thesis Committee:
Professor Mark Muñiz
Assistant Professor Robbie Mann
Professor Benjamin Richason

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There have been many people that have helped me through this research. First and foremost I would like to thank Mervin Eisel. Without his vigilance and recognition of the scientific value of the artifacts found on his land we never would have known of the existence of a site that could be of great value to the archaeological record of the state of Minnesota. In addition, his willingness to let St. Cloud State University have access to his property for research purposes is greatly appreciated.

My friends, family and professors have been very supportive of my research as well. Specifically, Hollie Lincoln and Cory Yates that volunteered to help me with my fieldwork on some days that were less than comfortable to be outside in Minnesota. My committee of professors have offered a wide variety of expertise to draw on. No one has help me more than Professor Muñiz. Thank you so much for your time and patience and hanging in there with me through one of the coldest field days I have had in ten years.

Abstract

Middle Archaic archaeological sites in Minnesota are rarely discovered and the cultural context of this period is poorly known. This thesis presents the research conducted on a recently identified Middle Archaic site in central Minnesota called Twin Lakes. The site was dated using modern dating techniques. This along with the in depth lithic and statistical analysis adds to the interpretation of the lifeways of early Minnesota people and an elusive time period in the state's archaeological record.

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Chapter 1: Project Description

Site History

The goal of this thesis is to conduct an archaeological field and laboratory investigation of the Twin Lakes site that will ultimately allow making a recommendation regarding the site's eligibility for nomination to the National Register of Historic Places (NRHP) as outlined in National Park Service Bulletin 36. The investigations were conducted in compliance with Scott Anfinson's (2011) State Archaeologist's Manual for Archaeological Projects in Minnesota. The research included fieldwork, background research, two different dating techniques, an in-depth analysis of lithic artifacts and theoretical interpretation. The fieldwork included subsurface testing of the site to establish site boundaries and determine if there are intact cultural deposits as well as collecting additional cultural material for analysis. After the additional field work there was a detailed analysis of lithic artifacts to help determine site function and aid in site evaluation for NRHP eligibility. By dating the site, it can be placed into chronological and archaeological context. By conducting this research this thesis will add valuable information to the archaeological record of the state of Minnesota.

The Twin Lakes site is located on private land north of Little Falls in Crow Wing County, Minnesota. The site itself is situated in the beautiful rolling hills of central Minnesota overlooking two ancient glacial lakes. Nestled in a wine vineyard planted by the owner of the property it is no wonder people lived in this area before and continue to now. The site was originally discovered by the landowner, who found a large biface approximately 18 inches below the surface while planting berry bushes and a possible point base on the surface while wandering his tilled berry bushes. After the discovery, he took the artifacts to Jim Cummings; MnDNR

Naturalist at Mille Lacs Kathio State Park for advice on how to proceed with his findings, intelligently recognizing that they could be of scientific importance. Cummings referred the ever vigilant landowner to Professor Mark Muñiz of St. Cloud State University. An initial walk-over survey and two shovel tests took place in the fall of 2013 by professor Muñiz and a small cohort of graduate students. A few lithic flake artifacts and fire-cracked rock fragments were found on the surface and one of the shovel tests was positive for containing cultural material. The artifacts were left with the landowner, but Professor Muñiz published a brief update of the finds in January 2014 in the online newsletter “Minnesota Fieldnotes”. In the summer of 2014, there was continued work on the newly discovered site. Professor Muñiz opened a 1m x 1m square excavation unit adjacent to Shovel Test 2. In addition, Assistant Professor Rob Mann’s field school conducted additional shovel tests using an arbitrary sampling strategy based on the surface topography to define the boundaries of the site. The material found added to the mystery of the site because of the high volume of Knife Lake siltstone recovered. It resembled a lithic artifact assemblage one might expect from some of the oldest sites in Minnesota according to Bakken’s (2011) doctoral dissertation. This was intriguing that this site could be so old and could be an exciting and important contribution to the archaeological record of Minnesota. This is why the Twin Lakes site is the topic of this thesis. While this early work identified the northern site boundaries and documented that a subsurface artifact layer was present, there was still much to learn about where the remaining boundaries were, the age of the site, how it functioned for its original occupants, and the degree of significance it might have for scholarly research.

The following chapter will cover the geomorphological history of the Upper Mississippi Valley focusing specifically on central Minnesota. Knowing the area's natural history is crucial to knowing many things about the archaeological record. This includes where it would have been possible for people to live, what they could eat, where the water sources were located, what materials they could have used for tools, what plants were able to grow in habitable environments, etc. Knowing the geological history is also crucial in archaeology for writing state guidelines on subsurface testing. Each state has different guidelines based on the geology of the area, therefore having a good knowledge of the geological history of the site plays a big role in the excavation techniques used. References for this section will include the Minnesota Geological Survey (MGS) and *Principles of Geoarchaeology: A North American Perspective* by Michael Waters (1992). I will also refer to Guy Gibbon (2012), the Crow Wing County Soil survey from the United State Department of Agriculture (1965), Patterson, Jennings and Johnson (2004) and Teller and Leverington (2004). The paleoenvironmental references include Gibbon (2012), Jacobson and Grimm (1986), Jacobson (1979), Mattson (2013) and Wright (2004).

Chapter 3 discusses the general regional cultural history of Minnesota. This chapter also includes the results from the Minnesota Historical Society site search within a mile of Twin Lakes and also includes associated prehistoric sites excavated at Fort Ripley. Chapter 4 discusses the research design implemented at the Twin Lakes site based on the Minnesota State Guidelines for excavation. This chapter also includes the lab methods, information on the field forms that were used, the methods for the flake analysis and the biface analysis. Chapter 5 is the summary of the previous Phase I work conducted at the Twin Lakes site prior to thesis fieldwork, followed by the summary of the Phase II work conducted for this thesis. Chapter 6 is a summary of the artifacts recovered from the Twin Lakes site including descriptions, the lithic assemblage and the source material information. Chapter 7 is the statistical analysis that combines numerous techniques of working with the data. Chapter 8 presents the results from the OSL and AMS dating of the Twin Lakes site. Chapter 9 is the conclusion chapter that includes site interpretation and my recommendations for eligibility based on the National Register of Historic Places criteria, significance of this site, and recommendation for further research.

Chapter 2: Geological History

Geomorphology of Minnesota

This section will discuss the geological history of Minnesota from the end of the last Ice Age to the stabilization of the ecological regions approximately 3,000 BC. Minnesota has experienced the last four major glacial advances which shaped and reshaped the landscape (Minnesota Department of Natural Resources 2015). The shifting of the climatic ecological zones is important in understanding the early lifeways of the people of Minnesota (Gibbon 2012). Minnesota is located at the southern end of the Laurentide Ice Sheet and was repeatedly glaciated early in the Pleistocene (Patterson and Johnson 2004:119). The end of the last Ice Age lasted from ~60,000-10,000 years ago and was called the Wisconsin glaciation. Thousands of years ago Minnesota was a very different place than seen today. Eight thousand B.C. marks the beginning of the Holocene (Waters 1992; Gibbon 2012; Minnesota Department of Natural Resources 2015). When the glaciers began their retreat around 12,000 B.C. many of the lobes were fronted by ice-damned lakes and the resulting melting water formed raging rivers and massive glacial lakes (Patterson and Johnson 2004:122). The largest of these was Lake Agassiz, with a basin of 580,000 square miles, it covered all of northwestern Minnesota at one time and was the largest glacial lake in North America (Teller and Leverington 2004:729).

The southern end of the Laurentide ice sheet was divided into lobes and each lobe carried distinct sediments that make up the underlying soils of the state. These sediments are used to identify the movement of the glaciers by glacial stratigraphers (Patterson and Johnson 2004:120). As the ice melted, the landscape was littered with glacial outwash features including moraines and eskers. In places along rivers, as a result of the melting, valleys and floodplains were piled with many feet of glacial outwash, likely covering many of the earliest archaeological sites in the state (Mattson 2013; Theler and Boszhardt 2003). Since the ideal occupational site for hunter-gatherers would probably be in close proximity to water, the very early sites by the old shorelines would be inundated by water as the ice melted.

As the ice retreated, the abrupt releases of water from Lake Agassiz rose the level of Lake Superior and resulted in frequent changes of beach position (Teller and Leverington 2004:733). In addition, because of the weight of the glaciers, the surrounding land rose from isostatic rebound when the ice was removed raising large beaches created by glacial lakes over the landscape (Teller and Leverington 2004). According to the Minnesota DOT archaeological predictive model (http://www.dot.state.mn.us/mnmodel/about/projectsummary.html), geomorphologists and archaeologists are trying to reconstruct the paleo-landscape to discern when particular parcels of land were above water and where the old shoreline would have been at particular points in time.

As the climate warmed, land previously under the ice was exposed and large deciduous forests and prairie plains grew to the west while spruce-dominated forests shifted northward (Gibbon 2012). The ice did not recede in one episode but would have expanded and retreated over thousands of years. According to Jacobson and Grimm (1986) pine forest replaced the prairie in two distinct steps: one at 7000 B.C. and the other at 6000 B.C. The period of 5000-4000 B.C. represents the least change in the pollen sequence of the Holocene (Jacobson and Grimm 1986:965). The ending of prairie domination of Minnesota during the Holocene was around 2,000 B.C., after that the white pines began to expand rapidly to the west (Jacobson 1979:700). Central Minnesota, at the time the Middle Archaic Twin Lakes site was most likely occupied, was on the ecotone of these two ecosystems (Figure 1).These series of shifts between prairies and forests in the state affected the indigenous plants and resources of the study area. The environment and shifting of ecosystems would also affect the lifeways of early people in Minnesota. There were abundant faunal resources such as deer, bison, moose, and small game. Fish were also an important resource as well as seasonally available foodstuff such as nuts, berries, and wild grains (Mattson 2013:13).

The OSL date from the Twin Lakes site (which is discussed in Chapter 8) is from 4,600-3,200 B.C. and according to the figure below would put the Twin Lakes site on the ecotone of the prairie and the deciduous oak forest. This location would be ideal for early hunting and gathering societies because they can take advantage of the resources in both ecosystems.

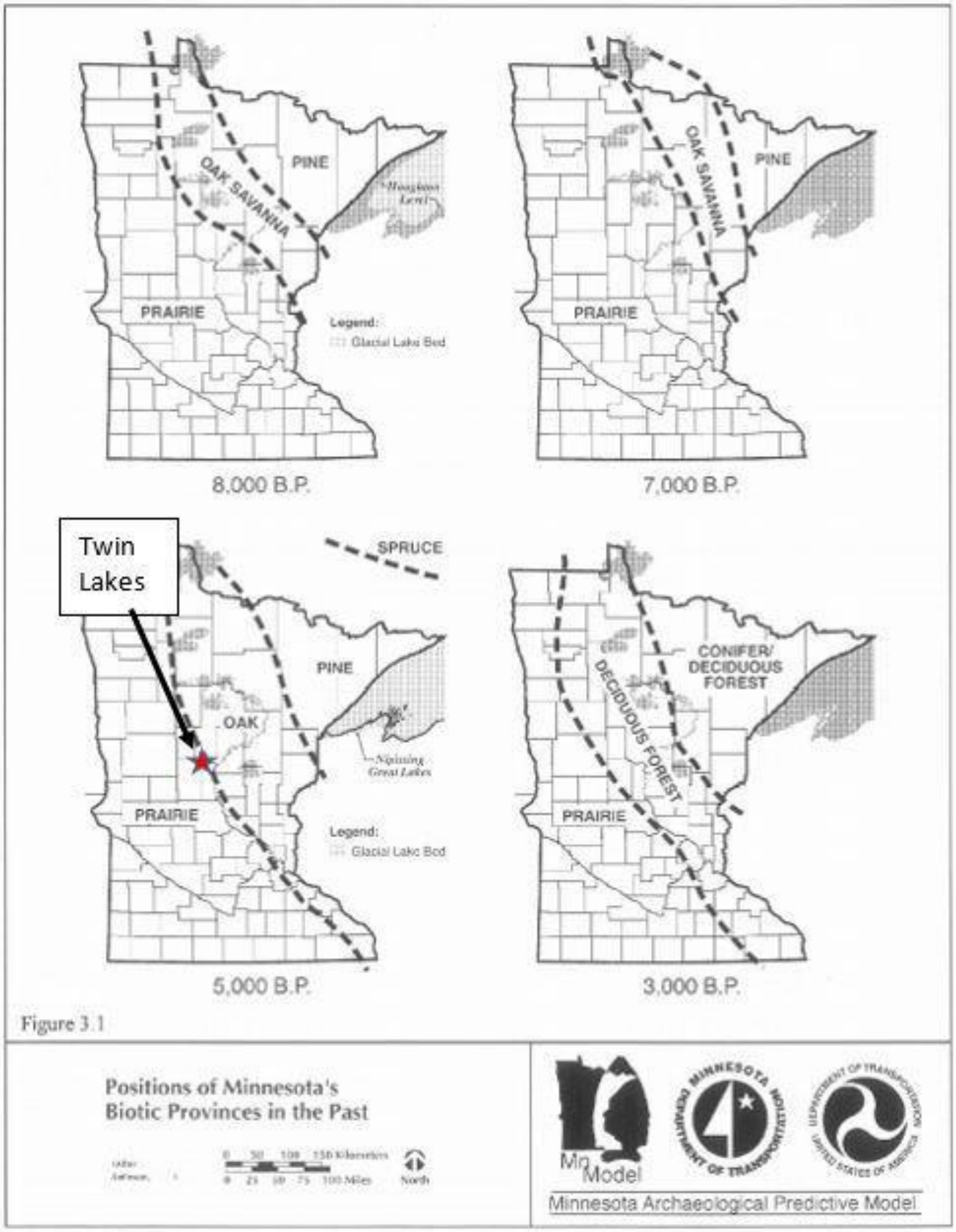

Figure 1. The positions of Minnesota's Biotic Provinces in the Past (Minnesota Department of Transportation MnModel).

Crow Wing County Geological History

Figure 2. The location of Crow Wing County in Minnesota.

Crow Wing County (Figure 2) is located at the geographic center of Minnesota. The area is predominantly comprised of wetlands, rolling hills (glacial moraines), large deep lakes and glacial outwash plains (Gibbon 2012:25). This area includes the Headwater Lakes region that is a geologically dynamic area where the Mississippi cuts through the landscape (Gibbon 2012:25). This area is also located in the center of the frequently fluctuating prairie forests shifts of the Holocene as discussed in the previous chapter. In addition, according to Gibbon (2012), wild rice beds are abundant in this area of central Minnesota. According to the United Sates Department of Agriculture (USDA) Crow County soil report (1965) the majority of the land is used for timber sales followed by small areas of agriculture. Because of the highly acidic and rocky nature of the soil and the topography of the area, a variety of pine trees grow well in Crow Wing but this area is poor for farming. The parent material of the soils is glacial till and there are two major types of glacial till found in the county: one is brown sandy till found in the Brainerd drumlin field and red clay till occurs in the morainic hills in the east-central section of the county. The large till deposits are mixed with finely sorted glacial outwash areas in the lowland parts of the county. Glacial lakes make up 144 square miles of the 1157 total square miles that comprise the county (USDA 1965:1).

The Headwaters Area of the Mississippi and the Nokasippi rivers that lay just to the west of the Twin Lakes site follow the general water level sequence taken from Mattson (2013). Mattson‘s water sequence is as follows;

- 12,000 to 9,000 B.C.- Numerous large basins formed from the melting of entrapped ice blocks. The water levels then were higher than modern levels as drainage systems were only beginning to develop.
- 7,000 B.C- Lake elevations had stabilized at roughly ten feet above today’s levels.
- 6,000 - 2,500 B.C- The age range of the Twin Lakes site, warm and dry conditions resulted in a lowering of lake levels by as much as thirty feet. Many shallow lakes and streams dried up completely during this time.
- 2,000 B.C- Cool and moist conditions had returned and lake elevations returned to approximately their former levels 10 feet above todays lake levels (Mattson 2013:14).

The present day regional landscape of Twin Lakes exhibits a variety of glacial features, including moraine complexes, outwash plains, ice block lakes, drumlin fields, kames, kettles, and eskers. Glacial forces also contributed to the formation of the area’s numerous modern lakes (Ojakangas and Matsch 1982). The sediments around the Twin Lakes site developed during successive advances of the late Wisconsin glaciation, forming predominantly in glacial outwash plains, in the glacial till on ground moraines, end moraines, and drumlins. The location of the site is on a glacial end moraine as designated by the soils on the USDA soil survey (Figure 3).

Site Morphology and Soils

The development of soils in an area is dependent on five factors. These factors are the parent material, climate, vegetation, topography and time (Arneman 1965). The time for the development of the soils at the Twin Lakes site is relatively young because they have only been developed since the end of the last Ice Age. The development of the soil horizons are lessened because the sand and gravel are highly permeable and allow oxidation and leaching of organic matter. The site and its surrounding soils are part of the Rollins complex (Figure 3) that consists of well drained soils formed on glacial outwash plains, moraines, drumlins and eskers (https://soilseries.sc.egov.usda.gov/OSD_Docs/R/ROLLINS.html).

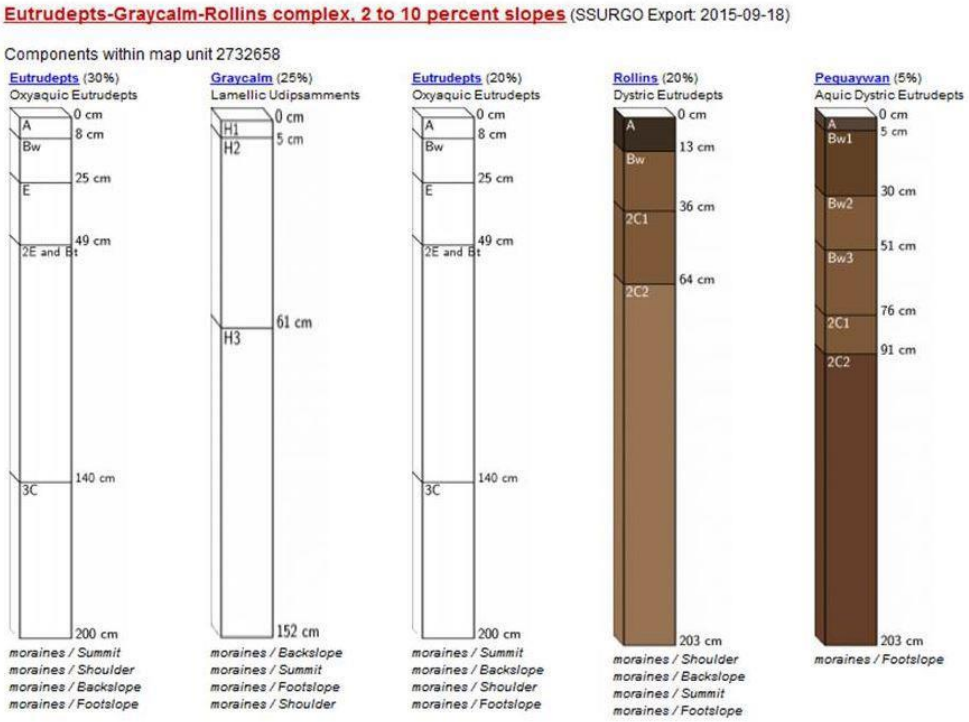

Figure 3. Typical profile of the Rollins Complex (courtesy of Professor Richason)

These soils are part of the entisol soil order which are classified mainly by poorly developed soil horizons. The temperature of the area been similar to modern temperature patterns since the Late Holocene climate stabilized about 2,500 B.C. with warm summers and cold winters (Gibbon 2012:30). The topography of the site and surrounding area are steep escarpments down to glacial lakes or ponds adjacent to rolling hills with slight slopes and an occasional flat farmed area.

Figure 4. Topographic map of site area from the MN topo website. The site location is the red star.

The current vegetation is white pines and a variety of deciduous trees as well as areas of cultivated fields. The soil profiles and textures recorded from Test Units 1 and 2 are very close to the typical soil profile described below (Figure 3) for the soil series designated at the site. The soils were gravelly sandy loam underlain by glacial till.

The soil report for the site area was obtained from the Natural Resource Conservation Service's (NRCS) Web Soil Survey(http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm). A soil map of the Twin Lakes site area is included in Figure 3. It is dominated by moraine soils (http://www.dnr.state.mn.us/snas/naturalhistory.html).

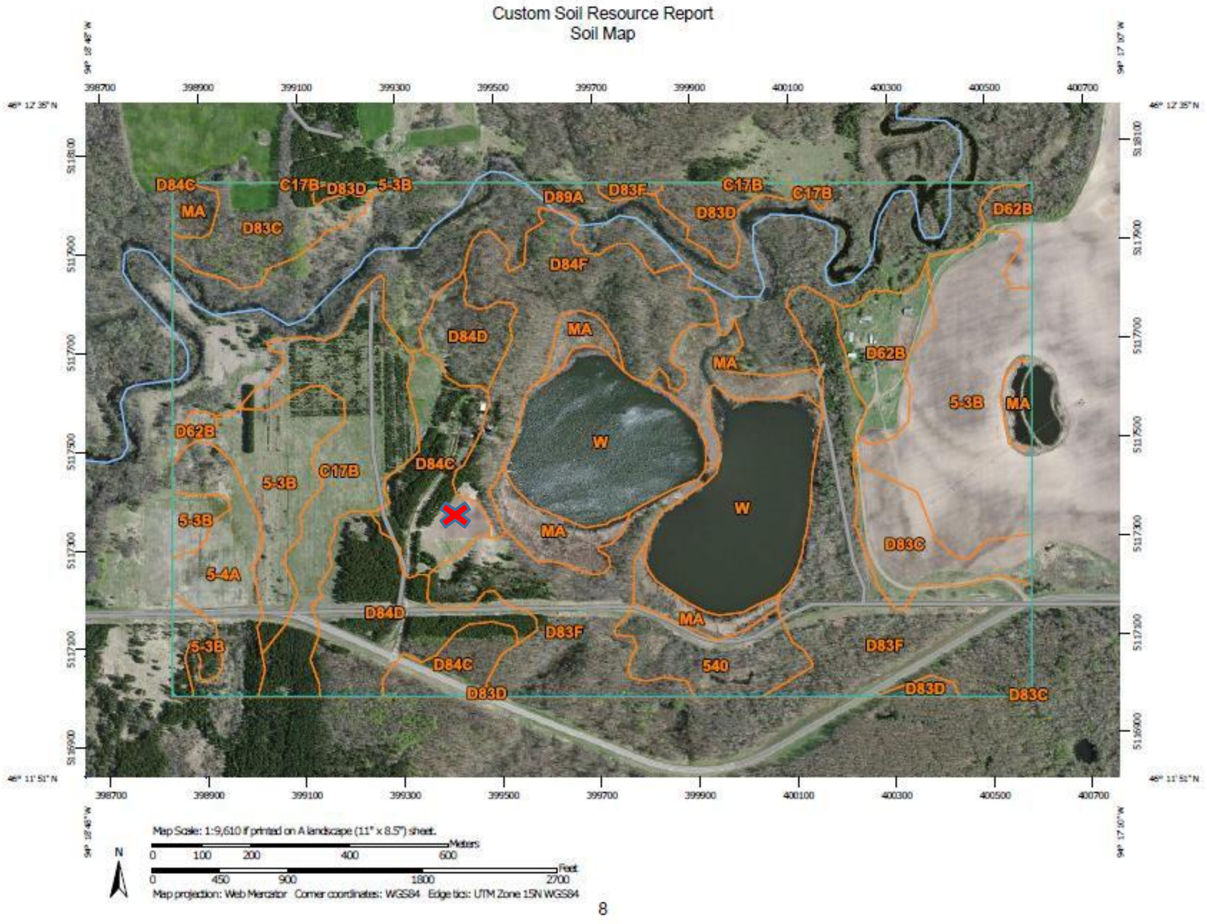

Figure 5. The soil map of Twin Lakes Site project area from the USDA soil survey. The red X is the site location.

Figure 6. Soil map with TIN model areal to show the topography of the area. The red X is the site location (courtesy of Professor Richason).

The soil series at the site is identified as D84C—Eutrudepts-Graycalm-Rollins complex, 2 to 10 percent slopes. As stated earlier the site is surrounded by other Rollins Complex soils. The following information is provided by the NRCS.

Description of Eutrudepts, Sandy

Setting

Landform: Moraines

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex, linear, concave

Across-slope shape: Linear, convex

Parent material: Coarse-loamy glaciofluvial deposits over sandy outwash over coarse-loamy till

Typical profile

A – 0 to 3 inches: loam

Bw – 3 to 10 inches: fine sandy loam

E – 10 to 19 inches: fine sandy loam

2E and Bt – 19 to 55 inches: loamy sand

3C – 55 to 79 inches: cobbly loamy sand

The 1939 aerial photo (Figure 7) shows that the area of the site has been stripped and plowed repeatedly by landowners from at least 1939. This establishes an Ap horizon or a plow zone at the location of the site. The current use of the site area is a grape vineyard with berry bushes planted on the southern edge of the fenced vineyard area.

Figure 7. Aerial image from 1939 (courtesy of Professor Richason), the X is the site.

The lidar image below with 1 meter topography overlay (Figure 8) shows the gently sloping topography of the site. From the lidar image you can also see the old gravel pit to the southern end of the site that was identified by Mervin Eisel and the finger ridge overlooking the west lake. The lidar location of the gravel pit corresponds with distinct vegetation on the 1939 aerial photo which may suggest the pit was dug in the early 20th century.

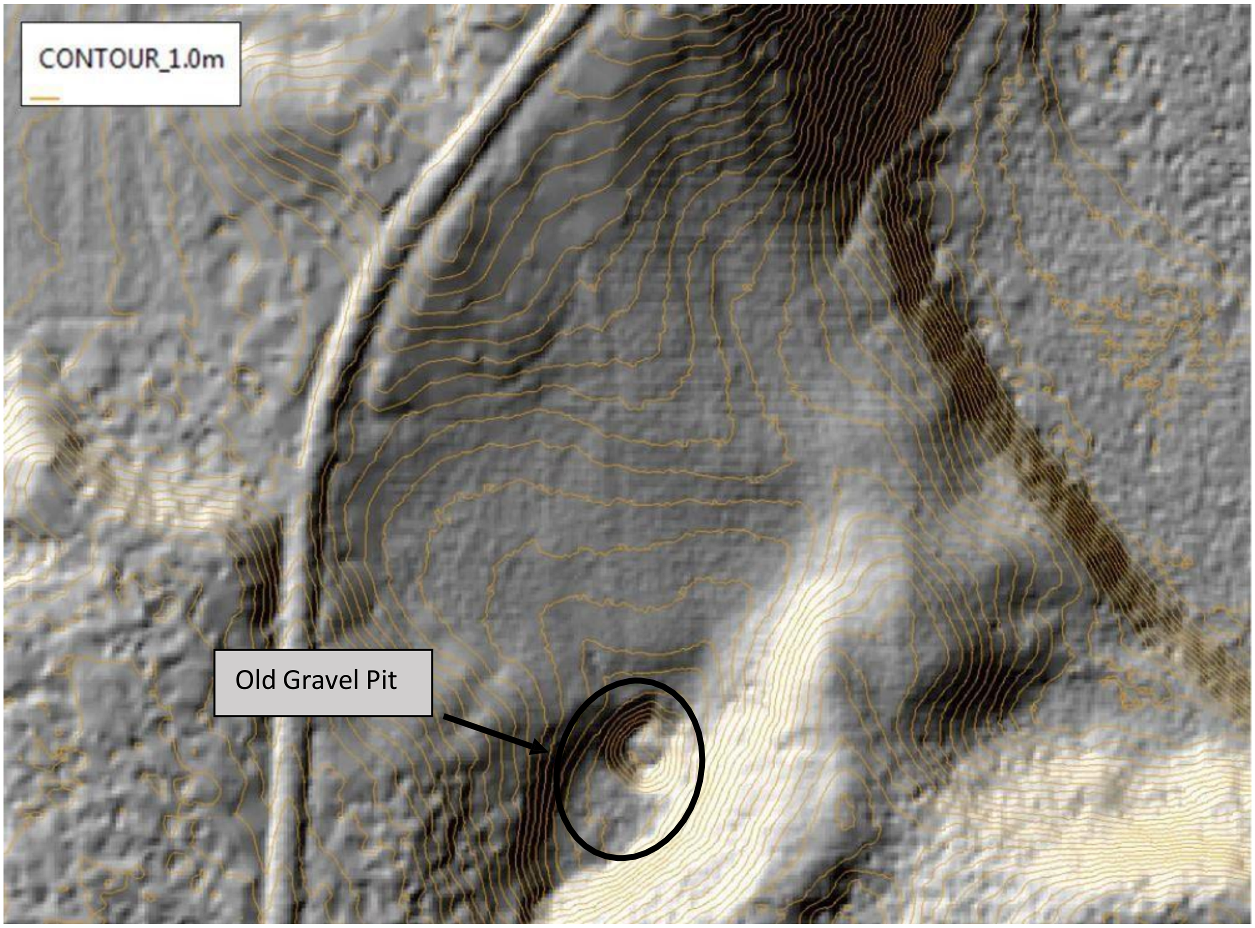

Figure 8. Lidar image of the site area with a 1m contour map overlay (courtesy of Professor Richason)

These images of the site give a clearer picture of the topography of the area and the land uses in the past establishing an Ap plow zone. The plow zone is important in further analysis discussed in later chapters. In addition to the detailed soil report generated for the area, the hand-drawn soil profiles from Test Units 1 and 2 were digitized with Microsoft word and the profile photo from Test Unit 2 was enhanced with Aviary Photo Editor and also digitized in Microsoft word and included in Chapter 5.

Chapter 3: Culture History

Reviewing the culture history of the state of Minnesota is important for putting the Twin Lakes site into context. Lithic technologies, such as styles of points, can be an age marker as well as using laboratory-based dating methods. This culture history is a compilation of recent archaeological research done in Minnesota and the overview of the Archaic Period in the Upper Mississippi Valley. The available resources would have an effect on how the people exploited their environment and in turn what general lithic technologies they needed and their subsistence pattern. This chapter focuses on the Archaic period because the optically stimulated luminescence (OSL) date indicated that the site dates to the Middle Archaic. The OSL date will be discussed in more detail in Chapter 8.

Archaic Tradition of the Upper Mississippi Valley and Minnesota

The Paleoindian tradition ended during the early Holocene around 8,000 BC and was followed by Archaic hunters and gatherers (Gibbon 2012). By 10,000 BC the classic megafauna species of the Pleistocene (e.g., mammoth, mastodon, saber tooth cat, etc.) were extinct and the habitat of the Upper Mississippi Valley became almost modern as far as the species of animals that people hunted for food (Theler and Boszhardt 2003). As the climate continued to change during the early Holocene so did the people of Minnesota.

The Archaic period spans from approximately 8,000 – 500 BC and is divided into Early, Middle, and Late sub-periods based on technological innovations and burial patterns (Gibbon 2012; Theler and Boszhardt 2003). The overall cultural patterns for the Archaic people of Minnesota changed while adjusting to a rapidly fluctuating postglacial environment. The spruce forest spread farther north as the glaciers receded and a mixed pine-oak forest replaced it.

Because of this biome shift, new plants and animals began to appear (Gibbon 2012). The melting ice exposed new land surfaces and the melting glaciers formed extensive lakes and large, swift rivers that would shape the land into the Minnesota we know today. People of this period also began to exploit a larger variety of plant and animal resources than what was seen during the Paleoindian period (Gibbon 2012). The Archaic people relied increasingly on the exploitation of smaller game, fish, shellfish, plant foods, and other energy resources that were not very abundant in late glacial environments (Gibbon 2012; Theler and Boszhardt 2003).

Archaic people had more varied artifact assemblages than their Paleoindian predecessors that reflect an adjustment in subsistence practices (Gibbon 2012). In addition, from the archaeological evidence it appears that Archaic hunters and foragers seem to have been less nomadic and more numerous than Paleoindian societies (Gibbon 2012). As a result, their sites, which are often identified by the presence of large notched and stemmed projectile points, are more frequently discovered and excavated by archaeologists than older Paleoindian sites. However, because of massive sedimentation associated with a warm and dry climate during the earlier phases of the Archaic, it is believed that many Archaic sites are deeply buried in river valley deposits and are masked from surface surveys and subsurface excavations (Gibbon 2012). There was an increasingly warmer and drier climate in the Upper Mississippi Valley around 7,000 BC that allowed prairie vegetation to spread over the region (Theler and Boszhardt 2003). This lasted for approximately 2,000 years causing lower water levels. For the archaeological record of this time period this means that ideal occupation sites along rivers and lakes that were exposed during this dry period would now be underwater. Because of this, these sites are rare and are sometimes out of reach from the shovel of the archaeologist. Specialty equipment, like backhoes and water pumps, maybe need to reach many Early Archaic sites.

Early Archaic (8000-5000 BC)

The timing for the transition between the Paleoindian and the Archaic period in Minnesota can depend on the location in the state the region borders both prairie and woodland environments (Gibbon 2012). This transition was gradual and the exact beginning of the Archaic can be debated and can change with further discoveries. Early Eastern Archaic points appear in Minnesota approximately 7400 B.C, but if point forms like Dalton, Hi-Lo, and Quad are included in this category, the Early Eastern Archaic starts as early as 8,700 BC in the upper Mississippi region (Gibbon 2012). The Early Eastern Archaic points are notched or stemmed forms that appear to be transitional between the Paleoindian and younger Archaic traditions (Theler and Boszhardt 2003). Very early points exhibit a mixture of Paleoindian fluting and Archaic beveling and serrated edges. The majority of the Early Eastern Archaic points are found in the southern portion of the state (Gibbon 2012). These Early Eastern Archaic sites are usually associated with thin scatters of scrapers and other generalized artifacts in excavated components. The basic tool kit seems to be common to a mobile forager’s technology and includes weapon tips, scrapers, and knives for hunting larger mammals such a deer, moose or bison (Gibbon 2012).

There is also, according to Gibbon (2012), material culture of the Late Paleoindian and Archaic people that did not survive in the archaeological record. This would have included: hardwood tools, wooden containers, cords and textiles, clothes, wooden spears and cooking implements. In addition, small wigwam-like houses and boats could have also been lost to the elements and in turn the archaeological record (Gibbon 2012).

Middle Archaic (5000-1500 BC)

The Twin Lakes site OSL date (determined in December 2014) ranges from 4630-3230 years B.C., at a 95-percent confidence interval. This would put the site in the Middle Archaic period according to Gibbon's (2012: Figure 1.2) archaeological periods in central Minnesota that places the Middle Archaic from 3000-7500 BC (Gibbon 2012:6). The Middle Archaic is identified by several shifts in cultural patterns (Theler and Boszardt 2003). The settlements became larger and there is evidence for an increasingly less mobile lifestyle and exploitation of aquatic habitats, perhaps because of the increasingly stable environment (Theler and Boszardt 2003). In Minnesota this largely means exploitation of fish, water fowl and wild rice, although there is no direct evidence for the use of wild rice at this time. Also, the sites seem to be more frequently reoccupied and the first evidence of large cemeteries emerges in the archaeological record nearby in Wisconsin (Theler and Boszardt 2003). Several new tool technologies arise during the Middle Archaic including ground-stone and grooved axes that were used as woodworking tools (Theler and Boszardt 2003). During the Middle Archaic there was also an almost universal use of side-notched projectile points (Theler and Boszardt 2003). The Middle Archaic marks the introduction of the use of copper tools in Minnesota and especially Wisconsin that is referred to as the Old Copper Culture (Gibbon 2012; Theler and Boszardt 2003).

An interesting problem in Early and early-Middle Archaic Minnesota is the apparent absence of some tool types present in contemporary assemblages to the south (Gibbon 2012; Arzigian 2003). This includes ground stone tools such as bannerstones, plummets and fully grooved and three quarter grooved axes that do not appear in any quantity in Minnesota until the late-Middle Archaic (3800-3000 BC). This could be because they were unsuited for the bison-centered prairie lifeways in Minnesota and this tool technology is most suited for the exploitation of predominantly Woodland environments. Copper artifacts also appear during this period as well as new weapon points (Gibbon 2012; Arzigian 2003).

Even though there is no evidence that the Twin Lakes site is directly related to the Old Copper Culture, it is part of Minnesota's culture history at around the same time period that the Twin Lakes site has been dated. According to Gibbon (2012:82) the Old Copper Culture starts in the early-Late Archaic whereas Stoltman (1997) places it in the Middle Archaic. Major quarries were located on Isle Royal in northern Minnesota , the Keweenaw Peninsula in Michigan and the Brule River in Wisconsin, and naturally occurring copper was deposited elsewhere by glaciation as well (Gibbon 1998:28).

Late Archaic (1500-500 BC)

The Late Archaic is marked by extensive trade networks, burials, copper tools, and new lithic technologies including smaller spear points (Theler and Boszardt 2003). Red ochre is widely used ceremonially and found in Late Archaic burials all over the Upper Mississippi River Valley. The Late Archaic is also characterized by the increasing exploitation of edible seed-bearing plants, such as wild rice. While the people remained hunters and gatherers, this subsistence shift would eventually lead to increasingly less mobility with the regular occupation of seasonal settlements (Gibbon 2012:88).

In Minnesota, the Late Archaic is marked by the appearance of different diagnostic weapons points that tend to be side notched or stemmed and made from a larger variety of exotic raw material, including marine shells and copper (Gibbon 2012:78-79). There was also a switch to communal burial sites and a continued absence of pottery (Gibbon 2012:90). This period of time between 3000-500 BC seems to be absent of any catastrophic climate change and the central Minnesota ecosystem had stabilized (Gibbon 2012). This is believed to have added to the continued increase in population and settlement size. Increased stability of the environment and the presence of larger, more permanent settlements can also be linked to the increased diversity of the cultural material recovered from the Late Archaic sites in Minnesota. One of the biggest differences between the Middle and the Late Archaic, according to Gibbon (2012), is the use of native copper to make a large variety of utilitarian implements.

Archaic Burials

According to Arzigian (2003) there are 16 possible Archaic burial sites in Minnesota. They are considered Archaic if they do not contain pottery and they are not associated with mounds. Only four of these burials have been radiometrically dated to the Archaic. The remaining burials are assumed to be Archaic because of the associated site and or lithic assemblage. The oldest dated site is Minnesota Woman that was found in 1931 about 10 to 12 feet below the ground surface during road construction (Arzigian 2003). In 1932 excavations were conducted by Jenks that confirmed the location and found additional remains. Found along with the remains was an elk antler and a marine shell pendent (Arzigian 2003). Recent AMS dates from the burial date to 7840 +/- 70 radiocarbon years BP. There are four burial sites that produced diagnostic artifacts that date them to the Archaic. Five of the 16 burials were dated by the presence of red ocher and the absence of pottery. Also, common themes in the Archaic burials are their locations in glacial knolls and glacial ridges. It is interesting to note that the

Twin Lakes site is also located on a glacial ridge. The burials are constructed as trenches dug out from a glacial mound and then filled back in with gravel and till. Both primary and secondary burials are represented in the Archaic sites (Arzigian 2003).

Associated Sites

There was a site search conducted through the Minnesota Historical Society. The contact to acquire this information is Thomas Cinadr who is the Survey and Inventory Manager for the Minnesota Historical Society. He was sent the UTM coordinates for the site and then conducted a site search for within a mile radius of the Twin Lakes site. Unfortunately there were no sites found. This is most likely because the area around the site is mainly private land and has not been surveyed. In addition, as previously stated, the Middle Archaic is generally poorly represented in the state of Minnesota (Gibbon 2012:77). There has, however, been extensive archaeology done at Fort Ripley that is only 3.6 miles from Twin Lakes. The information on these locally associated sites from Fort Ripley is included below to get an idea of other sites in the area.

Mattson’s 2013 report discusses Phase I and Phase II archaeological excavations at Fort Ripley. The first site 21MO328 is a multi-component site located on a terrace just west of the Mississippi River. The initial Phase I survey was conducted in July 2012 and there was sufficient cultural material recovered to be recommended for a Phase II investigation. The results of the Phase II revealed a mainly historic component with little prehistoric artifacts. After a closer examination of the soil profiles in the test units it was determined that there was a significant amount of soil disturbance that interfered with the identification of any intact culture deposits so the site was declared not eligible for the National Register.

The second site excavated was 21MO329. This site was also found in the initial Phase I investigation in July of 2012. The Phase II investigation yielded a large number of artifacts and the majority was prehistoric. There was deep undisturbed soil stratigraphy with artifacts recovered down to 85 cmbs. The site was C14 dated to the Late Woodland and the Contact period in Minnesota. Mattson speculates that the lower undated strata are than the C14 results show because of the depth and the lithic assemblage. This site is eligible for the National Register.

In addition, on September 28, 2012, Timothy Notch, Camp Ripley Training Area Coordinator, recovered a lithic biface from the exposed shoreline on the west side of the Mississippi River just north of Fort Ripley. This information is located in the Supplemental Report Biface recovery, Mississippi River shoreline, Camp Ripley Military Reservation, Morrison County, Minnesota to Mattson's Phase II report (Mattson 2013). The lanceolate biface was made of jasper taconite and this style of point is associated with the Paleoindian time period (Gibbon 2012: 48). The presence of this biface so close to Twin Lakes indicates a habitation of the area possibly up to the end of the last Ice Age.

The following chapter will discuss the research design and field methods used to excavate the Twin Lakes site including Phase I and Phase II archaeological state guidelines.

Chapter 4: Research Design and Methods

As previously stated, the goal of this thesis is to conduct an archaeological field and laboratory investigation of the Twin Lakes site that will ultimately allow for a recommendation regarding its eligibility for nomination to the National Register of Historic Places (NRHP) as outlined in National Park Service Bulletin 36. To accomplish this required field investigations to sample the site contents and establish its full boundary. In addition, it required collecting samples to determine the age of the site. The sections below discuss the research design used to collect the field data needed for the analysis. The field investigations were conducted in compliance with Scott Anfinson's (2011) State Archaeologist's Manual for Archaeological Projects in Minnesota.

State Guidelines for a Phase I excavation

The previous shovel testing and surface collection done at the site in 2013 followed a Phase I approach and revealed the presence of an intact cultural deposit below the modern ground surface but little else was known. Phase I projects in Minnesota, according to the Minnesota State guidelines (Anfinson 2011:27), are described as;

> *Reconnaissance or Phase I Surveys determine if sites exist in a particular area and define the vertical and horizontal boundaries of any sites. Such surveys can also make preliminary assessments as to a site's archaeological nature (e.g., context, function, condition). Phase I surveys can involve the use of a great variety of archaeological field techniques including visual inspection, surface walkover, controlled surface collection, shovel testing, augering, coring, and electronic remote sensing. A Phase I survey provides enough information to allow consideration of avoidance if a site is to be impacted by an undertaking and to gather enough information to allow for reasonable recommendations for more detailed work should it be necessary.*

The 2013 fieldwork for the Phase I investigation at Twin Lakes included a controlled pedestrian survey of the vineyard where the crew systematically walked transects between each of the vineyard rows to cover the entire area. A GPS unit was used to mark the locations of the surface finds. Two shovel tests were excavated in 10cm levels terminated at glacial till and any artifacts were collected from each shovel test. Because of the presence of deeply buried cultural material, according to Professor Muñiz, the site warranted further investigation in the form of a Phase II test excavation.

State Guidelines for a Phase II excavation

The goal of all fieldwork at the Twin Lakes site was to identify if artifacts were present below the ground surface, to determine the nature of any subsurface deposits, to establish how many cultural components were at the site, to define the horizontal and vertical boundaries of the site, and to determine the site's significance. Each of these goals is standard to the "evaluation" phase (i.e., Phase II) of cultural resources management (CRM) archaeology, where a site is evaluated for its eligibility to be nominated to the NRHP (National Park Service Bulletins 15 and 36). The field methodology used at the Twin Lakes site in 2014 would be considered closely in line with a Phase II investigation according to the State Archaeologist's Manual for Archaeological Investigations in Minnesota (Anfinson 2011:35).:

> *Evaluation or Phase 2 Surveys can incorporate two basic objectives: to assess the importance/eligibility of a site and to gather detailed site information to help design an adequate and efficient data recovery plan should mitigation be necessary. Phase 2 surveys can also better define the vertical and horizontal limits of a site or gather other information for a National Register of Historic Places (NRHP) nomination or formal site interpretation. Evaluation Survey requires intensive fieldwork that usually involves the excavation of formal units (1x1 m or larger) with close provenience control and a level of analysis beyond reconnaissance surveys.*

Therefore, further research was conducted in 2014 to provide more details about the site and serve as the basis for this thesis. There was subsurface testing conducted including 17 shovel tests that were dug in 10-cm levels and two 1x1 meter test units. Test Unit 1 was placed by Professor Muñiz and was located adjacent to Shovel Test 2. Test Unit 1 was excavated in 5 cm arbitrary increments down to glacial till and screened using a ¼-inch mesh. A full profile drawing was made by Muñiz to document the entirety of the soil profile in Test Unit 1. A Munsell book was used to designate soil colors for the soil stratigraphy. Soil horizons were defined and texture and structure were recorded for each.

Test Unit 2 was located five meters south of Shovel Test 8 (Figure 4). The unit was set up using two tape measures and unit string. The datum was placed at 10-cm above the highest corner of the unit which was the northwest corner. The levels were excavated at 5-cm increments and the artifacts were collected by level. Shovel Test 8 had yielded the most cultural material from all of the subsurface tests conducted at the site. The levels were excavated in 5cm increments down to the glacial till and all contents were screened through ¼-inch mesh. All of the bags were labeled with the unit number, excavator name, date, level, depths and a description and count of the artifacts. There were photos taken at the beginning of every level with a photo board. The entirety of the soil profile of the north and south walls of Unit 2 were drawn by hand and the Munsell colors, soil texture, and structure were determined for each stratum and included on the profile. The profiles were also photographed (Appendix 4). Soil samples were taken from the Bw horizon in Test Unit 2 for dating through the optically stimulated luminescence (OSL) technique. The Bw horizon contained the highest concentration of artifacts in Test Unit 2 at Level 5 (20-25 cmbs). The soil samples for OSL dating were carefully removed with PVC cores underneath the plow zone so there was a uniformity of the soils in the sample. The samples were removed on an overcast day and under a tarp to ensure darkness to improve the sample. In addition to the soil samples for the OSL dating, charcoal was taken from approximately the same stratigraphic level in Test Unit 1. This charcoal was dated with the accelerator mass spectrometry (AMS) technique to compare with the OSL date. A Trimble GeoXH GPS unit was used to collect location data at the site during the Phase I excavation. After the Phase II excavation was complete, a total station was brought out to the site to collect more accurate spatial information on the locations of the shovel tests, test units, and the fence surrounding the vineyard.

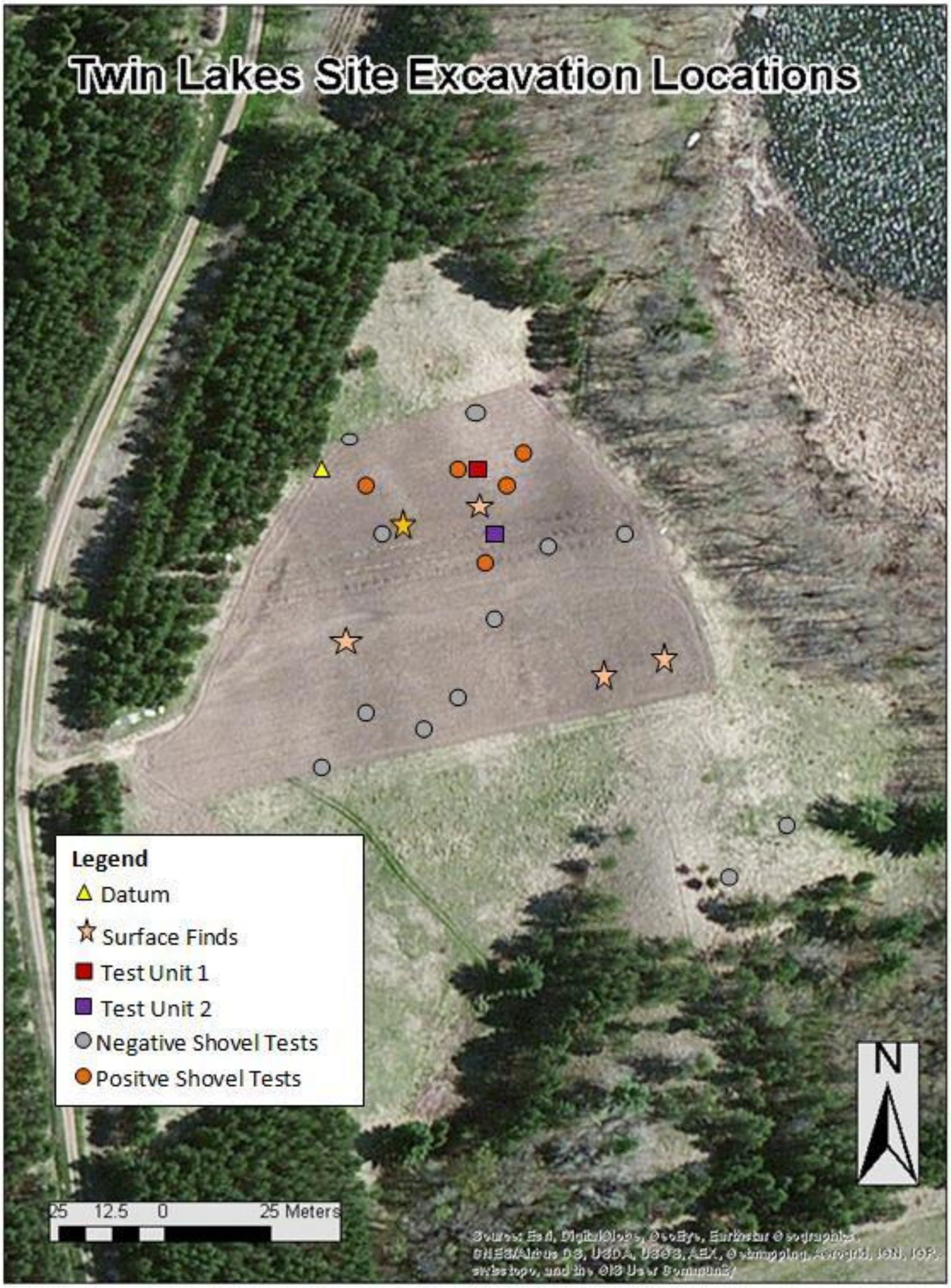

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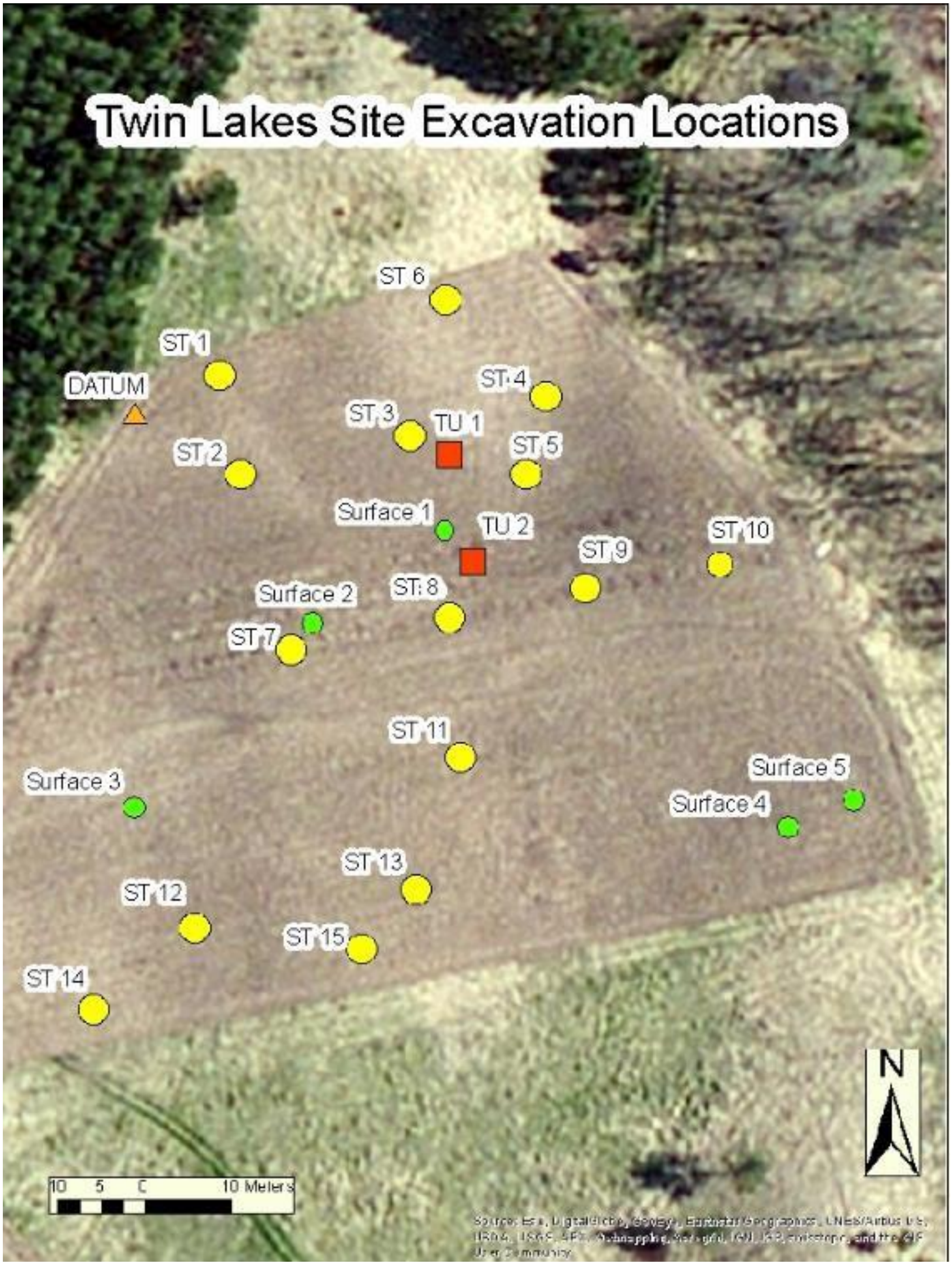
Figure 9. Twin Lakes location of surface finds, shovel tests and excavations units

Provenience	Artifact Count
Shovel Test 2	3
Shovel Test 3	1
Shovel Test 4	4
Shovel Test 5	1
Shovel Test 8	13
Test Unit 1	25
Test Unit 2	7
Surface 1	1
Surface 2	1
Surface 3	1
Surface 4	1
Surface 5	1
TOTAL	59

Table 1. Artifact count (including all lithic debitage) for the positive Shovel Tests and Units



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 10. Map of site area with individual labels

Field Forms

For collecting the field data there were two different forms used along with field notes: shovel test forms and test unit level forms. The shovel test forms recorded: the name of the excavator, the date excavated, the depths of the soil stratigraphy, the maximum depth, Munsell colors, soil textures, provenience information and whether the shovel test was positive or negative for cultural material. Appendix 2 has all of the scanned shovel test forms from the excavation at the Twin Lakes site. The test unit level forms collected: the name of the excavator, the date excavated, the depths of the soil stratigraphy, Munsell colors, soil textures, provenience information, the location of the datum, the start and stopping measurements of each level depth, and whether the test unit level was positive or negative for cultural material. Appendix 3 has all of the scanned Test Unit Level forms used for the Twin Lakes excavations. Additional field notes from the excavations can be found in Appendix 1.

