Early and Middle Holocene Archaeology of the Northern Great Basin

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Fluted or Basally-Thinned? Re-Examination of a Lanceolate Point from the Connley Caves in the Fort Rock Basin

by Charlotte Beck, George T. Jones, Dennis L. Jenkins, Craig E. Skinner, and Jennifer J. Thatcher

Introduction

Fluted points are found throughout the Great Basin, but nearly all come from surface contexts. Because so few come from buried contexts—only five by our count (see Beck and Jones 1997 for discussion)—archaeologists have been hard-pressed to establish their temporal placement. As a consequence, the discovery of another fluted point from subsurface context, especially one with radiocarbon control, is very exciting. This paper was inspired by the possibility of such a find, although the excavation took place long ago. We are alluding to a point, specimen 5B-29/3-1, collected from Connley Cave 5 by Stephen Bedwell (Bedwell 1973: Figure 16). This point has been referred to by Bryan (1988:59; Bryan and Tuohy 1999:254) as fluted, but otherwise has received little notice. Interestingly, another lanceolate point collected by Bedwell from Fort Rock Cave, the one reputed to be ca. 13,000 radiocarbon years old, has received considerably more attention (e.g., Beck and Jones 1997; Fagan 1975; Grayson 1993; Holmer 1986), although it exhibits no attributes suggestive of fluting.

The point in question was "rediscovered" by Beck in the course of a visit to the University of Oregon Museum of Natural History to analyze fluted points. The suggestion that the point might be fluted caused considerable discussion among those at the Museum. Whether or not the Connley Cave specimen *is* fluted, however, is controversial and is the subject of this paper. Musil (this volume), for example, states that:

> The lack of attributes diagnostic of fluted points, and the recovery of the point base in a level dated between 9540±260 and 7430±140 RCYBP [ca. 11,000 and 8170 cal. BP], suggests that the Connley Caves fragment is not a fluted point and does not represent evidence of a late fluted point manifestation in the Far West.

Musil's statement sums up the problems that plague Great Basin fluted point studies in general: First, what constitutes fluting, and second, to what time period do fluted points in this region date? It is assumed by most researchers that Great Basin fluted points are representative of a western expression of Clovis and thus should be temporally coeval with Clovis elsewhere, but this has never been demonstrated. Therefore, in this paper we examine these questions and then evaluate the Connley Cave specimen within the context of the discussion. First, a detailed description of specimen 5B-29/3-1 is presented by Jones. The description is followed by the trace element and hydration results, which are presented by Skinner and Thatcher. Next, to place the point in context, Jenkins provides a description of Bedwell's excavations as well as the more recent excavations undertaken by the University of Oregon field school. Finally, Beck and Jones present an evaluation of fluting criteria and the dating of fluted points in the Great Basin. We join in the end with a summary of the data and our conclusions.

The Point

Specimen number 5B-29/3-1, a basal section of an obsidian concave-based projectile point, exhibits several flake scars that originate in the basal concavity and parallel the longitudinal axis of the point, giving it the appearance of being fluted (Figure 1). The lateral margins diverge slightly distally and exhibit no morphology to suggest shouldering. The point is illustrated in Figure 2 at twice its actual size; the following description refers to this figure.

Figure 1. Specimen 5B-29/3-1 from Connley Cave 5.

Metrics

The length of the point base is 29.1 mm. Basal width is estimated at 18.4 mm (the proximal corner on one side has been broken). The width at the distal end is 24.0 mm. The base exhibits a deep concavity, measuring a maximum of 5.2 mm. The maximum thickness of the fragment is 4.8 mm.

Breakage and Resharpening

The distal break is a transverse bending fracture, which presumably occurred at the haft. There are breaks on both lateral margins at the distal end of the fragment. These are complex breaks and may have occurred while the point was in the haft. A 5.5 mm section distal to the margin break has been resharpened by removal of several small flakes. This may also have been done while the point was in the haft, since the entire broken edge was not resharpened. Finally, the proximal corner of the base exhibits an "impact" fracture with force directed at the basal corner. There is a partial bulb preserved at the break; a small "burin" spall trails down the edge (distally) for 2.5 mm.

Flaking Pattern

The point base exhibits pressure flaking perpendicular to the lateral edges. The flake scars invade the surface from 2 to 8 mm. Some shaping of parts of the lateral edges was completed before "fluting," but pressure flakes overlap the "flute" flakes and thus were struck off subsequent to the removal of the "flute" flakes. Fine pressure nibbling was applied to finish the basal concavity. Both edges as well as the basal concavity are abraded (ground), leaving a matte ground facet along the edges.