A field catalog was also maintained on site to document and manage the variety of samples collected. The field catalog included: site name, catalog number, level, provenience, material, number of bags, and comments. The comments include a description and count of the artifacts that are in each bag. The field catalog can be found in Appendix 6.

Laboratory Methods

Once the artifacts were collected at the Twin Lakes site they were brought back to the SCSU Archaeology Lab. First, all of the artifacts were cleaned with water and a toothbrush and then looked over to make sure that they were indeed real artifacts. Diagnostic characteristics of a flake include platforms, fissuring, waves of percussion and bulbs (Andrefsky 2005). The material that was initially collected in the field that was not cultural was discarded. The flakes were examined and spreadsheets were developed with certain attributes that can tell us more about the sample for the lithic analysis. To measure the dimensions of the flakes a digital caliper was used. To find the weight of the flakes a digital scale was used. Any flakes that were too light to register on the scale were given a “>.05 g” weight measurement because if they weighed more the weight would have been registered on the scale. A goniometer angle measuring tool was used for the biface analysis to calculate the maximum and minimum angles of the left and right margins of the biface. There were six measurements taken on each side of the biface that produced a range and the mean was found based on these measurements. All of the flakes were photographed by level (Figures 17-42). The biface that was examined was also photographed (Figures 43-44). The artifacts will stay at the SCSU Archaeology Lab for further study until being returned to the landowner. What follows is an in-depth discussion of the attributes that were recorded for each of the flakes and the biface.

Flake Analysis

The lithic artifact analysis is based on approaches discussed in Andrefsky’s (2005) *Lithics* book and Odell’s (2003) *Lithic Analysis* book. These books take a logical approach to lithic analysis and identify what attributes can be used for analysis. This analysis focused on the attributes required for certain statistical tests and had close guidance from Professor Mark Muñiz. Given the fact that we know there was a human occupation at Twin Lakes, the flake attributes should be able to give more information about what kind of lithic manufacturing (e.g., flake production from cores or bifacial production) was taking place at the site.

The following describes the attributes that were included in the lithic analysis spreadsheet and why they are useful information for interpreting the human behavior at the Twin Lakes site.

The flake's *condition* refers to whether the flake is complete. A complete flake means it has the proximal end or striking platform, the medial section or the middle of the flake, and the distal end meaning the terminal end of the flake. The incomplete flakes were labeled medial, proximal or distal fragments depending on which portion of the flake they represent.

The *material type* refers to the type of material or stone used to make the artifact. Material type is very important because often it can be traced back to the source of the raw material and its proximity to the site. With the Twin Lakes site, the lithic raw material is overwhelmingly Knife Lake siltstone. Research by Kent Bakken (2011) has proposed that in Minnesota certain cultural traditions had specific preferences for lithic raw materials and that these patterns are significant enough to use the raw material proportions in an assemblage to estimate a cultural affiliation for the site.

The *presence of cortex* indicates that the flake has remnants of the outside crust formed on the surface of the rock by time and weathering. Based on Andrefsky (2005) using the triple cortex typology separates the relative amount of cortex on the dorsal surface of the flake into three categories (Andrefsky 2005:115). For this analysis, a flake with 50-100% cortex on the dorsal surface would make it a primary flake, less than 50% would make it a secondary flake, and the absence of cortex would make it a tertiary flake. A primary and secondary flake would indicate that it was removed in the early stage of the tool making process (Andrefsky 2005:115). Therefore the absence of cortex is telling as well and would imply that the flake was made later in the tool making process or could have been made from tool maintenance or sharpening.

The standard metric attributes of *weight* (grams), *maximum length* (millimeters), *maximum width* (millimeters), and *maximum thickness* (millimeters) are included. The length is the longest axis of the flake but does not necessarily follow the flake's struck orientation (see below). The width is the widest part of the flake perpendicular to the maximum length, and the thickness is the thickest part of the flake perpendicular to the plane of the length-width axes. These measurements are important because they can be used to analyze the artifacts as geologic clasts that are independent of cultural modification. Comparing the distribution of flakes as pieces of rock, instead of artifacts, can tell us something important about the effects of site formation processes such as plowing or freeze-thaw action.

The *oriented length*, *width* and *thickness* were also recorded with similar parameters as the maximum measurements. However, oriented length means the actual direction the flake was removed from the core (e.g., a line transecting the flake from the center of the platform to the center of the termination). These measurements will differ in some cases from the maximum measurements described above because the orientation of the flake as struck from the core will change. These oriented measurements are important because the size of the flakes recovered can suggest at what point in the tool manufacturing process that the flakes were made (Ahler 1989). For example, the smaller flakes would be present when a tool was almost completed or being retouched (i.e., resharpened) through pressure flaking. Larger flakes may come from the outer edge of the tool blank and often include cortex, indicating they were made in the generally earlier stages of production of the tool and may even become tools themselves. The *weight* measurement is a good indicator of the stage of reduction because it is easily replicable and co-varies with other linear dimensions (Odell 2003: 126).

The *general shape* of the artifact is based on the outline form and will be determined by using commonly defined shapes. A standardized list of shape images (Muñiz 2013) was used to compare against each specimen. Analyzing variety in flake shapes may indicate if a preferred form of flake tool blank was being manufactured.

The *presence of pot lids* indicate a burning episode because pot lids are formed when the rock is heated to the point that water trapped in the crystal structure explodes and leaves a circular divot in the center of the rock. This heating of the rock may be cultural in the form of a hearth or non-cultural in the form of a natural burning episode.

The *depth of the deposits* and *soil horizon* are important for identifying vertical patterning of artifacts that can indicate one or several cultural occupation levels. In addition, soil horizon is an important designation because of the difference between the disturbed Ap (plow zone) and the "intact" (not plowed) soil horizons. The artifacts found in undisturbed soil horizons may be more likely to be *in situ* (i.e., indicating a greater potential for recording primary human behavior) whereas artifacts found in the plow zone have been moved from their original location. However, it is important to note that research has demonstrated that plow zone artifacts may still retain spatial information horizontally even if disturbed vertically (Dunnel and Simek 1995).

The *edge damage* category is in reference to the appearance of the outer edge of the flake. Old edge damage would appear worn and patinated as it has been weathered to the same degree as the rest of the flake's surface. New edge damage may be sharp and distinctly different from the weathered surface with more of a luster. Edge damage can indicate ancient usage of the flake for tool purposes, but if the damage is new then it would not have been used in the same temporal period that it was made.

Platform condition was examined to record if the flakes have broken or complete platforms. Only the flakes with complete platforms can tell you more about the lithic production process as preparation of platforms is related to reduction strategies and can be a culturally specific activity (Andrefsky 2005).

Platform Measurements were taken on complete platforms and *platform width* and *thickness* were measured in mm. The size of the platform can also indicate at what point in the tool manufacturing process that the flakes were produced and possibly what kind of tool they used to make the flakes (Andrefsky 2005). Generally larger platforms are made by larger hammers.

The *Platform Attribute* column refers to weather the flake platform was faceted or not. The presence of faceted striking platforms has been used to recognize biface production (Andrefsky 2005). The presence of facets indicate that the flakes were likely made in the latter stages of biface production. Non-faceted platforms (i.e., flat or plain) are often associated with core reduction to produce flake tools.

Biface Analysis

In addition to the flakes found at the site there was also one surface collected bifacial hafted element and a large bifacial non-hafted fragment that was collected from the subsurface by the landowner while digging holes to plant grape vines. Both bifaces are made of Knife Lake siltstone.

Figure 11. Bifaces from the Twin Lakes site

The basis for this biface analysis was from Professor Muñiz’s (2013) article on biface analysis from the Wendt site at Knife Lake. Because there were only two bifaces recovered out of context from the Twin Lakes site, this will not leave much for comparison within the site boundaries but can indicate a certain lithic technology was used that can possibly be tied to a certain time period. The smaller hafted biface might be able to be used as a cultural diagnostic but was not analyzed because the land owner did not make it available.

The table above provides the series of attributes recorded for the biface. The *condition* refers to whether the biface included a hafted element meaning that it could have been attached to a shaft. The *weight* of the biface was recorded in grams. The standard metric attributes of *maximum length (mm), width (mm),* and *thickness (mm)* will be measured from the center of the biface as if it were complete; the width will be the widest part of the biface from side to side and the thickness will be the thickest part of the biface.

The *oriented length*, *width* and *thickness* were also recorded with similar parameters to the maximum measurements. Oriented length is the actual direction the biface was formed as a presumably useable tool (e.g., a line transecting the biface from the center of the tip to the center of the base). These measurements will differ slightly in some cases from the maximum measurements described above because the orientation of the biface as a tool could change slightly as compared to measuring the biface as a geologic clast.

The *presence of cortex* indicates that the biface has remnants of the outside crust the rock formed by time and weathering. This could also indicate whether the material could have come from a secondary source like a cobble that could have been carried or curated and then formed into a biface. If there was no cortex present it could indicate that the material came from a primary source such as a bedrock quarry or that all of the cobble cortex was removed during manufacture.

The *edge angles* were measured at six different points on each margin of the biface to find the maximum, minimum and mean edge angle. Variations in edge angle can indicate the use of the biface for tasks such as cutting, scraping, or digging. For example, cutting tools would have very acute angles because they would be sharper whereas a hoe would have less acute angles because it is used to turn dirt for farming (Andrefsky 2005).

The *material* category refers to the raw material that the biface is made of. The *edge damage/uses* refers to damage that was caused by natural or cultural processes and can indicate the use of a tool or it can also indicate movement on the landscape by gravity or a plow.

In addition, the *oriented length* and *width of the negative flake scars* on both sides of the biface were measured for complete or nearly complete flake scars. This was done to run a statistical analysis comparing the flake sample's orientated width and length to the biface's values for the negative flake scars. This analysis will show if the flakes found in the subsurface testing could have come from the manufacturing of a biface like the one recovered from the site.

The additional non-chipped stone material collected included bone fragments, ocher, fire cracked rock, and a nail. The bone was recovered from the surface and not in the excavations. The landowner reported that he intentionally and periodically scatters deer bones in the vineyard as part of his compost so the bone is most likely part of his compost. These objects were recorded in the artifact catalog for the site but not analyzed for the thesis.

Chapter 5: Fieldwork Results

This chapter presents the results from the Phase I and Phase II field investigations. The results are presented as daily entries in field notebooks to accurately document progression of the fieldwork. Then the following chapters go more into depth on the analysis of the artifacts and the results of the dating techniques that were conducted after the completion of the fieldwork.

Work Summary and Results from Phase I

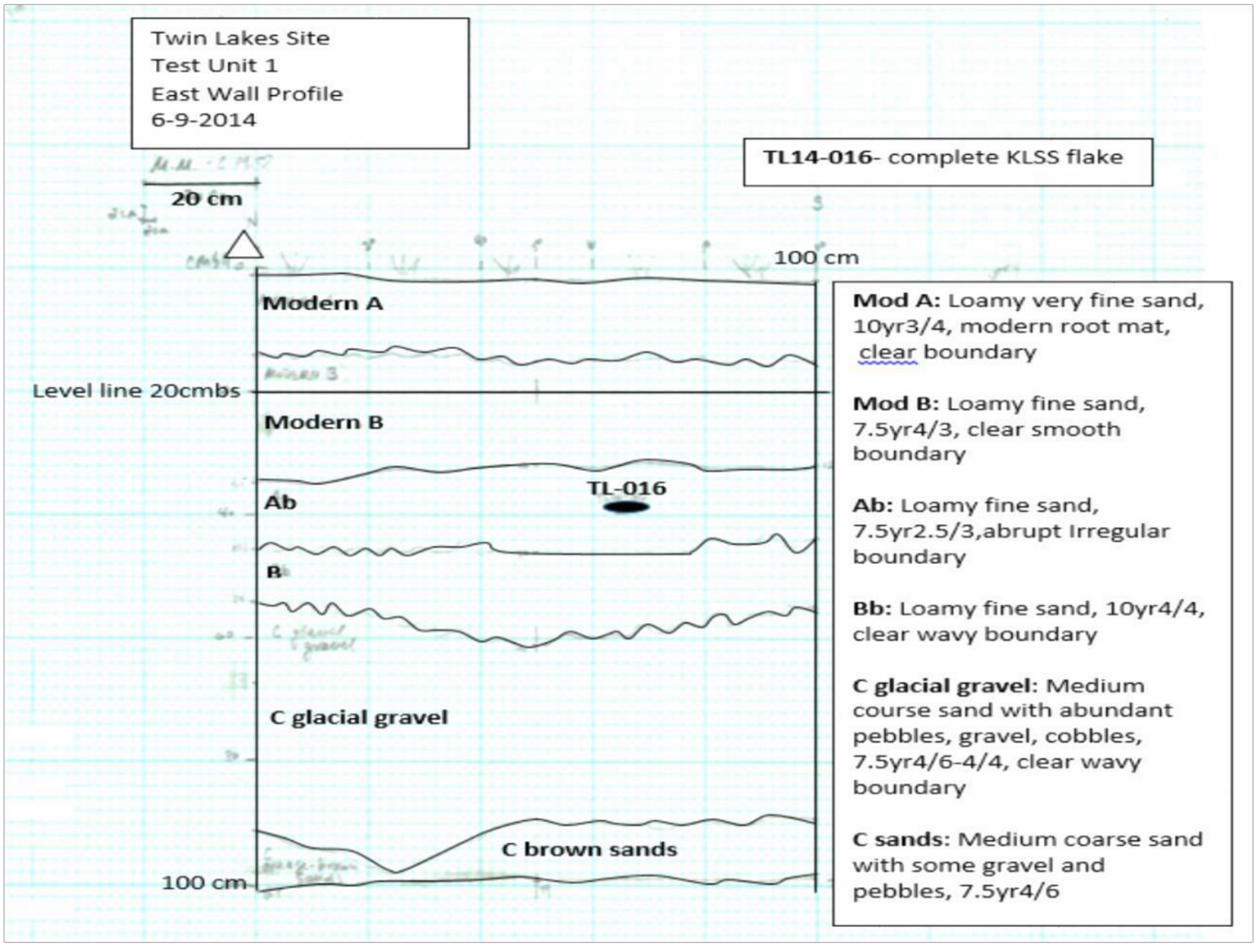
This will be a brief summary of the Phase I field work from Professor Muñiz's field notes (Appendix 1) and the shovel test forms (Appendix 2). As previously stated in the Project Description from Chapter 1, the initial investigation of the Twin Lakes site began on November 15, 2013. The field was surveyed in transects running east-west along with the planted rows in the orchard for best visibility. Two KLS flakes were found and a piece of fire cracked rock. There were two shovel tests dug in 10cm levels. In Shovel Test 2 there were two KLS flakes recovered from 90-100 centimeters below surface (cmbs). This could have indicated a deeply buried cultural deposit (Muñiz 2014a).

Work Summary and Results from Phase II

Summer 2014

In the summer of 2014, there was continued work on the newly discovered site. Professor Muñiz opened a 1m x 1m square excavation unit adjacent to Shovel Test 2. In addition, Professor Rob Mann's field school conducted additional shovel tests using an arbitrary sampling strategy based on the surface topography to define the boundaries of the site. The material found added to the mystery of the site because of the high volume of Knife Lake siltstone (KLS) recovered. It resembled a lithic artifact assemblage one might expect from some of the oldest sites in Minnesota according to Bakken's (2011) doctoral dissertation. Test Unit 1 was placed just south of Shovel Test 2 in between the rows of the grape arbors. There were 25 flakes recovered from TU 1 including 2 jasper, 2 quartzite and 21 KLS. Figures 12 and 13 illustrate the wall profiles from Test Unit 1.

On June 6, 2014 Professor Mann's SCSU field school visited the Twin Lakes site to continue shovel testing. There were an additional nine shovel tests dug. All of the positive shovel tests were concentrated on the north side of the vineyard, on top of the small hilltop. Five of the nine shovel tests were positive for cultural material. Shovel Test 7 was positive for charcoal and ochre. Shovel Tests 3, 4, 5 and 8 were positive for lithic artifacts. The highest artifact yield came from level 25-35cmbs where there were 13 flakes recovered (Muñiz 2014a). The Phase I shovel testing established that there were subsurface deposits in several areas of the Vineyard that would warrant Phase II investigation



Twin Lakes Site
Test Unit 1
East Wall Profile
6-9-2014

TL14-016- complete KLSS flake

Mod A: Loamy very fine sand, 10yr3/4, modern root mat, clear boundary

Mod B: Loamy fine sand, 7.5yr4/3, clear smooth boundary

Ab: Loamy fine sand, 7.5yr2.5/3,abrupt Irregular boundary

Bb: Loamy fine sand, 10yr4/4, clear wavy boundary

C glacial gravel: Medium course sand with abundant pebbles, gravel, cobbles, 7.5yr4/6-4/4, clear wavy boundary

C sands: Medium coarse sand with some gravel and pebbles, 7.5yr4/6

Figure 12. Test Unit 1 East Wall Profile (drawn by Professor Muniz)

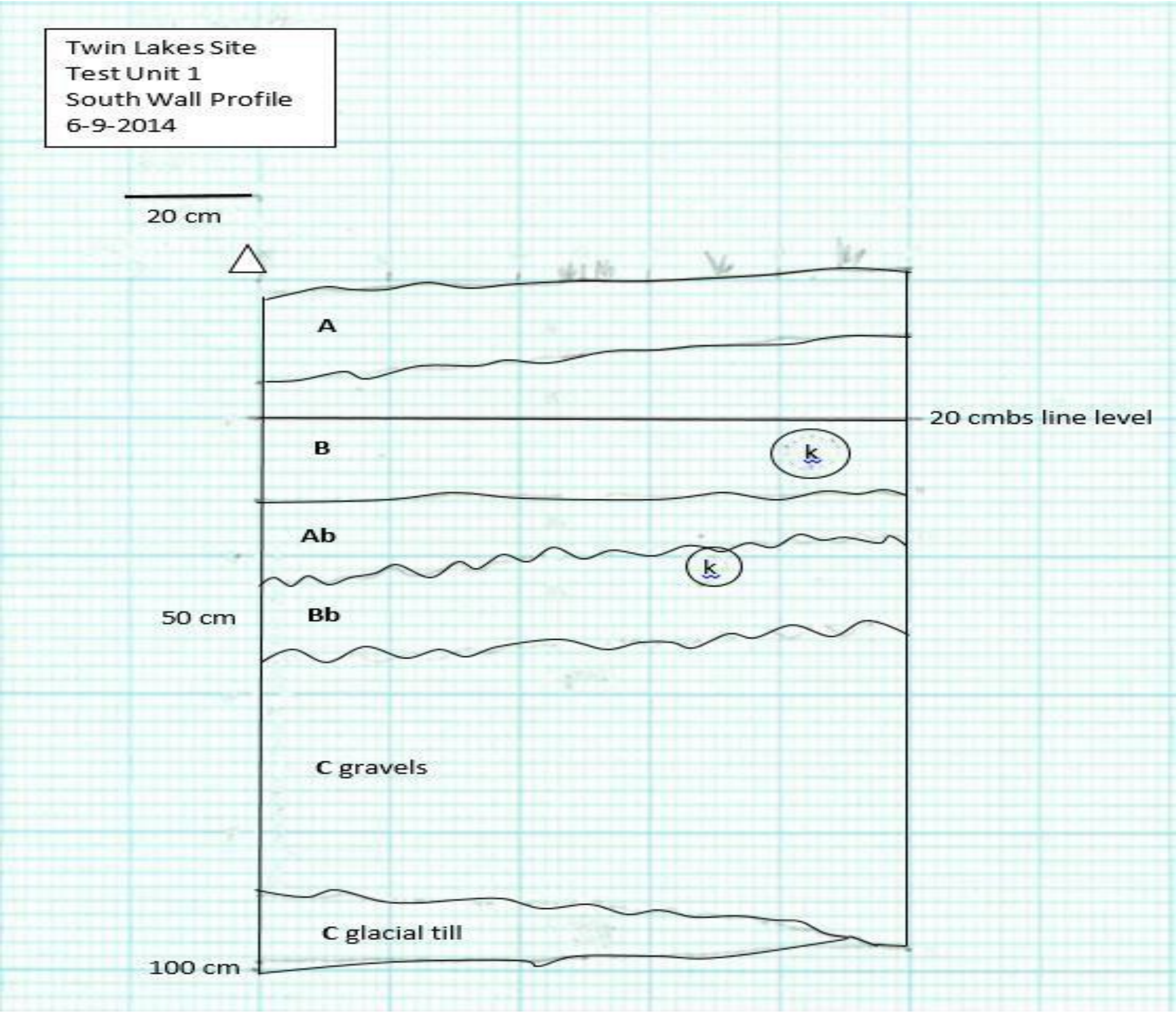


Figure 13. Test Unit 1 South wall profile (drawn by professor Muniz)

October 18, 2014

In mid-October 2014 Hollie Lincoln and Liz Sharkey went out to the Twin Lakes site to excavate a new 1m x 1m test unit. The Test Unit 2 was placed one meter to the south of Shovel Test 8, which contained the densest concentration of lithic artifacts of all the shovel tests.

Figure 14. Elizabeth Sharkey and Hollie Lincoln excavating Unit #2

On this particular day there was one flake recovered from Level 1 (10-15cmbd), one Fat Rock Quartz flake from Level 3 (18-22cmbd), four flakes from Level 5 (27-32cmbd), and Level 6 contained two flakes (32-38 cmbd). A photo of Level 4 is below and the remaining Unit 2 photos are in Appendix 1. The Unit was unable to be finished so we had to return to finish the unit on November 8th.

Figure 15. Photo of the beginning of Level 4 in Test Unit 2

November 8, 2014

On November 8, 2014 Corey Yates and Liz Sharkey returned to the Twin Lakes site to finish Test Unit 2. Levels 7 and 8 were both negative for artifacts. Level 8 was 10cm into glacial till because of the difficulty of only excavating a 5 cm level with all of the large rocks. Level 8 was the end of excavation. The north and south profiles were drawn to show the sloping landform from west to east that exhibited the shallower soils to the east (Figures 16-18).

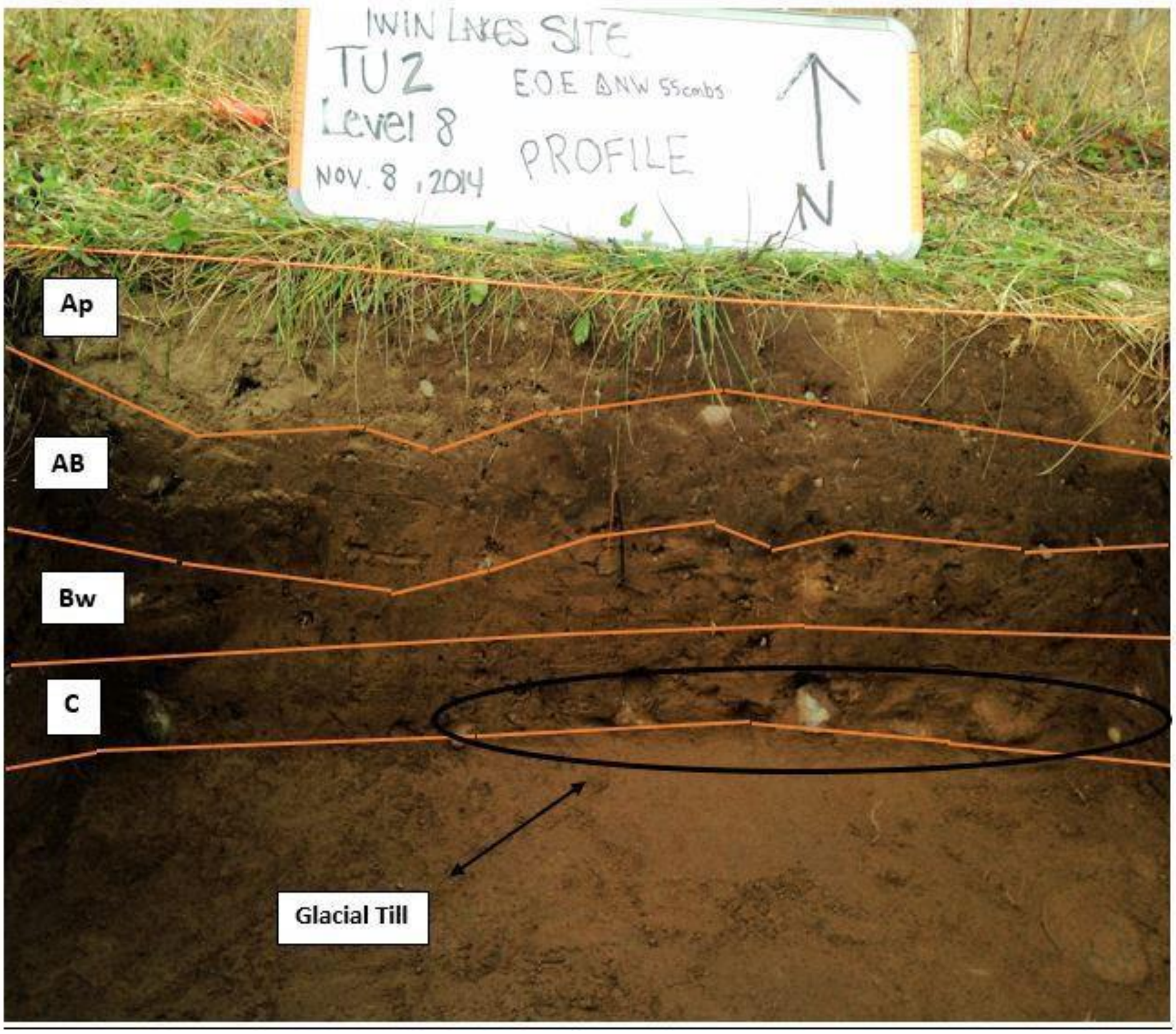


Figure 16. Unit 2 North Profile enhanced by Aviary Photo Editor

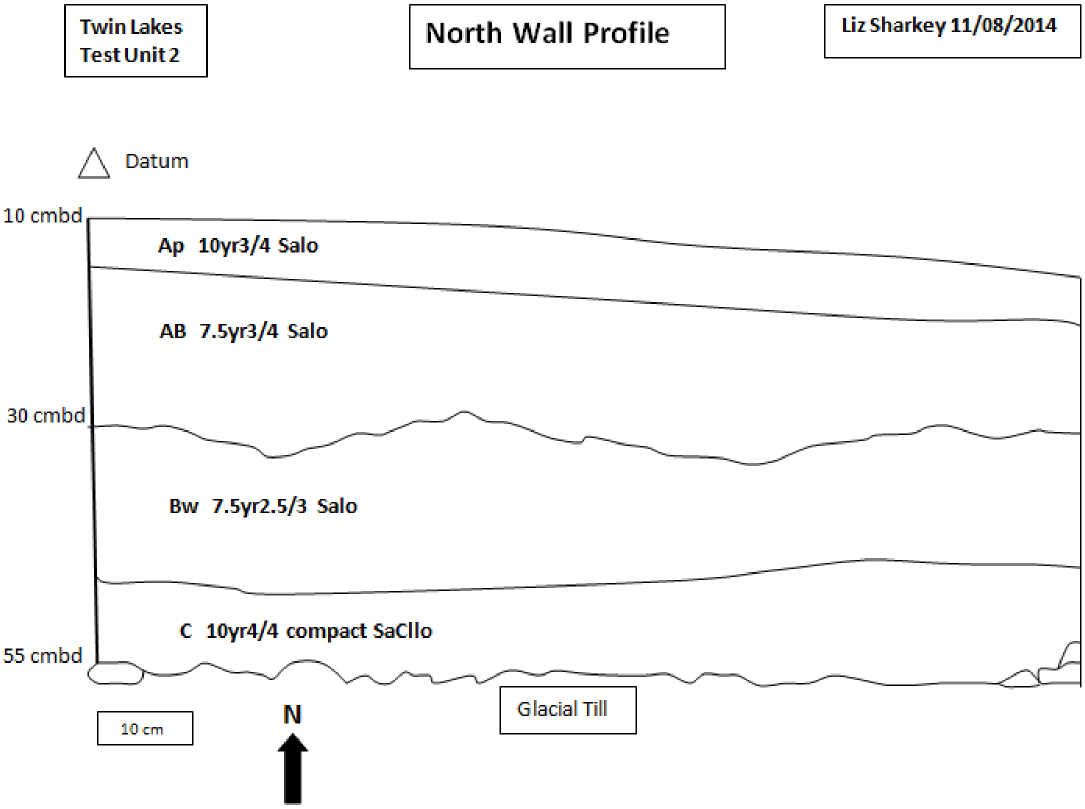


Figure 17. Digitized profile of the North wall of Test Unit 2

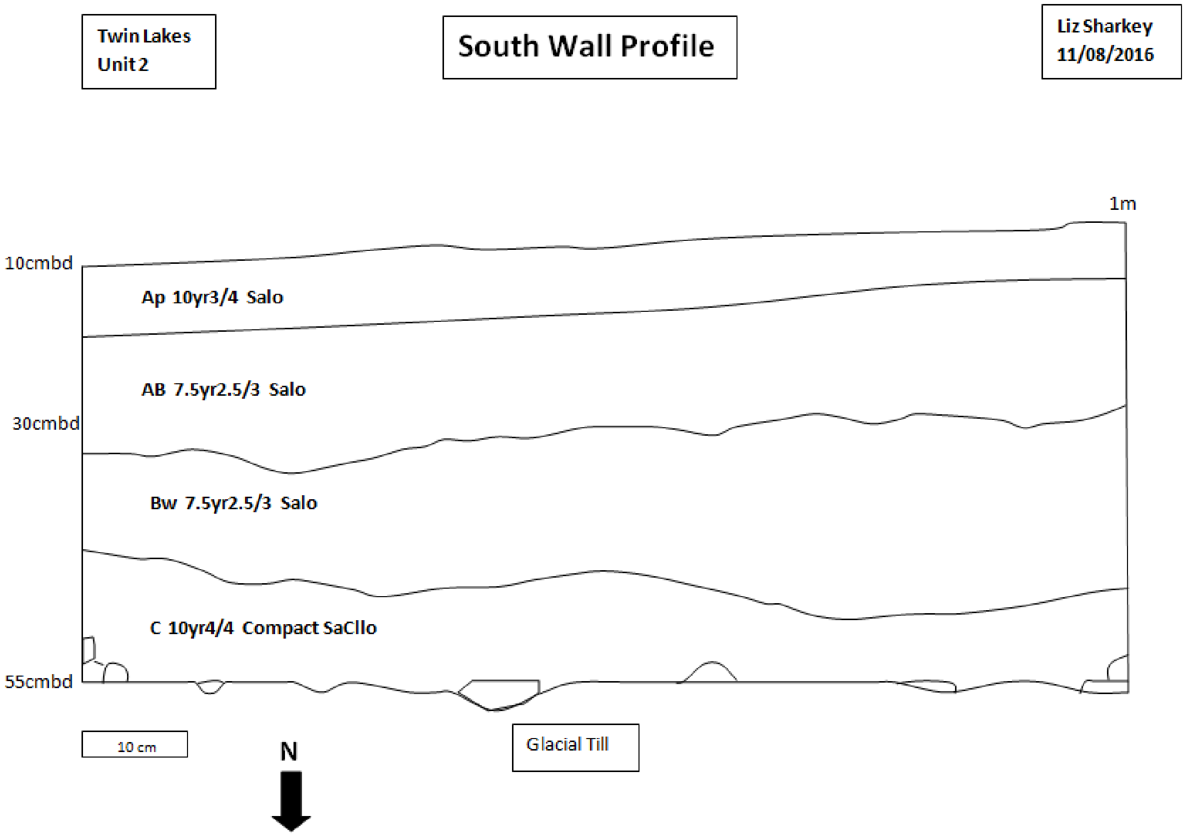


Figure 18. Digitized profile of the South wall of Test Unit 2

There was a total of seven flakes and one shatter recovered from Test Unit 2. Six flakes were KLS, one flake was Fat Rock quartz, and one was an unknown type of white banded chert that is possibly chalcedony.

November 16, 2014

On November 16, 2014 Hollie Lincoln and Liz Sharkey returned to Twin Lakes to determine the southern boundary of the site. There were six additional shovel tests (numbers 12-17) placed on the south side of the vineyard to establish a southern boundary. All of the additional shovel tests were negative. The southern side of the vineyard where the shovel tests were placed was a lower bowl-like area with shallower soils than the north side of the vineyard that is on the top of a small hill. Based on the testing, the site is isolated to the higher northern side of the vineyard.

November 21, 2014

Professor Muñiz and Liz Sharkey returned to the Twin Lakes site one last time on a very cold day on November 21, 2014 to gather total station information for more precise data on the excavation locations. The accuracy of the Sokkia 630R total station is ideal for small areas such as the Twin Lakes site to make more accurate site maps. In addition to the total station work we examined a small field of glacial boulders for any sign of KLS secondary sources that could have been used as a source of material for the Archaic people of the area. The boulder field investigation yielded a boulder that looks be a form of jasper which is commonly used in the state for raw material (Bakken 2011) as well as examples of KLS.

Figure 19. Possible jasper boulder.

Figure 20. Possible Knife Lake Siltstone boulder.

Chapter 6: Artifact Analysis

Artifacts Recovered

The artifactual material recovered from surface collection, shovel testing, and Unit 1 and 2 excavations at the Twin Lakes site includes complete flakes and flake fragments (medial and distal). Flakes are by far the most abundant cultural material recovered from the site and indicates lithic tool production on the site. In addition to the flakes there was one piece of angular shatter found in Unit 2, Level 5 that is the only artifact that was made of an unknown chert material. There was also a bladelet (i.e., small shaped flake meeting the common definition for a blade) found in Shovel Test 8. The two bifacial fragments that sparked the initial investigation of the site in 2013 were found by the land owner on the south end of the site by the berry bushes. However, no new material was found in this area. In addition, there was a modern nail recovered. The non-cultural material recovered was a variety of rodent bones found in Unit 1 as well as red ochre fragments found in sub-surface testing. Red ochre can be cultural when found in a cultural context, for example in a burial, but without a cultural context it is just interesting to note that the mineral is in the soil for future reference. Charcoal was recovered from Unit 1 in Level 5 (20-25 cm below surface) and mapped in place before being collected. This was used to date the stratum with the greatest concentration of cultural deposits ranging from 20-30 centimeters below surface (cmbs). Lastly, there were pieces of fire cracked rock found on the surface and in subsurface testing. This can also occur naturally, but along with the charcoal found below ground may represent an ancient cultural burning event in the site area.

Lithic Material Sourcing and Analysis

Rock types commonly used for tools by Archaic Native Americans would be a large variety of cherts and chalcedonies, sometimes referred to as “flint”, as well as certain types of siltstone, quartz and quartzite. The more siliceous the material and the less crystalline the structure (meaning a high silica content without established cleavage planes), the easier it is to be shaped into tools because it will fracture conchoidally (Andrefsky 2005). In addition, because of the way this material separates away from its core with a conchoidal fracture, it produces sharp edges needed for various cutting tools. Following this principle, chert and chalcedony are generally the best materials for making tools, with siltstone coming next, followed lastly by quartzite and then quartz (Bakken 2011).

The accumulation of raw material to make tools can be from primary or secondary sources. A primary source is the actual *in situ* rock outcropping as a geologic bed. A secondary source would be when material is removed from the primary source, such as by water or glaciers moving cobbles, and then deposited elsewhere (Bakken 2011). This is especially prevalent in glaciated areas where the advancing and retreating of glaciers has moved and mixed the rocks over thousands of years (Bakken 2011:8). Because of the location of the Twin Lakes site, the most likely source of the majority of the lithic material would be a secondary glacial till source based on the location of the known primary sources discussed later. Below discusses the types of material found at the Twin Lakes site, their sources and frequency of occurrence.

The predominant material found at Twin Lakes is Knife Lake siltstone (KLS). KLS is a silicified metamorphosed rock also known as argillite, argillite-quartzite, felsite, silicified shale, metagraywacke, siltstone, basalt and Lake of the Woods chert (Mullholland 2002:6; Bakken

1997:75). The main primary source outcrops of KLS are in northern Minnesota and southwestern Ontario, Canada (Mullholland 2002: 6). The secondary cobbles of KLS identified near Duluth exhibit a common breakage pattern on the ends of the cobble that resemble a stepped or layered shale like breakage (Mullholland 2002: 6), however, other bedrock sources at Knife Lake are quite homogeneous and of good quality (Mark Muñiz personal communication 2015). KLS ranges from black to gray, sometimes with a greenish tint, and banding can occur. According to lithic collections studied in the state, KLS was the predominant lithic material used at early Paleoindian and Archaic sites in Minnesota and was phased out in the younger Woodland assemblages (Bakken 1997; Mullholland 2002). Large KLS and jasper boulders were identified on the property surrounding the site and are consistent with a secondary cobble source in the local glacial till (Figures 19-20).

The second most frequent material at Twin Lakes is Fat Rock Quartz. This particular type of quartz is associated with the Little Falls formation (Bakken 2011:97). There have also been large boulders identified near Fort Ripley which is located just a few miles to the west of the Twin Lakes site (Mattson 2013; Bakken 2011). In addition, Fat Rock Quartz has also been found at the confluence of many of the rivers in the area including the Crow Wing and Mississippi confluence as well as the Nokasippi and the Mississippi confluence (Bakken 2011:98). The Nokasippi River runs across the northern border of the private property where the site is located. Quartz is not usually considered a high quality material for flint knapping because of the large crystalline structure, but Fat Rock Quartz is unique in that the crystals are almost invisible to the naked eye and it has very few intrusions (Bakken 2011). Because of this, it is considered a good quality material for tool production and it is local to the area.

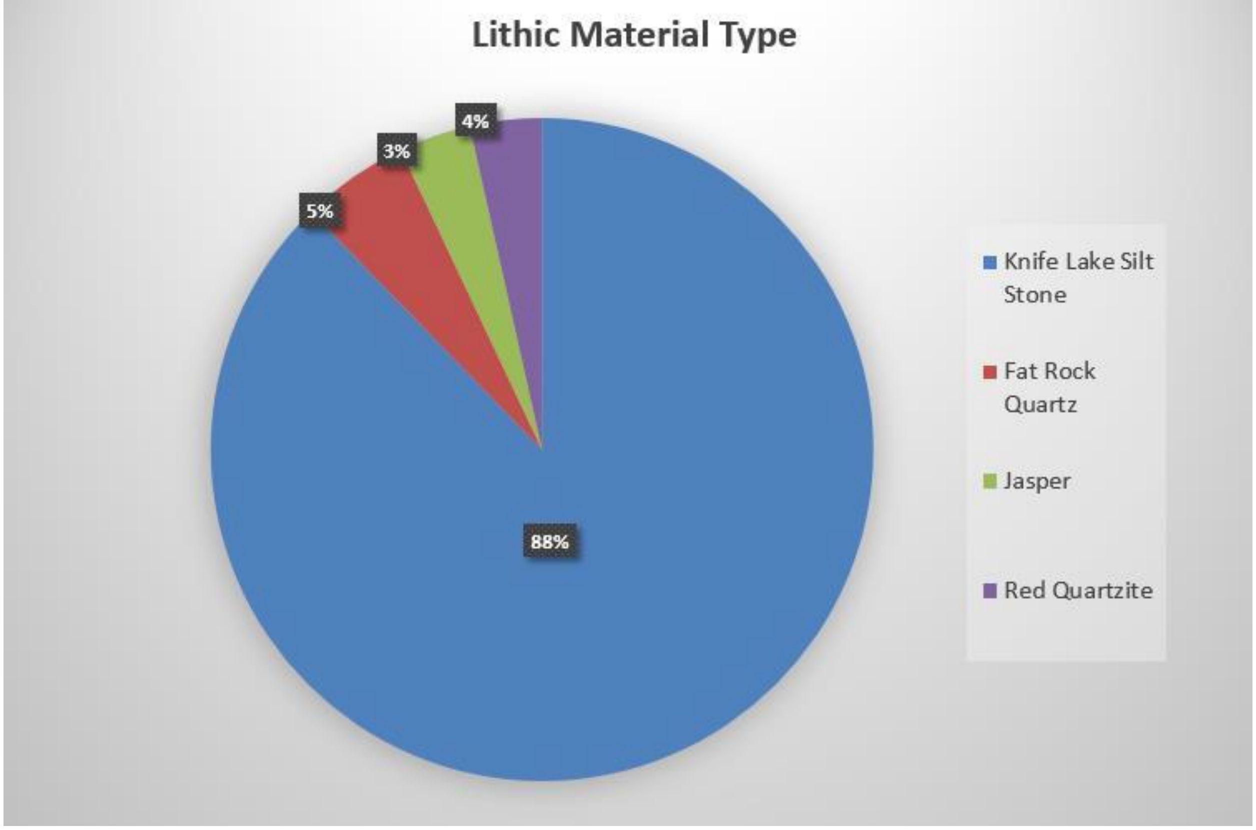


Figure 21. Percentage of types of lithic material recovered

Below in Table 2 are the results from the Twin Lakes flake analysis. In Table 3 are the results from the biface analysis.

Twin Lakes Lithic Analysis					Maximum size measurments				Orientated size measurments							Platform measurments (mm)				
Catalog number	Provienence	Flake condition	Materialtype	Cortex present	Wt (g)	Length (mm)	Width (mm)	Thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	General shape	Pot lids present	Platform attribute	Platform condition	Width	Thickness	Edge damage	Soil Horizon	Depth
TL14-003	Test Unit 1	complete	KLSS	no	0.1	11.5	8.8	1.6	10.6	8	1.6	irregular square	no	n/a	broken	n/a	n/a	old	A	10-15 cmb
TL14-003	Test Unit 1	complete	KLSS	no	0.6	21.1	14.2	1.7	19.5	13.7	1.7	irregular square	no	n/a	broken	n/a	n/a	old	A	10-15 cmb
TL14-004	Test Unit 1	complete	KLSS	yes	7.1	51.2	35.1	4.2	38.6	25.3	4.2	irregular square	no	faceted	complete	5.6	2.1	old	A	15-20 cmb
TL14-005	Test Unit 1	complete	Jasper	yes	0.05	10.9	6.4	1.9	10.9	6.4	1.9	irregular square	no	faceted	complete	5.1	2	old	B	20-25 cmb
TL14-005	Test Unit 1	distal	KLSS	no	0.05	10.6	6.8	0.8	10.6	6.8	0.8	irregular square	no	n/a	complete	n/a	n/a	old	B	20-25 cmb
TL14-005	Test Unit 1	complete	red quartzite	no	0.1	9.1	9.6	2.1	9.1	9.6	2.1	irregular square	no	n/a	complete	n/a	n/a	old	B	20-25 cmb
TL14-005	Test Unit 1	complete	KLSS	no	0.05	11.9	6.5	2	10.7	6.5	2	irregular square	no	facteted	complete	3.7	1.5	new	B	20-25 cmb
TL14-005	Test Unit 1	proximal	KLSS	no	0.15	9.6	9.5	1.7	9.6	9.5	1.7	irregular square	no	flat	complete	7.7	1.7	none	B	20-25 cmb
TL14-007	Test Unit 1	complete	red quartzite	no	0.05	9.1	7	1.8	8.1	7.2	1.8	irregular square	no	n/a	broken	n/a	n/a	none	B	25-30 cmb
TL14-007	Test Unit 1	complete	KLSS	no	1.4	31.5	13.6	2.7	14.8	31.5	2.7	irregular square	no	faceted	complete	16.4	3.1	none	B	25-30 cmb
TL14-008	Test Unit 1	medial	red jasper	no	0.05	9.7	8.4	1.1	9.7	8.4	1.1	irregular square	no	n/a	no platform	n/a	n/a	none	B	30-35 cmb
TL14-008	Test Unit 1	distal	KLSS	no	0.05	9.2	6.2	1.8	6.9	9.2	1.8	irregular square	no	n/a	no platform	n/a	n/a	none	B	30-35 cmb
TL14-009	Test Unit 1	complete	KLSS	no	0.3	24.3	8.2	2	9.3	24.3	2	irregular square	no	n/a	no platform	n/a	n/a	new	B	35-40 cmb
TL14-009	Test Unit 1	medial	KLSS	no	2	27.7	19.1	3.1	18.8	27.7	3.1	irregular square	no	n/a	no platform	n/a	n/a	none	B	35-40 cmb
TL14-016	Test Unit 1	complete	KLSS	no	28.9	67	49.8	9.5	49.8	67	9.5	irregular square	no	facted	complete	8.9	3.7	none	B	40-45 cmb

Table 2. Flake Analysis Results

Catalog number	Provienence	Flake condition	Material type	Cortex present	Wt (g)	Length (mm)	Width (mm)	Thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	General shape	Pot lids present	Platform attribute	Platform condition	Width	Thickness	Edge damage	Soil Horizon	Depth
TL14-017	Test Unit 1	distal	KLSS	no	0.05	8.4	6.8	0.7	8.4	6.8	0.7	irregular square	no	n/a	noplatform	n/a	n/a	old	B	40-45 cmb
TL14-017	Test Unit 1	complete	KLSS	no	0.05	9.2	7.3	1.1	9.2	7.3	1.1	irregular square	no	n/a	noplatform	n/a	n/a	old	B	40-45 cmb
TL14-017	Test Unit 1	distal	KLSS	no	0.1	12.5	9.9	1.7	12.5	9.9	1.7	irregular square	no	n/a	noplatform	n/a	n/a	old	B	40-45 cmb
TL14-017	Test Unit 1	complete	KLSS	no	3.3	31.1	27.5	3.8	27.5	25.5	3.8	irregular square	no	faceted	complete	13.8	2.4	new	B	40-45 cmb
TL14-019	Test Unit 1	medial	KLSS	no	6.7	33.3	30.2	3.9	30.2	33.3	3.9	irregular square	no	n/a	broken	n/a	n/a	old	B	40-45 cmbs
TL14-021	Test Unit 1	complete	KLSS	no	10.3	59.9	47.3	4.4	59.9	47.3	4.4	irregular square	no	n/a	broken	n/a	n/a	old	B	57-60 cmb
TL14-022	Test Unit 1	proximal	KLSS	no	0.3	17	8.4	2	17	8.4	2	irregular square	no	n/a	broken	n/a	n/a	old	B	50-60 cmb
TL14-022	Test Unit 1	proximal	KLSS	no	0.1	8.7	8.1	1.5	8.7	8.1	1.5	irregular square	no	n/a	broken	n/a	n/a	old	B	50-60 cmb
TL14-022	Test Unit 1	medial	KLSS	no	0.2	12.6	11.3	1.4	11.3	12.6	1.4	irregular square	no	n/a	broken	n/a	n/a	old	B	50-60 cmb
TL14-023	Test Unit 1	complete	KLSS	yes	0.1	10.8	10.6	1.5	10.8	10.6	1.5	irregular square	no	n/a	noplatform	n/a	n/a	old	B	60-65 cmb
TL14-024	Shovel Test 3	complete	Quartz	no	0.1	12.5	6.8	1.4	9.9	6.7	1.4	irregular square	no	n/a	noplatform	n/a	n/a	new	A	0-10 cmbs
TL14-025	Shovel Test 5	complete	KLSS	no	0.2	15.1	6.9	1.6	6.9	15.1	1.6	irregular square	no	n/a	noplatform	n/a	n/a	new	B	70-80 cmb
TL14-027	Shovel test 4	distal	KLSS	no	1.2	25.9	17.2	2.5	25.9	17.2	22.5	irregular square	no	n/a	noplatform	n/a	n/a	old	A	0-10 cmbs
TL14-028	Shovel Test 8	complete	KLSS	no	0.3	22.2	17.9	1.9	17.9	22.2	1.9	irregular square	no	n/a	noplatform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	0.05	9.5	8.8	1.1	9.5	8.8	1.1	irregular square	no	n/a	noplatform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	0.2	17.5	6.8	1.4	6.8	17.5	1.4	irregular square	no	n/a	noplatform	n/a	n/a	old	B	25-35 cmb

Table 2, continued.

Catalog number	Provienence	Flake condition	Material type	Cortex present	Wt (g)	Length (mm)	Width (mm)	Thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	General shape	Pot lids present	Platform attribute	Platform condition	Width	Thickness	Edge damage	Soil Horizon	Depth
TL14-028	Shovel Test 8	medial	KLSS	no	0.05	10.5	10	1.8	10	10.5	1.8	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	0.3	17.4	8.3	2	7.2	17.5	2	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	1.3	31.9	12.3	3.7	31.9	12.3	3.7	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	0.6	23.8	13.4	2.8	13.4	23.8	2.8	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	0.8	22.9	13.4	3.4	13.4	22.9	3.4	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	2	26	20.4	3.5	20.4	26	3.5	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	1	23.4	16.2	3	23.4	16.2	3	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	medial	KLSS	no	1.6	21.7	19.3	4.8	21.7	19.3	4.8	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	9.3	47	32.1	5.2	46.1	31.7	5.2	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-028	Shovel Test 8	complete	KLSS	no	11	53.3	37	5.5	53.3	37	5.5	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-35 cmb
TL14-033	Surface	proximal	KLSS	yes	3.5	31.3	23.4	6.4	23.8	21.9	6.4	irregular square	no	flat	complete	4.2	8	old	A	Surface
TL14-034	Surface	complete	KLSS	yes	5.7	34.2	28.6	6	34.2	28.6	6	irregular square	no	flat	complete	5.1	3.2	old	A	Surface
TL14-036	Surface	complete	KLSS	yes	6.5	25.4	23.5	10.7	25.4	23.5	10.7	irregular square	no	flat	complete	12.3	22	old	A	Surface
TL14-037	Surface	complete	KLSS	no	2.9	33.8	24.2	3.99	24.2	33.8	3.9	irregular square	no	flat	complete	2.7	11.8	old	A	Surface
TL14-038	Test Unit 2	proximal	KLSS	yes	6.5	40.5	19.3	7	40.5	19.3	7	irregular square	no	flat	complete	7.3	5.6	old	A	0-5 cmbd
TL14-039	Test Unit 2	proximal	Quartz	no	2.1	24.2	12.5	6.7	24.2	12.5	6.7	irregular square	no	faceted	complete	5	8.5	old	A	10-15 cmb

Table 2, continued.

Catalog number	Provienence	Flake condition	Material type	Cortex present	Wt (g)	Length (mm)	Width (mm)	Thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	General shape	Pot lids present	Platform attribute	Platform condition	Width	Thickness	Edge damage	Soil Horizon	Depth
TL14-040	Test Unit 2	complete	KLSS	no	5.6	45.2	29.5	5	45.2	29.5	5	irregular square	no	n/a	no platform	n/a	n/a	old	B	20-25 cmb
TL14-040	Test Unit 2	complete	KLSS	no	0.7	27.2	8.6	2.6	27.2	8.6	2.6	irregular square	no	n/a	no platform	n/a	n/a	old	B	20-25 cmb
TL14=040	Test Unit 2	complete	KLSS	no	0.1	26.6	7.9	2.6	7.9	26.6	2.6	irregular square	no	n/a	no platform	n/a	n/a	old	B	20-25 cmb
TL14-041	Test Unit 2	proximal	KLSS	no	0.7	19	15.2	2.2	19	15.2	2.2	irregular square	no	n/a	no platform	n/a	n/a	old	B	25-30 cmb
TL13-002	Shovel Test 2	proximal	Quartz	no	0.2	10.6	8.5	2.7	10.3	8	2.7	irregular square	no	n/a	complete	4.6	2.5	new	B	40-45 cmb
TL13-002	Shovel Test 2	complete	KLSS	no	0.2	18.3	14.7	1.5	14.7	18.1	1.5	irregular square	no	n/a	no platform	n/a	n/a	old	B	40-45 cmb
TL13-002	Shovel Test 2	complete	KLSS	no	0.9	25.6	10.7	2.7	25.6	10.7	2.7	irregular square	no	n/a	no platform	n/a	n/a	old	B	40-45 cmb
TL13-004	Surface	complete	KLSS	yes	4	40	18.8	5.8	35.6	17.9	5.8	irregular square	no	n/a	no platform	n/a	n/a	old/new	A	Surface

Table 2, continued

Twin Lakes Biface Anylisis			Max Size Measurements			Orienetated Size Measurements						Edge Angle Right			Edge Angle Left margin			
Catalog Number	Weight (g)	Condition of biface	Length (mm)	Width (mm)	Thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	W/T ratio	Lateral Margins Complete	Cortext Present	Max	Min	Mean (n=6)	Max	Min	Mean (n=9)	Edge damage/ uses
n/a	328.854	non-halfted	151.5	93.6	25.2	129.5	76.7	22.4	3.42	no	yes	70	50	50.33	70	42	57.44	old

Table 3. Biface Analysis Results

Chapter 6 discussed the artifacts recovered from the Phase I and Phase II excavations at the Twin Lakes site, as well as the identification of lithic material and the results from the lithic analysis in Tables 2 and 3. The following chapter will cover the statistical analysis that uses the results from the flake and biface analysis.

Chapter 7: Statistical Analysis

The first goal for this statistical analysis is to take the sample of flakes that were collected from the surface and the plowed Ap horizon and the subsurface unplowed Bw horizons and determine with some certainty if they are from the same parent population. In this case, parent population meaning that they are from the same cultural occupation of the site and possibly the same lithic manufacturing activity.

The second goal is to determine if there were any patterns that could be used to identify the manufacturing activity that produced the flakes and if so, at what stage they were manufactured. Manufacturing activity refers to how a tool was made (e.g., from reducing a biface or making flakes from a core) and manufacturing stage refers to at what point in the tool making process the object was made (e.g., early, middle, or later). This analysis was done by comparing the Twin Lakes site assemblage with lithic debitage studies from replicative flint knapping experiments (Patterson 1990; Ahler 1989) that analyzed the size distribution and flake shape at different steps in the tool making process. Flint knapping is a reductive technology which would produce a predictable pattern of size constraints on the byproducts produced for each stage of biface production (Ahler 1989: 85, 89). Given this, bifacial reduction was experimentally documented in replicative studies to produce a certain frequency curve for the flake size distribution (Patterson 1990:550).

From knowing what tool was being produced and at what point in production these flakes were made, the third goal is to determine whether this can indicate “expedient” and/or “curated” tool production activities. Expedient technologies are tools that are simply designed and produced in response to a need while curated technologies are more complex and produced in anticipation of a need (Binford 1979). Curated tools would be more refined tools such as bifaces, bifacial cores and blades. Expedient tools would be utilized flakes and flake cores. These different production strategies, according to Binford (1979), would produce different debris assemblages. For the purpose of this thesis, the sample is used to make inferences about a much larger unknown parent population, then make inferences on the type of site that is represented at Twin Lakes.

***t* Test Results**

Both of the Test Units were positive for lithic artifacts as well as 6 of the 17 shovel tests. The total number of flakes recovered from the Twin Lakes field work is 56. All of the 56 flakes were weighed, measured and described according to the methods discussed above. There were 12 artifacts collected from the Ap horizon and 44 from the intact subsurface horizons. This statistical analysis will show any trends in the artifact assemblage. The *t* test enables us to analyze the variables from two samples into a single statement of the probability that both could be selected from the same population (Drennan 2004: 153). A 90% confidence level was established which means that if the results of the statistical tests fall within the 90% confidence interval ($p \leq 0.10$), it will indicate a significant difference is present. A variety of *t* tests were run to compare the flakes from the Ap horizon to those form undisturbed deposits below.

The first *t* test was run to compare the artifacts from the Ap horizon to the artifacts from the intact subsurface B horizons. This can show statistically the probability that the artifacts in the disturbed upper portion of the soil and the undisturbed lower portions of the soil came from the same parent population. Determining this is an important first step in figuring out if there is more than one cultural occupation at the site. According to Waters (1992) there have been instances where sites with extensive churning have resulted in misinterpretations of archaeological sites as single or multiple components because the artifacts have accumulated into one layer or dispersed unevenly into several stratigraphic layers masking the actual number of components at the site (Waters 1992:291). By using statistical analysis one can make supported inferences to help resolve the problem of soil disturbances in sites.

The *t* tests were run on the maximum length, width and the weight of the flakes from the Ap and B horizons. These three measurements were selected because they record the basic shape and mass of a flake which may be influenced by natural site formation processes (Waters 1992). The average and the standard deviations from the Ap and the B horizon for each attribute are also included in the table. The results are as follows.

Ap Horizon Weight	B Horizon Weight	*t* test Result
$\bar{x}$ = 3.36 s= 2.61	$\bar{x}$= 2.1125 s= 4.97	*t*=0.2488

Table 4. The average ($\bar{x}$), standard deviation (s) and the result of the *t* test (*t*) for comparison of weight for the Ap and B lithic artifact samples.

Ap Horizon Length	B Horizon Length	*t* test Result
$\bar{x}$= 29.3 s= 11.626	$\bar{x}$= 22.065 s= 14.196	*t*=0.1111

Table 5. The average ($\bar{x}$), standard deviation (s) and the result of the *t* test (*t*) for comparison of length for the Ap and B lithic artifact sample.

Ap Horizon Width	B Horizon Width	*t* test Result
$\bar{x}$= 19.367 s= 8.19	$\bar{x}$= 14.913 s= 10.69	*t*=0.187

Table 6. The average ($\bar{x}$), standard deviation (s) and the result of the *t* test (*t*) for comparison of width for the Ap and B lithic artifact sample.

The results of the three *t* tests all fail to indicate any significant difference between the Ap and B horizons at a 90% confidence level. This along with the low averages and standard deviations show statistically that there is a high likelihood that the two samples came from the same parent population or a common activity at the site. This result allows the two samples to be combined and treated as one for the remainder of this study. The tables below (Tables 7-9) include the averages and the standard deviations for all of the metric attributes for the entire combined sample (n = 56).

Weight	Oriented Length (mm)	Oriented Width (mm)	Oriented Thickness (mm)
$\bar{x}$= 2.379 s= 4.572	$\bar{x}$= 13.18 s= 20.18	$\bar{x}$= 18.385 s= 11.54	$\bar{x}$= 3.49 s= 3.32

Table 7. The average (*x*) and standard deviation (s) of the oriented length, width, and thickness of the entire sample (n = 56).

Maximum Length (mm)	Maximum Width (mm)	Maximum Thickness (mm)
$\bar{x}$= 23.616 s= 13.912	$\bar{x}$= 15.867 s= 10.3	$\bar{x}$= 3.13 s= 2.1

Table 8. The average ($\bar{x}$) and standard deviation (s) of the maximum length, width, and thickness of the entire sample (n = 56).

Platform Length (n = 16)	Platform Width (n = 16)	Platform Thickness (n = 16)
$\bar{x}$= 24.62857	$\bar{x}$= 22.80714	$\bar{x}$= 4.942857
s= 12.65984	s= 15.80586	s= 2.854339

Table 9. The average ($\bar{x}$) and standard deviation (s) of the platform length, width, and thickness of the entire sample.

Below are the photographs of the flakes recovered from the surface collection, shovel tests and the test units.

Photos of Artifacts

Photos of Artifacts by level for Test Unit 1:

Figure 22. Test Unit 1 photo of three flakes from Level 1

Figure 23. Test Unit 1 photo of one flake from Level 4

Figure 24. Test Unit 1 photo of five flakes from Level 5

Figure 25. Test Unit 1 photo of two flakes from Level 6

Figure 26. Test Unit 1 photo of two flakes from Level 7

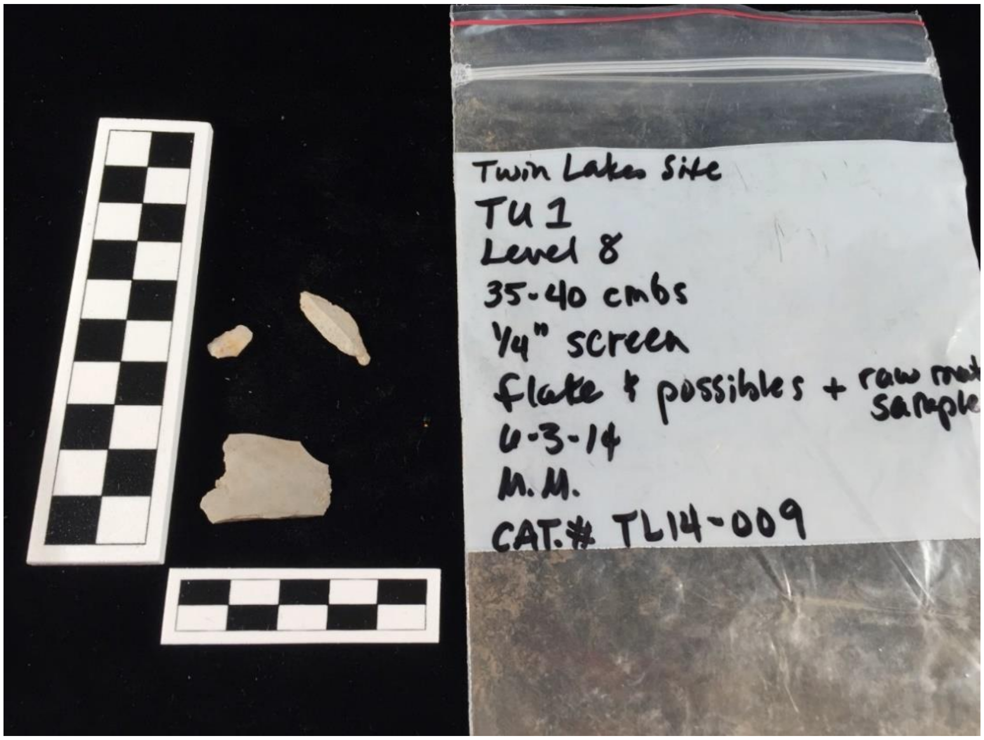


Figure 27. Test Unit 1 photo of three flakes from Level 8

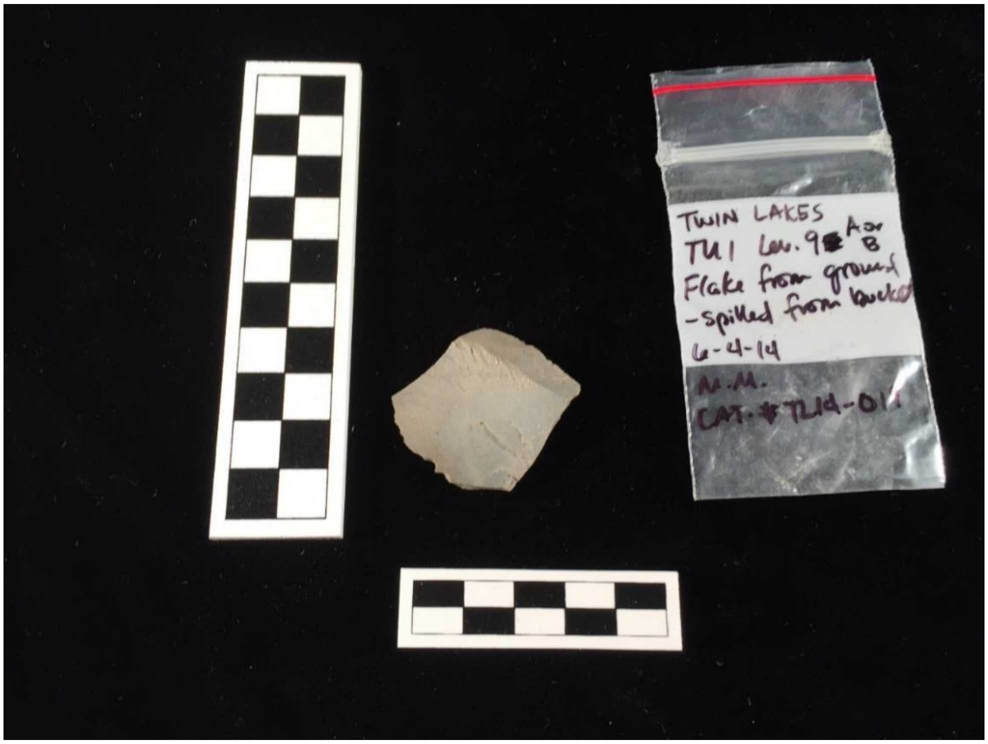


Figure 28. Test Unit 1 photo of one flake from Level 9a or 9b.

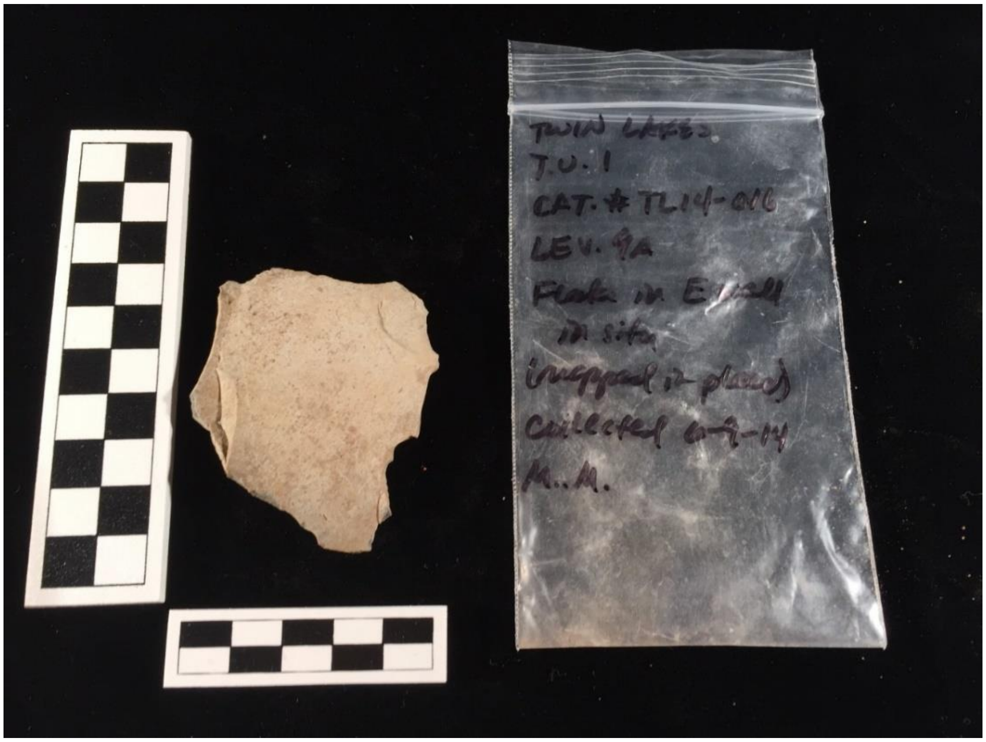


Figure 29. Test Unit 1 photo of one flake from Level 9a

Figure 30. Test Unit 1 photo of four flakes from Level 9a

Figure 31. Test Unit 1 photo of three flakes from Level 10

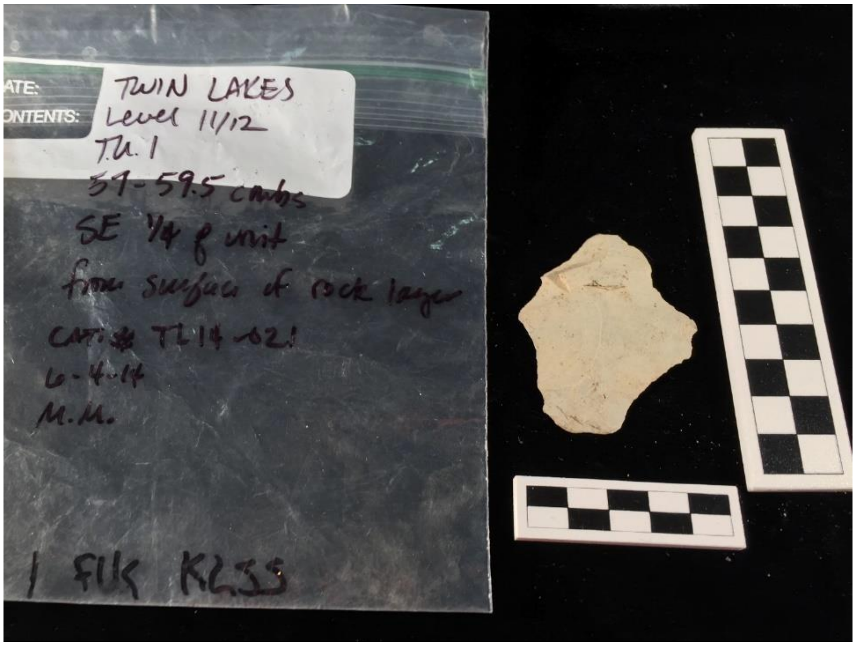


Figure 32. Test Unit 1 photo of one large flake from Levels 11/12

Figure 33. Test Unit 1 photo of one flake from Level 13

Test Unit 2 Artifact Photos

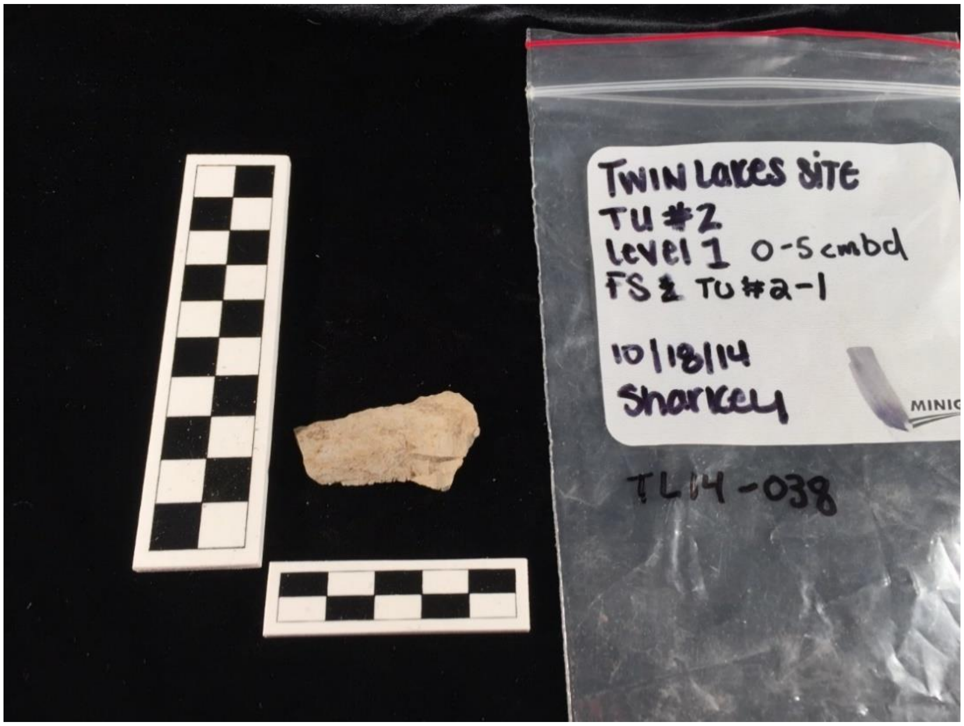


Figure 34. Test Unit 2 photo of one flake from Level 1

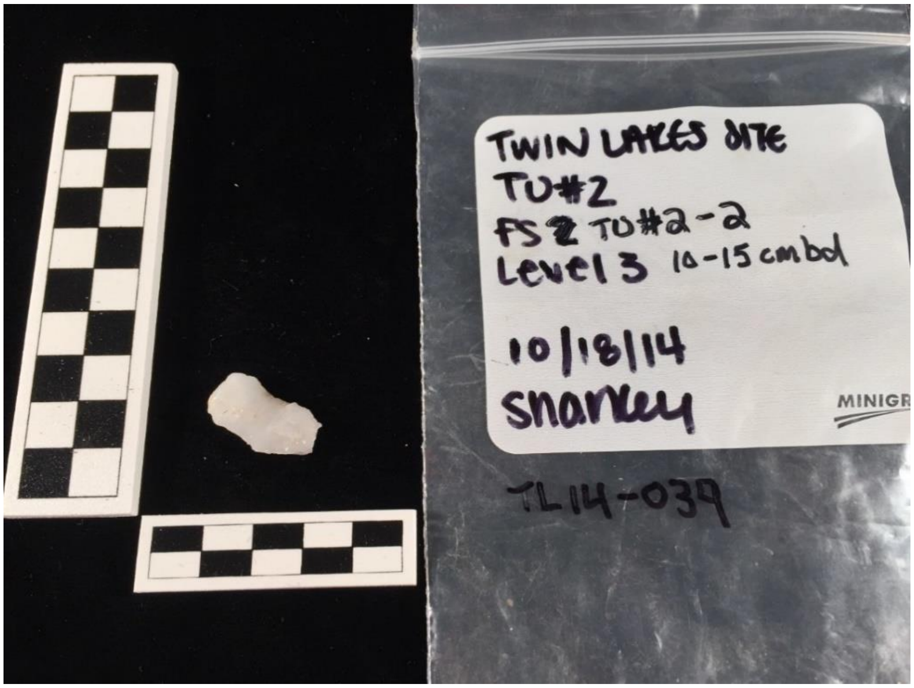


Figure 35. Test Unit 2 photo of one flake from Level 3

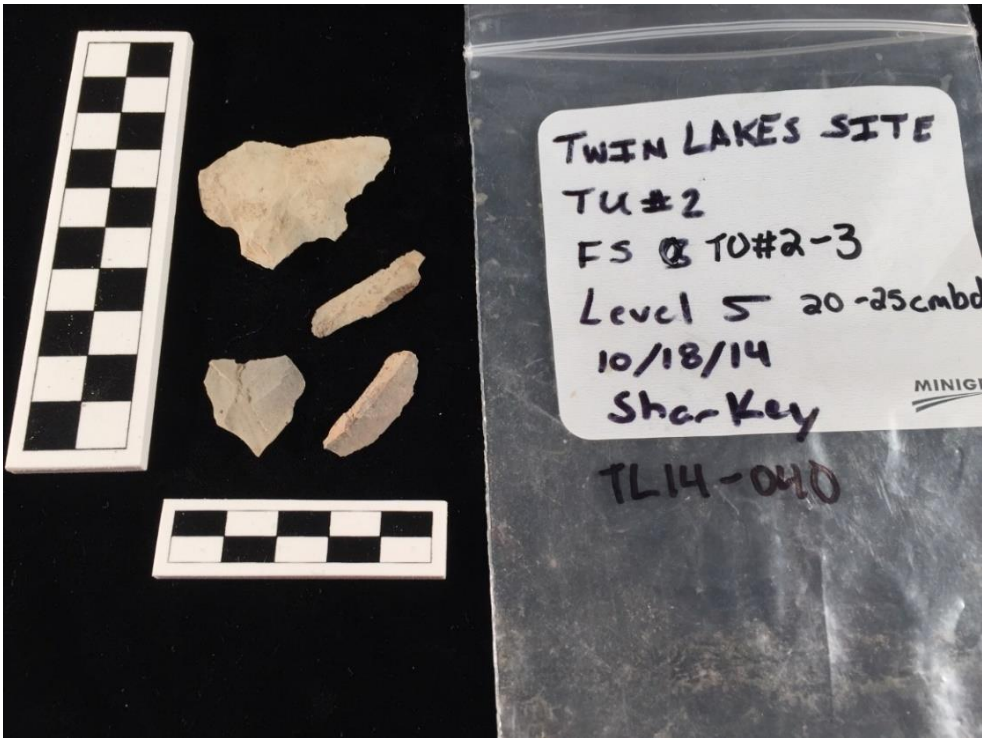


Figure 36. Test Unit 2 photo of four flakes from Level 5

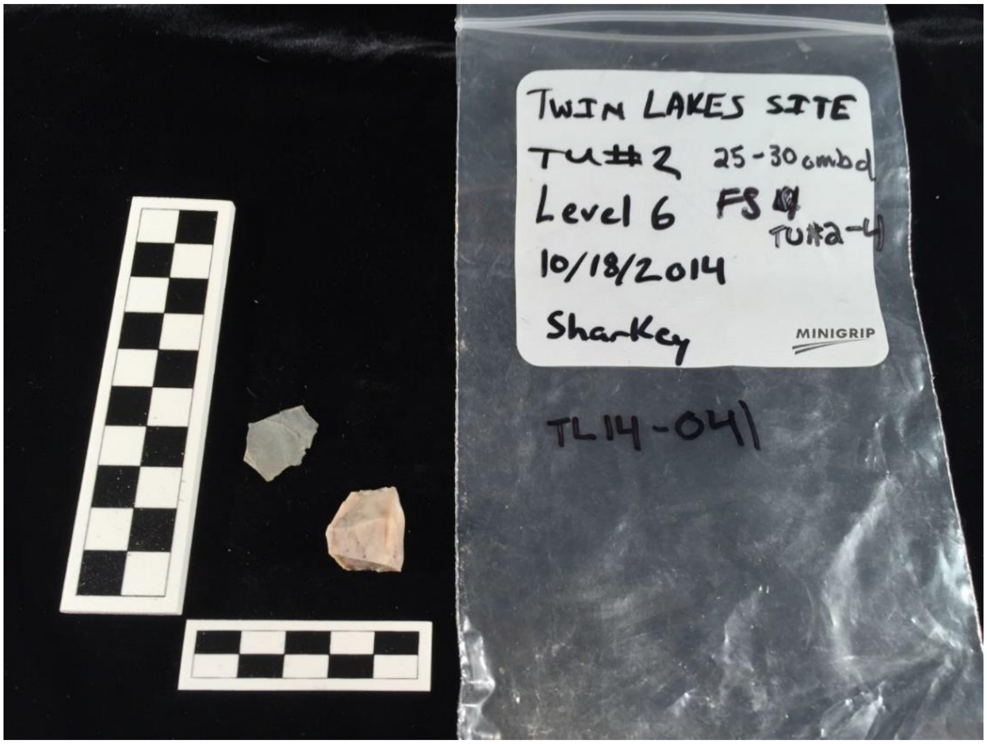


Figure 37. Test Unit 2 photo of two flakes from Level 6

Surface Artifacts Photos

Figure 38. Photo of surface flake #1

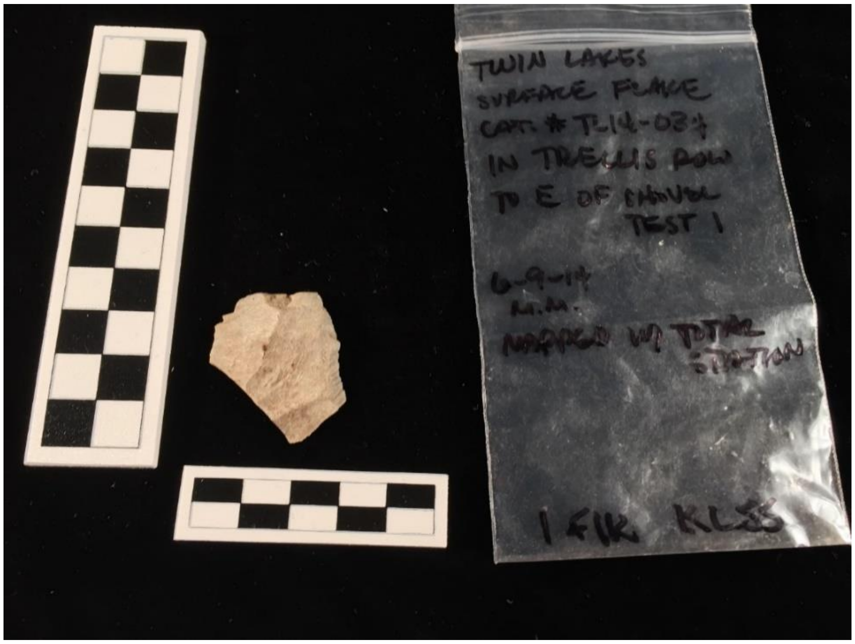


Figure 39. Photo of surface flake #2

Figure 40. Photo of surface flake #3

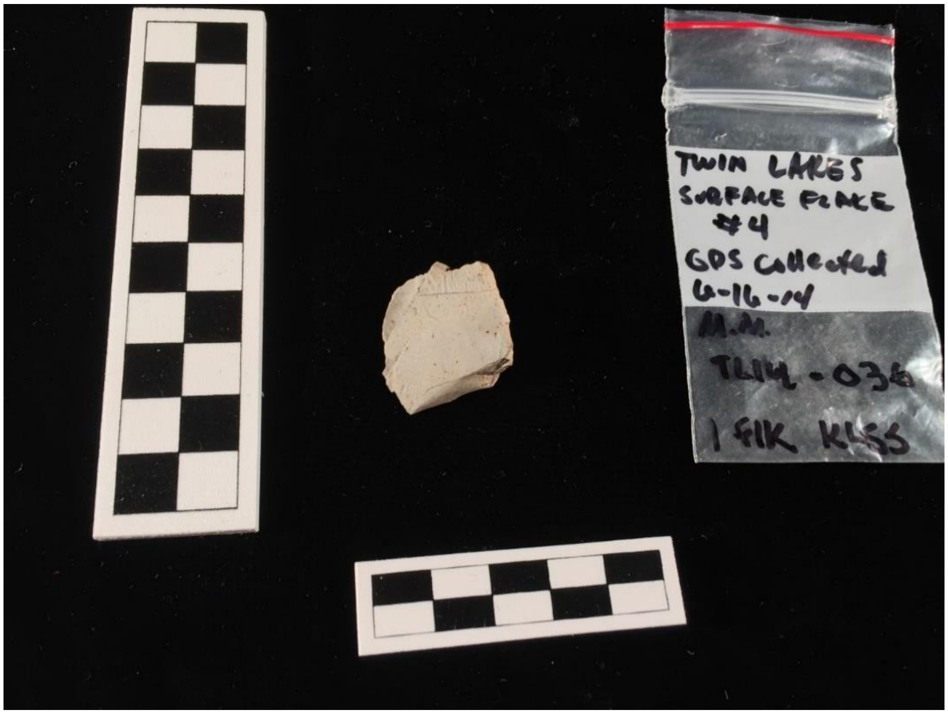


Figure 41. Photo of surface flake #4

Figure 42. Photo of surface flake #5

Shovel Test Artifact Photos by Shovel Test Number

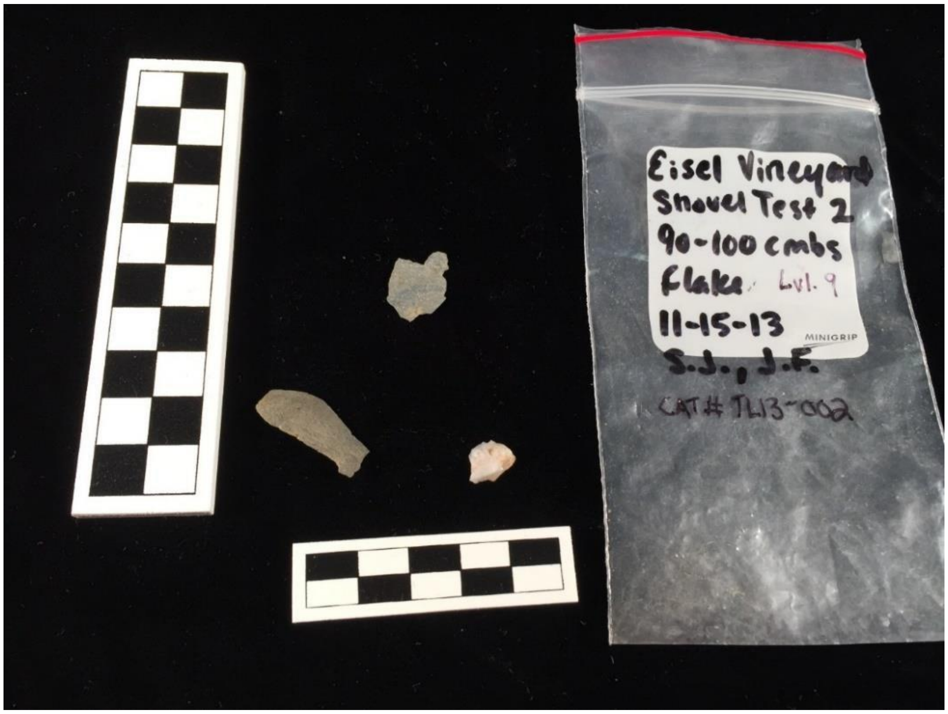


Figure 43. Shovel Test 2 photo of three flakes from Level 9.

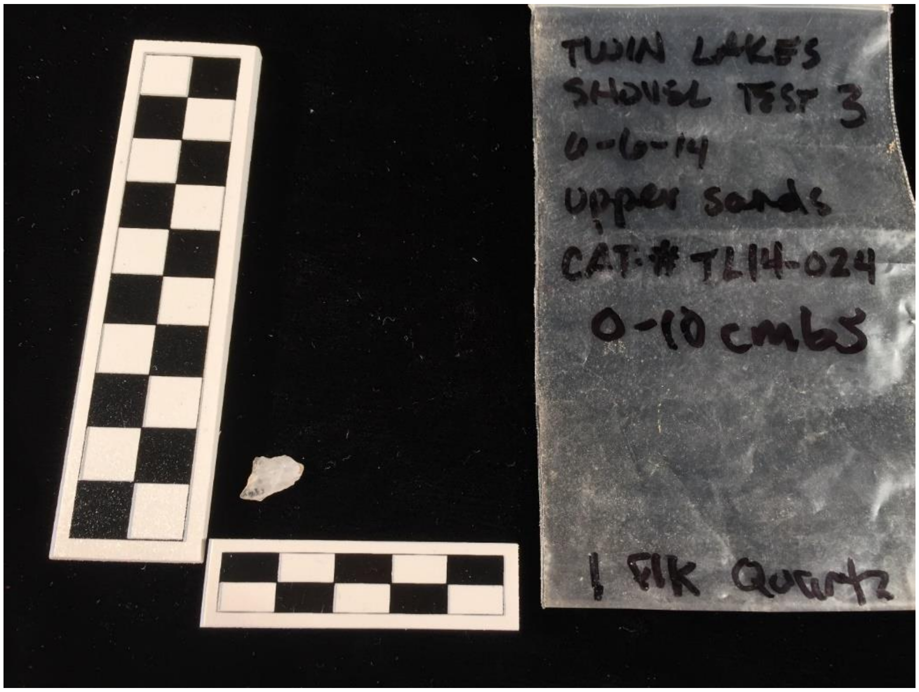


Figure 44. Shovel Test 3 photo of one flake from Level 1.

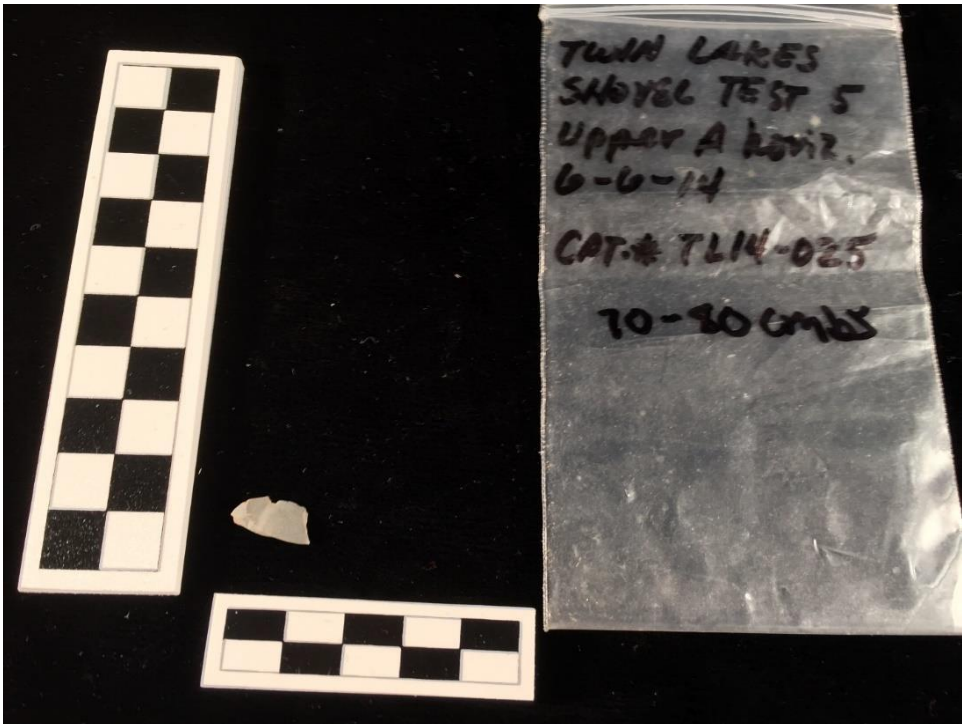


Figure 45. Shovel Test 5 photo of one flake from Level 8.

Figure 46. Shovel Test 8 photo of one flake from Level 3

Figure 47. Shovel Test 8 photo of 13 flakes Level 2-3

Negative Flake Scar Analysis

There were two bifaces collected from the Twin Lakes site. One, a possible point base, was collected on the surface and other, a large broken biface (Figures 48-49) was found 18 inches below the ground surface by the landowner prior to any survey or excavation done by SCSU. Both were said to have come from the south side of the orchard by the berry bushes. The biface pictured below in figures 43-44 would be classified according to Muñiz (2014) as a mid-to-late stage biface because of its symmetry and absence of cortex. In addition, the biface would be defined as edge retouched because of the large flakes removed on the faces and the smaller flakes removed on the edges for sharpening (Muñiz 2014b:121).

Figure 48. Large biface with negative flake scars (patinated side)

Figure 49. Large biface with negative flake scars (non-patinated side)

The complete and nearly complete negative flake scars on both sides of the large biface were measured in their oriented position to compare to the flakes that were excavated on the site to see if it was statistically possible that they could have come from a similar sized biface. This would build a case that the flakes removed from the biface and the flakes recovered from the site excavations could have come from the same parent population. This comparison was done with a *t* test.

Biface Orientated Flake Length (n = 13)	Flake Orientated Length (n =13)	*t* test Result
$\bar{x}$= 20.077 s= 11.835	$\bar{x}$= 20.18 s= 13.181	*t*=0.399725

Table 10. The average (x) and standard deviation (s) for maximum oriented length of all of the flakes from the biface and the collected sample.

Biface Orientated Flake Width (n = 13)	Flake Orientated Width (n = 56)	*t* test Result
$\bar{x}$= 22.092 s= 12.196	$\bar{x}$= 18.386 s= 11.546	*t*=0.717477

Table 11. The average ($\bar{x}$) and the standard deviation (s) for maximum oriented width of all of the flakes from the biface and the collected sample.

Given the results from the *t* test, one can conclude with 90% probability that the flakes from the excavations and the flakes from the biface came from the same population. This is because these tests failed to establish a significant difference. This shows that it is statistically possible that the flakes that were found could have come from a biface of a similar size as that recovered from the site.

Striking Platforms

The number of facets on the striking platform has been used by lithic analysts to determine whether the flakes came from core reduction or bifacial reduction with the idea being that bifaces are prepared more carefully than a core platform therefore yielding more facets along their edges (Odell 2003:126). Following this reasoning, according to Andrefsky (2005), the presence of faceted striking platforms has been used to determine the stage of biface production (Andrefsky 2005: 90). He states that the greater the number of facets found on the lithic debitage, the later the stage of biface production they were made (Andrefsky 2005: 90). There were seven flakes recovered from Test Unit 1 at the Twin Lakes site that had identifiable faceted striking platforms. There were eight additional flakes with complete platforms that were not faceted but where flat. Five of the faceted flakes are KLS, one is quartz and one is jasper. This could suggest that the flakes were made in the later stages of biface production and in turn add to the evidence of the flakes being linked to the bifaces found on the site.

Flake Platform Width (n = 13)	Flake Platform Thickness (n = 13)
$\bar{x}$= 7.335714	$\bar{x}$= 5.578571
s= 4.11815	s= 5.645036

Table 12. The average ($\bar{x}$) and the standard deviation (s) of the faceted platform measurements.

Flakes with Platform Orientated Length	Flakes with Platform Orientated Width	Flakes with Platform Orientated Thickness
$\bar{x}$= 24.62857	$\bar{x}$= 22.80714	$\bar{x}$= 4.942857
s= 12.65984	s= 15.80586	s= 2.854339

Table 13. The average ($\bar{x}$) and the standard deviation (s) of all of the flakes with platforms.

In looking at the averages for the orientated length, width and thickness for the flakes with the complete platforms, they are longer, wider and thicker than the average of the flakes without platforms. This is because the flakes with the platforms are considered to be complete meaning that they retain all of the diagnostic characteristics of the flake (Andrefsky 2005: 98).

These include the medial, distal and proximal sections as opposed to incomplete flakes that would be only a portion of the three sections.

Flake Size Distribution and the Production Continuum

Below discusses two comparisons: the first is based on Patterson's (1990) article that discusses the formation of a biface reduction continuum versus a core reduction continuum, and the second is based on Ahler's (1989) chapter that takes the continuum and breaks it up into biface manufacturing stages assuming that you only have a sample of the continuum. There is some argument that the reduction of a biface cannot be broken up into stages because to be a stage the sample would have to be almost identical to discern from other stages (Shott 1996). This can be seen in two different ways. First, to have a true continuum on an archaeological site one would have to assume that the tool was produced entirely in one spot. If this was the case you would have a perfect continuum that would not have to be subjectively divided into stages. Therefore, since it rarely happens that archaeologists find all of the evidence of the continuum, it is useful to break the continuum into stages, no matter how subjective or generalized it may be to identify at what point in the tool production process the debitage was deposited at the site. Second, by having stages this can also help to identify the site purpose. For example, procurement sites where chunks of material are collected to make tools should differ from small satellite hunting camps where the tools may have already been made but they are being retouched or maintained. Both are useful for the analyzing of lithic debris and both comparisons have been included below with the sample from the Twin Lakes site.

Patterson Comparison

According to Patterson in his 1990 article, "Characteristics of Bifacial-Reduction Flake-Size Distribution", bifacial-reduction experiments conducted in the early 1980s suggest that the characteristics of flake-size distribution can be employed to detect bifacial-reduction activities at archaeological sites (Patterson 1990:550). Controlled bifacial reduction from these experiments produced an exponential curve for the flake size distribution that is unique to biface production and differs from that of core reduction (Patterson 1990:550). Core reduction means that the core is reduced to produce flakes for tools rather than reducing the core itself into a bifacial shape where the end product is the tool. Below is the graph from Patterson's article that represents the distribution of flake size frequencies when making a biface. The Twin Lakes flakes were also graphed to compare against Patterson's criterion. The sample was divided into flake size intervals (x axis) and graphed by frequency (y axis) using the equation Patterson used for his data. The similarities of the two graphs can be seen below.

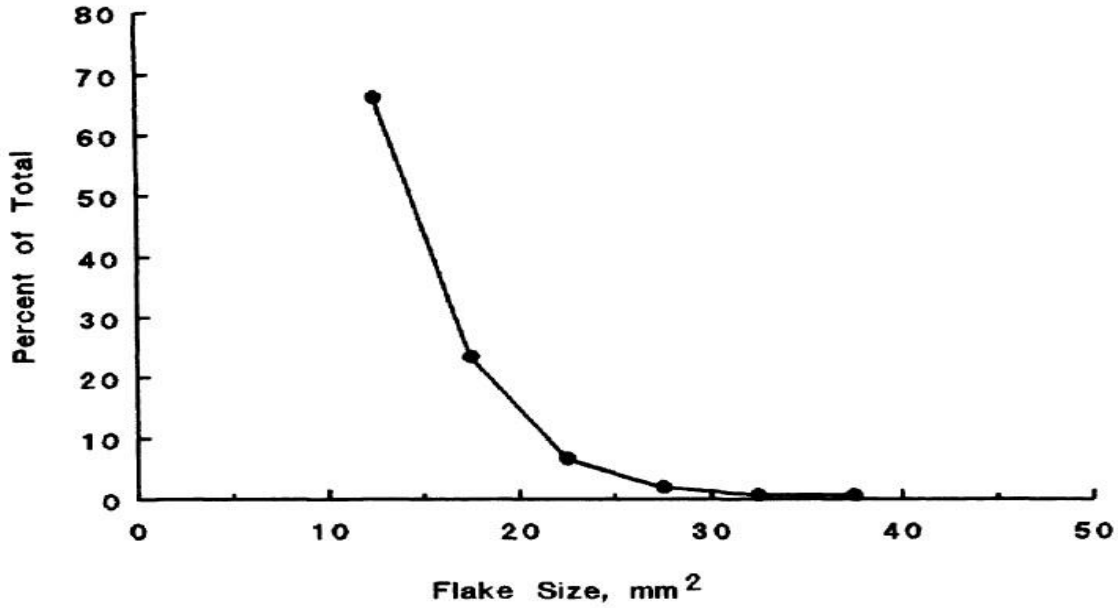


Figure 1. Flake-size distribution for bifacial reduction, Experiment 1I.

Figure 50. Distribution of flake size from bifacial reduction (Patterson 1990:551)

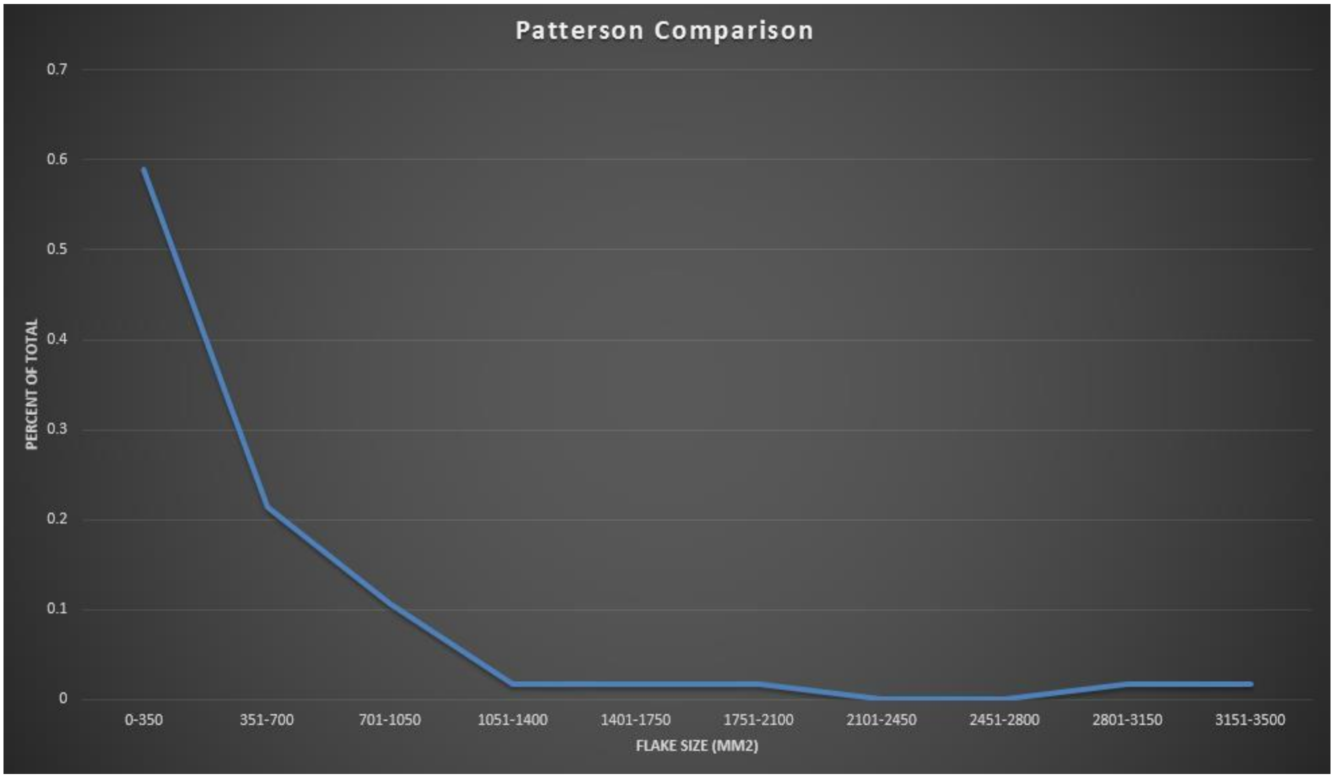


Figure 51. Distribution of flake size from the Twin Lakes site using Patterson’s guidelines

Given that that graphs are all most identical, the conclusion would be with some degree of certainty that the flakes that were recovered from Twin Lakes could have been from bifacial reduction activities on the site.

Ahler Analysis

Ahler's "mass analysis" is a useful tool for lithic analysis given the fact it focuses on distribution information based on size grade to determine the stage of tool manufacturing of the entire sample (Ahler 1989: 85). This takes into account all of the debitage including the complete and incomplete flakes to produce a graph based on size class. Below is the graph of curves produced by each stage of biface reduction when analyzing the flaking debris that is produced.

The two graphs of the Twin Lakes flakes are compared to the Ahler graph to see the stage of lithic production represented at the site according to Ahler. The X axis is the cumulative count and the Y axis is the cumulative weight. The first graph compares all of the flakes recovered and the second graph is representing just the flakes recovered in the intact subsurface horizons. The reason for including both is to see if the subsurface deposits have a different distribution without the plow zone material. Following Ahler's approach, all data were first sorted by weight from least to greatest before being graphed.

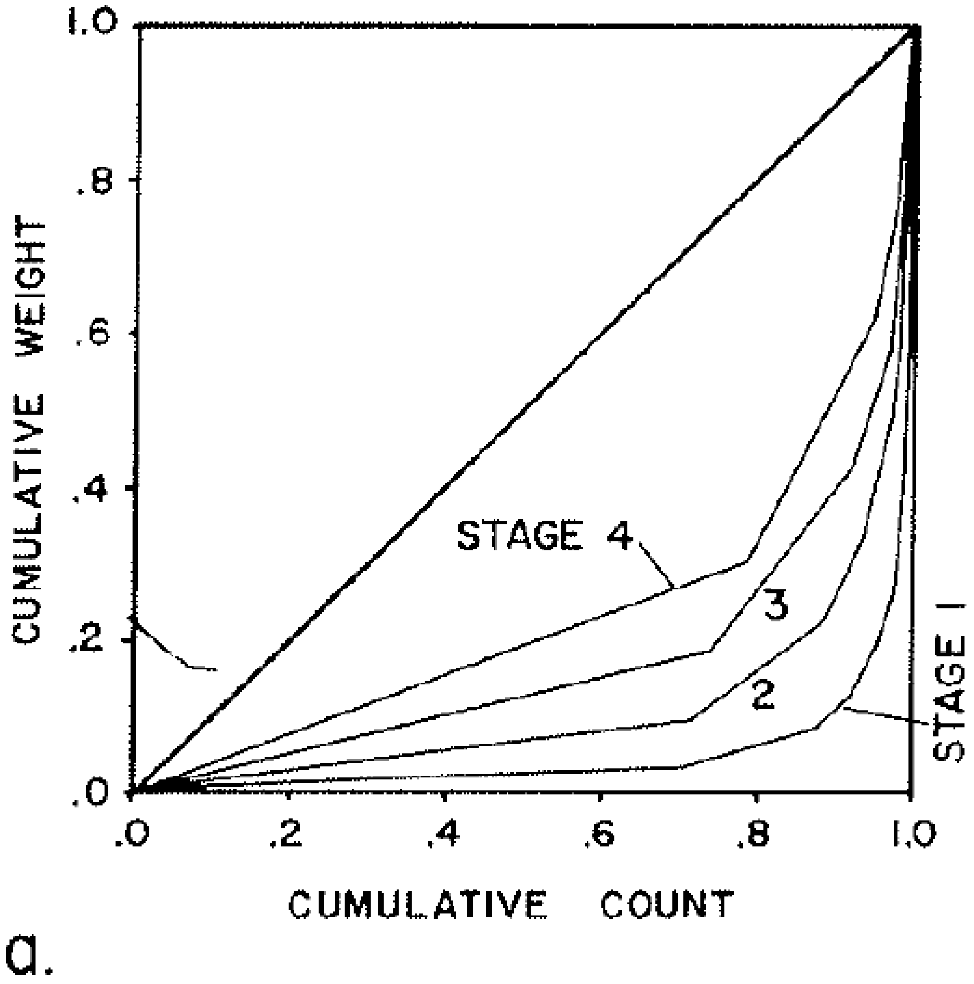


FIGURE 1

(a) Example of concentration curves for flaking debris from several stages (1-4) in the manufacture of a biface (data are stage totals from Stahle and Dunn 1984:7-8); (b) example of a cumlative distribution function for flake weight data by screen size for several stages (1-4) in the manufacture of a biface (data are stage totals from Stahle and Dunn 1984:7-8).

Figure 52. Ahler (1989:97) cumulative stages graph

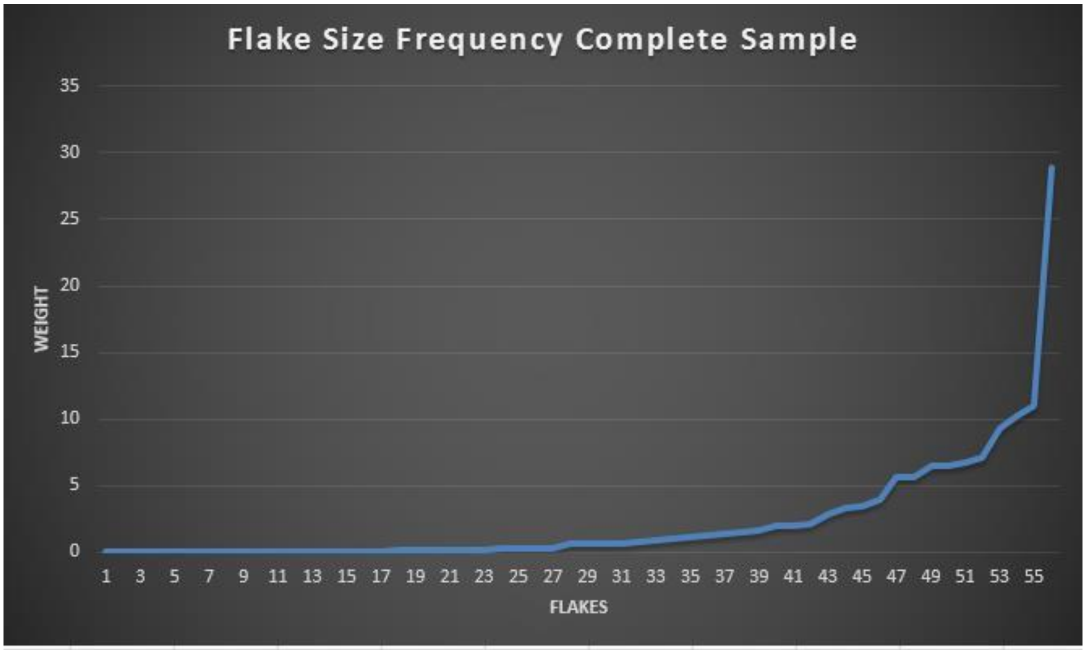


Figure 53. Graph of Twin Lakes site flake size frequency of the complete sample (n = 56) for comparison to the Ahler graph.

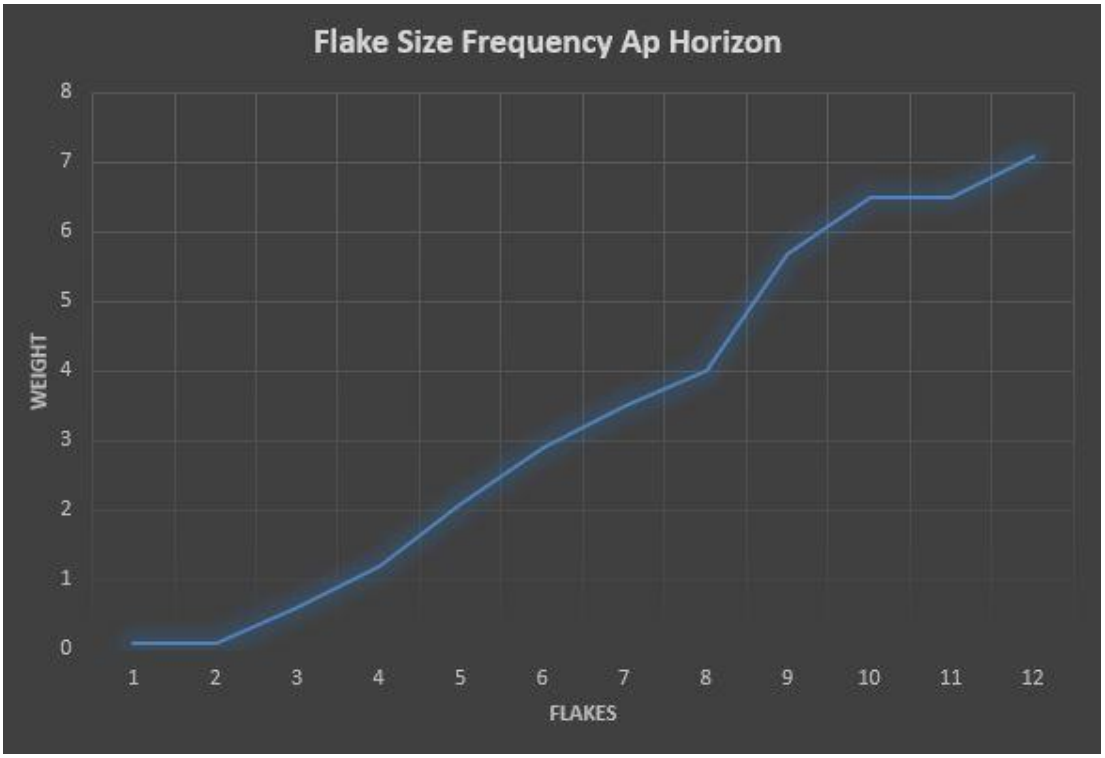


Figure 54. Graph of Twin Lakes site flake size frequency of the Ap horizon subsurface sample (n = 44) for comparison to the Ahler graph.

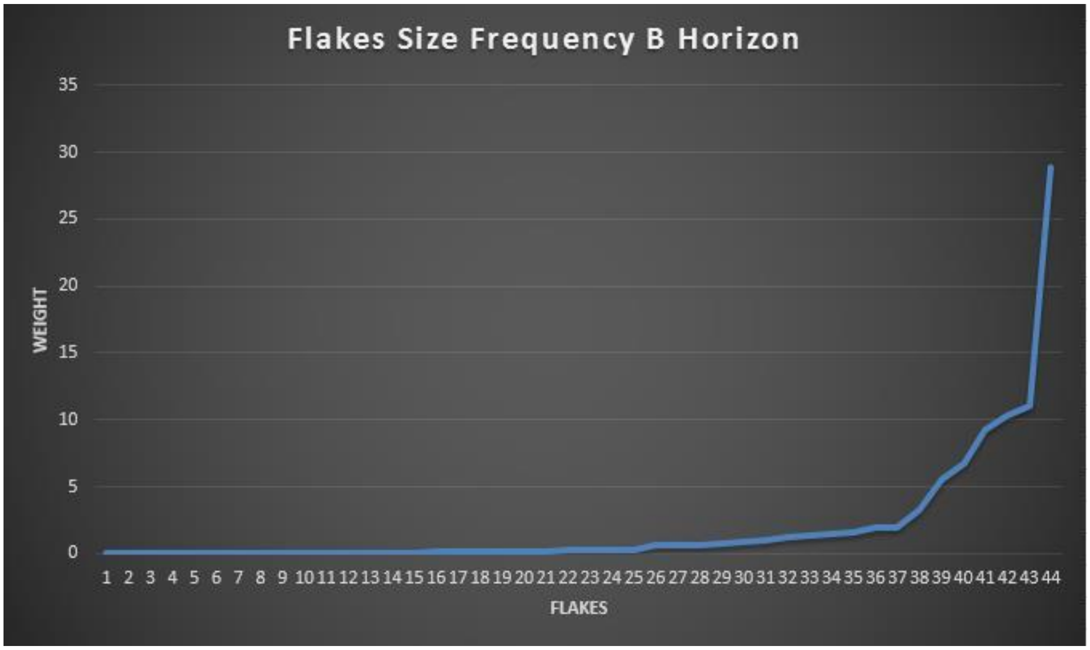


Figure 55. Graph of Twin Lakes site flake size frequency of the B horizon subsurface sample (n = 44) for comparison to the Ahler graph.

Both of the graphs in Figures 53 and 55 look very similar to each other. The graph in Figure 54 representing the weight of the flakes from the Ap horizon is slightly different. This can be explained by the smaller number of flakes recovered from the stratum that gives the graph a steeper grade and also the fact that the Ap is churned from surface disturbances. Nonetheless, given the similarities of the graphs from the larger samples that include both the Ap and B horizons and the results of the t Tests conducted earlier, the conclusion is that the plow zone flakes were part of the same tool manufacturing process as the subsurface flakes and were not dragged in from elsewhere from the modern ground disturbing activities. This offers additional support that the assemblage from the Ap horizon and the assemblage from the B horizons are part of the same parent population. Furthermore, when comparing the graphs to the Ahler graphs you can see that the curve represented is closest to the second phase of production curve. Ahler based his stages on Stahle and Dunn’s 1982 experimental research. They used size graded screens to determine the stages based on what size mesh collected different portions of the sample during certain reduction phases. They found that both the number of flaking debris and weight data differed significantly between stages (Ahler 1989; Stahle and Dunn 1982). According to Stahle and Dunn, the purpose of identifying stages in the biface reduction continuum is because the manufacturing of a biface more than likely took place in more than one area. Therefore identifying stages in the manufacturing process can tell you what activity took place at the site being researched (Stahle and Dunn 1982:84). The second phase of biface reduction is a cross section thinning phase after the removal of the cortex in the first phase (Stahle and Dunn 1982).

Statistical Analysis Summary

Statistics and graphs are a very useful tool to visually see your results and identify patterns in the data. After looking at the results from the statistical analysis of the artifacts from the Ap and the B soil horizons found at the Twin Lakes site this analysis concludes with reasonable confidence that they are not significantly different from each other at a 90% confidence interval and may in fact be from the same parent population. This means that they are most likely related to one lithic production manufacturing event. Also, given that 88% of the material on the site, both bifaces and flakes, is Knife Lake siltstone adds additional confidence that the bifaces and the flakes are part of the same cultural component. This site is therefore interpreted as a single component site and not a multicomponent site.

The result of the Patterson comparison concludes that the sample is from biface manufacturing and not core reduction. The Ahler comparisons give me confidence to suggest that the flakes collected at the site do indeed come from early stage bifacial reduction manufacturing. This is also suggested by the lack of cortex present on the flakes that suggest either a late stage of production or that the core material was a secondary source and carried to the site and therefore possibly a curated technology. The analysis of the negative biface flake scars and the flakes found in the subsurface excavation represent with a reasonably high degree of confidence that these flakes came from bifacial reduction which would also point to Binford's (1979) curated tool kit. In addition, the bifaces recovered from the site are both in the latter stages of biface reduction (Muñiz 2014b) meaning that they are finished or close to being completed.

Chapter 8: Dating Results

AMS Dating Results

A St. Cloud State University Student Research Fund (SRF) grant was awarded to pay for a radiocarbon date at the Twin Lakes archaeological site. The money paid for an accelerator mass spectrometry (AMS) date on a charcoal sample collected from Test Unit 1.

Radiocarbon dating is a specialized procedure that cannot be conducted by SCSU. AMS dating, or accelerator mass spectrometry, is one of two ways of radiocarbon dating. The following description is based on information provided directly from Beta Analytic Radiocarbon Dating lab (http://www.radiocarbon.com/). Radiocarbon dating is a technique that archaeologists have been using since the late 1940s and the AMS technique has been used since the late 1970s. Both are well researched and tested techniques that produce dates with statistically verified error rates that are well accepted by the scientific community as being accurate. Radiocarbon dating is based on the half-life of the radioactive isotope in ^{14}C. Carbon 14 is found in all organic material and starts to breakdown after the life of the organism has terminated. This breakdown occurs at a constant stable rate and because of this it is possible to date organic material by measuring what remains of the ^{14}C in relation to the content of the stable isotopes carbon 12 and carbon 13.

The difference between AMS dating and regular radiocarbon dating is that AMS directly counts the number of ^{14}C atoms present in the sample (http://www.radiocarbon.com/accelerator-mass-spectrometry.htm). Accelerator Mass Spectrometry (AMS) dating involves accelerating ions to extraordinarily high kinetic energies followed by mass analysis (http://www.radiocarbon.com/accelerator-mass-spectrometry.htm). By using this approach the AMS technique needs less of a sample size to obtain an accurate date and generally produces smaller standard errors. By AMS dating charcoal from within the main artifact-bearing deposit at the site, this would determine an age for the cultural deposit that can then be compared to an optically stimulated luminescence date (described later).

The charcoal was collected by Professor Muñiz from Test Unit 1, Level 9a. There were six samples wrapped in aluminum foil and taken back to the lab. They are field specimen numbers TL14-010 through TL14-015 (Appendix 6). The charcoal was sent to Direct AMS Radiocarbon Dating Service in Bothel, Washington on April 9, 2015. Our original intention was to send our sample into Beta Analytic in Florida but it was not covered by the SCSU Student Research grant. Direct AMS was a more affordable testing lab. The samples were prepared by weighing and labeling each sample for the lab. The samples had to weigh over 10 mg and be burned wood fragments. Each sample was examined under a microscope and weighed. Following this lab work the samples were given a priority order designated by Professor Muñiz from best sample to worst sample for dating purposes. The result from the AMS dating was an age of 275±23 radiocarbon years BP. At two standard errors, there is a 44% chance the charcoal dates between 1521 – 1578 AD and a 54% chance that it dates between 1622 – 1665 AD (Table 17 and Figure 50).

AMS code	Sample#	Material	AMS Date 14C BP at 1σ	δ(^{13}C)	*CALIB 7.0.4 2σ (calibrated to calendar years AD)	Relative proportion of intercept curve
D-AMS 010342	TL 14-10	charcoal	275 +/- 23	-22.9	1521 – 1578 1582 – 1591 1622 – 1665 1786 – 1792	43.9% 1.5% 53.7% 0.9%

Table 14. Original and calibrated AMS date.

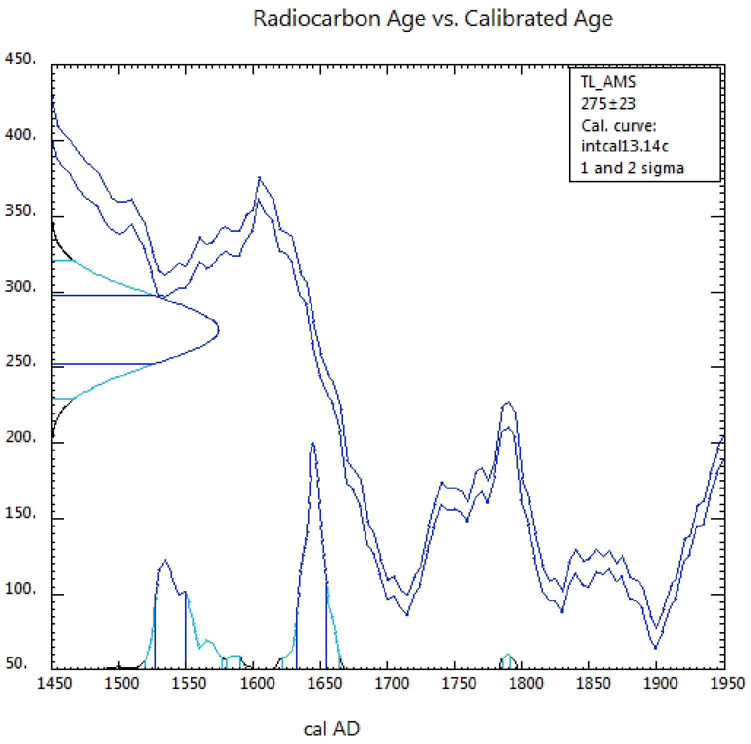


Figure 56. Calib 7.0.4 Twin Lakes AMS date calibrated to calendar years AD.

OSL Dating Results

The optically stimulated luminescence (OSL) dating technique enables evaluation of the time that has elapsed since mineral grains in the soil were last exposed to daylight or heated to a few hundred degrees Celsius (Preusser 2008:95). The method uses an optically and thermally sensitive light, or luminescence signal, in minerals such as quartz and feldspar (Preusser 2008:96). This method has been used by quaternary scientists to date soil stratigraphy since the 1960s but has more recently been used to date archaeological sites (Preusser 2008:96). The Twin Lakes site OSL sample was analyzed by Ron Goble at the University of Nebraska-Lincoln Luminescence Geochronology Laboratory.

At two standard errors (95% confidence), the Twin Lakes site OSL date (determined in December 2014) ranges from 6,630 – 5,230 cal BP or 4,630 - 3,230 B.C.. This would put the site in the Middle Archaic period according to Gibbon’s (2012:6) chronology that places the Middle Archaic from 3000-7500 B.C. However, it should be noted that Gibon’s chronology is much older than other established chronologies for the Upper Midwest (e.g., Stoltman 1997; Theler and Boszhardt 2003). The OSL date came from the Bw horizon which also contained the highest concentration of artifacts in Test Unit 2 at Level 5 (20-25 cmbs).

UNL#	Burial Depth (m)	H2O (%)	K20 (%)	±	U	±	Th	±
UNL3973	0.25	10.9	1.78	0.06	1.24	0.10	4.80	0.28

Cosmic	Dose Rate	D+	No. Of Aliquots	Age (ka BP) and standard error at 1σ
0.22	2.08±0/ 09	12.37	55	5.93±0.35

Table 15. OSL dating results

Interpretation of Results

The result from the AMS dating is disappointing because of the discrepancy between the AMS date and the OSL date. There are a couple of explanations for this discrepancy. First, it is possible that the AMS sample was not burned wood but a burned root. Burned roots of a plant could be much younger than the soil that they are growing in. The burn event would start at the exposed part of the plant above ground and travel down into the roots. Then with farming and tilling, the soils on the top would be stripped of the evidence of the fire and the burned root would remain under the plow zone creating a charcoal-rich stratum. Therefore any charcoal recovered from this stratum would be much younger than the soil that it is contained in.

This theory also seems plausible because of the location of the charcoal sample in the soil profile and the landform. The location of the sample was from Unit 1, Level 9a, between 40-45 cmbs. According to the soil profile drawn by Professor Muñiz this was the transitional level between the Ap and B horizons. This is the transition from undisturbed buried A into the B horizon that is above the glacial till. In Minnesota, glacial till is a known soil marker indicating the end of the last Ice Age from 15,000-10,000 B.C.

Another explanation for why the AMS date was younger than expected is that it was a burn event unrelated to human habitation. A charcoal lens was also observed in Unit 2 at the same level in the soil strata, approximately 30-35 cmbd. Although this is shallower than the charcoal that was found in Unit 1, all of the soil strata were shallower in Test Unit 2 implying more erosion on that area of the landform. Charcoal present at similar depths in both units would indicate a natural burn event like a forest fire because of the horizontal dispersion of the charcoal over a large area. With a hearth feature, we would expect the charcoal would be more concentrated vertically in a basin or lens rather than spread out uniformly over a large area. The result for the OSL dating, putting the site in the Middle Archaic, makes sense with the lithic assemblage. Based on the principles behind the way that OSL works, the site would actually be older than the OSL date because the OSL date presents the youngest possible age for the sedimentary deposit based on the exposed soil being slowly blocked from the sunlight by additional soil deposition. This means that the artifacts in the dated soil were deposited prior to the covering of the stratum by additional younger sediment, therefore making the artifacts older than the OSL date. Below, in Figure 57, is a photo of the location of the OSL samples with an overlay of the vertical deposition of artifacts from Shovel Test 2 and 8 and Test Units 1 and 2.

OSL Location in Test Unit 2:

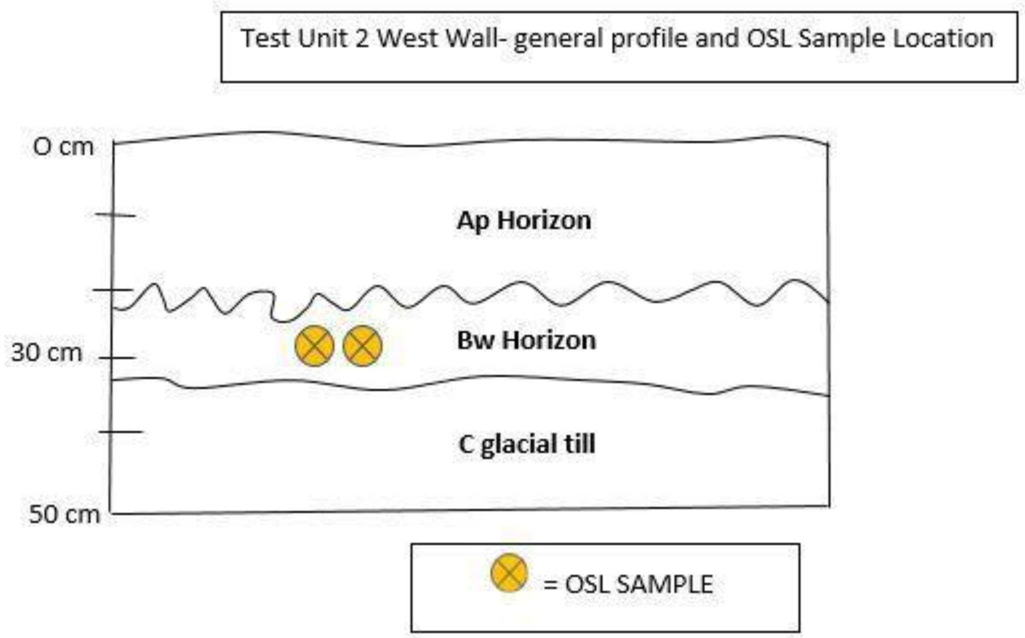


Figure 57. Location of the OSL samples taken from Test Unit 2

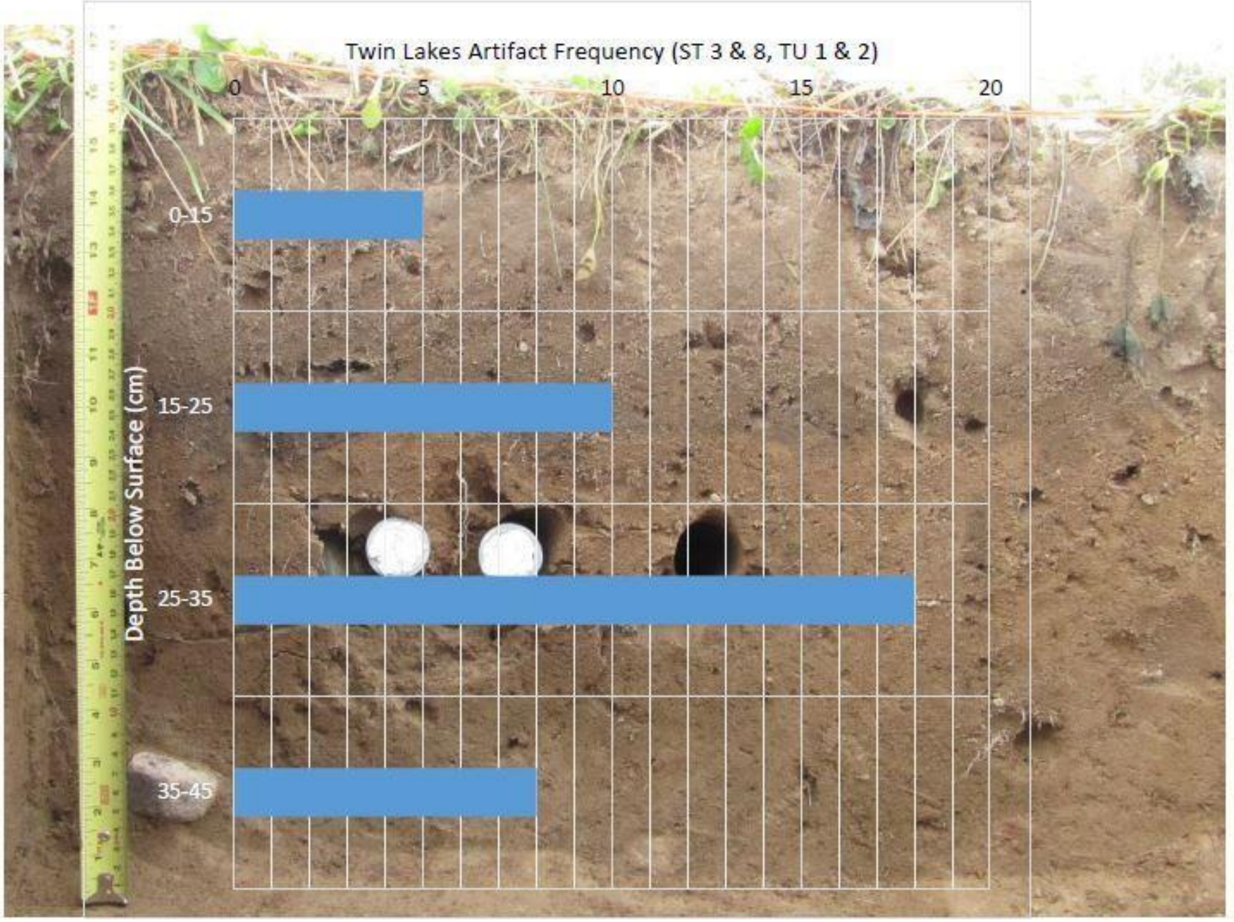


Figure 58. Artifact frequencies plotted by depth in relation to the OSL samples (two white core tubes) and scaled to the Test Unit 2 west wall profile (courtesy of Muñiz).

By dividing the OSL date by the depth below modern ground surface you can get a rough estimate of the amount of sediment deposition by year, which averaged ~237 years per cm. Based on this rough estimate, the main age of the cultural occupation could be anywhere from 237 years to 948 years older than the OSL date. This would date the site occupation between ~6167 and 6878 cal BP. According to Theler and Boszhardt (2003) this falls in the latter part of the Early Archaic. According to lithic collections studied in the state, KLS was the predominant lithic material used at early Paleoindian and Archaic sites in Minnesota and phased out in the

Woodland assemblages (Bakken 2011; Mullholland 2002). This trend is consistent with the OSL date for the Twin Lakes site artifact assemblage. Because of this it is concluded that the OSL date has accurately dated the Twin Lakes site to the Middle to Early Archaic.

Chapter 9: Discussion, Conclusion and NRHP Eligibility

Recommendation Theory and Site Interpretation

The Twin Lakes site is a Middle to Early Archaic site with only lithic material left behind; therefore to avoid making any overreaching assumptions on the function of the site I can only work with the evidence left behind. In an Archaic hunting and gathering society the environment plays more of a roll in how the people live than in more technologically “advanced” societies, meaning large populations with permanent dwellings, agriculture and storage facilities. This is because the environment will play a larger role in a society with more mobility than cultures with more static or permanent settlements. For the Twin Lakes site the most appropriate theoretical approach for interpreting the human behavior comes from Lewis Binford and the mid-range theory which will be discussed in the following paragraphs.

In moving towards Binford’s theory, Paul S. Martin (1971) discusses this shift from ‘old’ archaeology to Processualism in his article “The Revolution in American Archaeology”. Martin’s opinion was that one of the downfalls of “old” archaeology, also known as the “normative” approach, is the lack of models for cultural change. “Old” archaeologists explained culture as linear and the spread of ideas by diffusion from a central culture. This, according to Martin (1971), does “not increase our knowledge of the past nor applies it to contemporary problems of our society” (Martin 1971: 2). At the root of this change to Processualism was a new view of culture and because of this the Processualists believed that they were creating a new paradigm or interpretive framework for the entire profession. This new view of culture was as a system of interwoven social systems that can, along with the data, produce laws of causality from a pattern of actions and interactions within a culture (Martin 1971). Given this, culture change is viewed as a process that is predictable when one or more factors of the system are altered.

Lewis R Binford is considered to be one of the most influential archaeologists of the Processual movement. Binford is famous for his mid-range theory. While Binford was a Processualist, he still relied heavily on ethnographies for his research. Lewis Binford's main goal was to explore why it is difficult to associate meaning to culture using the old approach to archaeology and then suggested a new archaeological framework that is "more consistent with social reality" (Binford 1965:203). To accomplish this, Binford identified the reasons why it is difficult to accomplish a deeper understanding of culture with the "normative" approach. Binford believed that, in the "normative" view, information is obtained from objects that then suggest the evolutionary direction of the culture being studied. It is a linear view of culture or, what Binford named; an "aquatic" view meaning culture is flowing and building on itself in one direction (Binford 1965:204). Binford's new concept of culture saw people as participants that encompass everything in their culture, not just artifacts representing cultural norms. Under this new view, culture will then form environmental and sociocultural subsystems that are the locus of cultural processes and are the dynamic articulations of these subsystems (Binford 1965:203). Given this, his task was to isolate factors that cause a change in culture and then be able to produce a predictive model that can result in a logical conclusion. The taxonomy system needed to satisfy this approach is, in its essence, incredibly hard to develop given the amount of variables involved. To alleviate this problem, Binford's mid-range theory suggests using primary and secondary functions of objects and three categories of distinguishable cultural alignments. This new system was intended to be testable and should increase our understanding of the cultural process of change (Binford 1965:203). From this concept of predictive modeling came many new theories and models based on evolution and ecological factors including optimal foraging theory and hunter-gather models. The idea that culture is predictable brought in the need to quantify factors into a reactive "if" therefore "then" system of predictability.

To help with the identification of the Twin Lakes site function, the approach was drawn from Binford's (1980) article, "Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation". According to Binford in regards to connecting static data to higher level interpretations, his logic is that:

> "The archaeological record is at best a static pattern of associations and covariations among things distributed in space. Giving meaning to these contemporary patterns is dependent upon an understanding of the processes which operated to bring such patterning into existence. Thus, in order to carry out the task of the archaeologist, we must have a sophisticated knowledge and understanding of the dynamics of cultural adaptations, for it is from such dynamics that the statics which we observe arise. One cannot easily obtain such knowledge and understanding from the study of the archaeological remains themselves (Binford 1980:4)"

The idea is that every human activity will leave a mark or a footprint on the Earth's surface and a certain imprint or expression in the archaeological record. In order to determine what these footprints mean we need to understand certain lifeways and settlement patterns that will leave behind certain expressions on the archaeological record. There are two different human lifeways that are common in the Middle Archaic of Minnesota. They are, according to Binford (1980) and Gibbon (2012) “Foragers” and “Collectors”. In his article, Binford outlined what a general lithic assemblage would look like for foragers and collectors in the archaeological record by using an approach called structured patterning on the landscape.

In essence, Binford is identifying two different kinds of hunter-gatherer subsistence patterns and what their expression would look like in the archaeological record. There is a spectrum rather than a static pattern of subsistence meaning the people could switch between the two and groups of Archaic hunter-gatherers could actually be using both at different points of the year. While foragers would be a highly mobile group moving from camp to camp, collectors would be less mobile and working from a central base camp that people would set out from for a specific task and then return to with supplies. The difference results from foragers living in environments where critical resources are more readily available across the landscape and throughout the year. This allows them to move from place to place after using up the resources of a certain area, practicing “residential mobility” (Binford 1980). Collectors live in environments where critical resources are not always available in the same place at the same time. They solve that problem by using logistical mobility (Binford 1980). Collectors would therefore, because of their repetitive use of space, have a bigger archaeological foot print at their base camp than foragers who are constantly moving. One of the other main differences is the fact the collectors would collect or store food or provisions for future use. These storage spaces (i.e., caches) would also be expressed in the archaeological record. The limited artifacts recovered at the Twin Lakes site may not be adequate to make an assumption of mobility or subsistence patterns, but Binford's article provides an idea of the structured differences between collector and forager expressions on the archaeological record.

In Binford's (1979) article "Organization and Formation Processes: Looking at Curated Technologies" in the *Journal of Anthropological Research* he discusses the "organization of technology from the perspective of different settlement systems" and is "concerned with the organizational characteristics within a technology viewed from a situational perspective" (Binford 1979:255). Two different technologies are referred to as "expedient" and "curated". Expedient technologies are tools that are produced in response to a need and curated technologies are produced in anticipation of a need. Expedient tools would be made and used very quickly and an example might be an unmodified flake that was used as a knife for a few minutes and then thrown away. Curated tools require more time and steps to make and would have a much longer use life, such as a hafted bifacial knife that a hunter carried around and used for several weeks. According to Binford (1979), forgers and collector settlement systems would express different technologies in the archaeological record because of their settlement strategies. Foragers, being residentially mobile, would have more of an expedient technology while collectors, working out of a base camp and being more logistically oriented, would have more of a curated technology.

The following figure was drawn by Professor Muñiz to better explain the Forager/Collector model described by Binford. This has been very useful in the interpretation of the Twin Lakes site. The lithic artifacts recovered at the Twin Lakes site were in line with the Collector strategy on the flow chart below. Two bifaces recovered and the flakes that were analyzed suggest a curated technology. Also, the lack of cortex on the flakes suggests that the cores did not come from a primary source and they were carried and produced into bifacial tools as they moved back and forth from their primary residence. As you move up the flow chart from the artifacts it also follows that this area in Minnesota during the Middle Archaic would have been warmer in relation to climate of the entire Archaic period, as discussed in previous chapters but it would have still been cold in the winter given Minnesota's geographical location and the need for a stable primary residence would have been vital in the cold winters of central Minnesota. This is not saying that in the summer months the camps did not move to follow game animals, but based on the evidence from the Twin Lakes site, the conclusion is that it was a collector's satellite camp where they were manufacturing and/or maintaining bifaces.

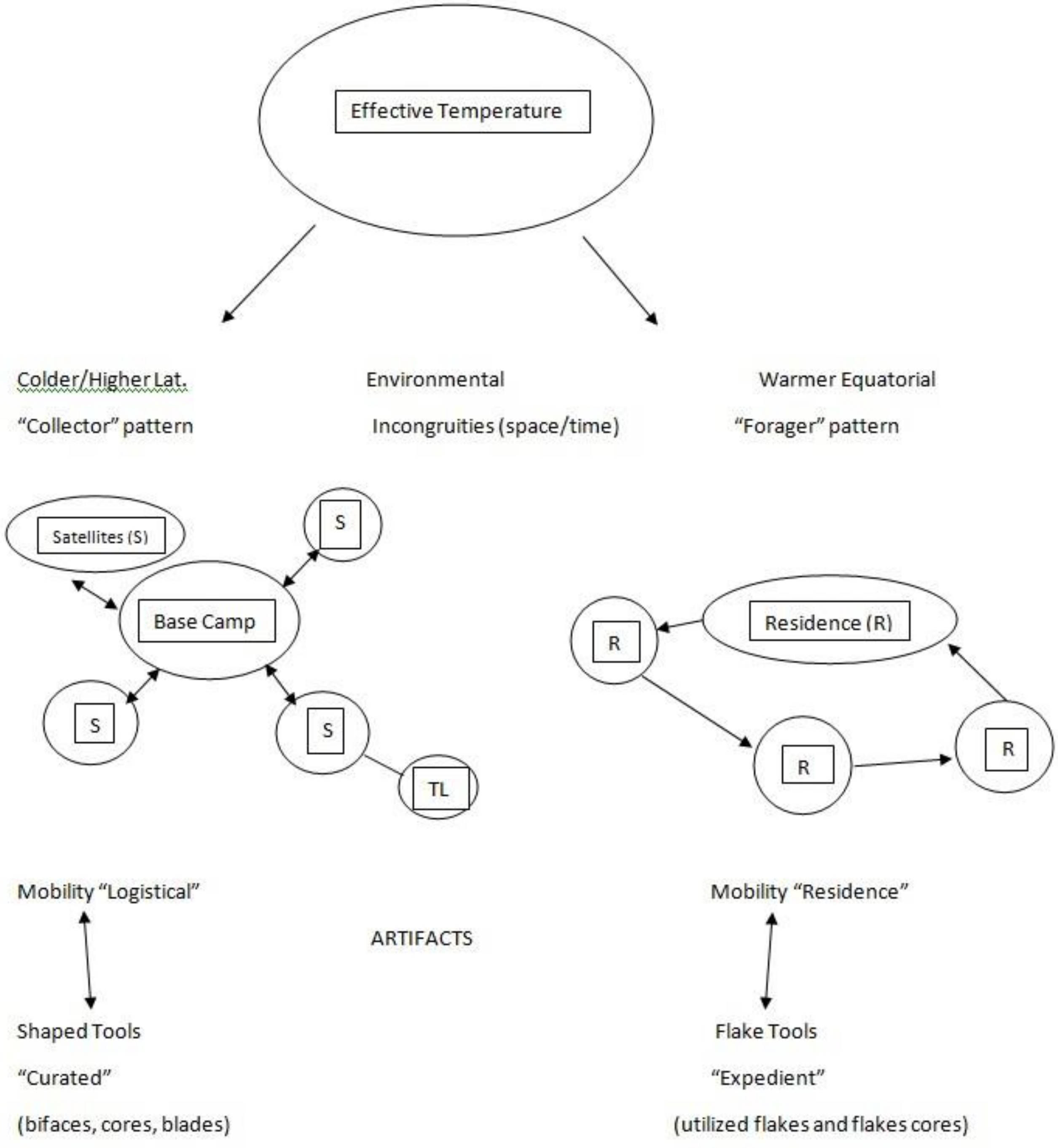


Figure 59. Flow chart illustrating Binford's Collector Forager Model (courtesy of Muñiz).

In slight contrast to Binford is Andrefsky's (1994) article in *American Antiquity* called, "Raw-Material Availability and the Organization of Technology". In this article the author discusses the availability of high or low quality lithic resources in relation to the production of expedient or curated tools as defined by Binford (1979). This is a very important point because the accessibility of high quality lithic resources is going to have just as great of an effect on the lithic assemblage of the site as the purpose of the site itself. Unlike Binford’s theory that associates expedient and curated tools to the forager / collector lifestyles, Andrefsky states that the tool type assemblage has to do more with the availability of high quality lithic material than the mobility pattern. According to Bakken, glacial till literally contains all of the high quality lithic materials used by ancient Minnesotans (Bakken 2011:8). So the proximity of high quality material to the site may be more important for determining whether the site occupants were more likely to make “curated” tools (from high quality stone) or “expedient” tools from low quality stone. The three different types of rock used in the assemblage at the Twin Lakes site were identified and sourced. The majority is Knife Lake siltstone, there is one Fat Rock quartz flake, and one unknown chert that is a white and black banded piece of angular shatter. These materials were sourced using both of Bakken’s (1997, 2011) works. In order to apply Andrefsky’s modification of Binford’s framework, the information was assessed and the relative quality of the three raw materials in the assemblage was compared to the distances to known or suspected sources.

KLS is found in quarries in north and eastern Minnesota, as a primary source but it is also found in glacial outwash plains as secondary sources. As noted earlier, Fat Rock quartz (FRQ) sources are also locally available. However, both KLS and FRQ are not considered to be the highest quality material as each is more difficult to flint knap than a good quality chert. This means for the Twin Lakes site that the abundance of high quality material such as finer cherts should not have an effect on the tools being curated or expedient since this type of high quality stone has not been identified locally.

Using Binford’s collector/forager model, the Twin Lakes site most likely represents a collector pattern settlement. This is supported by the artifacts recovered being bifaces and bifacial flakes. This is also most likely a satellite staging area away from a base camp because of the lack of occupational features, the very narrow range of artifact types, and the relatively low density of artifacts. During the late Early Archaic and early Middle Archaic, the weather would have been warm in the summer and cold in the winter (Gibbon 2012). This also matches expectations for Binford’s collector pattern although this does not mean that people could not be a collector in the winter and a forager in the summertime with warmer weather. There were no storage features found, which is in keeping with expectations for a collector strategy. All of the evidence at the Twin Lakes site points to the site being a satellite site of a base camp with a collector lifeway. In addition, it is generally thought that one of the identifiers between the Paleoindian and the Archaic is moving from a foraging to a collector hunting and gathering strategy (Mattson 2013:16).

Site NRHP Eligibility and Recommendations

The Phase II investigation at the Twin Lakes site was geared toward determining site eligibility for the NRHP. Field methods were designed to generate data to make this recommendation. In addition to a functional interpretation of the site, the information gathered in this thesis is to make a recommendation for site eligibility under the National Register of Historic Places (NRHP) guidelines and suggest further research strategies for the site. A

Minnesota Site Form has also been completed. Site eligibility for listing on the NRHP (36CFR 60.4) need to meet one or more of the following Criteria:

A. Is the site associated with events that have made a significant contribution to the broad patterns of our history?

B. Is the site associated with the lives of a person or persons of significance in our past?

C. Does the site display distinctive characteristics of a type, period or method of construction, or represent the work of a master builder, have high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction?

D. Is the site likely to yield information important to prehistory or history?

Given the above criteria, the Twin Lakes site is recommend eligible for the National Register under criteria **A** and **D**. It is eligible under criterion **A** because of the fact that it was OSL dated with a 95% confidence level to the Middle Archaic. From the results of the research, the Archaic period in Minnesota is poorly known. Given this the Twin Lakes Site will make a considerable contribution archaeologically to the climatically dynamic Archaic period as the large-scale shifts from Prairie to Lake-forest would have had an effect on the lifeways of the people of the Middle Archaic. The site is also eligible under criterion **D** because of its ability to yield more information on Minnesota's poorly understood Middle Archaic period. Given this, the Twin Lakes Site will make a considerable contribution to the broader pattern of Minnesota history.

As part of recommending NRHP eligibility, the Twin Lakes site was evaluated for site integrity. To ensure that the collected data have been recovered from a context that exhibits minimal disturbances affecting the site, the site needs to be evaluated for integrity under seven concepts defined in the National Register Bulletin 15 How to Apply the National Register Criteria for Evaluation. The seven kinds of integrity are as follows:

1. Location
2. Design
3. Setting
4. Materials
5. Workmanship
6. Feeling
7. Association

To determine site integrity, the site needs to demonstrate a lack of overall disturbances and retain evidence that it is in good enough condition to yield important information. To determine the integrity of *location* the site needs to be in its original location. This will be demonstrated by the depositional nature of the sediment surrounding the site (e.g., aeolian, colluvial, alluvial) and if any features are discovered in an intact soil strata. To determine integrity of *design* the site will be evaluated by its organization of space, if the site yields enough information to do so, and its placement on a landscape. Integrity of *setting* will be determined by the site relationship to its environmental setting and how it is a part of the surrounding area. *Material* integrity will be investigated by determining if the material found on the site reflects the time period of the occupation. *Workmanship* will be evaluated based on evidence of artisan labor or craftsmanship. For a prehistoric site this could include intact tools, artwork, or complete projectile points or bifaces that would show period craftsmanship. The *feeling* of the site will be determined by the current landscape and how much has it changed since the occupation of the site. The *association* will be established by the OSL date and research on sites of a common time period.

The Twin Lakes site shows several forms of site integrity as outlined in the NHPA. First, it demonstrates the integrity of location. Even with the plowing and cultivation of the area there were significant artifact deposits found in the intact subsoils of the site that would give the site the integrity of location. Also, even with the plow zone disturbance, the statistical analysis indicates the artifacts are from one cultural context which also adds to the integrity of location. The integrity of design could be attributed to the suggested function of the site as being a bifacial tool manufacturing site. This can also be tied into the integrity of setting because of the site's location at the highest part of the landform with a significant amount of subsoil integrity. The integrity of association was established earlier with the OSL date dating the site to the Middle Archaic. There is also integrity of *workmanship* demonstrated by the bifaces recovered from the site. This can also be supported with the results from the statistical analysis suggesting the flakes recovered from the site probably came from biface manufacturing.

The Twin Lakes site significance could be established just by the OSL dating the site to the Middle Archaic because of the lack of information from this time period in Minnesota but the location of the site also adds to the significance. As stated before and illustrated in Figure 1, the site is located on the ecotone between the prairie and the lake-forest biomes. This gives a rare opportunity to identify what resources were being exploited at a site that is on the boundary of both biomes. The Prairie Archaic Complex, to the west of the site, is mainly nomadic bison hunters with large associated site such as the Itasca Bison Kill Site 21CE1. To the east is the Lake-Forest Archaic Complex that utilized technologies for fishing, hunting small and large mammals and harvesting indigenous wild plants. An example of a Lake-Forest associated site is Petaga Point at Lake Mille Lacs, only 45 miles from the Twin Lakes Site (Minnesota State Historic Preservation Office http://www.mnhs.org/shpo/).

Based on the site significance and increasingly improving research technologies, there are many options for further research at the Twin Lakes site. Because of the location, I would suggest some research be done in the form of pollen or phytolith samples. This way we could identify the plants in the area and place the location into the Prairie Complex or the Lake-Forest Complex and possibly identify when the climatic shifts actually took place within the site boundaries. This research could include environmental reconstruction from coring the bottom of the glacial lakes directly to the east of the site. I would suggest that there be a geomorphological study reconstructing the paleoenviorment in the area for lake and water level fluctuations. This could help with future site identification. There could also be an in depth Lidar study including looking for micro features in the Lidar data and ground truthing the features with excavation to see if they were natural or man-made. In addition, there could be further excavations, given the land owner’s permission, on the site. I would not suggest a full mitigation of the site because it would be destroying the integrity but a few more 1x1m units to establish the area of highest concentration of the site and to possibly expose a feature. If a storage feature is found then the site could be reassessed to be the main collector’s base camp and not just a satellite camp.

The Twin Lakes site is an exciting addition to the archaeological record in Minnesota. This research has made a considerable contribution to the archaeological record as well as opening up further research to future archaeologists.

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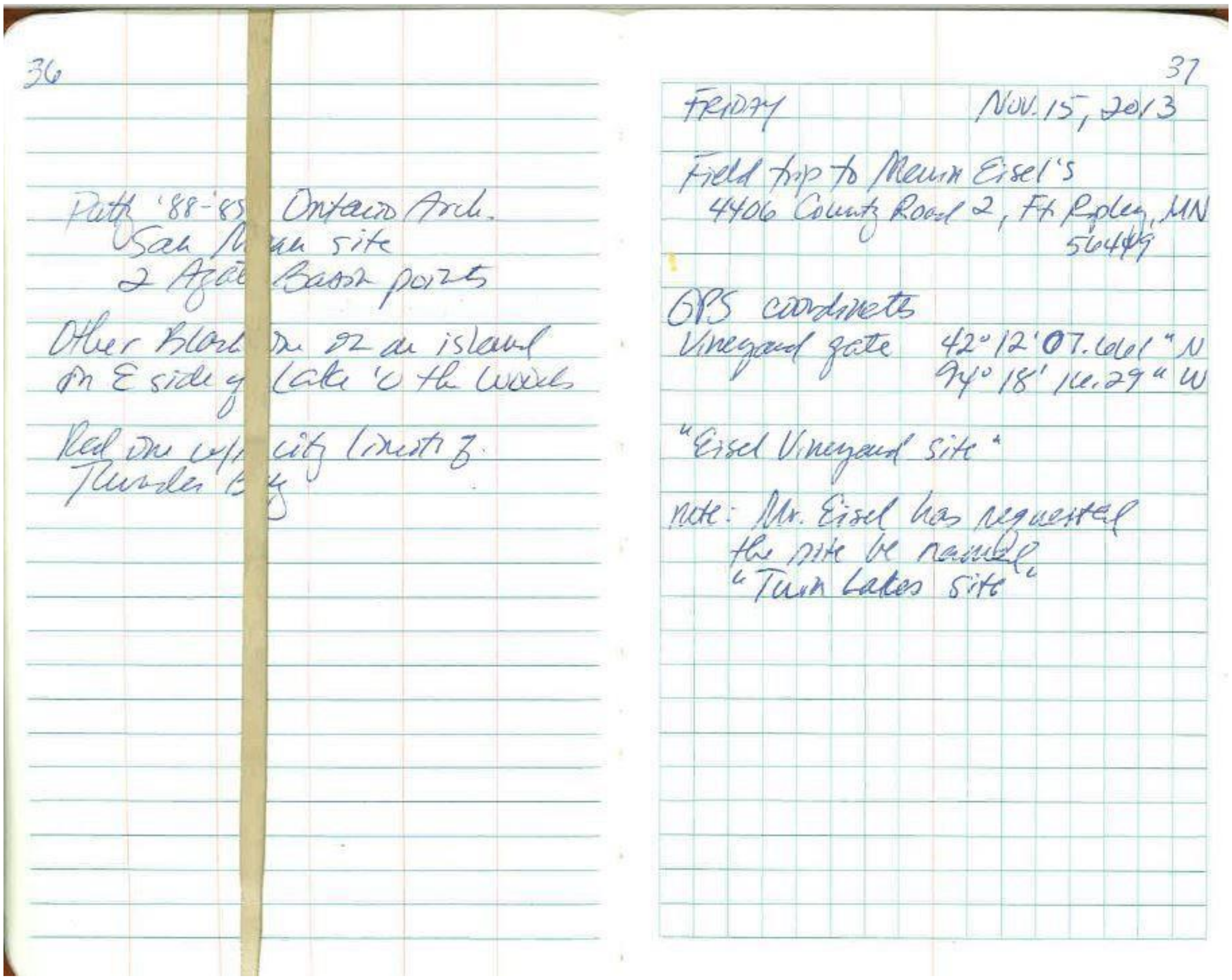
Appendix A: Field Notes



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Path '88-'85 Ontario Arch.
San M un site
2 Agat Basin points

Other Blad in 92 on island
on E side of Lake 'o the Woods

Red one w/ city limits of
Thunder By

37

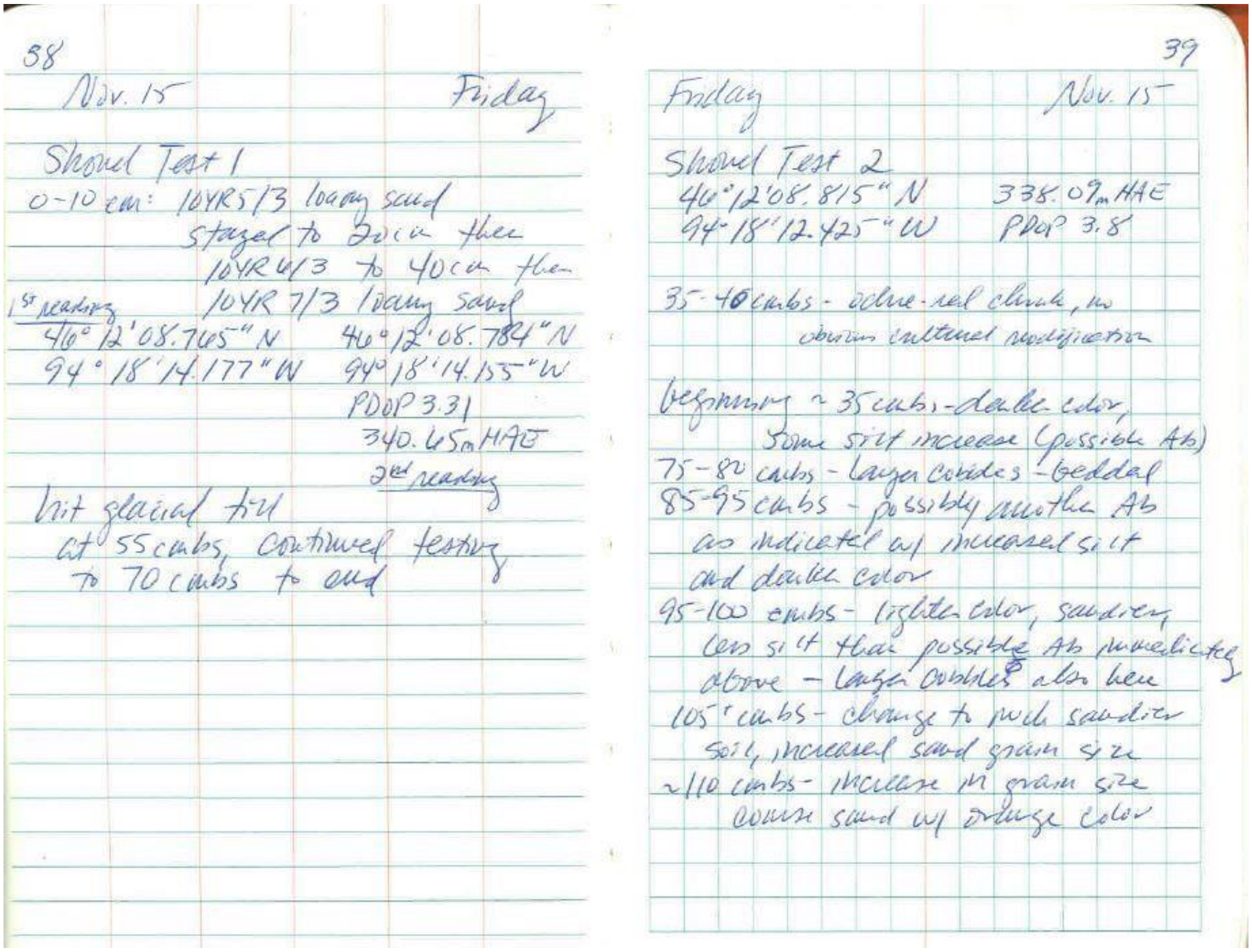
FRIDAY Nov. 15, 2013

Field trip to Marvin Eisel's
4406 County Road 2, Ft Ripley, MN
56449

GPS coordinates
Vineyard gate 42°12'07.661" N
94°18'16.29" W

"Eisel Vineyard site"

note: Mr. Eisel has requested
the site be named
"Twin Lakes site"



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Nov. 15 Friday

Shovel Test 1

0-10 cm: 10YR5/3 loamy sand
stayed to 20cm then
10YR6/3 to 40cm then
10YR 7/3 loamy sand

1st reading
40° 12'08.765"N 40°12'08.784"N
94° 18'14.177"W 94°18'14.155"W
PDOP 3.31
340.65m HAE
2nd reading

hit glacial till
at 55cmbs, continued testing
to 70cmbs to end

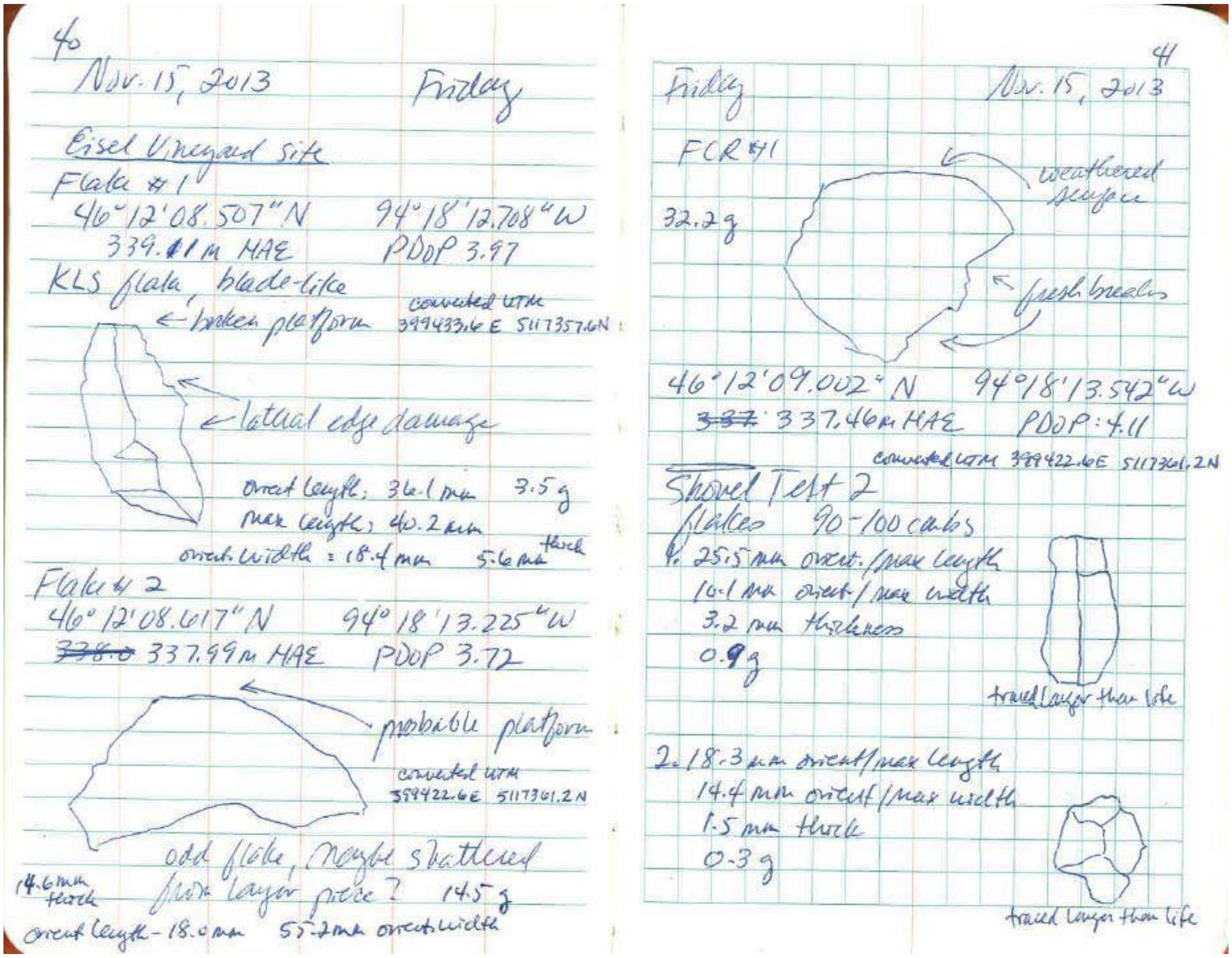
39

Friday Nov. 15

Shovel Test 2
40°12'08.815"N 338.09m HAE
94°18'12.425"W PDOP 3.8

35-40cmbs - olive-red chunk, no
obvious cultural modification

beginning ~35cmbs - darker color,
some silt increase (possible Ab)
75-80 cmbs - larger cobbles - bedded
85-95 cmbs - possibly another Ab
as indicated w/ increased silt
and darker color
95-100 cmbs - lighter color, sandier,
less silt than possible Ab immediately
above - larger cobbles also here
105+ cmbs - change to much sandier
soil, increased sand grain size
~110 cmbs - increase in grain size
coarse sand w/ orange color



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Nov. 15, 2013 Friday

Eisel Vineyard site

Flake #1

46°12'08.507"N 94°18'12.708"W

339.01m MAE PDOP 3.97

KLS flake, blade-like

← broken platform

converted UTM 399433.6 E 5117357.6N

← lateral edge damage

orient length: 36.1 mm 3.5 g

max length: 40.2 mm

orient. width = 18.4 mm 5.6 mm thick

Flake # 2

46°12'08.617"N 94°18'13.225"W

~~338.0~~ 337.99m HAE PDOP 3.72

probable platform

converted UTM 399422.6E 5117361.2N

odd flake, maybe shattered from larger piece? 14.5 g

14.6mm thick

orient length - 18.0 mm 55.2mm orient width

41

Friday Nov. 15, 2013

FCR #1

weathered surface

32.2g

fresh breaks

46°12'09.002"N 94°18'13.542"W

~~337~~ 337.46m HAE PDOP: 4.11

converted UTM 399422.6E 5117361.2N

Shovel Test 2

flakes 90-100 cmbs

1. 25.5 mm orient./max length

10.1 mm orient/max width

3.2 mm thickness

0.9 g

traced larger than life

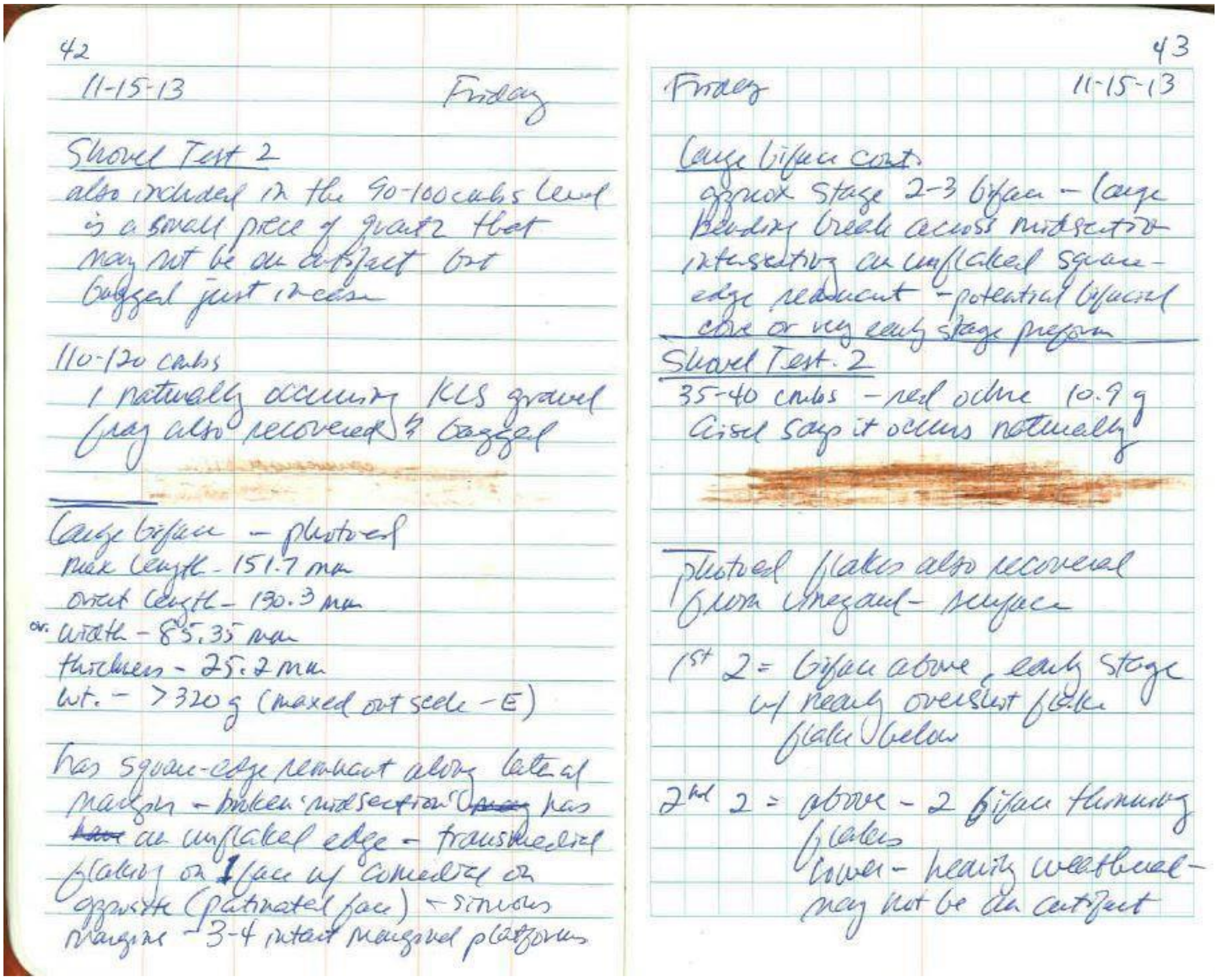
2. 18.3 mm orient/max length

14.4 mm orient/max width

1.5 mm thick

0.3 g

traced larger than life



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11-15-13 Friday

Shovel Test 2

also included in the 90-100 cmbs level is a small piece of quartz that may not be an artifact but bagged just in case

110-120 cmbs

1 naturally occurring KLS gravel (may also recovered) & bagged

Large biface - photoed

max length - 151.7 mm

overt length - 130.3 mm

av. width - 85.35 mm

thickness - 25.2 mm

wt. - >320 g (maxed out scale - E)

has square-edge remnant along lateral margin - broken 'midsection' ~~[illegible]~~ has ~~[illegible]~~ an unflaked edge - transmedial flaking on 1 face w/ cortex on opposite (patinated face) ← sinuous margins - 3-4 intact marginal platforms

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Friday 11-15-13

Large biface cont.

approx stage 2-3 biface - large bending break across midsection intersecting an unflaked square-edge remnant - potential bifacial core or very early stage preform

Shovel Test 2

35-40 cmbs - red ochre 10.9 g

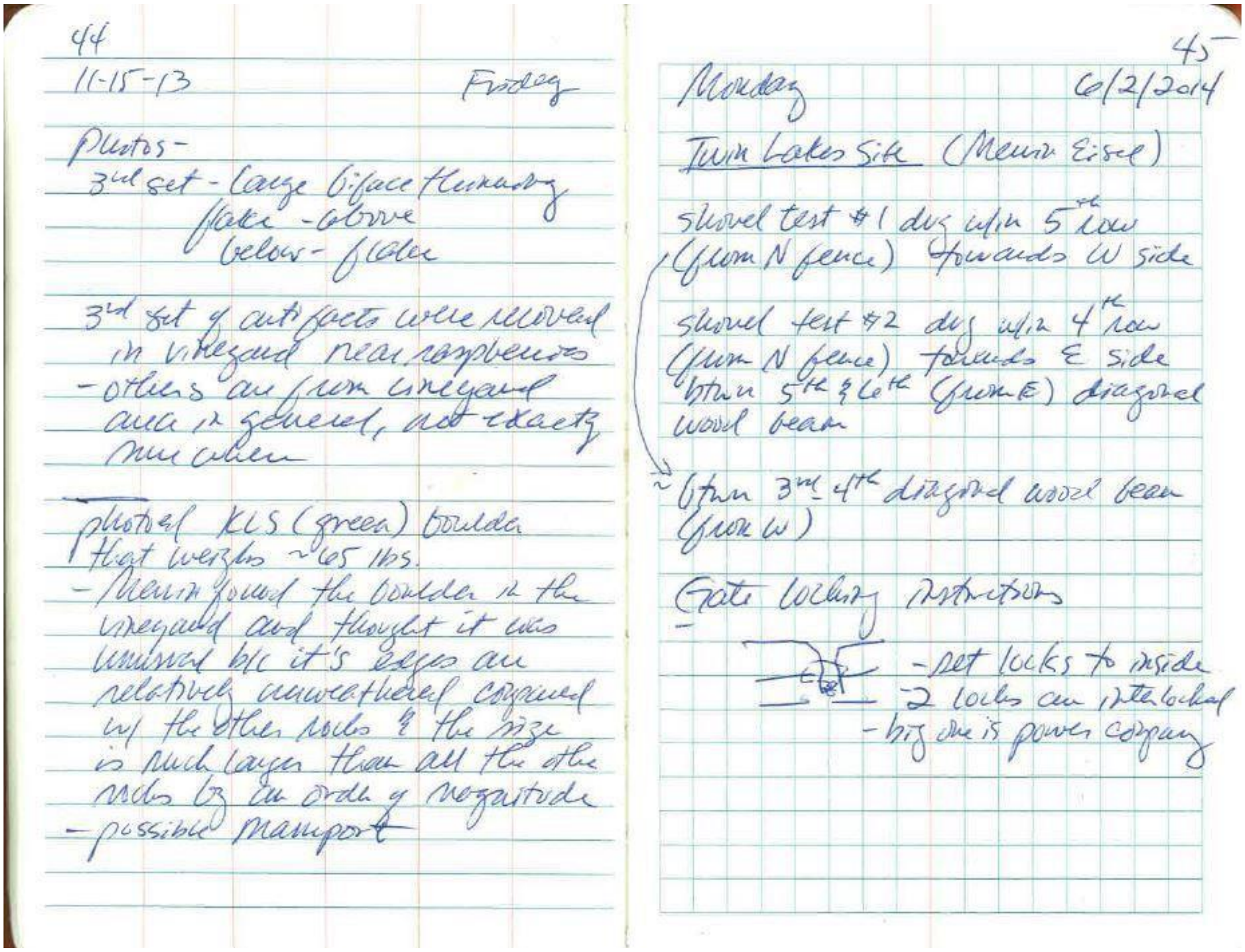
Gisel says it occurs naturally

photoed flakes also recovered from Unegaul - surface

1st 2 = biface above, early stage w/ nearly overshot flake flake below

2nd 2 = above - 2 biface thinning flakes

lower - heavily weathered - may not be an artifact



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11-15-13 Friday

Photos-
3rd set - large biface thinning flake - above
below - flake

3rd set of artifacts were recovered in vineyard near raspberries
- others are from vineyard area in general, not exactly sure where

photo'd KLS (green) boulder that weighs ~65 lbs.
- Mervin found the boulder in the vineyard and thought it was unusual b/c it's edges are relatively unweathered compared w/ the other rocks & the size is much larger than all the other rocks by an order of magnitude
- possible manuport

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Monday 6/2/2014

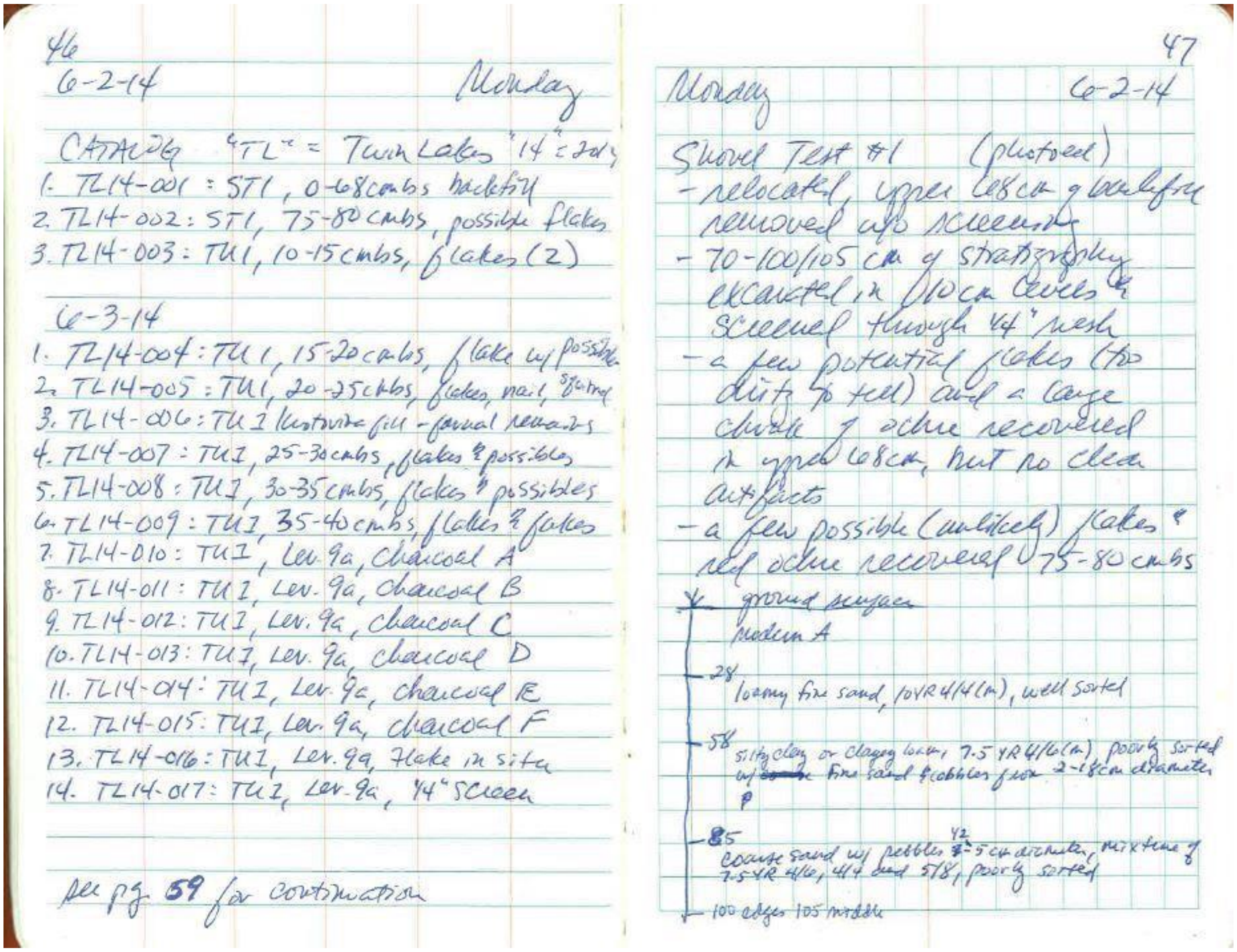
Twin Lakes Site (Mervin Eisel)

shovel test #1 dug w/in 5th row (from N fence) towards W side

shovel test #2 dug w/in 4th row (from N fence) towards E side btwn 5th & 6th (from E) diagonal wood beam

~btwn 3rd-4th diagonal wood beam (from W)

Gate locking instructions
-
- set locks to inside
- 2 locks are interlocked
- big one is power company



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6-2-14 Monday

CATALOG "TL" = Twin Lakes "14" = 2014

1. TL14-001 : ST1, 0-68cmbs backfill
2. TL14-002 : ST1, 75-80 cmbs, possible flakes
3. TL14-003 : TU1, 10-15 cmbs, flakes (2)

6-3-14

1. TL14-004 : TU1, 15-20 cmbs, flake w/ possible
2. TL14-005 : TU1, 20-25 cmbs, flakes, nail, squirrel
3. TL14-006 : TU I historic fill - faunal remains
4. TL14-007 : TU I, 25-30 cmbs, flakes & possibles
5. TL14-008 : TU I, 30-35 cmbs, flakes & possibles
6. TL14-009 : TU I, 35-40 cmbs, flakes & fakes
7. TL14-010 : TU I, Lev. 9a, Charcoal A
8. TL14-011 : TU I, Lev. 9a, Charcoal B
9. TL14-012 : TU I, Lev. 9a, Charcoal C
10. TL14-013 : TU I, Lev. 9a, Charcoal D
11. TL14-014 : TU I, Lev. 9a, Charcoal E
12. TL14-015 : TU I, Lev. 9a, Charcoal F
13. TL14-016 : TU I, Lev. 9a, Flake in situ
14. TL14-017 : TU I, Lev. 9a, 1/4" Screen

see pg. 59 for continuation

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Monday 6-2-14

Shovel Test #1 (photoed)

- relocated, upper 68cm of backfill removed w/o screening
- 70-100/105 cm of stratigraphy excavated in 10cm levels & screened through 1/4" mesh
- a few potential flakes (too dirty to tell) and a large chunk of ochre recovered in upper 68cm, but no clear artifacts
- a few possible (unlikely) flakes & red ochre recovered 75-80 cmbs

ground surface

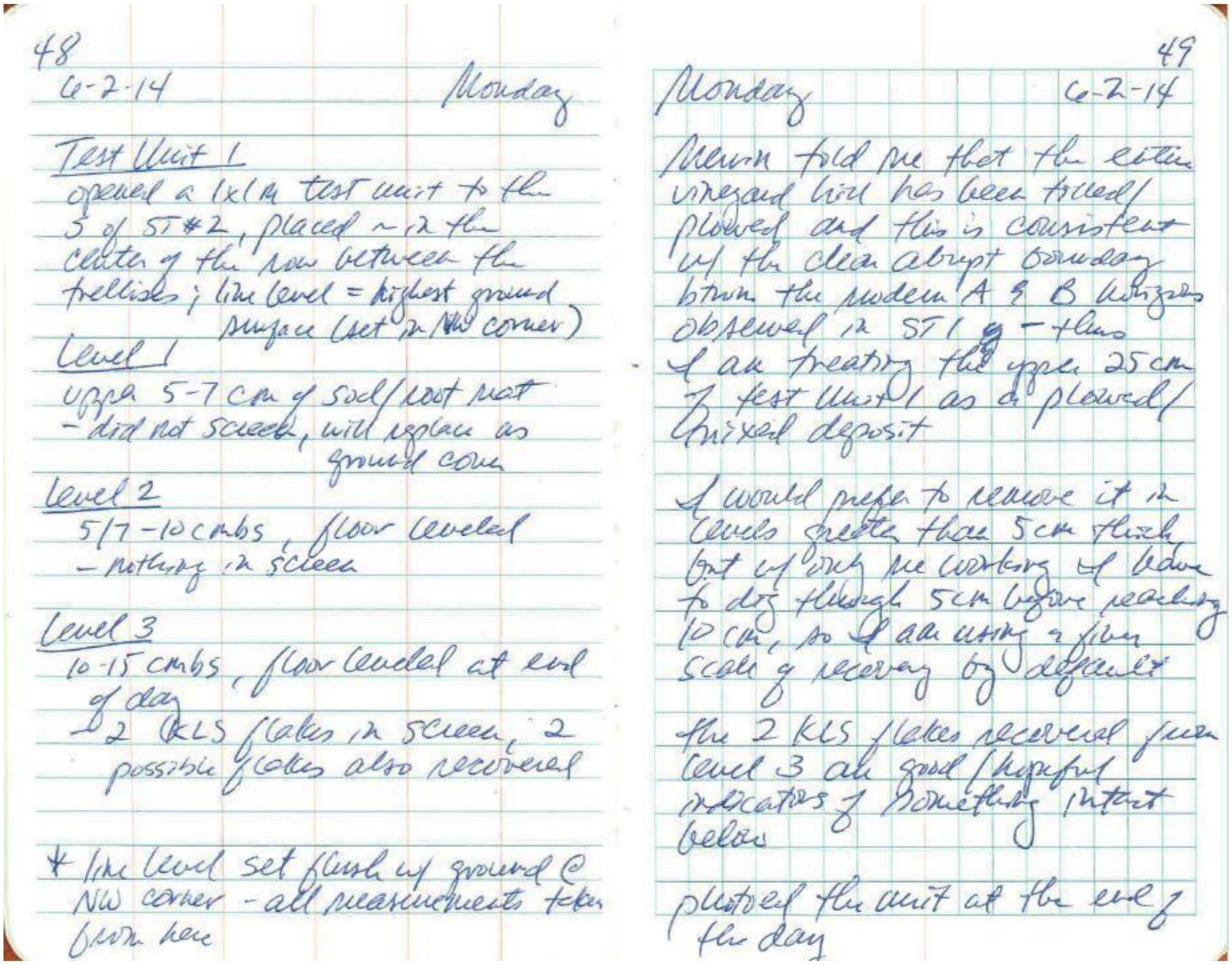
modern A

28 loamy fine sand, 10YR 4/4 (m), well sorted

58 silty clay or clayey loam, 7.5 YR 4/6 (m), poorly sorted w/ fine sand & cobbles from 2-18cm diameter

85 coarse sand w/ pebbles 1/2-5 cm diameter, mixture of 7.5 YR 4/6, 4/4 and 5/8, poorly sorted

100 edges 105 middle



48
6-2-14 Monday

Test Unit 1
opened a 1x1 m test unit to the S of ST#2, placed ~ in the center of the row between the trellises; line level = highest ground surface (set in NW corner)

Level 1
upper 5-7 cm of sod/root mat - did not screen, will replace as ground cover

Level 2
5/7-10 cmbs, floor leveled - nothing in screen

Level 3
10-15 cmbs, floor leveled at end of day
- 2 KLS flakes in screen, 2 possible flakes also recovered

* line level set flush w/ ground @ NW corner - all measurements taken from here

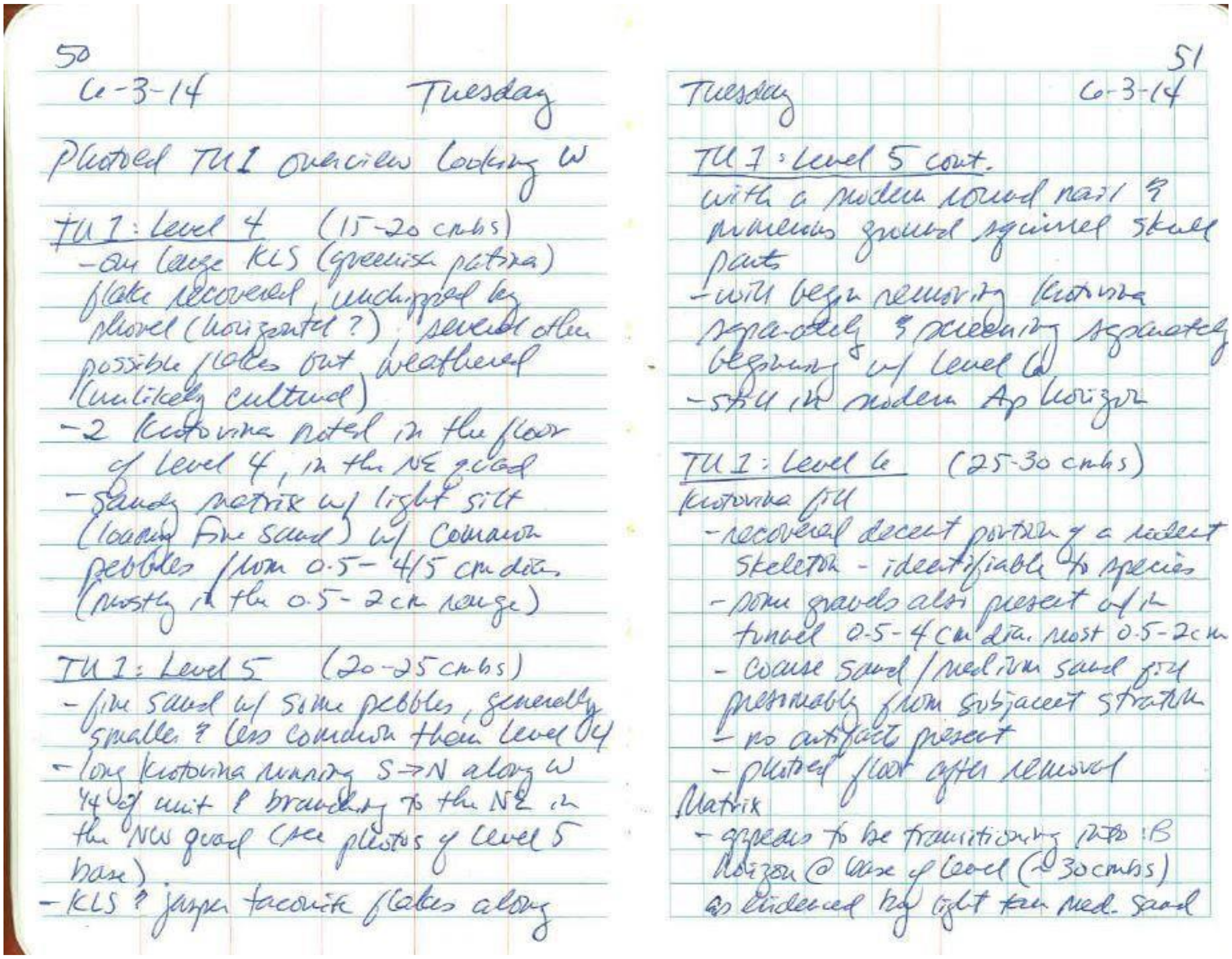
49
Monday 6-2-14

Melvin told me that the entire vineyard has been tilled/plowed and this is consistent w/ the clear abrupt boundary btwn the modern A & B horizons observed in ST 1 & - thus I am treating the upper 25 cm of test unit 1 as a plowed/mixed deposit

I would prefer to remove it in levels greater than 5 cm thick but w/ only me working I have to dig through 5 cm before reaching 10 cm, so I am using a finer scale of recovery by default

the 2 KLS flakes recovered from level 3 are good/hopeful indicators of something intact below

plotted the unit at the end of the day



50

6-3-14 Tuesday

Photoed TU1 overview looking W

TU 1: Level 4 (15-20 cmbs)

- an large KLS (greenish patina) flake recovered, unchipped by shovel (horizontal?) several other possible flakes but weathered (unlikely cultural)
- 2 krotovina noted in the floor of level 4, in the NE quad
- sandy matrix w/ light silt (loamy fine sand) w/ common pebbles from 0.5-4/5 cm dia. (mostly in the 0.5-2 cm range)

TU 1: Level 5 (20-25 cmbs)

- fine sand w/ some pebbles, generally smaller & less common than level 04
- long krotovina running S→N along W 1/4 of unit & branching to the NE in the NW quad (see photos of level 5 base)
- KLS & jasper taconite flakes along

51

Tuesday 6-3-14

TU 1: Level 5 cont.

with a modern round nail & numerous ground squirrel skull parts

- will begin removing krotovina separately & screening separately beginning w/ level 6
- still in modern Ap horizon

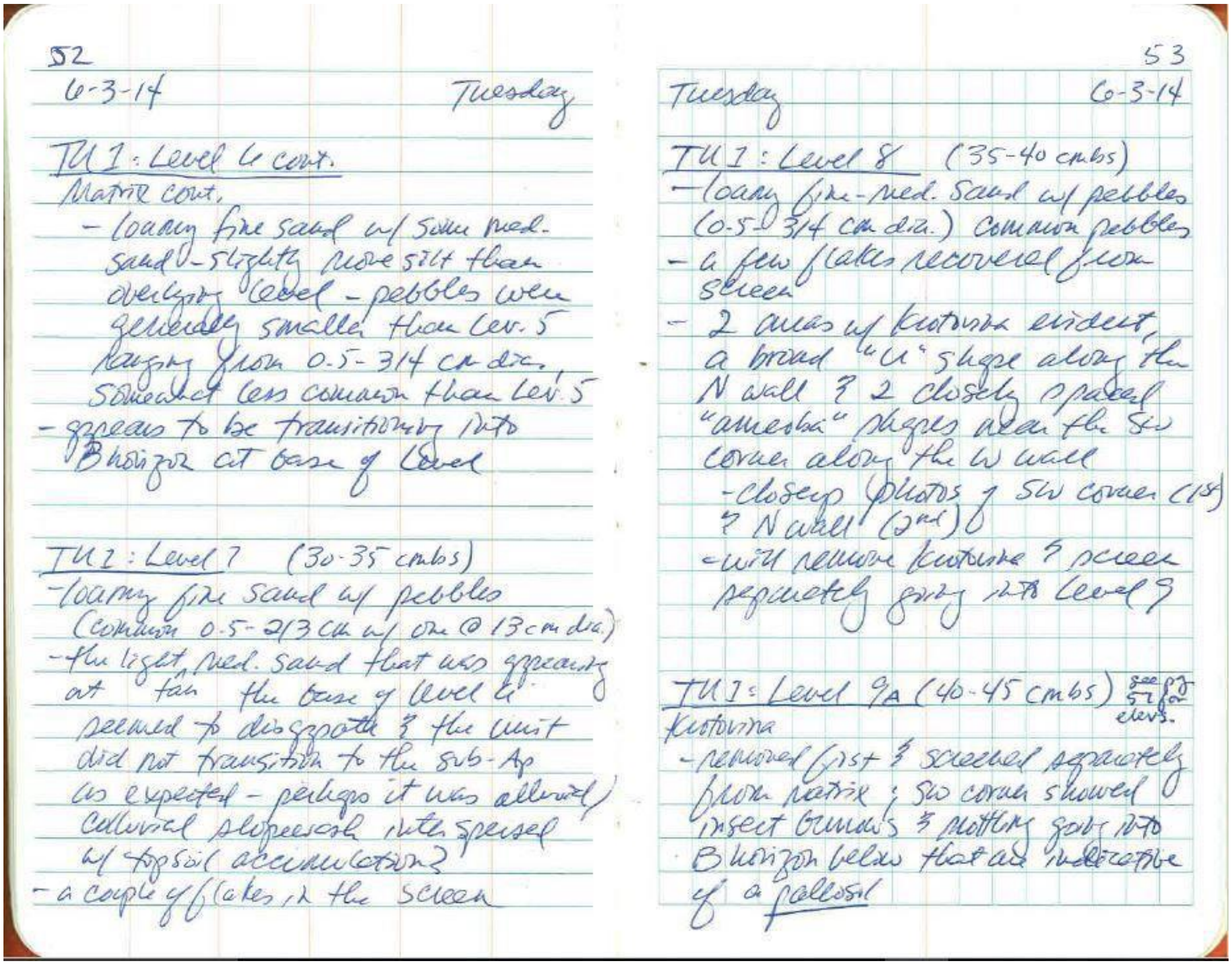
TU 1: Level 6 (25-30 cmbs)

Krotovina fill

- recovered decent portion of a rodent skeleton - identifiable to species
- some gravels also present of in tunnel 0.5-4 cm dia. most 0.5-2cm
- coarse sand / medium sand fill presumably from subjacent stratum
- no artifacts present
- photoed floor after removal

Matrix

- appears to be transitioning into B horizon @ base of level (~30 cmbs) as evidenced by light tan med. sand



52
6-3-14 Tuesday

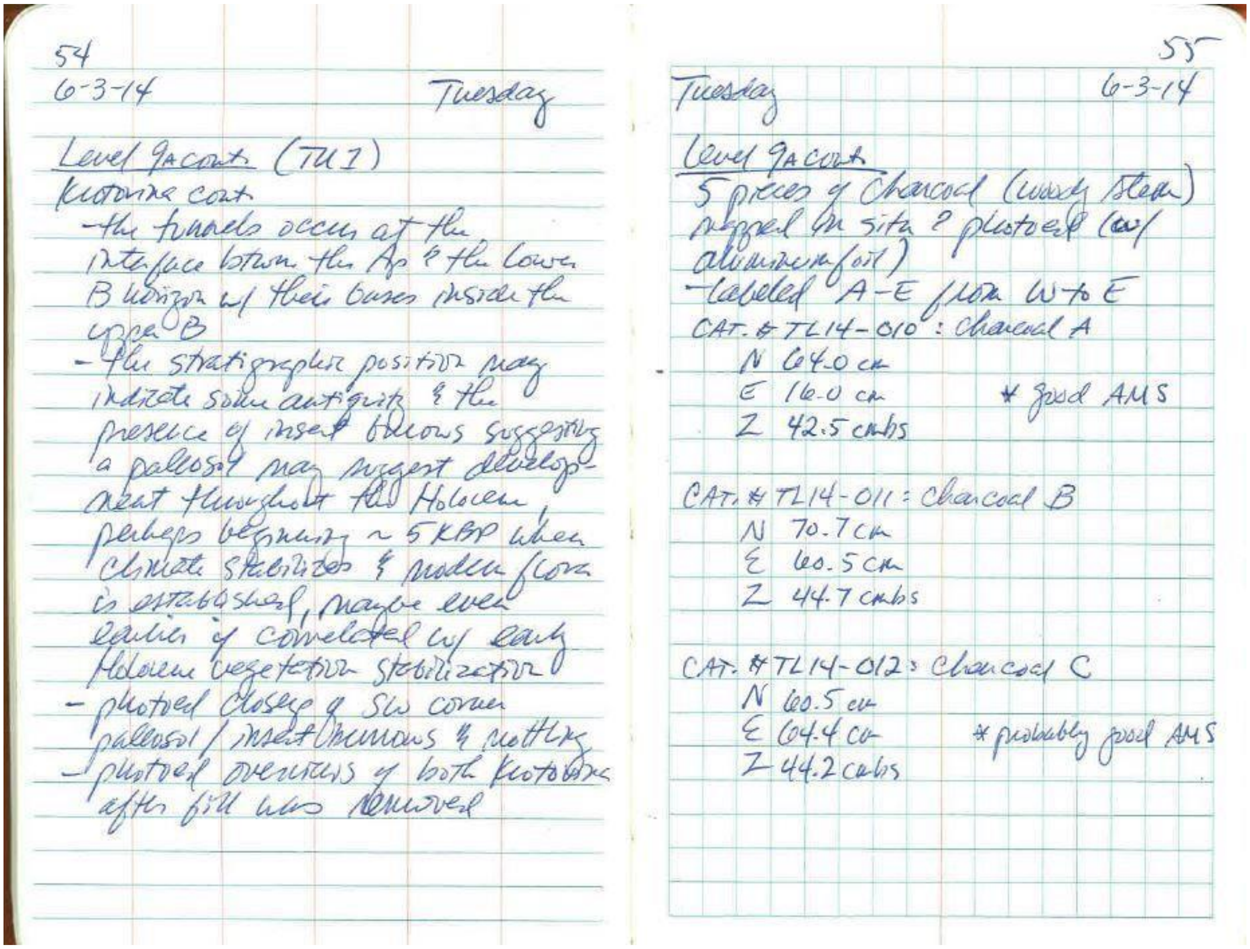
TU 1: Level 6 cont.
Matrix cont.
- loamy fine sand w/ some med. sand - slightly more silt than overlying level - pebbles were generally smaller than Lev. 5 ranging from 0.5-3/4 cm dia., somewhat less common than Lev. 5
- appears to be transitioning into B horizon at base of level

TU 1: Level 7 (30-35 cmbs)
- loamy fine sand w/ pebbles (common 0.5-2/3 cm w/ one @ 13 cm dia.)
- the light, tan med. sand that was appearing at the base of level 6 seemed to disappear & the unit did not transition to the sub-Ap as expected - perhaps it was alluvial/colluvial slopewash interspersed w/ topsoil accumulation?
- a couple of flakes in the screen

53
Tuesday 6-3-14

TU 1: Level 8 (35-40 cmbs)
- loamy fine-med. sand w/ pebbles (0.5-3/4 cm dia.) common pebbles
- a few flakes recovered from screen
- 2 areas of krotovina evident, a broad "U" shape along the N wall & 2 closely spaced "amoeba" shapes near the SW corner along the W wall
  - closeup photos of SW corner (1st) & N wall (2nd)
- will remove krotovina & screen separately going into Level 9

TU 1: Level 9A (40-45 cmbs) see pg 57 for elevs.
Krotovina
- removed first & screened separately from matrix; SW corner showed insect burrows & mottling going into B horizon below that are indicative of a paleosol



54

6-3-14 Tuesday

Level 9A cont. (TU I)

krotovina cont.

- the tunnels occur at the interface btwn the Ap & the lower B horizon w/ their bases inside the upper B
- the stratigraphic position may indicate some antiquity & the presence of insect burrows suggesting a paleosol may suggest development throughout the Holocene, perhaps beginning ~ 5 KBP when climate stabilized & modern flora is established, maybe even earlier if correlated w/ early Holocene vegetation stabilization
- photo'ed closeup of SW corner paleosol / insect burrows & mottling
- photo'ed overviews of both krotovinas after fill was removed

55

Tuesday 6-3-14

Level 9A cont.

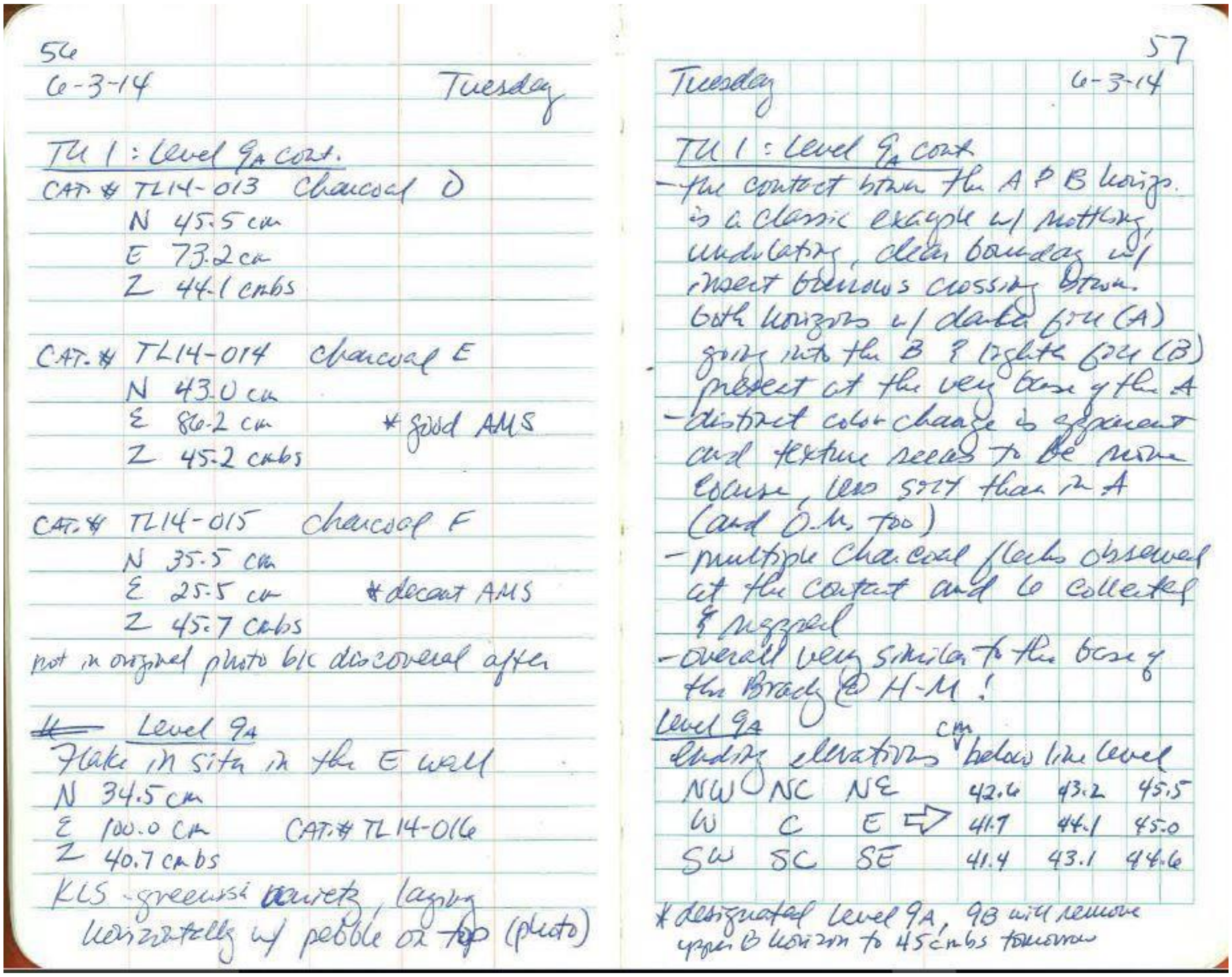
5 pieces of charcoal (woody stem) mapped in situ & photo'ed (w/ aluminum foil)

- labeled A-E from W to E

CAT. # TL14-010 : Charcoal A
N 64.0 cm
E 16.0 cm * good AMS
Z 42.5 cmbs

CAT. # TL14-011 : Charcoal B
N 70.7 cm
E 60.5 cm
Z 44.7 cmbs

CAT. # TL14-012 : Charcoal C
N 60.5 cm
E 64.4 cm * probably good AMS
Z 44.2 cmbs



56

6-3-14 Tuesday

TU 1: Level 9A cont.

CAT. # TL14-013 Charcoal D
N 45.5 cm
E 73.2 cm
Z 44.1 cmbs

CAT. # TL14-014 charcoal E
N 43.0 cm
E 86.2 cm * good AMS
Z 45.2 cmbs

CAT. # TL14-015 charcoal F
N 35.5 cm
E 25.5 cm * decent AMS
Z 45.7 cmbs
not in original photo b/c discovered after

~~#~~ Level 9A
Flake in situ in the E wall
N 34.5 cm
E 100.0 cm CAT. # TL14-016
Z 40.7 cmbs
KLS - greenish quartzite, laying horizontally w/ pebble on top (photo)

57

Tuesday 6-3-14

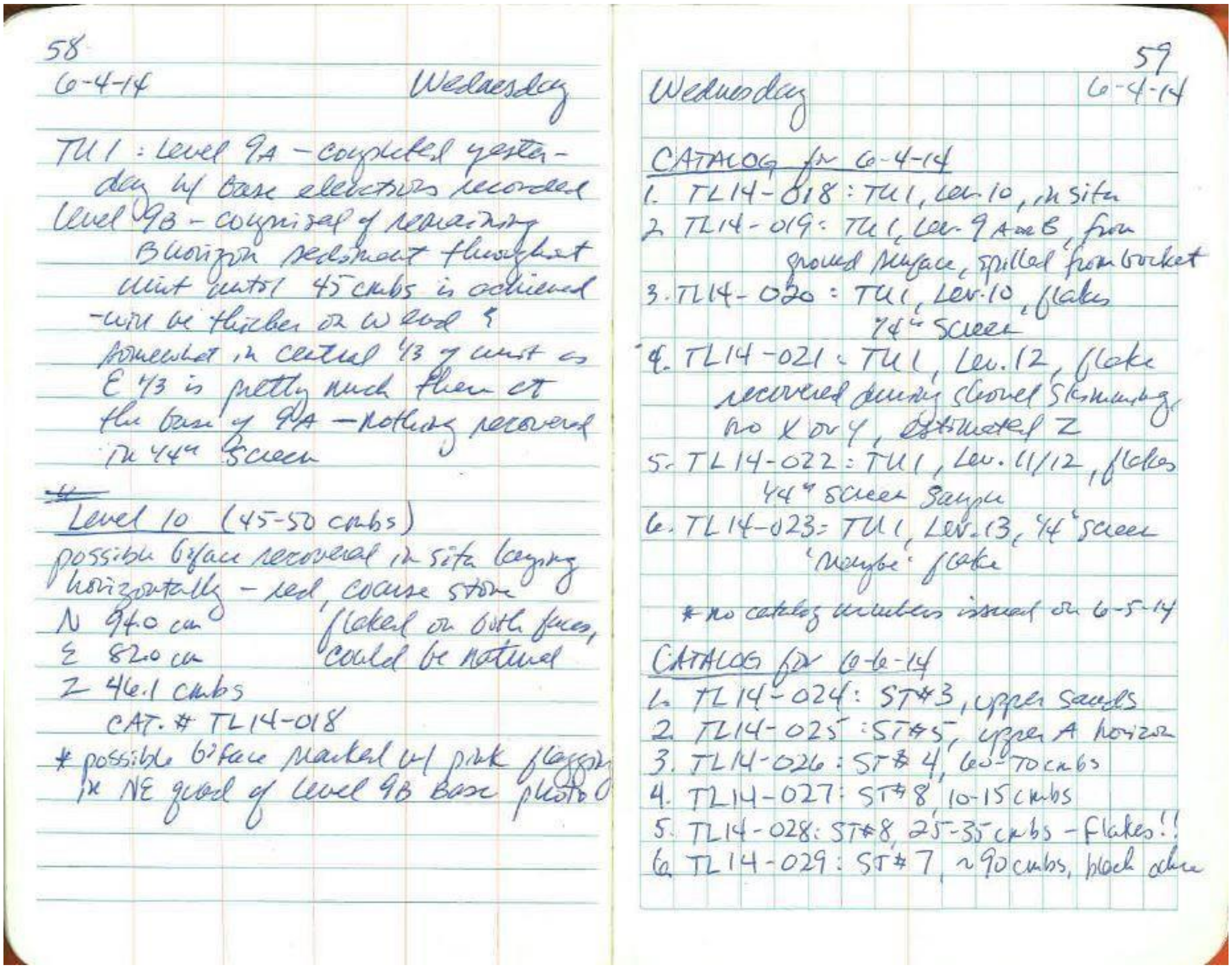
TU 1: Level 9A cont.

- the contact btwn the A & B horizs. is a classic example w/ mottling, undulating, clear boundary w/ insect burrows crossing btwn. both horizons w/ darker gray (A) going into the B & lighter gray (B) present at the very base of the A
- distinct color change is apparent and texture seems to be more coarse, less silty than in A (and O.M. too)
- multiple charcoal flecks observed at the contact and 6 collected & mapped
- overall very similar to the base of the Brady @ H-M!

Level 9A
ending elevations cm below line level

NW	NC	NE		42.6	43.2	45.5
W	C	E	⇨	41.7	44.1	45.0
SW	SC	SE		41.4	43.1	44.6

* designated level 9A, 9B will remove upper B horizon to 45 cmbs tomorrow



58
6-4-14 Wednesday

TU 1: Level 9A – completed yesterday w/ base elevations recorded
Level 9B – comprised of remaining B horizon sediment throughout unit until 45 cmbs is achieved – will be thicker on W end & somewhat in central 1/3 of unit as E 1/3 is pretty much there at the base of 9A – nothing recovered in 1/4" screen

~~#~~

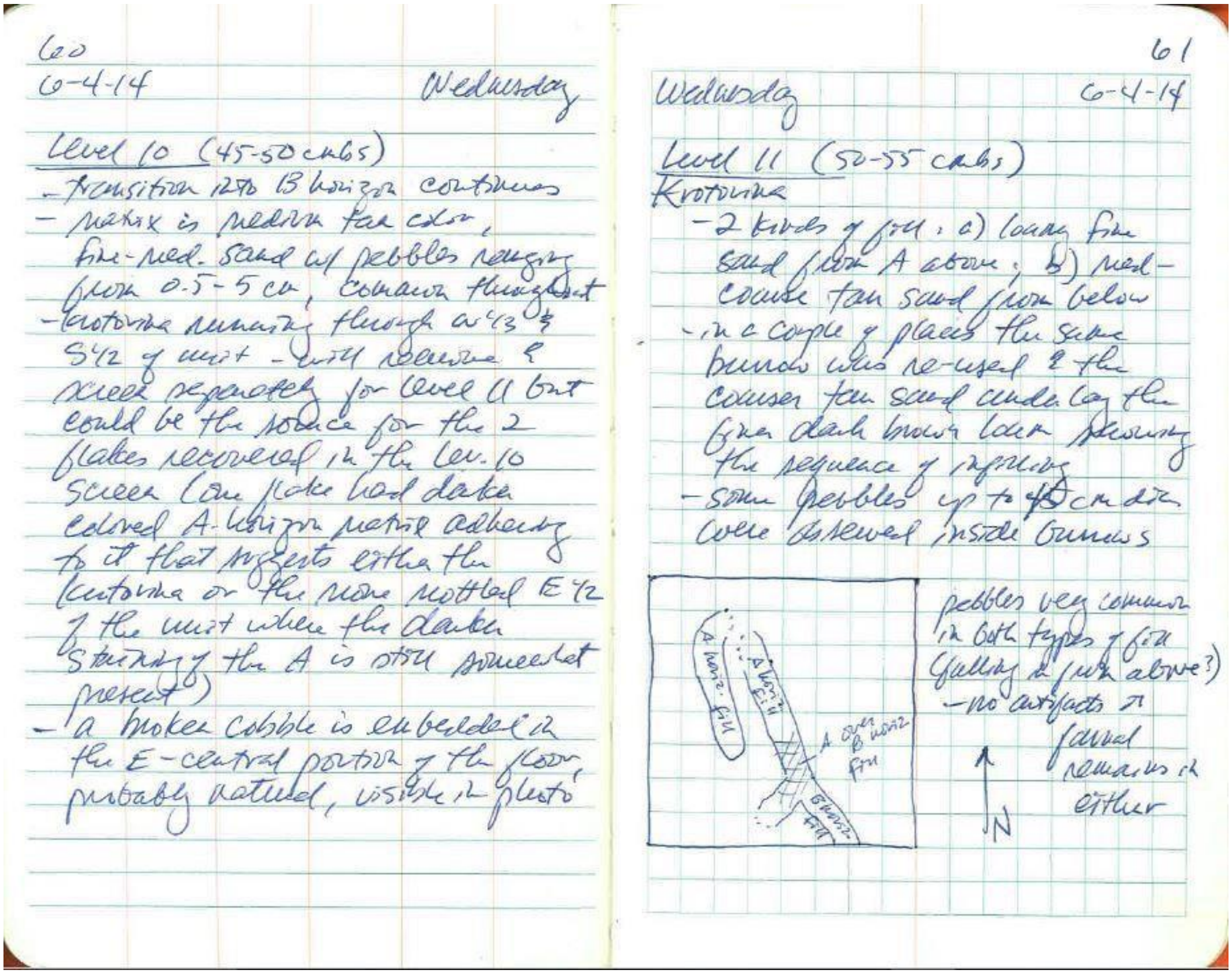
Level 10 (45-50 cmbs)
possible biface recovered in situ laying horizontally – red, coarse stone
N 94.0 cm — flaked on both faces,
E 82.0 cm — could be natural
Z 46.1 cmbs
CAT. # TL14-018
* possible biface marked w/ pink flagging in NE quad of Level 9B base photo

59
Wednesday 6-4-14

CATALOG for 6-4-14
1. TL14-018: TU1, Lev. 10, in situ
2. TL14-019: TU1, Lev. 9A and B, from ground surface, spilled from bucket
3. TL14-020: TU1, Lev. 10, flakes, 1/4" screen
4. TL14-021: TU1, Lev. 12, flake recovered during shovel skimming, no X or Y, estimated Z
5. TL14-022: TU1, Lev. 11/12, flakes, 1/4" screen sample
6. TL14-023: TU1, Lev. 13, 1/4" screen 'maybe' flake

* no catalog numbers issued on 6-5-14

CATALOG for 6-6-14
1. TL14-024: ST#3, upper sands
2. TL14-025: ST#5, upper A horizon
3. TL14-026: ST#4, 60-70 cmbs
4. TL14-027: ST#8, 10-15 cmbs
5. TL14-028: ST#8, 25-35 cmbs – flakes!!
6. TL14-029: ST#7, ~90 cmbs, black chert



60

6-4-14 Wednesday

Level 10 (45-50 cmbs)

- transition into B horizon continues
- matrix is medium tan color, fine-med. sand w/ pebbles ranging from 0.5-5 cm, common throughout
- krotovina running through W 1/3 & S 1/2 of unit - will remove & screen separately for Level 11 but could be the source for the 2 flakes recovered in the Lev. 10 screen (one flake had darker colored A-horizon matrix adhering to it that suggests either the krotovina or the more mottled E 1/2 of the unit where the darker staining of the A is still somewhat present)
- a broken cobble is embedded in the E-central portion of the floor, probably natural, visible in photo

61

Wednesday 6-4-14

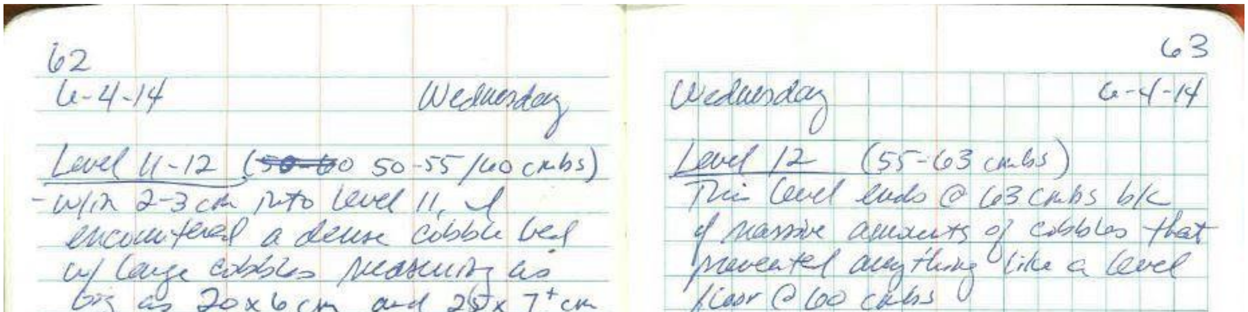
Level 11 (50-55 cmbs)

Krotovina

- 2 kinds of fill: a) loamy fine sand from A above; b) med-coarse tan sand from below
- in a couple of places the same burrow was re-used & the coarser tan sand underlay the finer dark brown loam showing the sequence of infilling
- some pebbles up to ~~4~~5 cm dia. were observed inside burrows

pebbles very common in both types of fill (falling in from above?)

- no artifacts or faunal remains in either



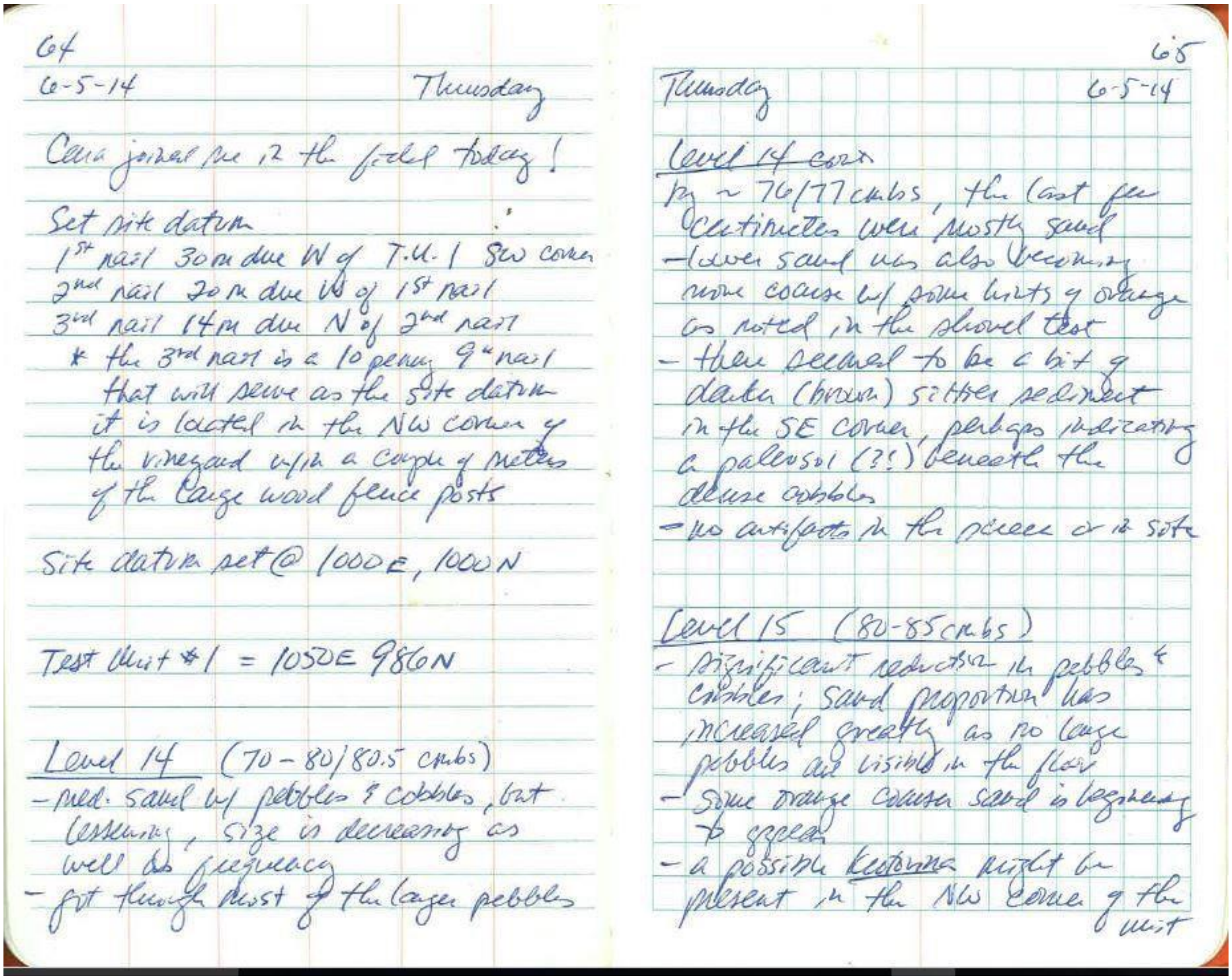
62
6-4-14 Wednesday

Level 11-12 (~~50-60~~ 50-55/60 cmbs)
- w/in 2-3 cm into level 11, I encountered a dense cobble bed w/ large cobbles measuring as big as 20 x 6 cm and 25 x 7+ cm in size, lots of cobbles in the matrix
- A large, intact biface thinning flake was recovered while shovel skimming, it came from w/in 57-59.5 cmbs in the SE 1/4 of the unit – bagged separately
- the SE 1/4 of the unit ended at ~60 cmbs b/c of so many large rocks that extended down into Level 12 – the rest of the unit measured btwn. 55-57 cmbs throughout
- fine-medium sand, little to no silt
- photoed larger rocks on black plastic after screening matrix – these are just the ones ≥5 cm, scale = 50 cm
- a couple of flakes recovered in screen
- check red frag. w/ TL14-018

63
Wednesday 6-4-14

Level 12 (55-63 cmbs)
This level ends @ 63 cmbs b/c of massive amounts of cobbles that prevented anything like a level floor @ 60 cmbs
- tons of cobbles & pebbles – large sized – photoed examples on black plastic w/ 50 cm scale & a typical view of the 1/4" screen after fine-med. sand had been sifted
- no artifacts or faunal remains recovered

Level 13 (63-70 cmbs)
- consistent w/ level 12: fine-med. sand w/ abundant pebbles & (large) cobbles. Some silt appears in pockets adhering to some stones & not others
- major pebble & cobble content as much or more than level 12
- no artifacts recovered – 1 'maybe' flake



64
6-5-14 Thursday

Cara joined me in the field today!

Set site datum
1st nail 30m due W of T.U. 1 SW corner
2nd nail 20m due W of 1st nail
3rd nail 14m due N of 2nd nail
* the 3rd nail is a 10 penny 9" nail
that will serve as the site datum
it is located in the NW corner of
the vineyard w/in a couple of meters
of the large wood fence posts

Site datum set @ 1000E, 1000N

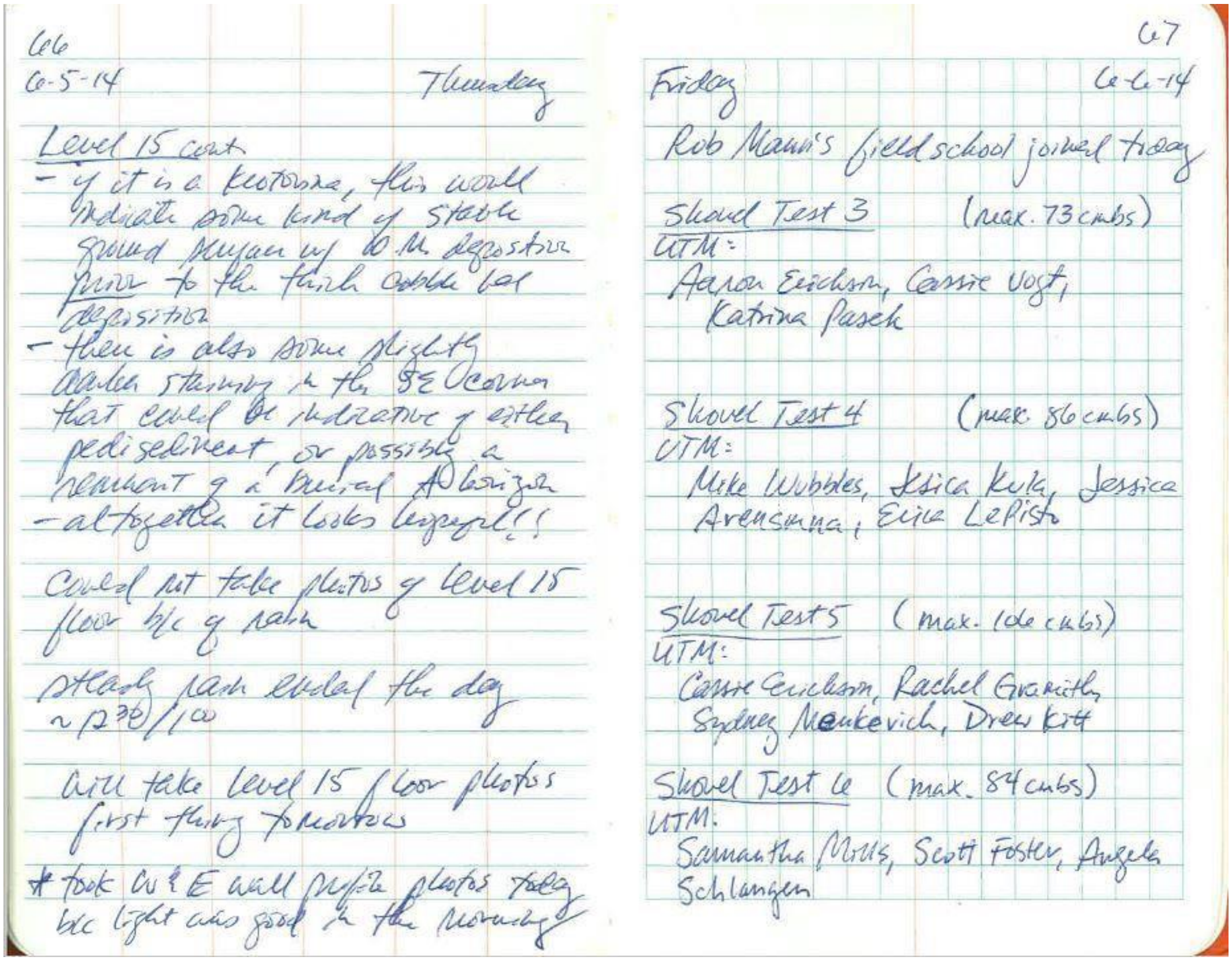
Test Unit #1 = 1050E 986N

Level 14 (70-80/80.5 cmbs)
- med. sand w/ pebbles & cobbles, but lessening, size is decreasing as well as frequency
- got through most of the larger pebbles

65
Thursday 6-5-14

Level 14 cont.
By ~ 76/77 cmbs, the last few centimeters were mostly sand
- lower sand was also becoming more coarse w/ some hints of orange as noted in the shovel test
- there seemed to be a bit of darker (brown) siltier sediment in the SE corner, perhaps indicating a paleosol (?!) beneath the dense cobbles
- no artifacts in the screen or in situ

Level 15 (80-85 cmbs)
- Significant reduction in pebbles & cobbles; sand proportion has increased greatly as no large pebbles are visible in the floor
- Some orange coarser sand is beginning to appear
- a possible krotovina might be present in the NW corner of the unit



66

6-5-14 Thursday

Level 15 cont.

- if it is a [illegible], this would indicate some kind of stable ground surface w/ no deposition prior to the third cobble bar deposition
- there is also some slightly darker staining in the SE corner that could be indicative of either pedisediment, or possibly a remnant of a buried A horizon
- altogether it looks [illegible]!?

Could not take photos of level 15 floor b/c of rain

steady rain ended the day
$\sim 12^{30}/1^{00}$

will take level 15 floor photos first thing tomorrow

* took W & E wall profile photos today b/c light was good in the morning

67

Friday 6-6-14

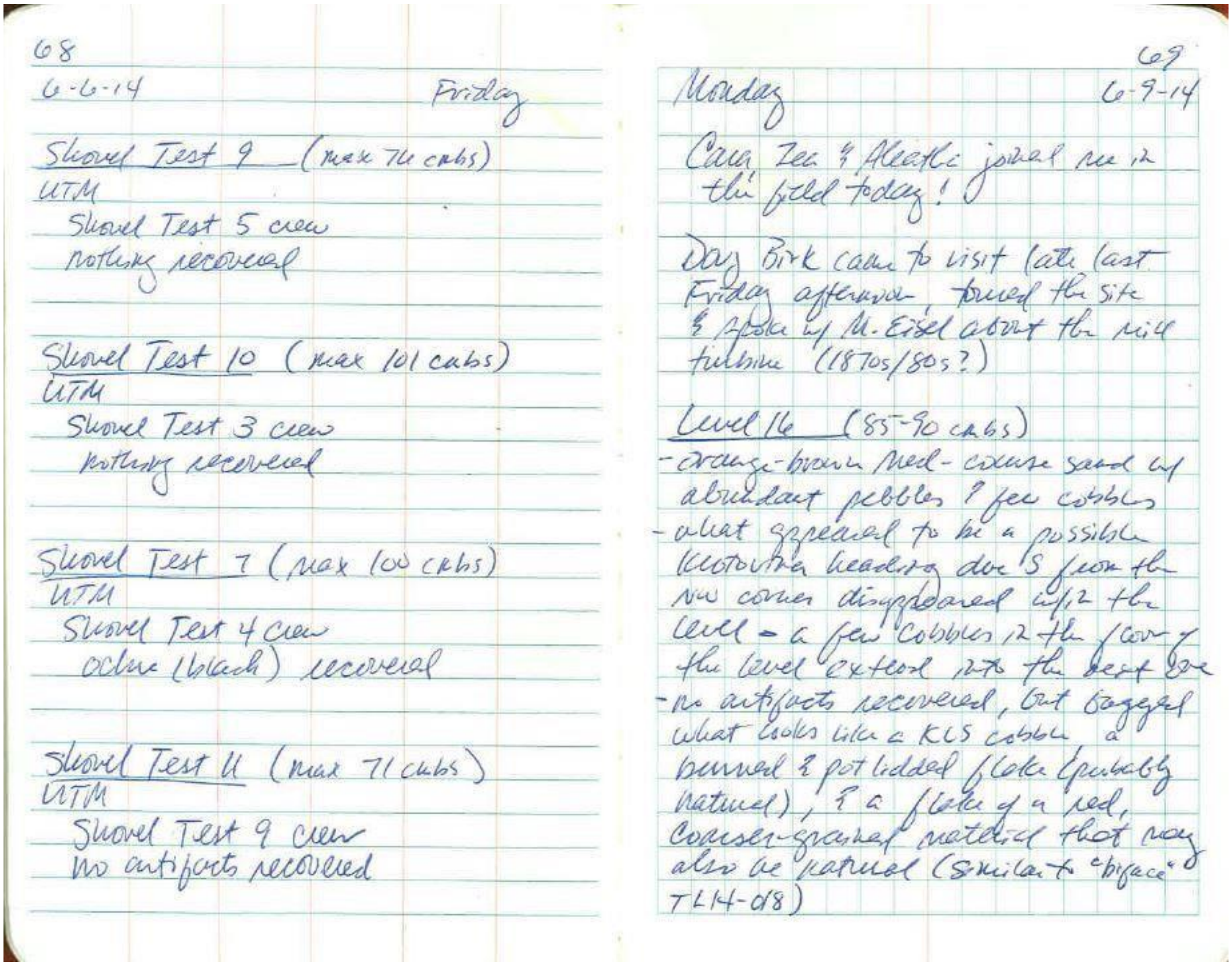
Rob Mann's field school joined today

Shovel Test 3 (max. 73 cmbs)
UTM:
Aaron Erickson, Cassie Vogt, Katrina Pasch

Shovel Test 4 (max. 86 cmbs)
UTM:
Mike Wubbles, Jessica Kula, Jessica Arensman, Erica LePisto

Shovel Test 5 (max. 106 cmbs)
UTM:
Cassie Erickson, Rachel Granith, Sydney Menkevich, Drew Kitt

Shovel Test 6 (max. 84 cmbs)
UTM:
Samantha Mills, Scott Foster, Angela Schlangen



68
6-6-14 Friday

Shovel Test 9 (max 76 cmbs)
UTM
Shovel Test 5 crew
nothing recovered

Shovel Test 10 (max 101 cmbs)
UTM
Shovel Test 3 crew
nothing recovered

Shovel Test 7 (max 100 cmbs)
UTM
Shovel Test 4 crew
ochre (black) recovered

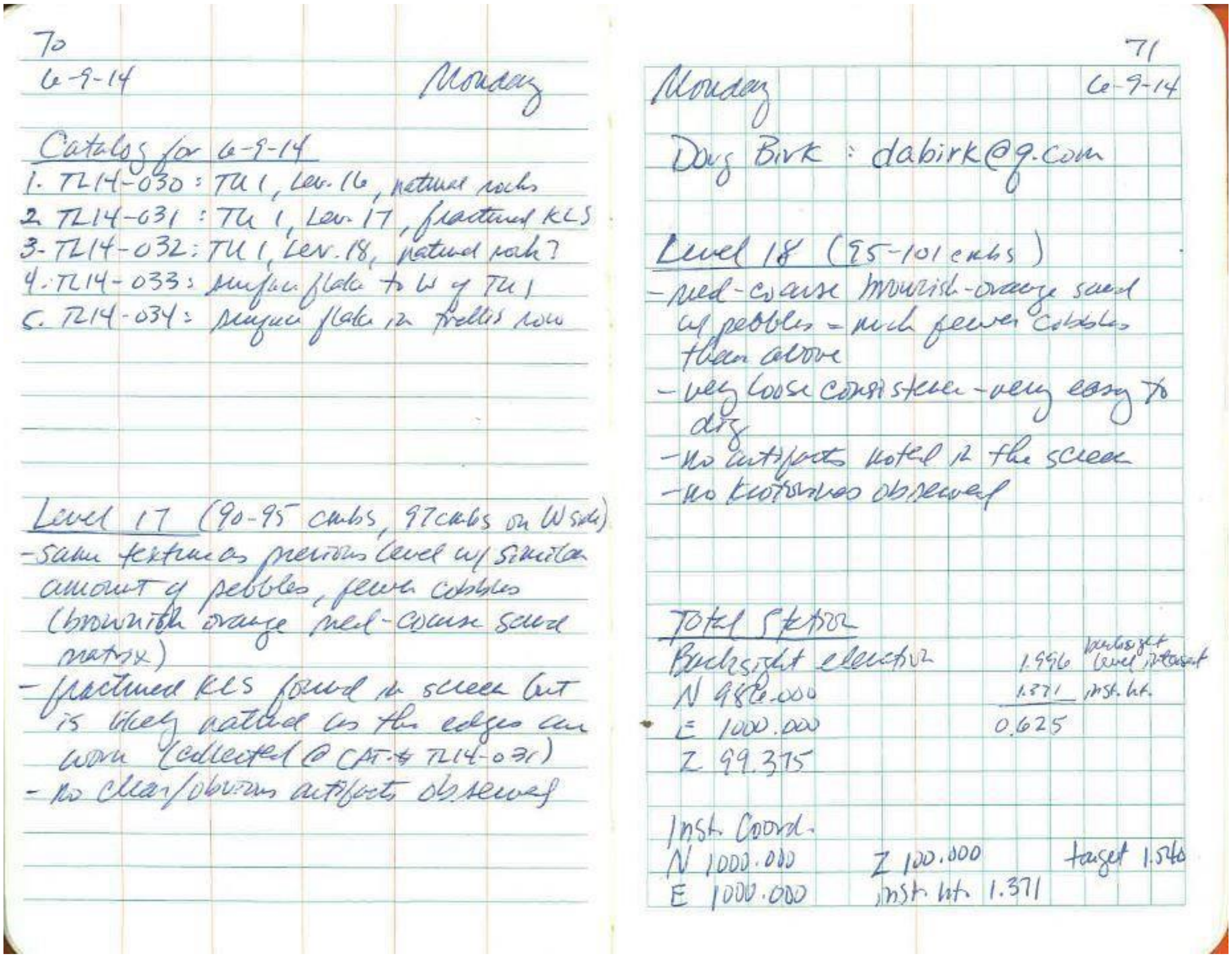
Shovel Test 11 (max 71 cmbs)
UTM
Shovel Test 9 crew
no artifacts recovered

69
Monday 6-9-14

Cara Lee & Aleathi joined me in the field today!

Doug Birk came to visit late last Friday afternoon, toured the site & spoke w/ M. Eisel about the mill turbine (1870s/80s?)

Level 16 (85-90 cmbs)
- orange-brown med-coarse sand w/ abundant pebbles & few cobbles
- what appeared to be a possible krotovina heading due S from the NW corner disappeared w/in the level – a few cobbles in the floor of the level extend into the next level
- no artifacts recovered, but bagged what looks like a KLS cobble, a burned & pot lidded flake (probably natural), & a flake of a red, coarser-grained material that may also be natural (similar to "biface" TL14-08)



70

6-9-14 Monday

Catalog for 6-9-14

1. TL14-030 : TU 1, Lev. 16, natural rocks
2. TL14-031 : TU 1, Lev. 17, fractured KLS
3. TL14-032 : TU 1, Lev. 18, natural rock?
4. TL14-033 : surface flake to W of TU 1
5. TL14-034 : surface flake in trellis row

Level 17 (90-95 cmbs, 97cmbs on W side)

- same texture as previous level w/ similar amount of pebbles, fewer cobbles (brownish orange med-coarse sand matrix)
- fractured KLS found in screen but is likely natural as the edges are worn (collected @ CAT # TL14-031)
- no clear/obvious artifacts observed

71

Monday 6-9-14

Doug Birk : dabirk@g.com

Level 18 (95-101 cmbs)

- med-coarse brownish-orange sand w/ pebbles - much fewer cobbles than above
- very loose consistency - very easy to dig
- no artifacts noted in the screen
- no features observed

Total Station

Backsight elevation 1.996 backsight level @ target

N 986.000 1.371 inst. ht.

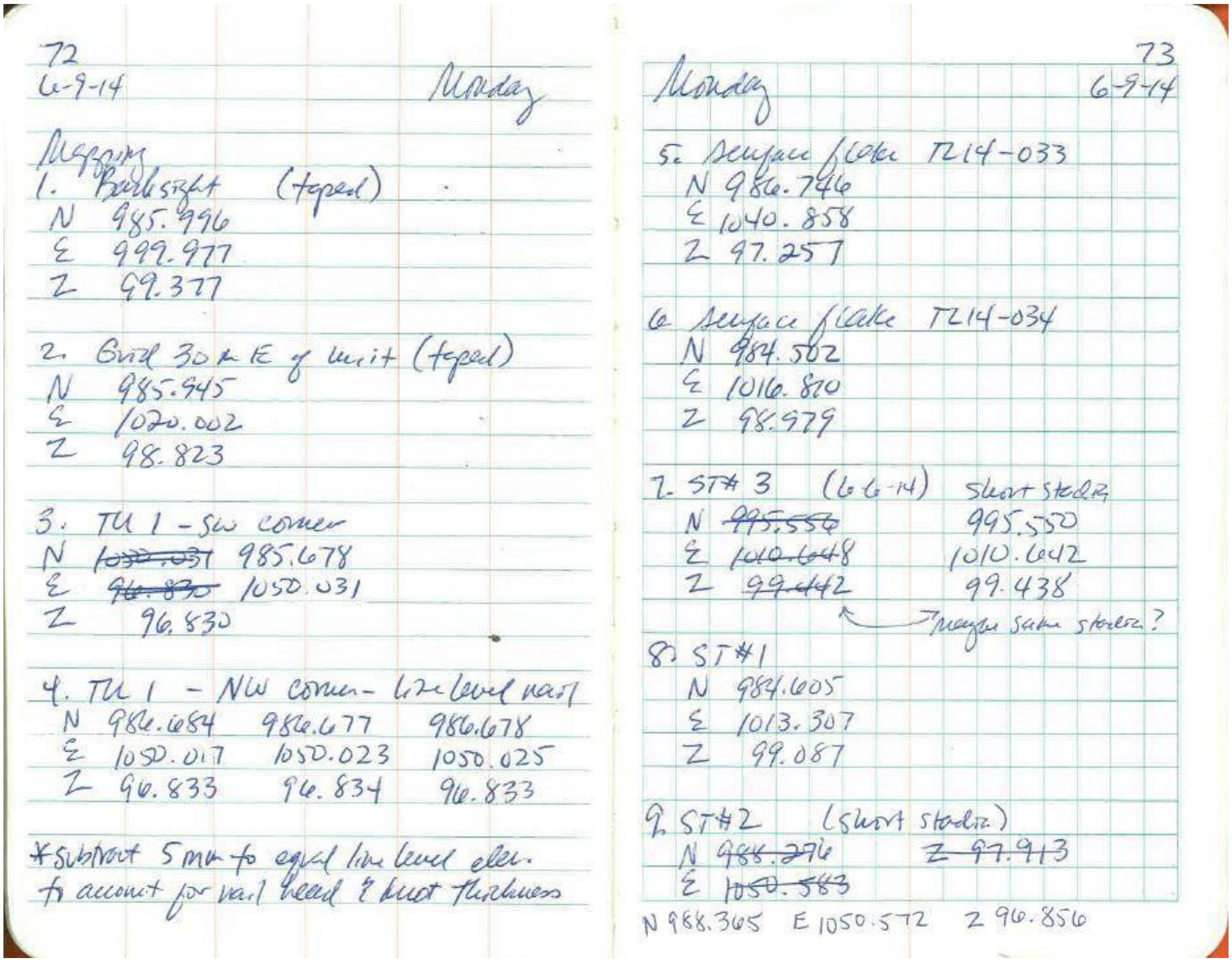
E 1000.000 0.625

Z 99.375

Inst. Coord.

N 1000.000 Z 100.000 target 1.540

E 1000.000 inst. ht. 1.371



72
6-9-14 Monday

Mapping
1. Backsight (taped)
N 985.996
E 999.977
Z 99.377

2. Grid 30 m E of unit (taped)
N 985.945
E 1020.002
Z 98.823

3. TU 1 - SW corner
N ~~1050.031~~ 985.678
E ~~96.830~~ 1050.031
Z 96.830

4. TU 1 - NW corner - line level nail

N	986.684	986.677	986.678
E	1050.017	1050.023	1050.025
Z	96.833	96.834	96.833

*subtract 5 mm to equal line level elev. to account for nail head & knot thickness

Monday 73
6-9-14

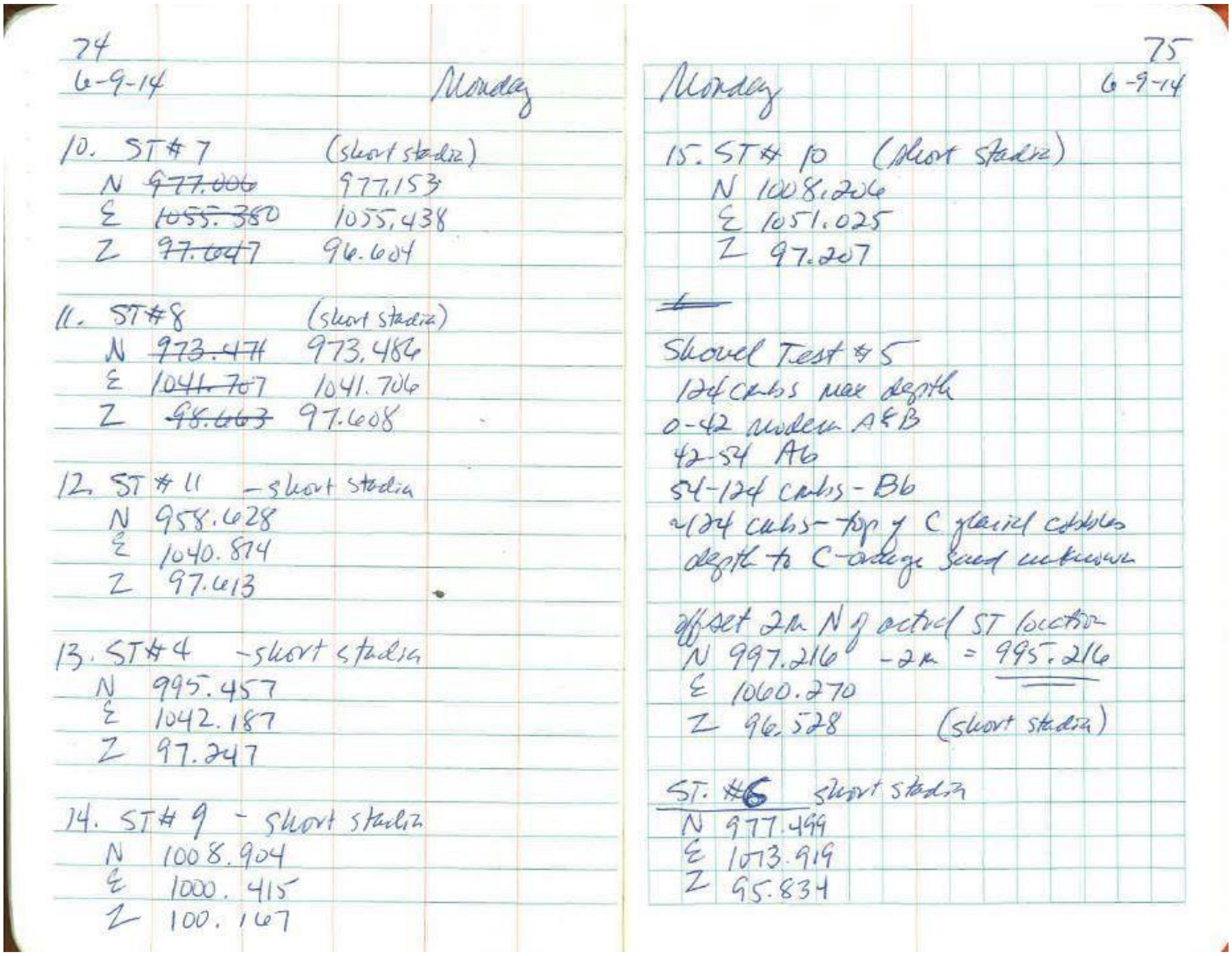
5. Surface flake TZ14-033
N 986.746
E 1040.858
Z 97.257

6 Surface flake TZ14-034
N 984.502
E 1016.820
Z 98.979

7. ST# 3 (6-6-14) short stake
N ~~995.554~~ 995.550
E ~~1010.648~~ 1010.642
Z ~~99.442~~ 99.438
maybe same stake?

8. ST#1
N 984.605
E 1013.307
Z 99.087

9. ST#2 (short stake)
N ~~988.276~~ ~~Z 97.913~~
E ~~1050.583~~
N 988.365 E 1050.572 Z 96.856



74
6-9-14 Monday

10. ST#7 (short stadia)
N ~~977.006~~ 977.153
E ~~1055.380~~ 1055.438
Z ~~97.047~~ 96.604

11. ST#8 (short stadia)
N ~~973.471~~ 973.486
E ~~1041.707~~ 1041.706
Z ~~98.663~~ 97.608

12. ST#11 - short stadia
N 958.628
E 1040.874
Z 97.613

13. ST#4 - short stadia
N 995.457
E 1042.187
Z 97.247

14. ST#9 - short stadia
N 1008.904
E 1000.415
Z 100.167

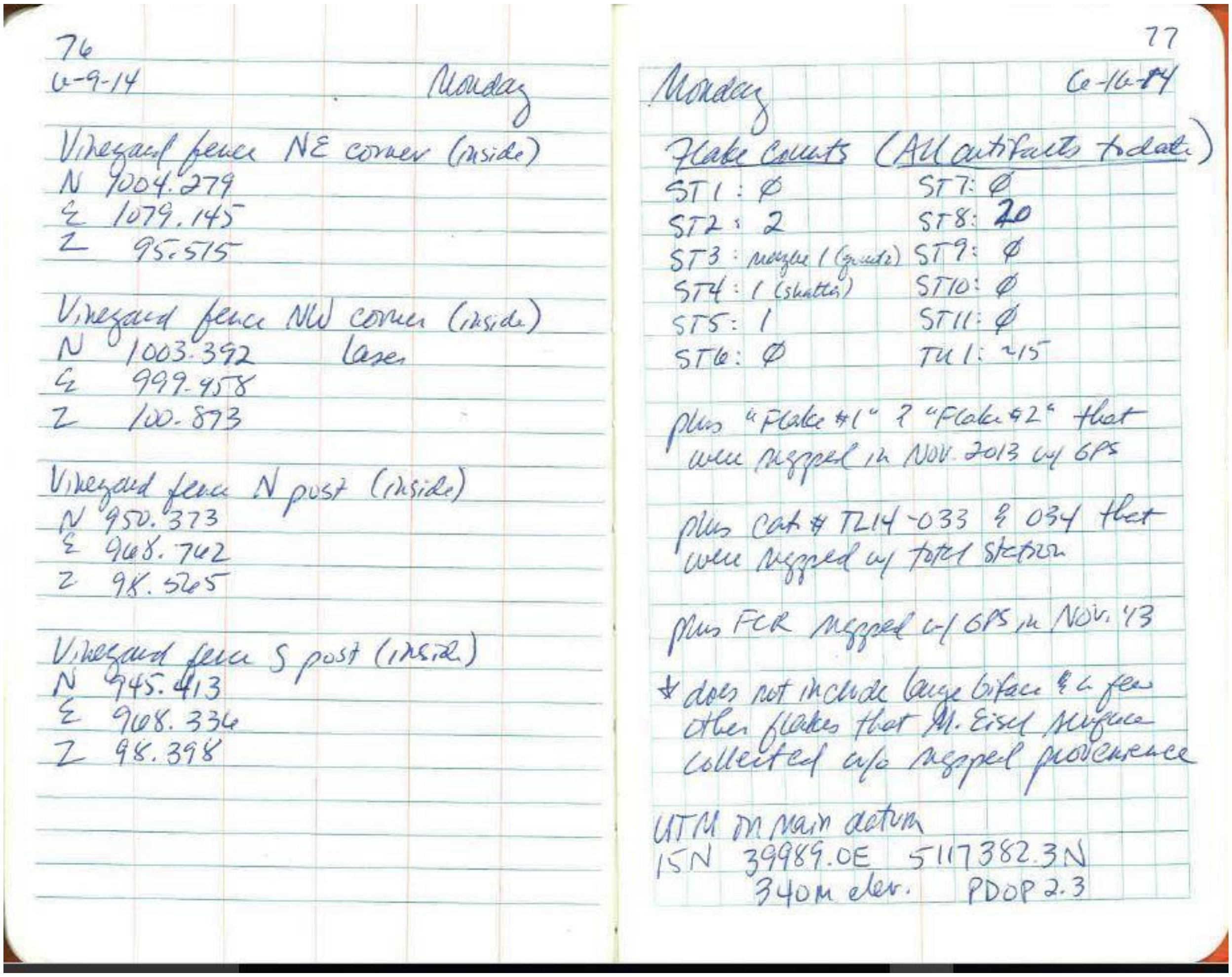
75
Monday 6-9-14

15. ST# 10 (short stadia)
N 1008.206
E 1051.025
Z 97.207

Shovel Test #5
124 cmbs max depth
0-42 modern A&B
42-54 Ab
54-124 cmbs - Bb
~124 cmbs - top of C glacial cobbles
depth to C-outwash sand unknown

offset 2m N of actual ST location
N 997.216 -2m = 995.216
E 1060.270
Z 96.528 (short stadia)

ST. #6 short stadia
N 977.499
E 1013.919
Z 95.834



76
6-9-14 Monday

Vineyard fence NE corner (inside)
N 1004.279
E 1079.145
Z 95.515

Vineyard fence NW corner (inside)
N 1003.392 laser
E 999.458
Z 100.873

Vineyard fence N post (inside)
N 950.373
E 968.742
Z 98.565

Vineyard fence S post (inside)
N 945.413
E 968.336
Z 98.398

77
Monday 6-16-14

Flake Counts (All artifacts to date)

ST1 : 0	ST7: 0
ST2 : 2	ST8: 20
ST3 : maybe 1 (quartz)	ST9: 0
ST4 : 1 (shatter)	ST10: 0
ST5 : 1	ST11: 0
ST6 : 0	TU 1: ~15

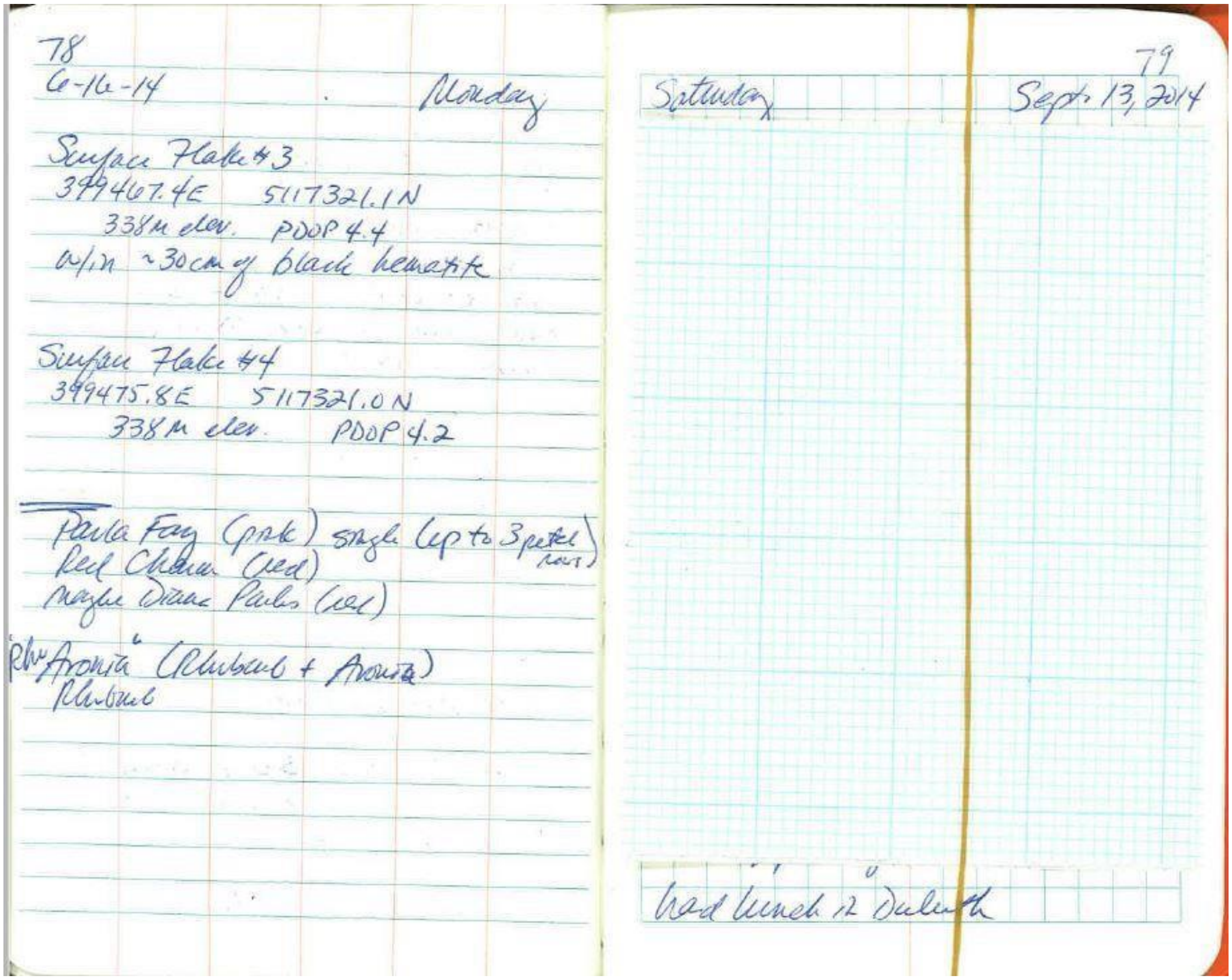
plus "Flake #1" & "Flake #2" that were mapped in Nov. 2013 w/ GPS

plus cat # TL14-033 & 034 that were mapped w/ total station

plus FCR mapped w/ GPS in Nov. '13

* does not include large biface & a few other flakes that M. Eisel surface collected w/o mapped provenience

UTM on main datum
15N 39989.0E 5117382.3N
340m elev. PDOP 2.3



78
6-16-14 Monday

Surface Flake #3
399467.4E 5117321.1N
338m elev. PDOP 4.4
w/in ~30cm of black hematite

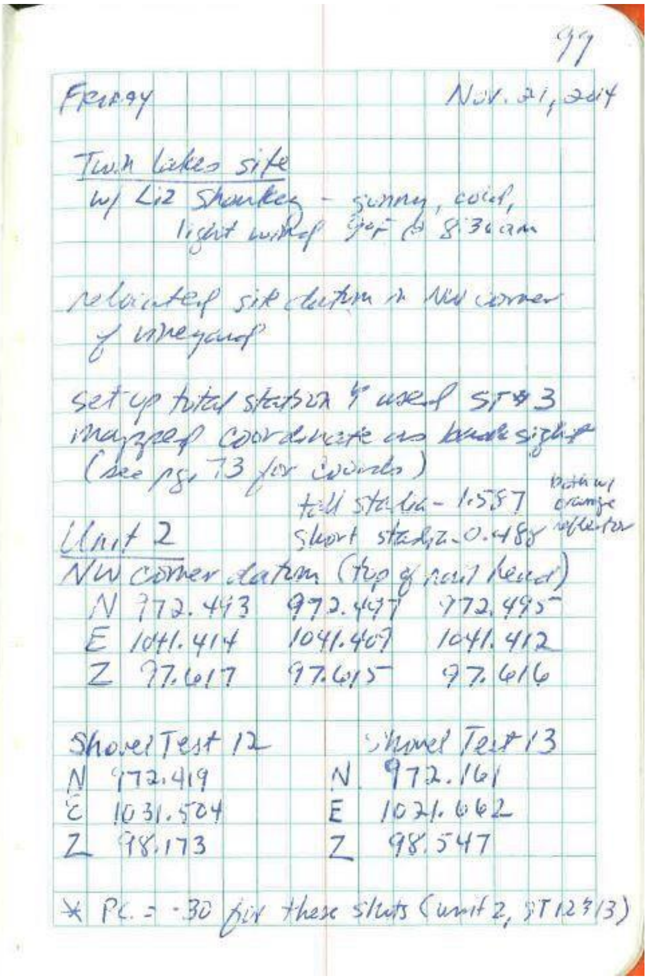
Surface Flake #4
399475.8E 5117321.0N
338m elev. PDOP 4.2

Paula Fay (pink) single (up to 3 petal rows)
Red Charm (red)
maybe Diana Parks (red)

Rh "Aronia" (Rhubarb + Aronia)
Rhubarb

79
Saturday Sept. 13, 2014

had lunch in Duluth



97

Friday Nov. 21, 2014

Twin Lakes site
w/ Liz Shanker - sunny, cold,
light wind, 30°F @ 8:30 am

relocated site datum in NW corner
of vineyard

set up total station & used ST#3
mapped coordinate as back sight
(see pg. 73 for coords)

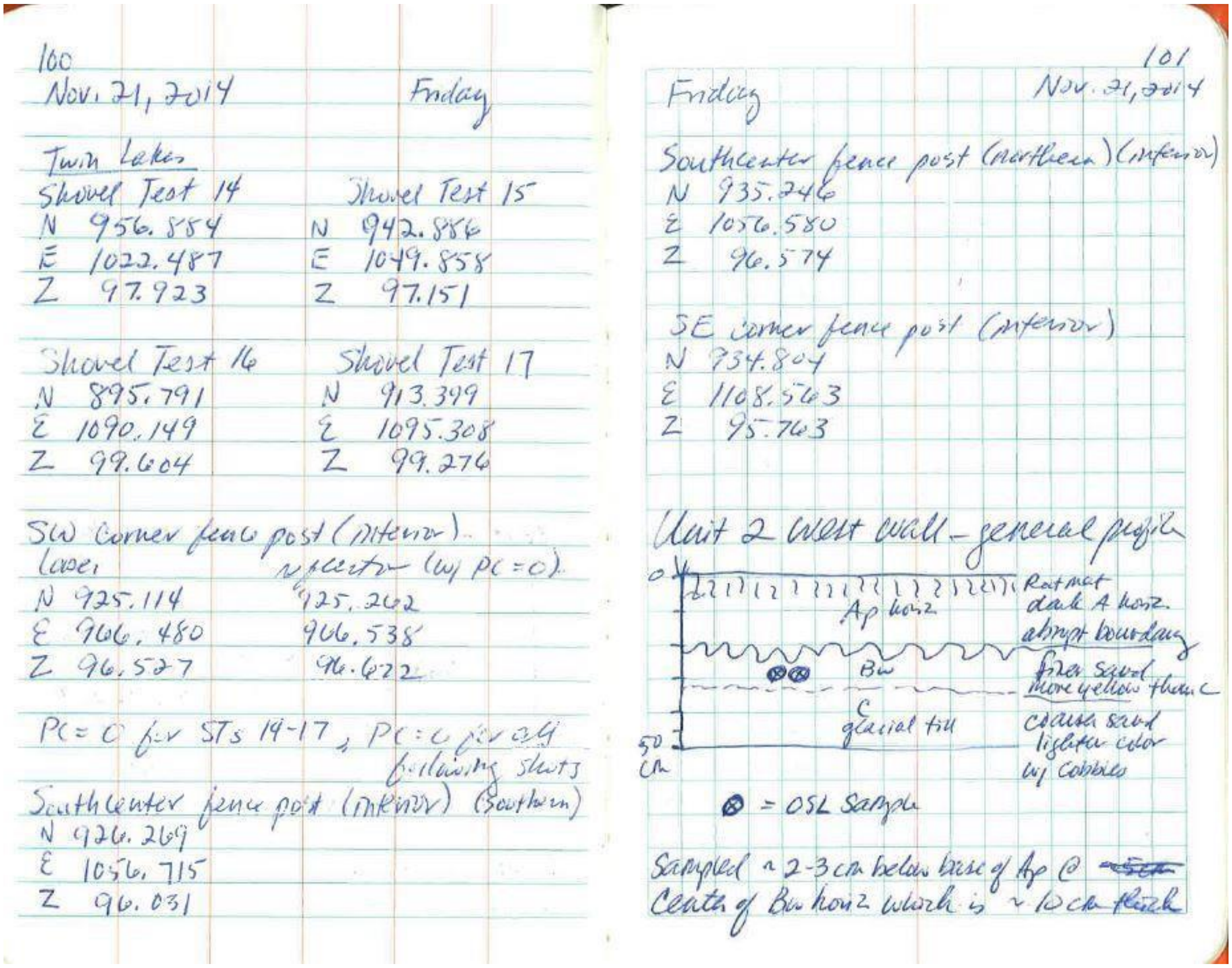
tall stadia - 1.587
short stadia - 0.488
both w/ orange reflector

Unit 2
NW corner datum (top of nail head)

N	972.493	972.497	972.495
E	1041.414	1041.407	1041.412
Z	97.617	97.615	97.616

Shovel Test 12		Shovel Test 13	
N	972.419	N	972.161
E	1031.504	E	1021.662
Z	98.173	Z	98.547

* P.C. = -30 for these shots (unit 2, ST12 & 13)



100
Nov. 21, 2014 Friday

Twin Lakes

Shovel Test 14	Shovel Test 15
N 956.884	N 942.886
E 1022.487	E 1049.858
Z 97.923	Z 97.151

Shovel Test 16	Shovel Test 17
N 895.791	N 913.399
E 1090.149	E 1095.308
Z 99.604	Z 99.276

SW corner fence post (interior)

laser	w/ center (w/ PC = 0)
N 925.114	925.262
E 966.480	966.538
Z 96.527	96.622

PC = 0 for STs 14-17, PC = 0 for all following shots

Southcenter fence post (interior) (Southern)
N 926.269
E 1056.715
Z 96.031

101
Friday Nov. 21, 2014

Southcenter fence post (northern) (interior)
N 935.246
E 1056.580
Z 96.574

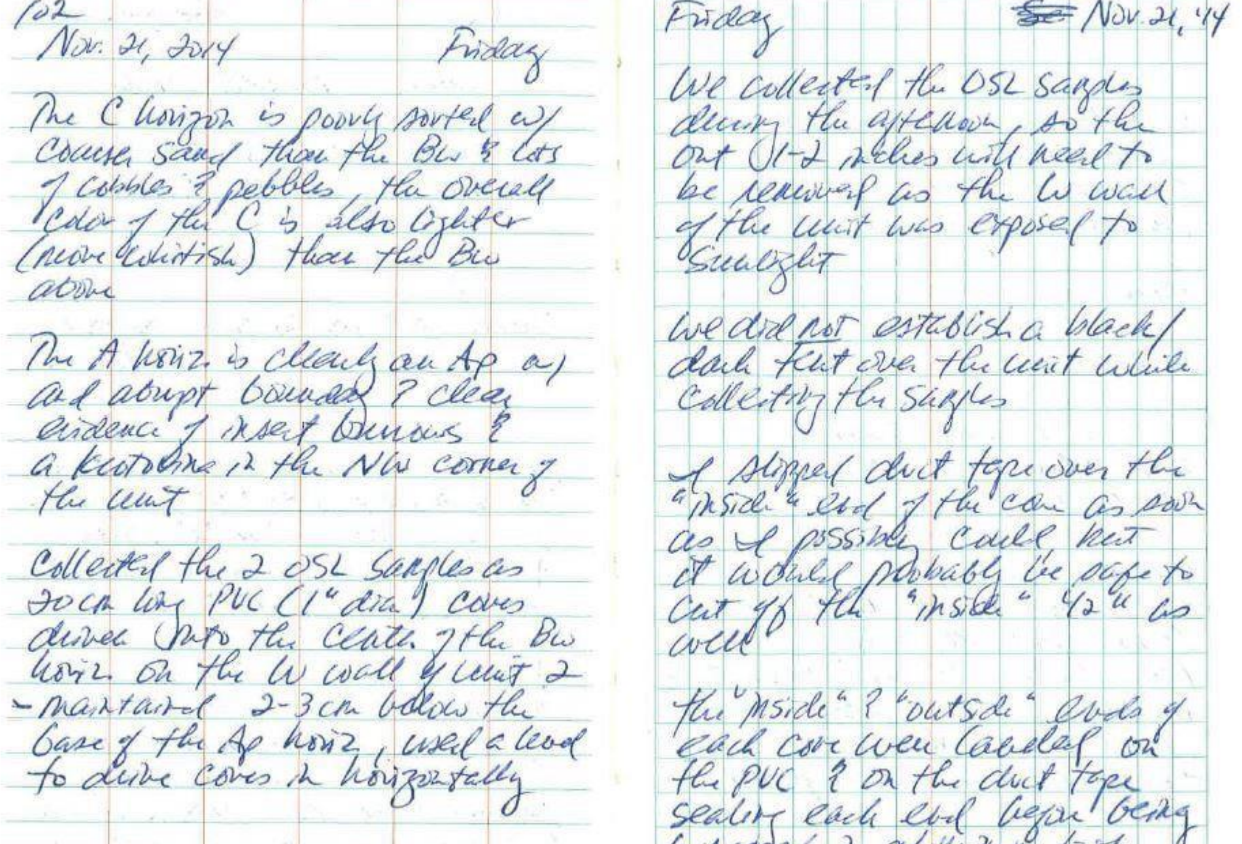
SE corner fence post (interior)
N 934.804
E 1108.563
Z 95.763

Unit 2 West wall – general profile

0
Root mat
dark A horz.
Ap horz
abrupt boundary
Bw
finer sand
more yellow than C
C
glacial till
coarser sand
lighter color
w/ cobbles
50 cm

⊗ = OSL Sample

Sampled ~ 2-3 cm below base of Ap @ Center of Bw horiz which is ~ 10 cm thick



102
Nov. 21, 2014 Friday

The C horizon is poorly sorted w/ coarser sand than the Bw & lots of cobbles & pebbles, the overall color of the C is also lighter (more whitish) than the Bw above

The A horiz. is clearly an Ap w/ and abrupt boundary & clear evidence of insect burrows & a krotovina in the NW corner of the unit

Collected the 2 OSL samples as 30cm long PVC (1" dia.) cores driven into the center of the Bw horiz. on the W wall of unit 2 - maintained 2-3cm below the base of the Ap horiz., used a level to drive cores in horizontally

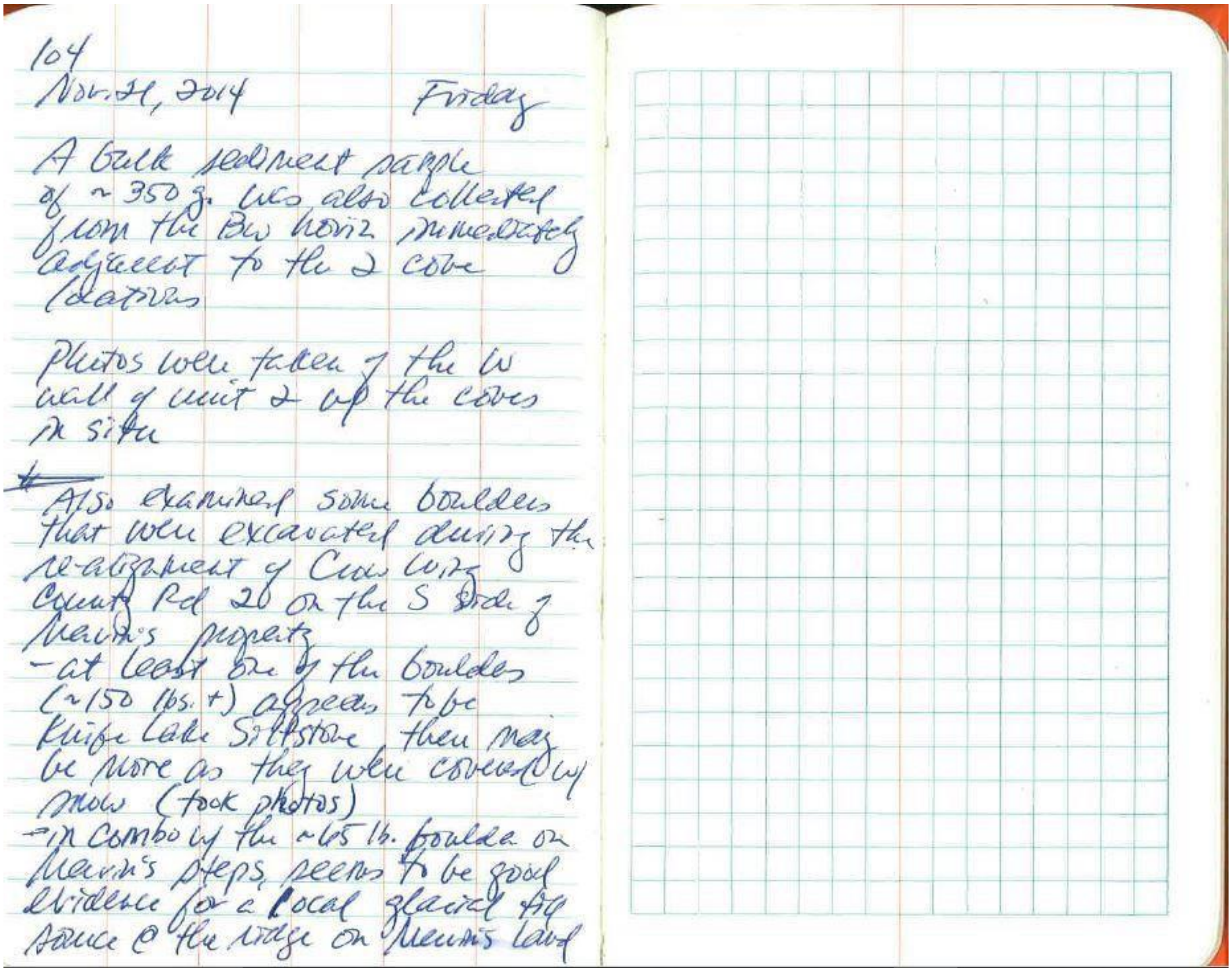
103
Friday ~~Se~~ Nov. 21, '14

We collected the OSL samples during the afternoon, so the outer 1-2 inches will need to be removed as the W wall of the unit was exposed to sunlight

We did not establish a black/dark tent over the unit while collecting the samples

I slipped duct tape over the "inside" end of the core as soon as I possibly could but it would probably be safe to cut off the "inside" 1/2" as well

The "inside" & "outside" ends of each core were labeled on the PVC & on the duct tape sealing each end before being wrapped in aluminum foil



104
Nov. 21, 2014 Friday

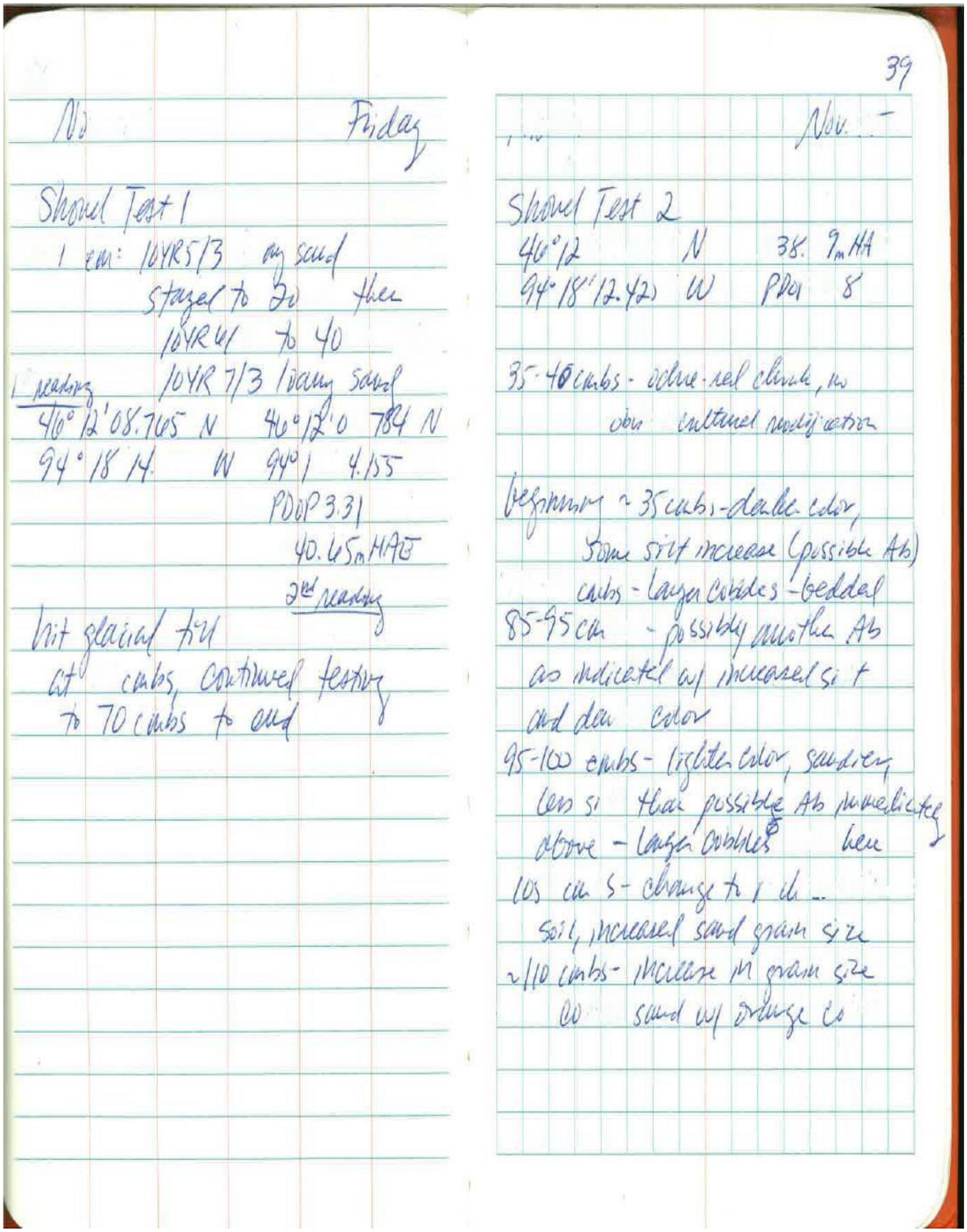
A bulk sediment sample
of ~350 g. was also collected
from the Bw horiz immediately
adjacent to the 2 core
locations

Photos were taken of the W
wall of unit 2 & of the cores
in situ

Also examined some boulders
that were excavated during the
re-alignment of Crow Wing
County Rd 20 on the S side of
Marvin's property
-at least one of the boulders
(~150 lbs.+) appears to be
Knife Lake Siltstone there may
be more as they were covered w/
snow (took photos)
→in combo w/ the ~65 lb. boulder on
Marvin's steps, seems to be good
evidence for a local glacial till
source @ the ridge on Marvin's land

Appendix B: Shovel Test Forms and Notes

Shovel Tests 1 and 2 notes



No Friday

Shovel Test 1

1 cm: 10YR5/3 dry sand

stayed to 20 then

10YR 4/1 to 40

10YR 7/3 loamy sand

1 reading

40° 12' 08.765 N 40° 12' 0 784 N

94° 18 14. W 94° 1 4.155

PDOP 3.31

40.65m HAE

2nd reading

hit glacial till

at cmbs, continued testing

to 70 cmbs to end

39

Nov.

Shovel Test 2

40° 12 N 38. 9m HA

94° 18' 12.42) W PDoP 8

35-40 cmbs - ochre-red chunk, no

obv cultural modification

beginning ~ 35 cmbs - darker color,

some silt increase (possible Ab)

cmbs - larger cobbles - bedded

85-95 cm - possibly another Ab

as indicated w/ increased silt

and dar color

95-100 cmbs - lighter color, sandier,

less si than possible Ab immediately

above - larger cobbles here

105 cm s - change to [illegible]

soil, increased sand grain size

~110 cmbs - increase in grain size

co sand w/ orange co

Shovel Test Form

Site/Locale ID Twin Lakes   Shovel Test ID # 3

Name/s CV, KP   Date 6/6/19

UTM: Z ____ E ____ N ____   PDOP: ____

Diameter (cm): 40   Max Depth (cm) 73   Photo: Y / N   [✓ Pos.] / Neg.   Collect: [✓ Y] / N

Catalog Number/s: TL 14-024

Gen. Obs.: ____

Stratigraphic Profile	Notes
0cm (surface) - - - - - - - - - - - - - - - - -	
-	10yr 2/2
10	Loamy Sand
-	
20 - - - - - - - -	
-	10yr 4/6
30	Sandy Loam
-	Flake found within
40	first 10cm of this level.
-	
50	
54 - - - - - - - - - - - - - -	base of heavy gravel/cobbles
60 - - - - - - -	
-	7.5yr 5/8 "orange sand"
70	Sand
-	
75	
-	
80	
-	
85	
-	
90	
-	
100	

Shovel Test Form

Site/Locale ID Twin Lakes Shovel Test ID # 4

Name/s Jessica, Kala, Michael W., Jessica H., Erica L. Date 6/6/14

UTM: Z ______ E ______ N ______ PDOP: ______

Diameter (cm): 38 cm Max Depth (cm) 86 cm Photo: [✓ Y] / N [✓ Pos.] / Neg. Collect: [✓ Y] / N

Catalog Number/s: TL14-026

Gen. Obs.: ______

	Stratigraphic Profile		**Notes**
	0cm (surface)	- - - - - - - - - - - - - - - - -	
	-		nothing significant
	10	Loamy Sand 10YR 3/4	
	-		
	20		
	-		
30cm	30		
	-	Loamy Sand 2.5Y 4/4 or 10 YR 4/4	cobbles appear
	40		
47cm	-		
	50	- - - - - - - - - - - - - -	M.M. boundary @ 50 cmbs
	-		Gets more orange as depth gets further
	60	Sand 10YR 4/6	down
	-		62cm - found odd, white, artifact. → rock
	70		appears to be chalky
	-		
	75		72cm - found angular piece of
	-		Knife Lake silt stone shatter - possible artifact M.H.
	80		Cobbles continue
	-		
86cm	85	FINAL DEPTH	
	-		
	90		
	-		
	100		

Shovel Test Form

Site/Locale ID Twin Lakes   Shovel Test ID # 5

Name/s CE, SKM, DK, RG   Date 06-06-14

UTM: Z ____ E ____ N ____ PDOP: ____

Diameter (cm): 40   Max Depth (cm) 106   Photo: [✓ Y] / N   [✓ Pos.] / Neg.   Collect: [✓ Y] / N

Catalog Number/s: TL14-025

Gen. Obs.: ____

Stratigraphic Profile   Notes

0cm (surface) - - - - - - - - - - - - - - - - -   ~~Corvina~~ Krotovina m.m.

\-   10YR 3/3 Dark Brown   We did not hit cobble

10

\-

20

\-   Sandy silt Loam

30

\-

40

\-

51 50

\-   10YR 3/2 very Dark gray Brown   sandy silt Loam paleosol (m.m.)

59 60   10YR 5/3 Brown

\-

70 Loamy sand ← Krotovina

\-

75   10YR 4/4 Dark Yellow Brown   Loamy Sand

\-

80

\-

85

\-

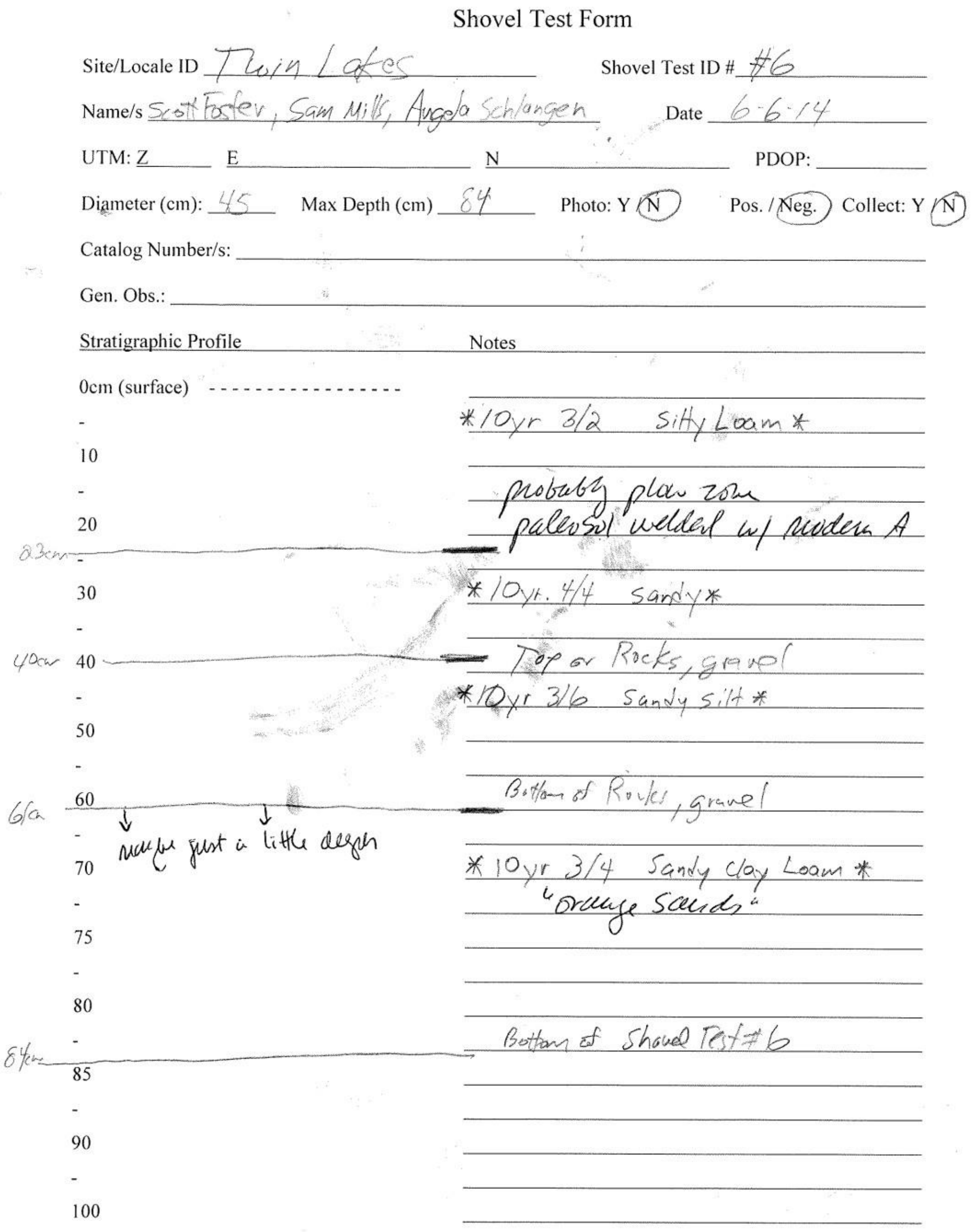
90

\-

100

\-

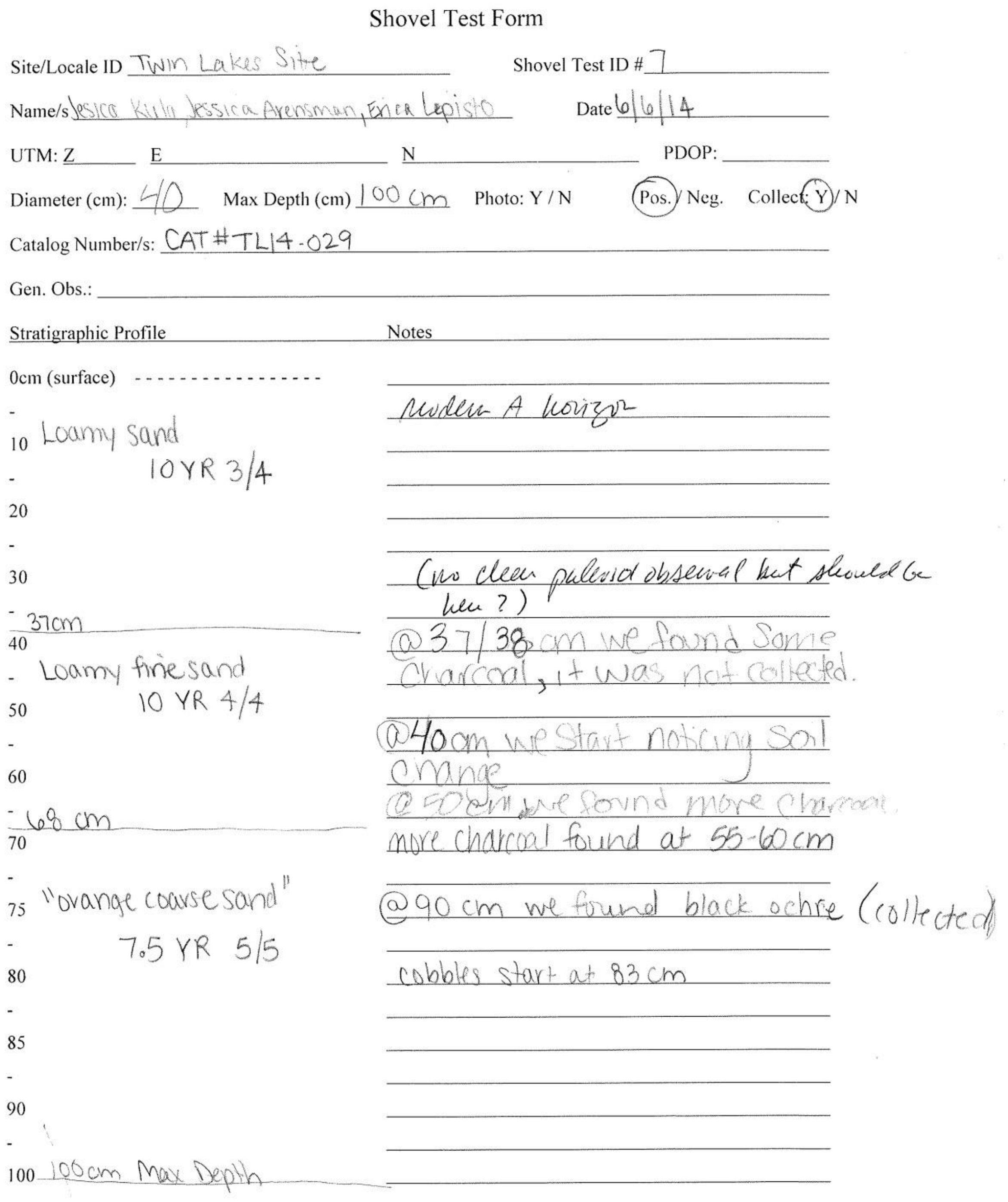
106



Shovel Test Form

Site/Locale ID Twin Lakes
Shovel Test ID # #6
Name/s Scott Foster, Sam Mills, Angela Schlangen
Date 6-6-14
UTM: Z ____ E ____ N ____
PDOP: ____
Diameter (cm): 45
Max Depth (cm) 84
Photo: Y [✓ N]
Pos. / [✓ Neg.]
Collect: Y [✓ N]
Catalog Number/s: ____
Gen. Obs.: ____

	Stratigraphic Profile	Notes
	0cm (surface) - - - - - - - - - - - - - - - - -	
	-	*10yr 3/2 Silty Loam*
	10	
	-	probably plow zone
	20	paleosol welded w/ modern A
23cm	-	
	30	*10yr. 4/4 sandy*
	-	
40cm	40	Top of Rocks, gravel
	-	*10yr 3/6 Sandy silt*
	50	
	-	
61cm	60	Bottom of Rocks, gravel
	- maybe just a little deeper	
	70	*10yr 3/4 Sandy Clay Loam*
	-	"orange sands"
	75	
	-	
	80	
	-	Bottom of Shovel Test #6
84cm	85	
	-	
	90	
	-	
	100	



Shovel Test Form

Site/Locale ID Twin Lakes Site Shovel Test ID # 7

Name/s Jesica Kuhn, Jessica Arensman, Erica Lepisto Date 6/6/14

UTM: Z ______ E ______ N ______ PDOP: ______

Diameter (cm): 40 Max Depth (cm) 100 cm Photo: Y / N [✓ Pos.] / Neg. Collect: [✓ Y] / N

Catalog Number/s: CAT# TL14-029

Gen. Obs.: ______

Stratigraphic Profile		Notes
0cm (surface)	- - - - - - - - - - - - - - - - -	
-		modern A horizon
10	Loamy sand	
-	10YR 3/4	
20		
-		
30		(no clear paleosol observed but should be here ?)
-	37cm	@37/38 cm we found some
40		charcoal, it was not collected.
-	Loamy fine sand	
50	10 YR 4/4	
-		@40cm we start noticing soil
60		change
-	68 cm	@50cm we found more charcoal
70		more charcoal found at 55-60cm
-		
75	"orange coarse sand"	@90 cm we found black ochre (collected)
-	7.5 YR 5/5	
80		cobbles start at 83 cm
-		
85		
-		
90		
-		
100	100cm Max Depth	

Shovel Test Form

Site/Locale ID Twin Lakes Site

Shovel Test ID # 08

Name/s Samantha Mills, Scott Foster, Jacob B. Fritz

Date 06-06-2014

UTM: Z ______ E ______ N ______ PDOP: ______

Diameter (cm): 48 Max Depth (cm) 62 Photo: [✓ Y] / N [✓ Pos.] / Neg. Collect: [✓ Y] / N

Catalog Number/s: TL14-027 and TL14-028

Gen. Obs.: ______

	Stratigraphic Profile		Notes
	0cm (surface)	- - - - - - - - - - - - - - - -	
	-		
	10	Loamy Sand	10-15cmbs flake Knife lake siltstone
	-	10yr 3/3	
20cm	20		*
	-		
	30	Loamy Sand	25-35cmbs found 12-17 flakes
	-	10yr 3/4	
	40		
	-		
49cm	50		*
	-	Sand 10yr 3/6	Sand had an orange tint
62cm	60		*
	-		
	70		
	-		
	75		
	-		
	80		
	-		
	85		
	-		
	90		
	-		
	100		

Shovel Test Form

Site/Locale ID Twin Lakes   Shovel Test ID # 9

Name/s Rachel Drew, Sydney, Cassie   Date 6-6-14

UTM: Z   E   N   PDOP:

Diameter (cm): 40cm Max Depth (cm) 76cm Photo: [✓ Y] / N   Pos. / [✓ Neg.]   Collect: Y / [✓ N]

Catalog Number/s: N/A

Gen. Obs.:

Stratigraphic Profile   Notes

0cm (surface) - - - - - - - - - - - - - - - - -   roots down to about 30cm

-

10 10yr 2/2 very dark brown

-

20 silty loam

-

30 10yr 3/3 dark brown sandy silty loam

-

40 10yr 4/4 dark yellowish brown sandy loam

-

50

- 10yr 3/4 dark yellowish brown

60 loamy sand

- Coarse orange sand

70 10yr 4/4 dark yellowish brown

-

75 bottom of shovel test

-

80

-

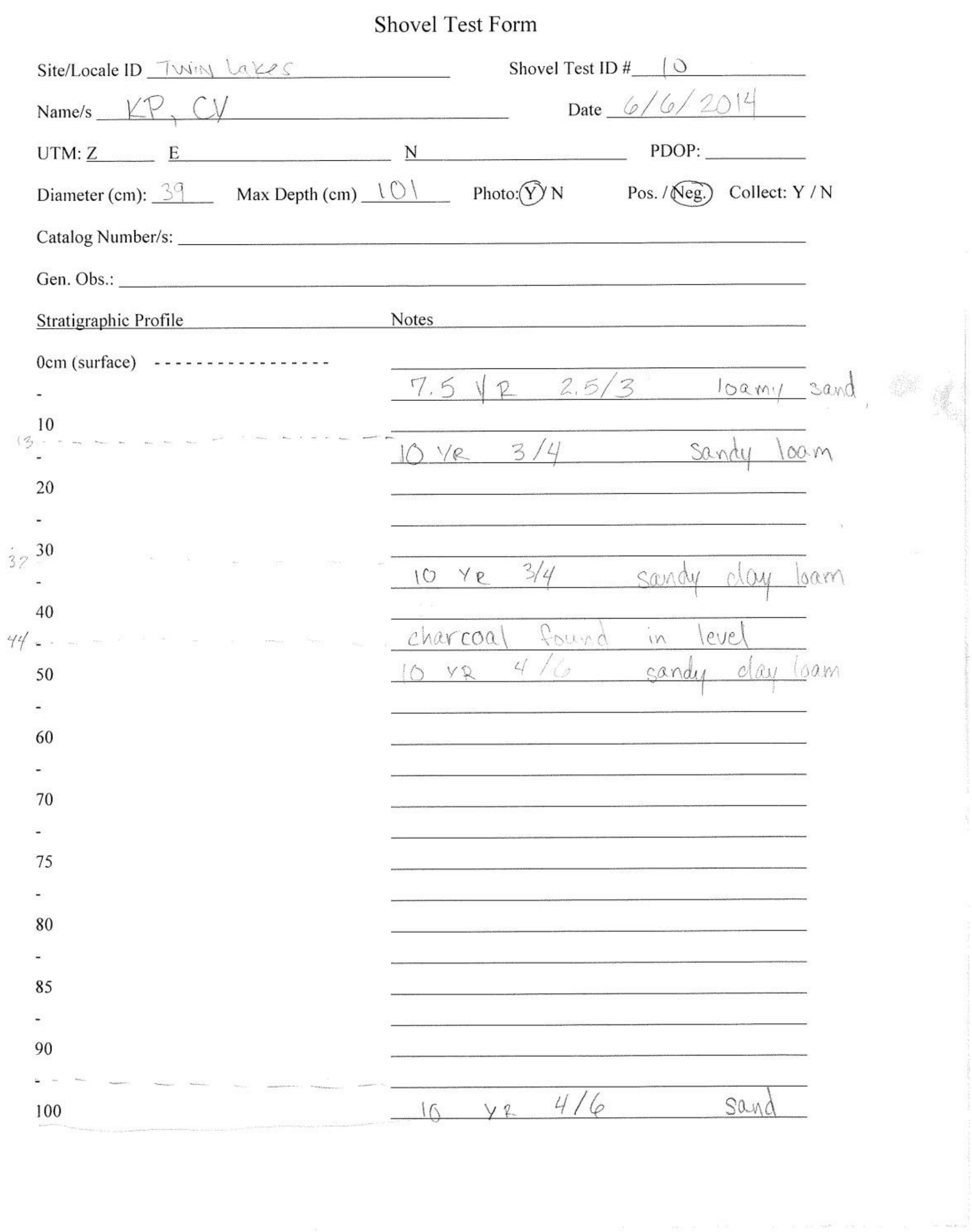
85

-

90

-

100



Shovel Test Form

Site/Locale ID Twin Lakes   Shovel Test ID # 10

Name/s KP, CV   Date 6/6/2014

UTM: Z ____ E ____ N ____ PDOP: ____

Diameter (cm): 39   Max Depth (cm) 101   Photo: [✓ Y] N   Pos. / [✓ Neg.]   Collect: Y / N

Catalog Number/s: ____

Gen. Obs.: ____

Stratigraphic Profile	Notes
0cm (surface) - - - - - - - - - - - - - - - - -	
-	7.5 YR 2.5/3 loamy sand
10	
13 - - - - - - - - - - - - - - -	10 YR 3/4 sandy loam
20	
-	
32 30 - - - - - - - - - - -	
-	10 YR 3/4 sandy clay loam
40	
44 - - - - - - - - - - - - -	charcoal found in level
50	10 YR 4/6 sandy clay loam
-	
60	
-	
70	
-	
75	
-	
80	
-	
85	
-	
90	
- - - - - - - - - - - - - - - -	
100	10 YR 4/6 sand

Shovel Test Form

Site/Locale ID Twin Lakes Site

Shovel Test ID # 11

Name/s SM, BG, CE, AK

Date 6-6-14

UTM: Z ____ E ____ N ____

PDOP: ____

Diameter (cm): 40

Max Depth (cm) 71

Photo: [✓ Y] / N

Pos. / [✓ Neg.]

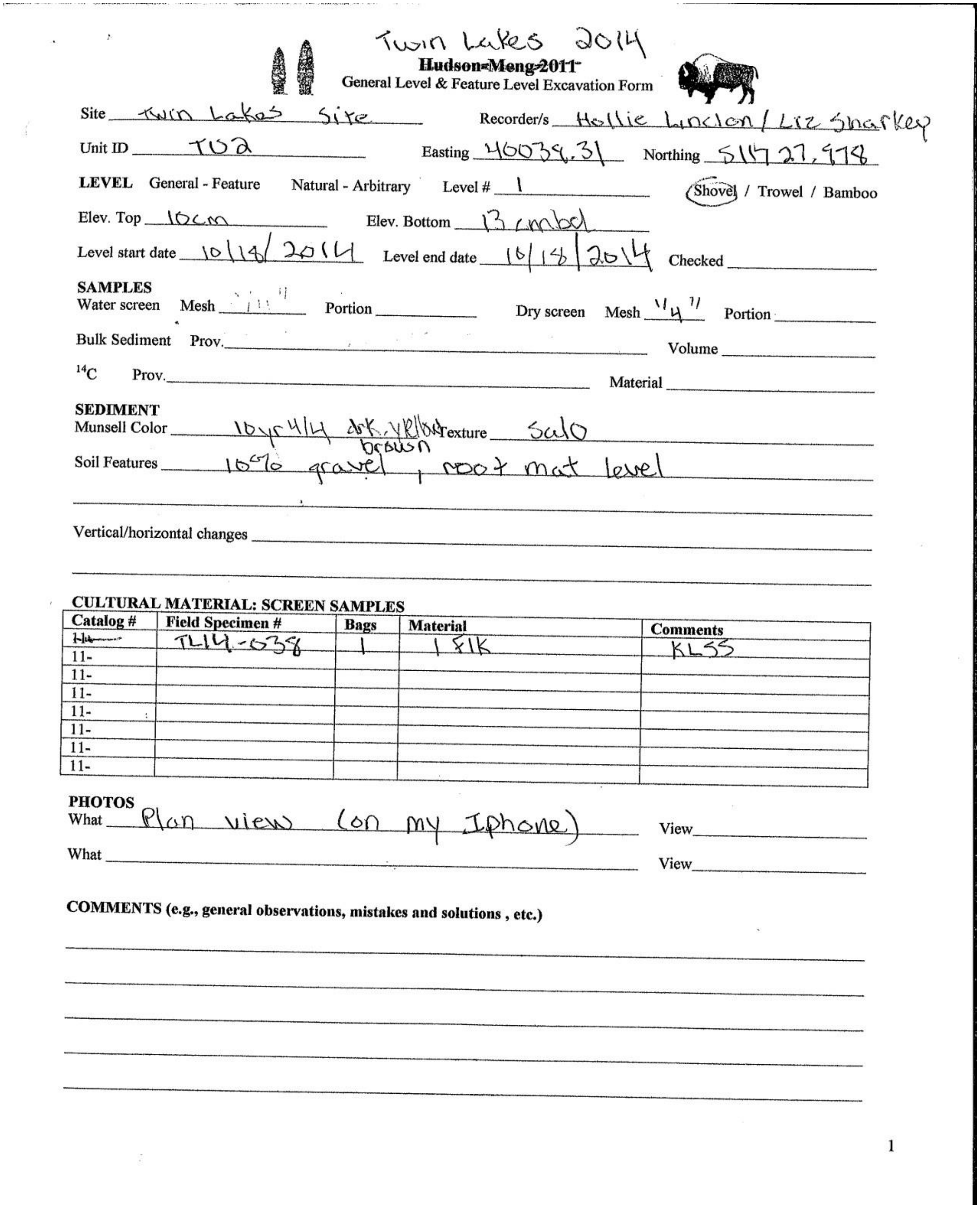
Collect: Y / [✓ N]

Catalog Number/s: —

Gen. Obs.: ____

	Stratigraphic Profile		Notes
	0cm (surface)	-----------------	-saw apiece of ochre.
	-		
	10	10YR 3/4 dark yellowish brown	
14cm	-		
	20		
	-		
	30		
	-		
	40	10YR 4/4 dark yellowish brown	
43cm	-		
	50		"orange sands" M.M.
	-		
	60		
	-		
	70	10YR 4/6 dark yellowish brown	
71cm	-		
	75		
	-		
	80		
	-		
	85		
	-		
	90		
	-		
	100		

Appendix C: Unit Forms



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Site Recorder/s Hollie Linclon / Liz Sharkey

Unit ID TU2 Easting 46039.31 Northing 5117 27.978

LEVEL General - Feature Natural - Arbitrary Level # 1 [✓ Shovel] / Trowel / Bamboo

Elev. Top 10cm Elev. Bottom 13 cmbd

Level start date 10/18/ 2014 Level end date 10/18/2014 Checked

SAMPLES

Water screen Mesh Portion Dry screen Mesh 1/4" Portion

Bulk Sediment Prov. Volume

^{14}C Prov. Material

SEDIMENT

Munsell Color 10yr4/4 dk. yellow brown Texture Salo

Soil Features 10% gravel, root mat level

Vertical/horizontal changes

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
~~11-~~	TL14-038	1	1 FlK	KL55
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS

What Plan view (on my Iphone) View

What View

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

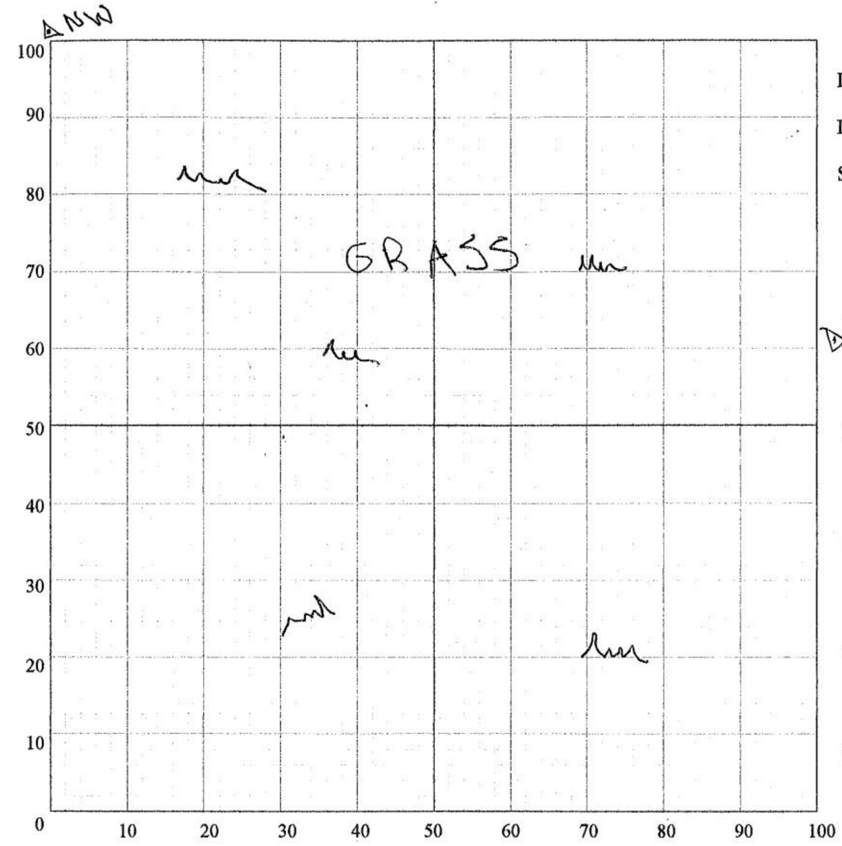
1

Site ______ Recorder/s ______

Unit ID ______ Easting ______ Northing ______

LEVEL General - Feature Natural [✓ - Arbitrary] Level # 1 Target elev. BLL ______

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: 10 cm

Line level: 10cm

Surface: ______

↑N

NW Begin 10 cm
End 13cm

NE Begin 17 cm
End 19cm

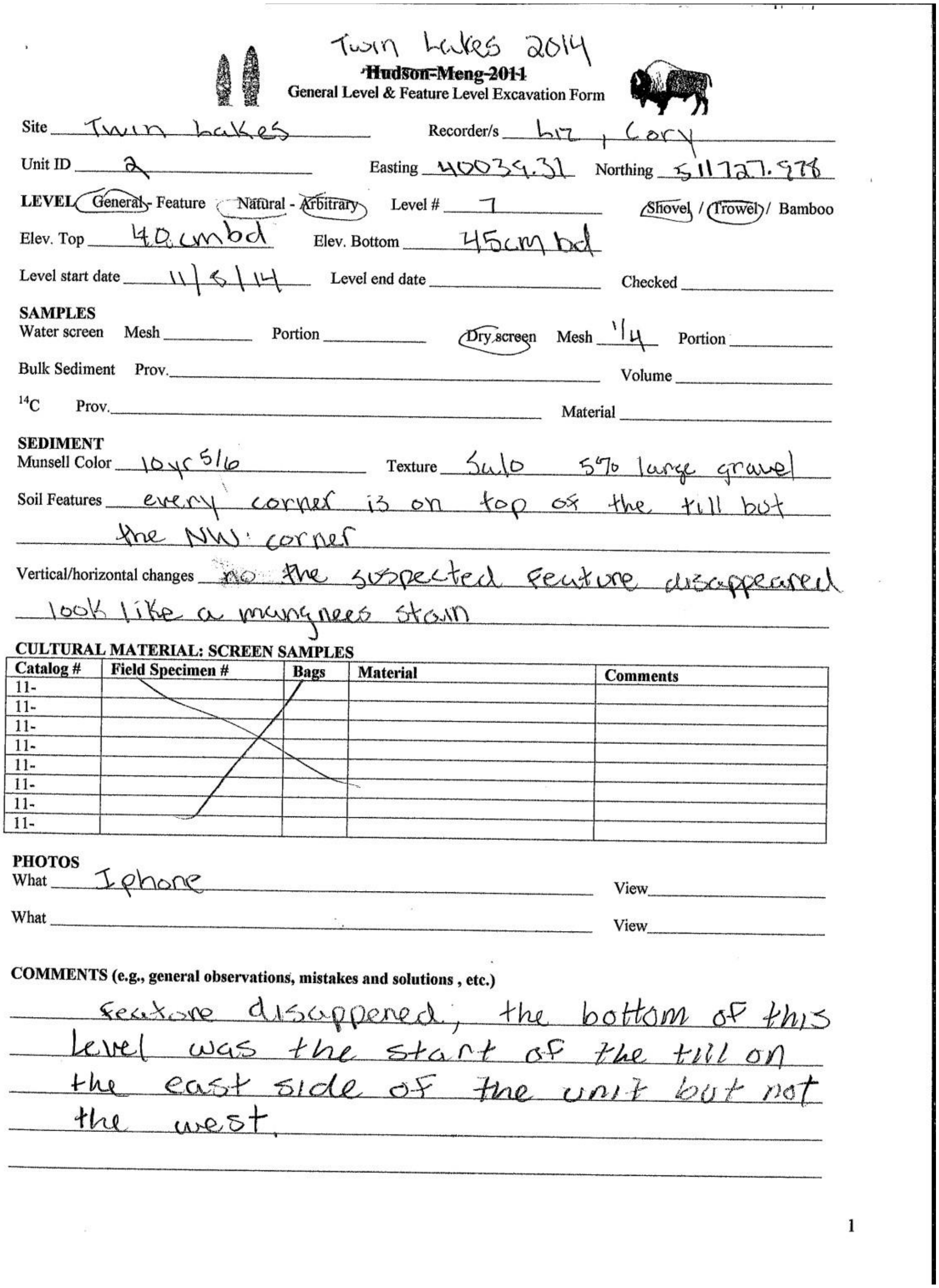
SE Begin 15cm
End 16 cm

SW Begin 8cm
End 12cm

Center Begin 13cm
End 16cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-	TL14-038	1 Flk						
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng-2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s Liz, Cory

Unit ID 2 Easting 40039.31 Northing 511727.978

LEVEL [✓ General] - Feature [✓ Natural - Arbitrary] Level # 7 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 40 cmbd Elev. Bottom 45cm bd

Level start date 11/8/14 Level end date ____ Checked ____

SAMPLES

Water screen Mesh ____ Portion ____ [✓ Dry screen] Mesh 1/4 Portion ____

Bulk Sediment Prov. ____ Volume ____

^{14}C Prov. ____ Material ____

SEDIMENT

Munsell Color 10yr 5/6 Texture Sulo 5% large gravel

Soil Features every corner is on top of the till but the NW corner

Vertical/horizontal changes ~~no~~ the suspected feature disappeared look like a mangnees stain

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-				
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS

What Iphone View ____

What ____ View ____

COMMENTS (e.g., general observations, mistakes and solutions, etc.)

feature disappered, the bottom of this level was the start of the till on the east side of the unit but not the west.

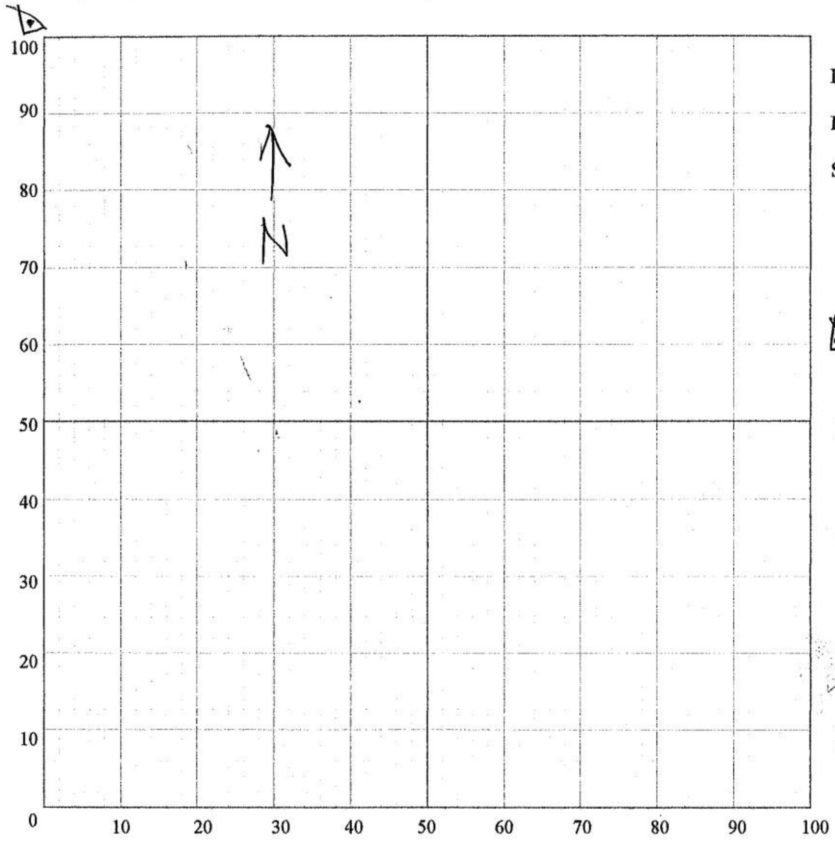
1

Site ______________________ **Recorder/s** ______________________

Unit ID ______________ **Easting** ______________ **Northing** ______________

LEVEL General - Feature Natural - Arbitrary Level # ______________ Target elev. BLL ________

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: NW

Line level: 10cm

Surface: __________

↑N

NW Begin 40cm

End 45cm

NE Begin 42cm

End 47

SE Begin 41cm

End 46cm

SW Begin 38cm

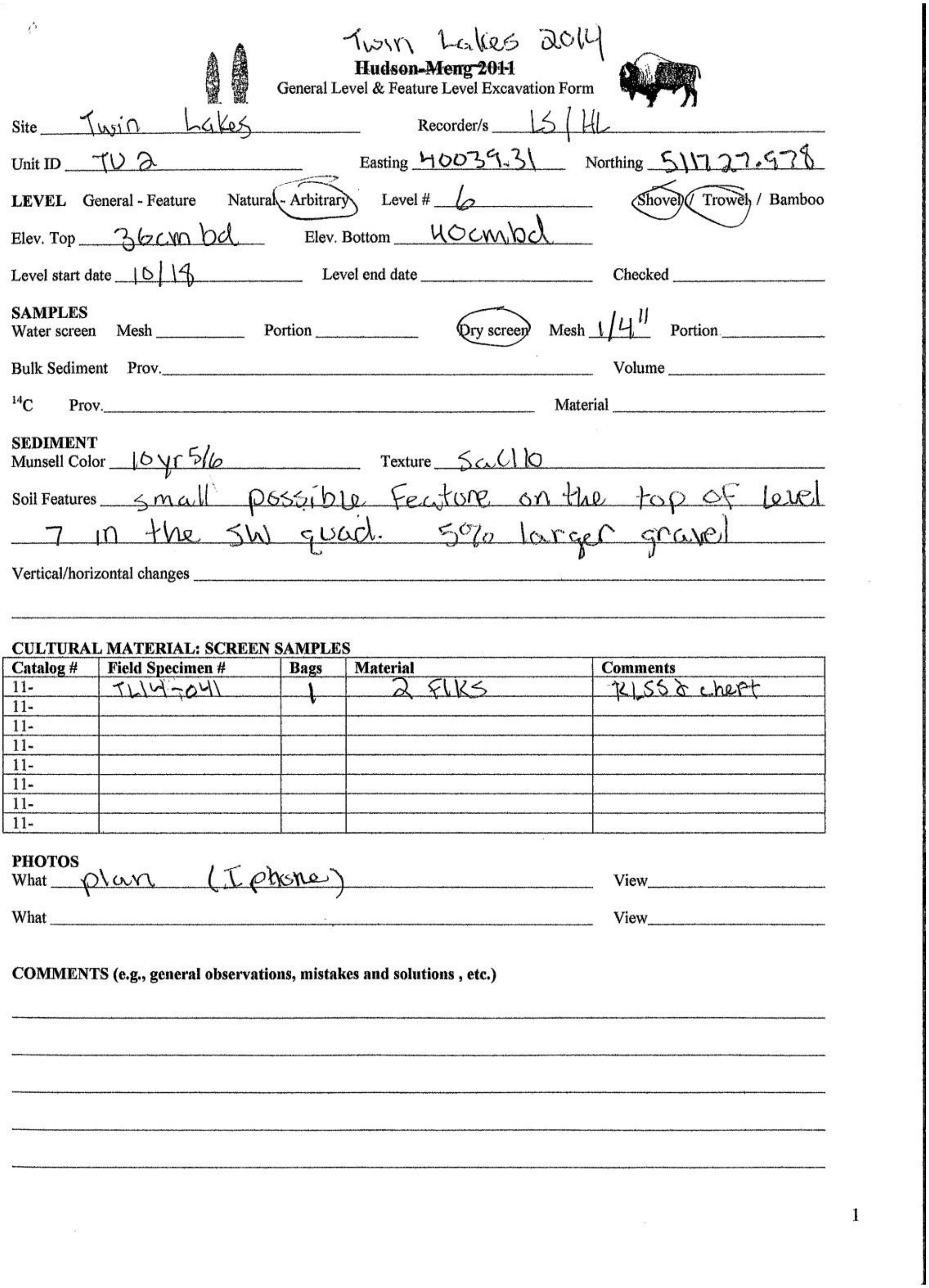
End 43cm

Center Begin 39cm

End 44cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s LS / HL

Unit ID TU 2 Easting 40039.31 Northing 511727.978

LEVEL General - Feature Natural - [✓ Arbitrary] Level # 6 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 36cm bd Elev. Bottom 40cmbd

Level start date 10/18 Level end date ____ Checked ____

SAMPLES
Water screen Mesh ____ Portion ____ [✓ Dry screen] Mesh 1/4" Portion ____

Bulk Sediment Prov. ____ Volume ____

^{14}C Prov. ____ Material ____

SEDIMENT
Munsell Color 10yr 5/6 Texture SaClLo

Soil Features small possible Feature on the top of level 7 in the SW quad. 5% larger gravel

Vertical/horizontal changes ____

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-	TL14-041	1	2 FLKS	RLSS & chert
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS
What plan (Iphone) View ____
What ____ View ____

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

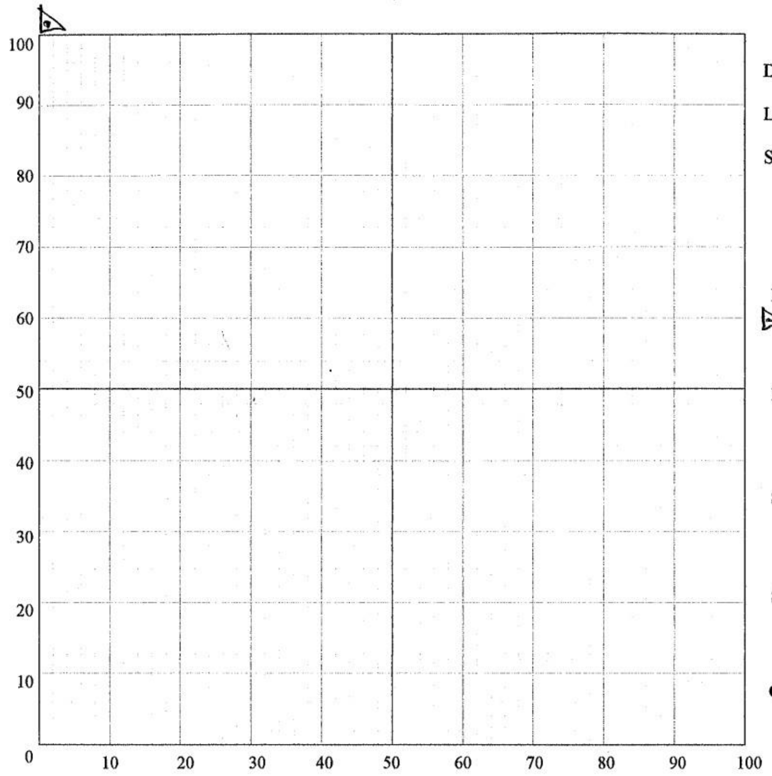
1

Site ____________ **Recorder/s** ____________

Unit ID TU 2 **Easting** ____________ **Northing** ____________

LEVEL General - Feature Natural [✓ - Arbitrary] Level # 6 Target elev. BLL ____________

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: SW

Line level: 10cmaS

Surface: ____________

↑N

NW Begin 36cm
End 40 cm

NE Begin 39cm
End 42 cm

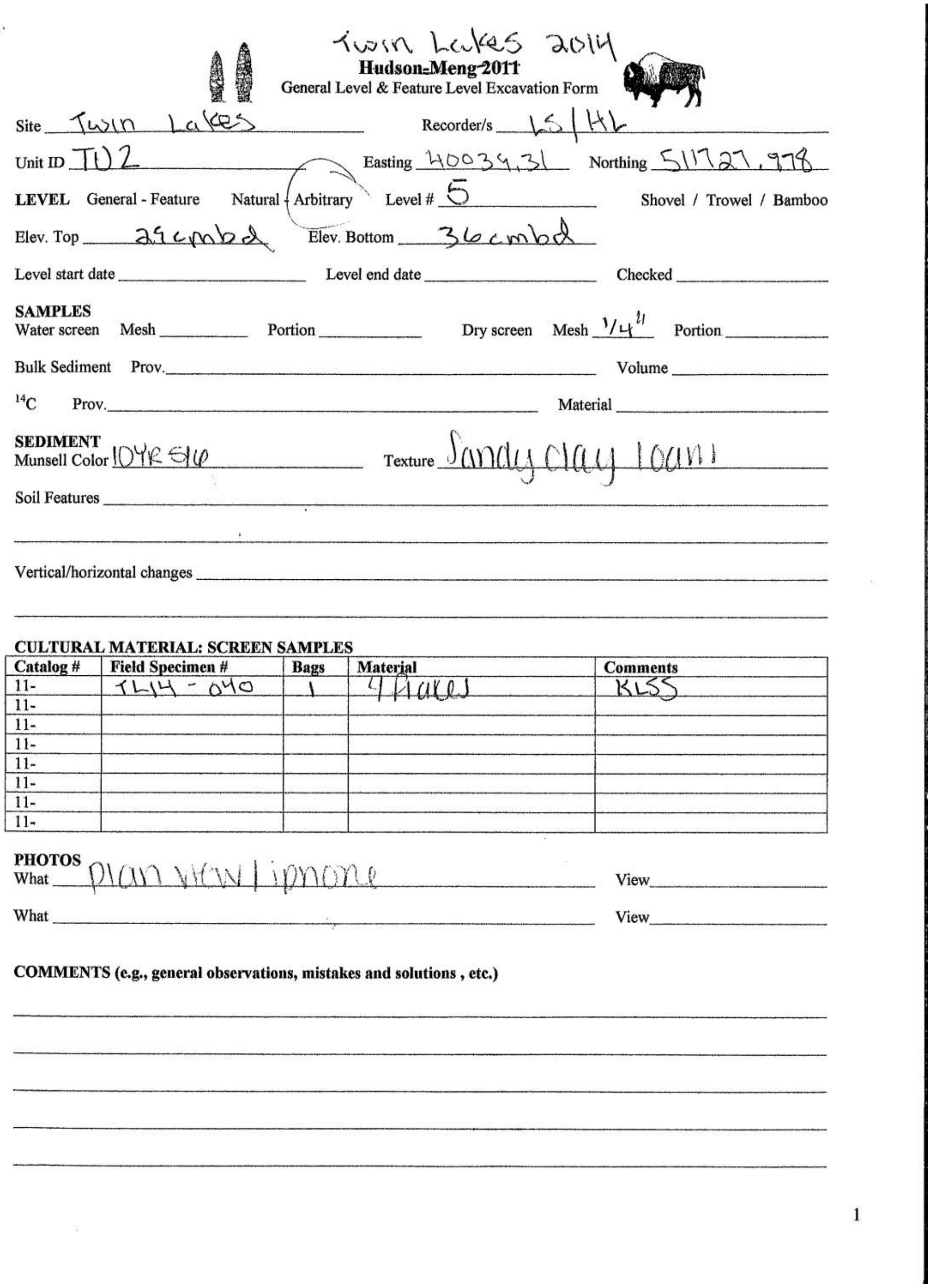
SE Begin 37 cm
End 41 cm

SW Begin 32cm
End 38 cm

Center Begin 34cm
End 39cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s LS/HL

Unit ID TU 2 Easting 40039.31 Northing 511727.978

LEVEL General - Feature Natural / [✓ Arbitrary] Level # 5 Shovel / Trowel / Bamboo

Elev. Top 29cmbd Elev. Bottom 36cmbd

Level start date ______ Level end date ______ Checked ______

SAMPLES

Water screen Mesh ______ Portion ______ Dry screen Mesh 1/4" Portion ______

Bulk Sediment Prov. ______ Volume ______

^{14}C Prov. ______ Material ______

SEDIMENT

Munsell Color 10YR 5/6 Texture Sandy clay loam

Soil Features ______

Vertical/horizontal changes ______

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-	TL14-040	1	4 flakes	KLSS
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS

What plan view / iphone View ______

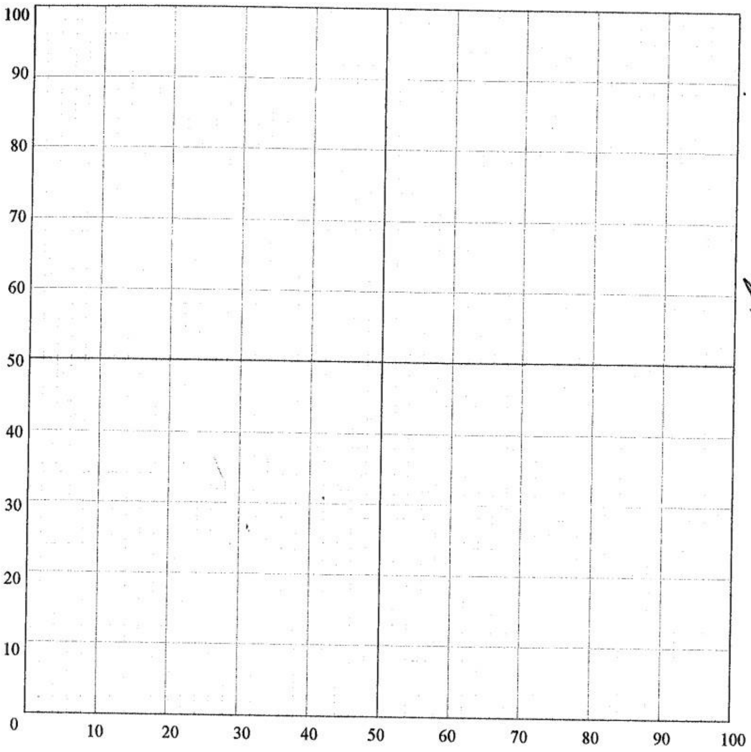
What ______ View ______

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

1

LEVEL General - Feature Natural - Arbitrary Level # 5 Target elev. BLL ______

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: NW

Line level: 10cm

Surface: ______

↑N

NW Begin 29cm
End 36cm

NE Begin 32cm
End 39cm

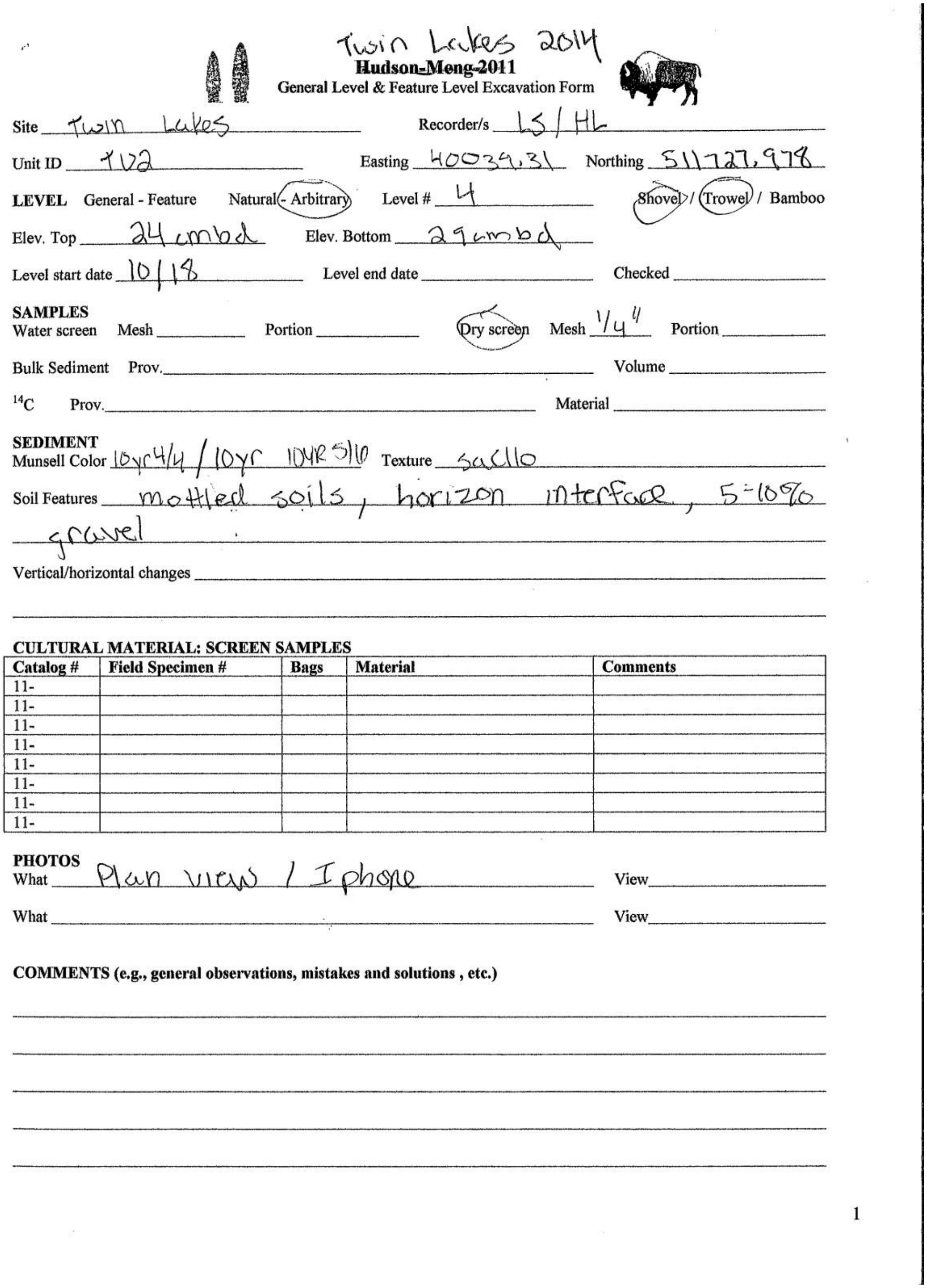
SE Begin 31cm
End 37cm

SW Begin 27cm
End 32 cm

Center Begin 29cm
End 34cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng-2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s LS / HL

Unit ID TU2 Easting 40039.31 Northing 511727.978

LEVEL General - Feature Natural [✓ - Arbitrary] Level # 4 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 24 cmbd Elev. Bottom 29cmbd

Level start date 10/18 Level end date ______ Checked ______

SAMPLES
Water screen Mesh ______ Portion ______ [✓ Dry screen] Mesh 1/4" Portion ______

Bulk Sediment Prov. ______ Volume ______

^{14}C Prov. ______ Material ______

SEDIMENT
Munsell Color 10yr4/4 / 10yr 10YR 5/6 Texture saCllo

Soil Features mottled soils, horizon interface, 5-10% gravel

Vertical/horizontal changes ______

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-				
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS
What Plan view / Iphone View ______

What ______ View ______

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

1

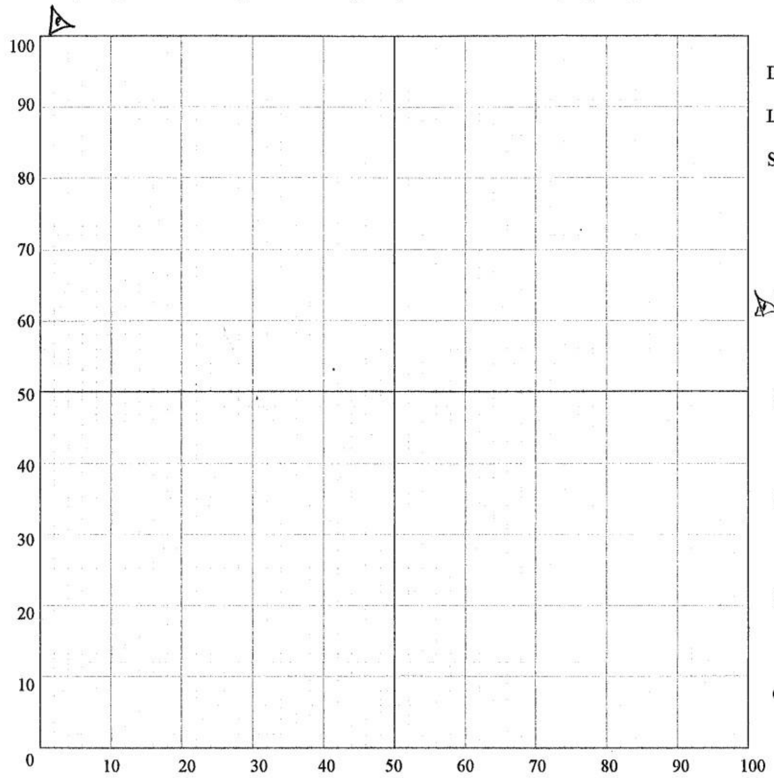
Site

Recorder/s LS/HL

Unit ID TU2 Easting Northing

LEVEL General - Feature Natural - [✓ Arbitrary] Level # 4 Target elev. BLL

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: NW

Line level: 10cm as

Surface:

↑N

NW Begin 24cm
End 29cm

NE Begin 28cm
End 32cm

SE Begin 26cm
End 31cm

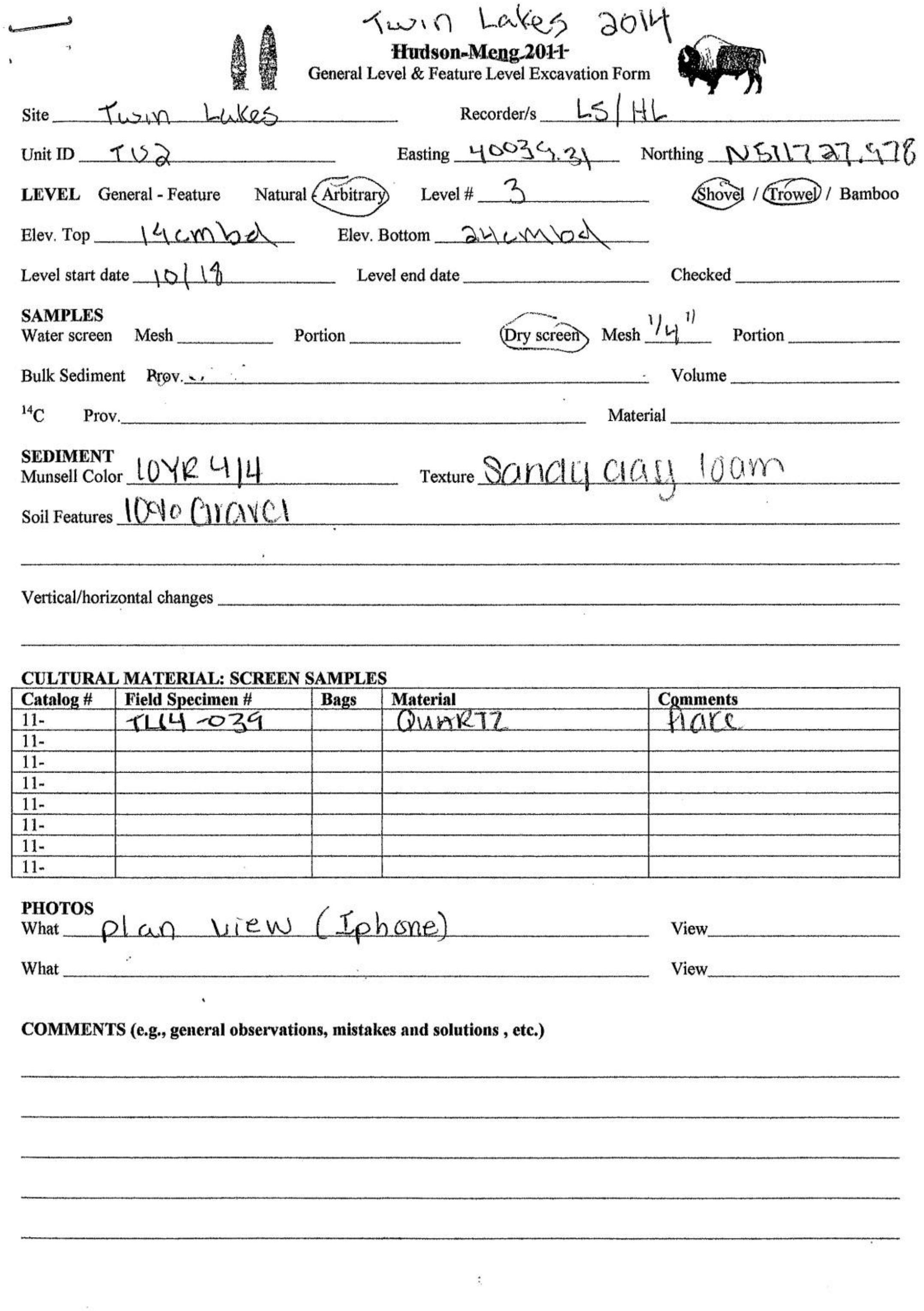
SW Begin 22cm
End 27cm

Center Begin 24cm
End 29cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								

Slip



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes

Recorder/s LS/HL

Unit ID TU2

Easting 40039.31

Northing N511727.978

LEVEL General - Feature Natural [✓ Arbitrary] Level # 3 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 14cmbd

Elev. Bottom 24cmbd

Level start date 10/18

Level end date

Checked

SAMPLES

Water screen Mesh Portion [✓ Dry screen] Mesh 1/4" Portion

Bulk Sediment Prov.

Volume

^{14}C Prov.

Material

SEDIMENT

Munsell Color 10YR 4/4

Texture Sandy clay loam

Soil Features 10% Gravel

Vertical/horizontal changes

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-	TL14-039		QUARTZ	flake
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS

What plan view (Iphone) View

What View

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

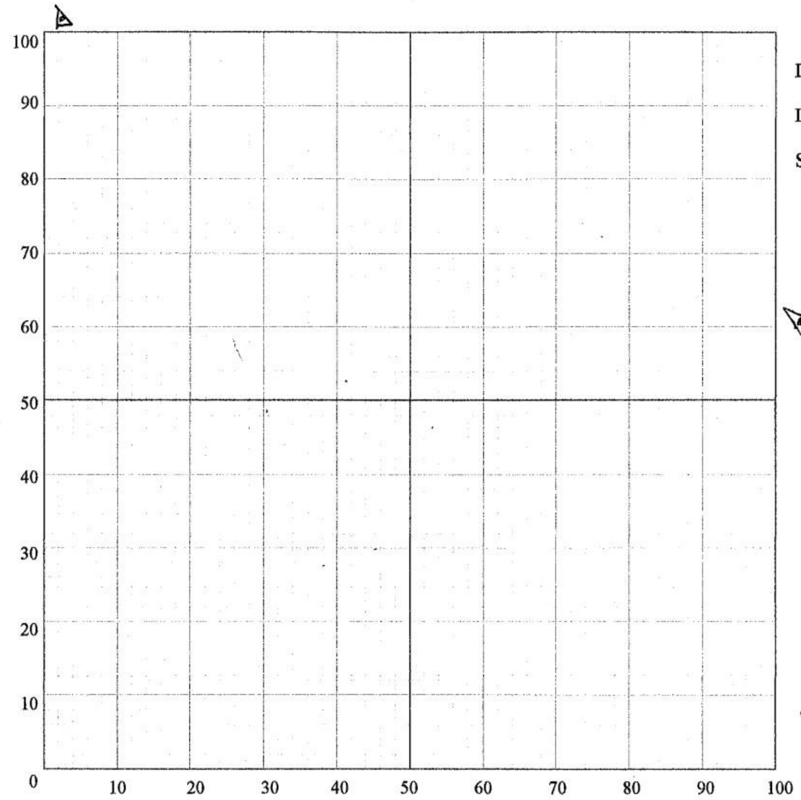
1

Site __________ **Recorder/s** LS / HL

Unit ID TU2 **Easting** __________ **Northing** __________

LEVEL General - Feature Natural - [✓ Arbitrary] Level # 3 Target elev. BLL __________

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: NW

Line level: 10 cmas

Surface: __________

↑N

NW Begin 19cm
End 24cm

NE Begin 24 cm
End 28cm

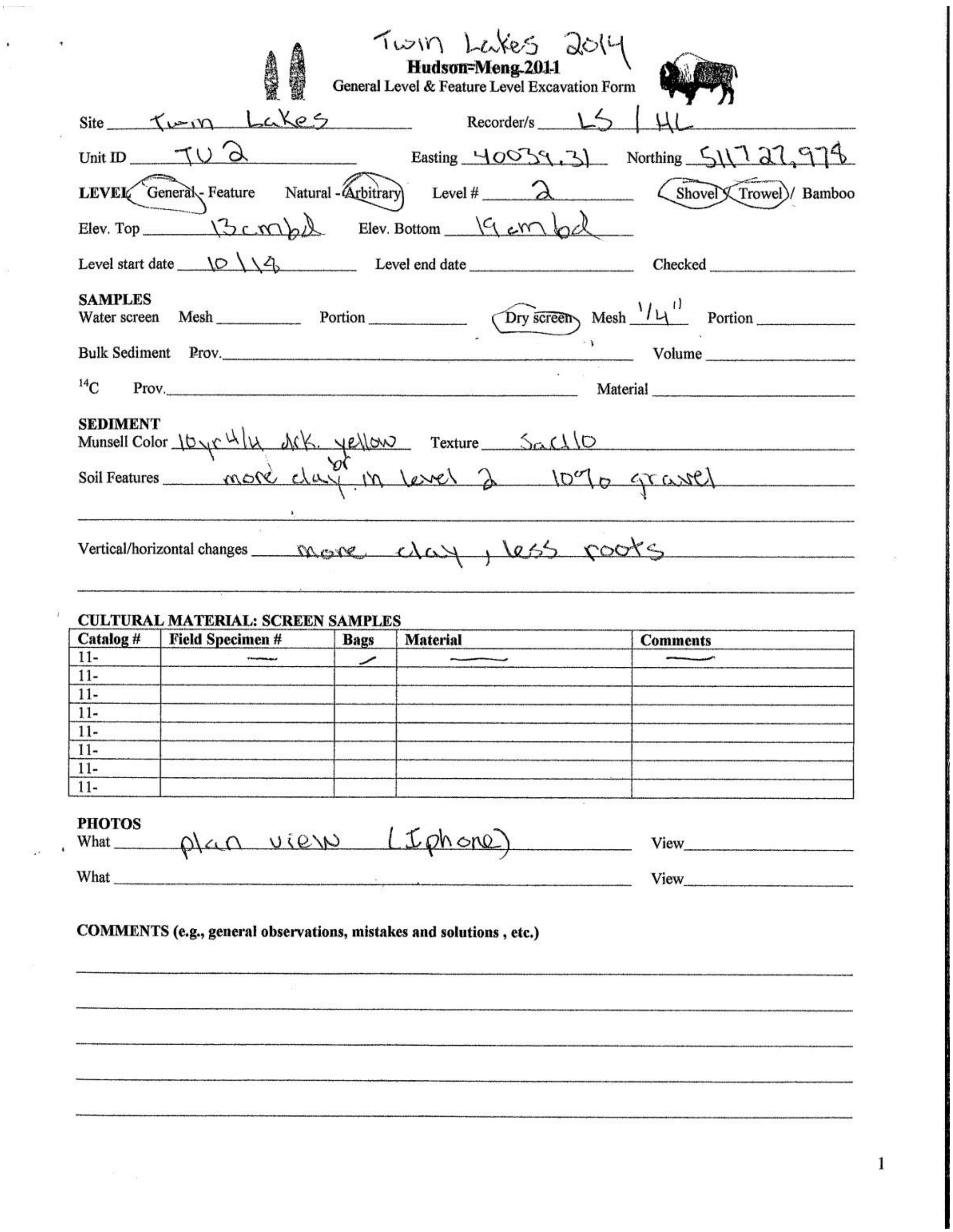
SE Begin 21cm
End 26cm

SW Begin 18cm
End 22cm

Center Begin 20cm
End 24cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s LS / HL

Unit ID TU 2 Easting 40039.31 Northing 5117 27.978

LEVEL [✓ General] - Feature Natural - [✓ Arbitrary] Level # 2 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 13cmbd Elev. Bottom 19 cm bd

Level start date 10 \ 13 Level end date ____ Checked ____

SAMPLES

Water screen Mesh ____ Portion ____ [✓ Dry screen] Mesh 1/4" Portion ____

Bulk Sediment Prov. ____ Volume ____

^{14}C Prov. ____ Material ____

SEDIMENT

Munsell Color 10yr4/4 drk. yellow Texture SaCl lo

Soil Features more clay or in level 2 10% gravel

Vertical/horizontal changes more clay, less roots

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-	—	/	—	—
11-				
11-				
11-				
11-				
11-				
11-				
11-				

PHOTOS

What plan view (Iphone) View ____

What ____ View ____

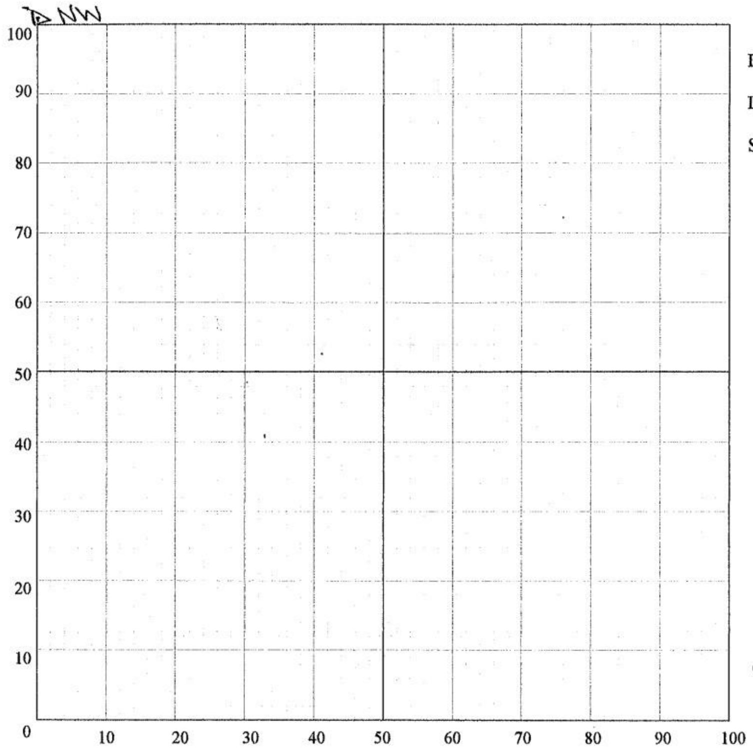
COMMENTS (e.g., general observations, mistakes and solutions , etc.)

Site ______________________ **Recorder/s** ______________________

Unit ID TU 2 **Easting** ______________ **Northing** ______________

LEVEL General - Feature Natural - [✓ Arbitrary] Level # 2 Target elev. BLL 18cm

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*



ELEVATIONS

Datum: SW

Line level: 10cmas

Surface: ____________

↑N

NW Begin 13cm
End 19cm

NE Begin 19cm
End 24cm

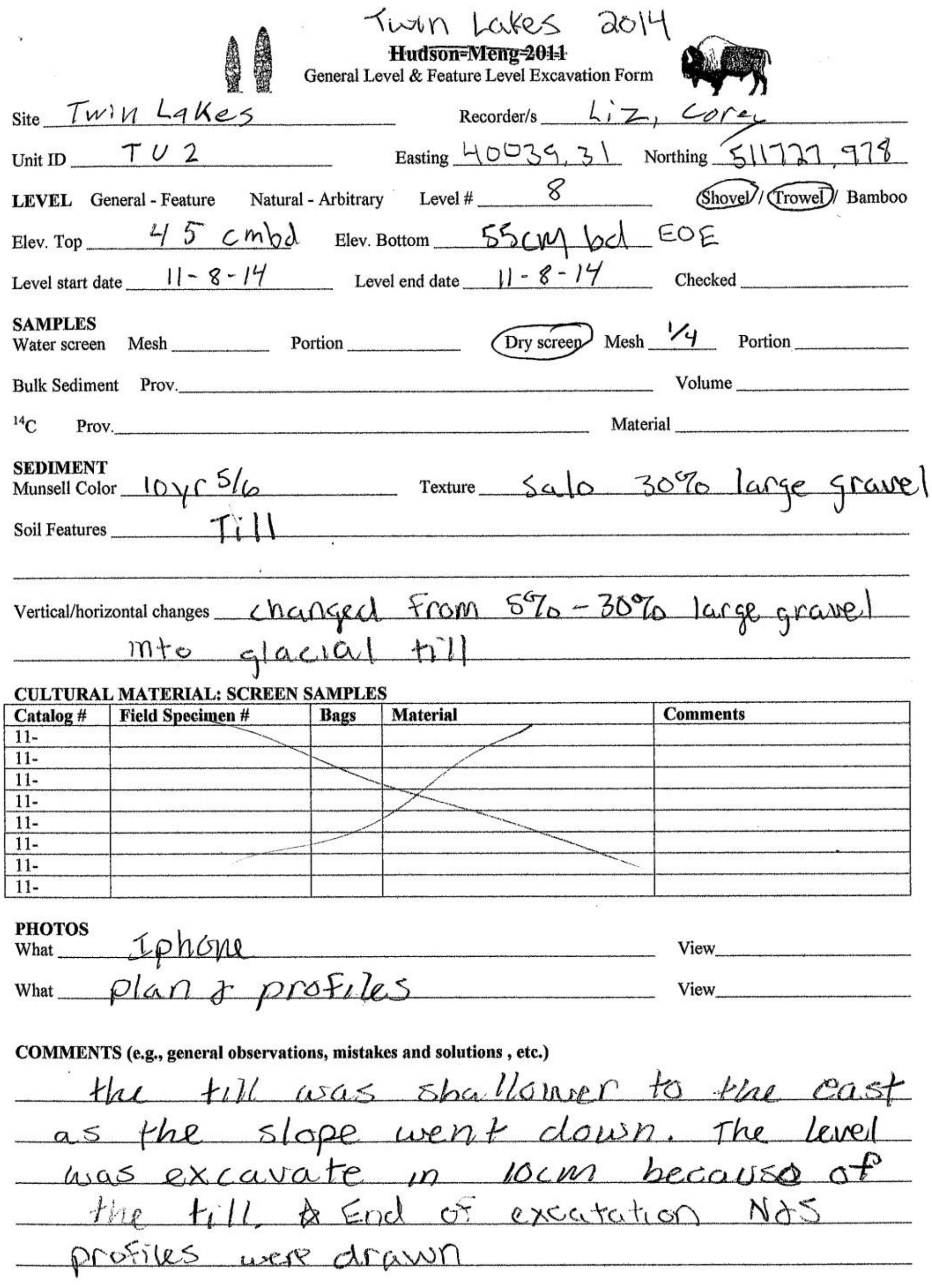
SE Begin 16cm
End 21cm

SW Begin 12cm
End 18cm

Center Begin 16cm
End 20cm

CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								



Twin Lakes 2014

~~Hudson-Meng 2011~~

General Level & Feature Level Excavation Form

Site Twin Lakes Recorder/s Liz, Corey

Unit ID TU 2 Easting 40039.31 Northing 511727.978

LEVEL General - Feature Natural - Arbitrary Level # 8 [✓ Shovel] / [✓ Trowel] / Bamboo

Elev. Top 45 cmbd Elev. Bottom 55cm bd EOE

Level start date 11-8-14 Level end date 11-8-14 Checked

SAMPLES

Water screen Mesh Portion [✓ Dry screen] Mesh 1/4 Portion

Bulk Sediment Prov. Volume

^{14}C Prov. Material

SEDIMENT

Munsell Color 10yr 5/6 Texture salo 30% large gravel

Soil Features Till

Vertical/horizontal changes changed from 5% - 30% large gravel into glacial till

CULTURAL MATERIAL: SCREEN SAMPLES

Catalog #	Field Specimen #	Bags	Material	Comments
11-				
11-				
11-				
11-				
11-				
11-				
11-				
11-				

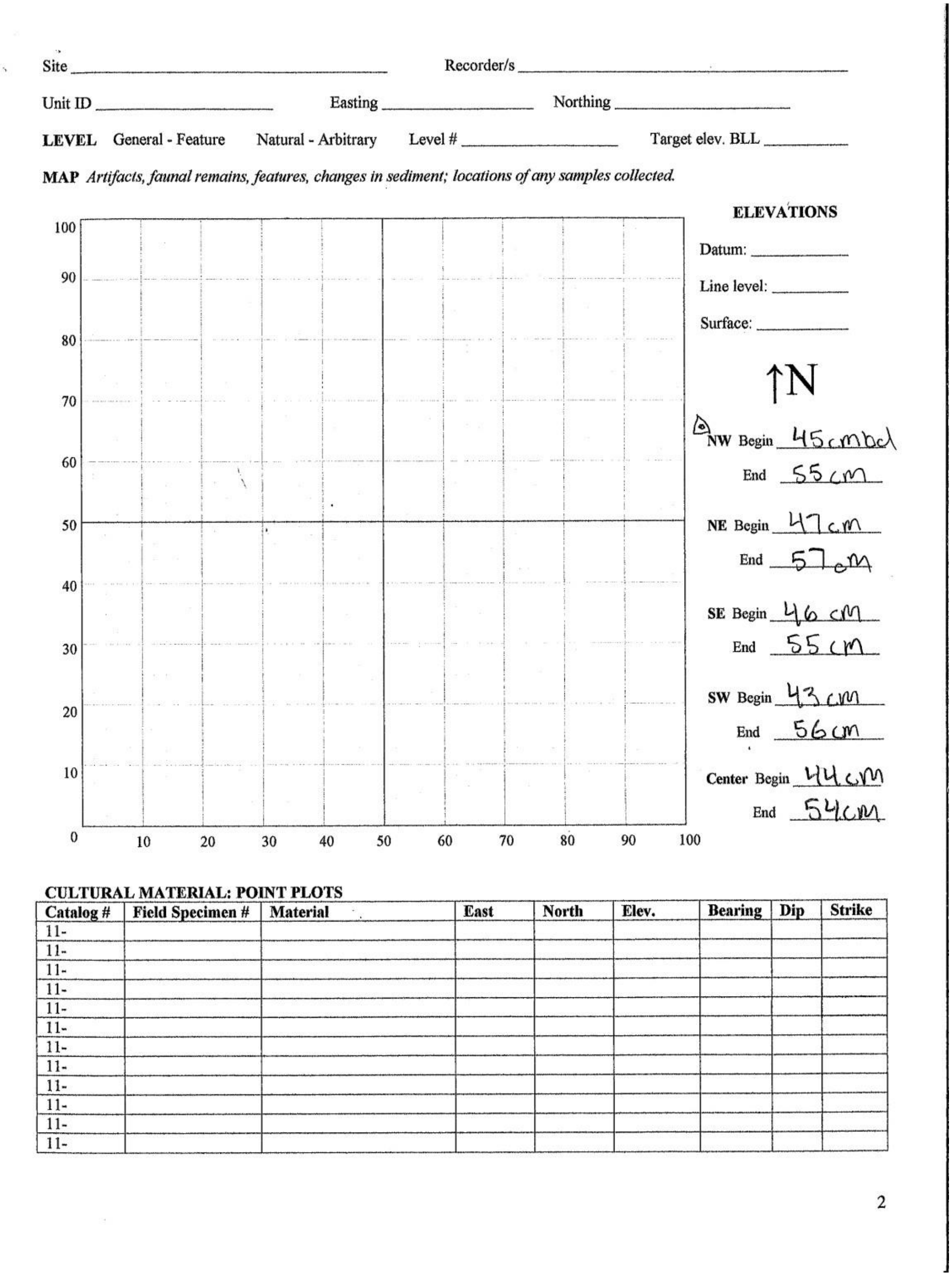
PHOTOS

What Iphone View

What plan & profiles View

COMMENTS (e.g., general observations, mistakes and solutions , etc.)

the till was shallower to the east as the slope went down. The level was excavate in 10cm because of the till. End of excatation N&S profiles were drawn



Site ______ Recorder/s ______

Unit ID ______ Easting ______ Northing ______

LEVEL General - Feature Natural - Arbitrary Level # ______ Target elev. BLL ______

MAP *Artifacts, faunal remains, features, changes in sediment; locations of any samples collected.*

ELEVATIONS

Datum: ______

Line level: ______

Surface: ______

↑N

NW Begin 45cmbd

End 55cm

NE Begin 47cm

End 57cm

SE Begin 46 cm

End 55 cm

SW Begin 43cm

End 56cm

Center Begin 44cm

End 54cm

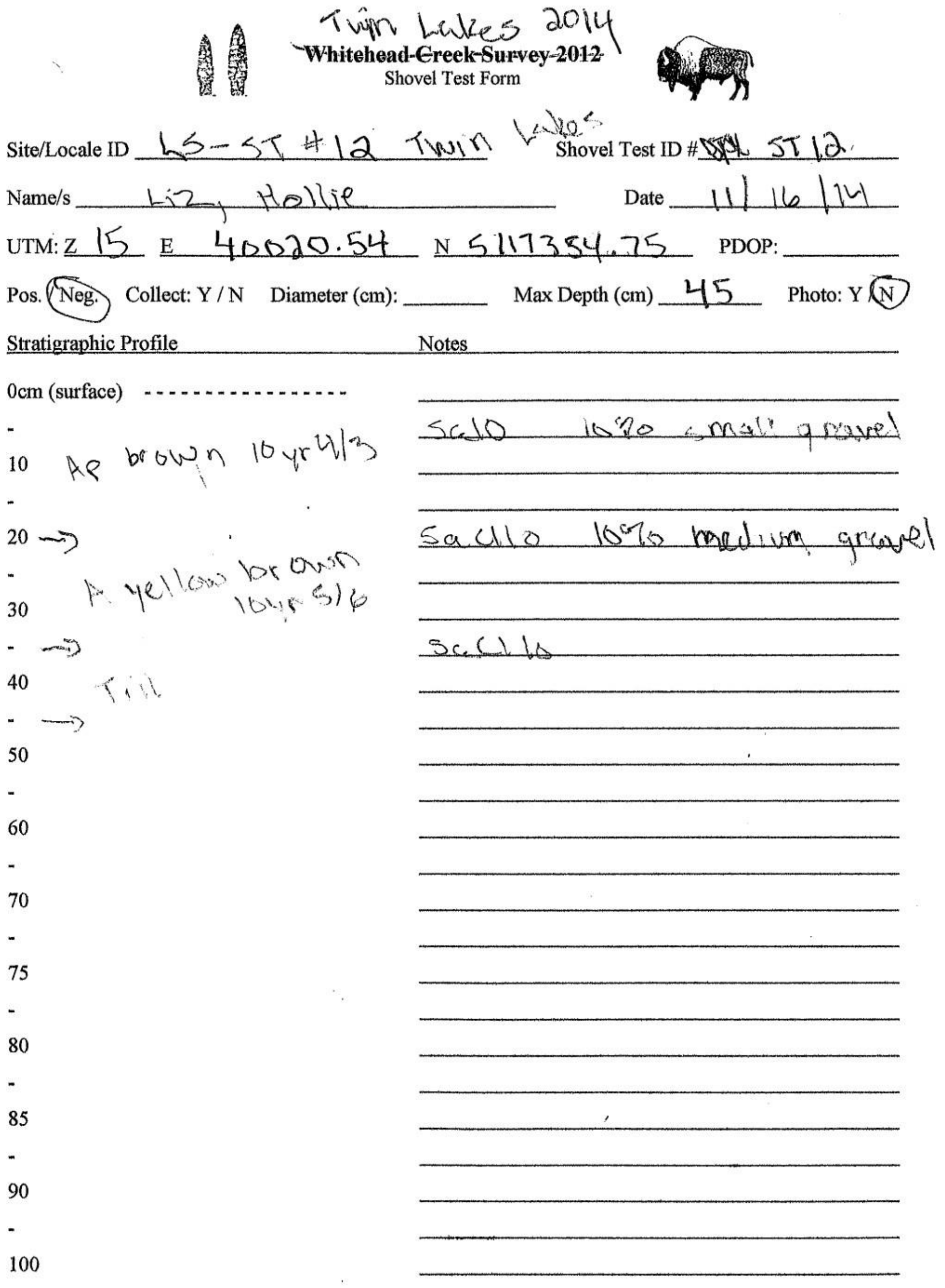
CULTURAL MATERIAL: POINT PLOTS

Catalog #	Field Specimen #	Material	East	North	Elev.	Bearing	Dip	Strike
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								
11-								

2

Appendix D: Test Unit 2 Excavation Photos

Test Unit 1 Surface photo top of level 1



Twin Lakes 2014
~~Whitehead Creek Survey 2012~~
Shovel Test Form

Site/Locale ID LS-ST #12 Twin Lakes Shovel Test ID # ST 12.

Name/s Liz, Hollie Date 11/16/14

UTM: Z 15 E 40020.54 N 5117354.75 PDOP:

Pos. [✓ Neg.] Collect: Y / N Diameter (cm): Max Depth (cm) 45 Photo: Y [✓ N]

Stratigraphic Profile	**Notes**
0cm (surface) -----------------	
-	SaLO 10% small gravel
10 Ap brown 10yr4/3	
-	
20 →	SaClLo 10% medium gravel
- A yellow brown 10yr5/6	
30	
- →	SaClLo
40 Till	
- →	
50	
-	
60	
-	
70	
-	
75	
-	
80	
-	
85	
-	
90	
-	
100	

Test Unit 2 top of level 2

Test Unit 2 top of level 2

Test Unit 2 top pf level 3

Test Unit 2 top of level 4

Test Unit 2 top of level 5

Test Unit 2 top of level 6

Test Unit 2 level 6 profile

Test Unit 2 top of level 7

Test Unit 2 end of excavation plan view

Test Unit 2 North profile

Test Unit 2 South profile

Appendix E: Field Specimen Log

TWIN LAKES ARCHAEOLOGICAL PROJECT 2013
MASTER FIELD CATALOG

Site	Cat #	FS#	Level	Provenience	Material	Bags	Comments
Twin Lakes	TL13-001		3	ST 2	ocher	1	not cultural
Twin Lakes	TL13-002		9	ST2	3 flakes	1	2 KLSS, 1 quartz
Twin Lakes	TL13-003		11	ST2	1 debitage	1	KLSS
Twin Lakes	TL13-004		surface	Flake #1	1 flake	1	GPS data
Twin Lakes	TL13-005		surface	Flake #2	1 flake	1	GPS data
Twin Lakes	TL13-006		surface	none	FCR	1	GPS data

TWIN LAKES ARCHAEOLOGICAL PROJECT 2014
MASTER FIELD CATALOG

Site	Cat #	FS#	Level	Provenience	Material	Bags	Comments
Twin Lakes	TL14-001	none	-	-	-	1	DISCARDED
Twin Lakes	TL14-002		9	75-80 cmbs	ocher	1	2 pieces in shovel test
Twin Lakes	TL14-003		3	10-15 cmbd	2 flakes	1	KLSS Unit 1
Twin Lakes	TL14-004		4	15-20 cmbd	1 rock,3 flakes	1	KLSS Unit 1
Twin Lakes	TL14-005		5	20-25cmbd	flake,bone,nail	1	Unit 1
Twin Lakes	TL14-006		6	25-30 cmbd	Rodent bones	1	Unit 1
Twin Lakes	TL14-007		6	25-30 cmbd	Flake shatter	1	Unit 1
Twin Lakes	TL14-008		7	30-35 cmbd	flakes	1	Unit 1
Twin Lakes	TL14-009		8	35-40 cmbd	flakes	1	Unit 1
Twin Lakes	TL14-010	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 1
Twin Lakes	TL14-011	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 2
Twin Lakes	TL14-012	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 3
Twin Lakes	TL14-013	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 4
Twin Lakes	TL14-014	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 5
Twin Lakes	TL14-015	6-3-14 M.M.	9a	40-45 cmbd	charcoal	1	Unit 1 Sample 6
Twin Lakes	TL14-016		9a	40-45 cmbd	flakes	1	KLSS Unit 1
Twin Lakes	TL14-017		9a	40-45 cmbd	flakes	1	KLSS Unit 1
Twin Lakes	TL14-018		10	45-50 cmbd	rock	1	Possible FCR Unit 1
Twin Lakes	TL14-019		9	40-45 cmbd	flakes	1	KLSS Unit 1
Twin Lakes	TL14-020		10	45-50 cmbd	flakes	1	KLSS Unit 1

Twin Lakes	TL14-021		11/12	50-60 cmbd	flakes	1	KLSS , potlid rockUnit 1
Twin Lakes	TL14-022		11/12	50-60 cmbd	Flakes/rock	1	KLSS Unit 1
Twin Lakes	TL14-023		13	60-65 cmbd	flake	1	KLSS Unit 1
Twin Lakes	TL14-024		3	20-30 cmbs	flake	1	ST 3, quartz
Twin Lakes	TL14-025		2	A horizon	flake	1	ST5 KLSS
Twin Lakes	TL14-026		6	62-72 cmbs	Bone/shatter	1	ST4 KLSS
Twin Lakes	TL14-027		A hor.	10-15 cmbs	flake	1	ST8 KLSS
Twin Lakes	TL14-028		2	25-35 cmbs	12 flakes	1	ST8 KLSS
Twin Lakes	TL14-029		-	-	-	-	DISCARDED
Twin Lakes	TL14-030		-	-	-	-	DISCARDED
Twin Lakes	TL14-031		17	80-85 cmbd	shatter	1	KLSS

TWIN LAKES ARCHAEOLOGICAL PROJECT 2014
MASTER FIELD CATALOG (continued)

Site	Cat #	FS#	Level	Provenience	Material	Bags	Comments
Twin Lakes	TL14-032		18	85-90 cmbd	rock	1	Unit 1
Twin Lakes	TL14-033		-	surface	flake	1	KLSS. mapped
Twin Lakes	TL14-034		-	surface	flake	1	KLSS. mapped
Twin Lakes	TL14-035		-	surface	rock	1	hemetite
Twin Lakes	TL14-036		-	surface	flake	1	KLSS, GPS
Twin Lakes	TL14-037		-	surface	flake	1	KLSS, GPS
Twin Lakes	TL14-038		1	0-5 cmbd	flake	1	KLSS Unit 2
Twin Lakes	TL14-039		3	10-15 cmbd	flake	1	Quartz Unit 2
Twin Lakes	TL14-040		5	20-25 cmbd	Flakes,blade	1	KLSS Unit 2
Twin Lakes	TL14-041		6	25-30 cmbd	Flake,shatter	1	KLSS and Hudson Bay chert? Unit 2