Side A (Figure 2A) shows two "flute" flake scars. Both originate from the concave area of the base and roughly follow the medial axis. The flake on the right was removed after the flake on the left. The left flake scar measures 18.6 mm in length. It was probably more than 20 mm when the flake was originally removed, but subsequent manufacture of the concavity has removed the bulbar scar. The scar intrudes upon the flake scars along the left edge, indicating that the flake was removed after this edge was shaped. The flake scar ends in a step fracture and just short of the transverse break.

The right flake scar measures 23.2 mm, but is interrupted by the transverse break. How much

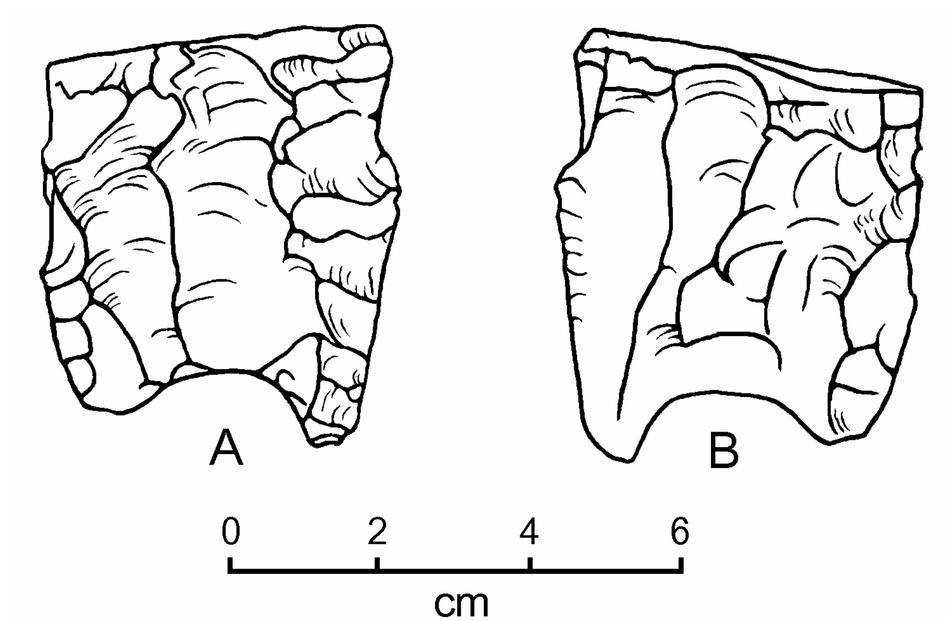

Figure 2. Drawing of specimen 5B-29/3-1 at 200%.

further this flake scar might have extended distally is difficult to estimate. Suffice to say, it probably was greater than 25 mm in length, given the basal modification. Although the bulbar scar has been removed by basal shaping, the taper of the flake surface suggests it was taken from an edge/platform only a few millimeters, at most, proximal to the location of the basal concavity edge. As it seems likely that the platform area lay in the concavity, a platform would have to have been isolated within that concavity for successful removal of a "flute" flake (see Crabtree 1966; Flenniken 1978). Pressure flakes originating from the right edge, impinge on the right side of the flake scar.

Side B (Figure 2B) exhibits no flake scars that originate at the base so clearly as on Side A. Instead, stacked basal thinning flakes originate in the concavity. One flake has the proper orientation to have been a flute flake, but the proximal section of the scar has been eliminated by later flaking and the right side has been affected by later flake scars originating from the edge. If this is a flute flake, it was removed much earlier than those on side A.

Trace Element Analysis

Specimen 5B-29/3-1 was geochemically characterized at the Northwest Research Obsidian Studies Laboratory. The analysis was carried out as part of an earlier trace element investigation of obsidian artifacts recovered from the Connley Caves during excavations in 1967 (Bedwell 1973; Thatcher 1999, 2001).

Nondestructive trace element analysis of the artifact was completed using a Spectrace 5000 energy-dispersive X-ray fluorescence spectrometer (Northwest Research Obsidian Studies Laboratory 2002). The geochemical composition of the specimen indicated that it originated from the Silver Lake/Sycan Marsh source, one of the most commonly identified sources found among characterized collections of artifacts from Fort Rock Basin sites (Table 1; Atherton 1966; Skinner 1983; Hughes 1986; Thatcher 1999; also see Skinner et al., this volume).

Table 1. Trace element composition of obsidian point.

Trace Element	ppm[1]	Uncertainty(±)[1]
Rubidium	125	3
Strontium	6	7
Yttrium	54	3
Zirconium	350	7
Niobium	21	1

[1]parts per million

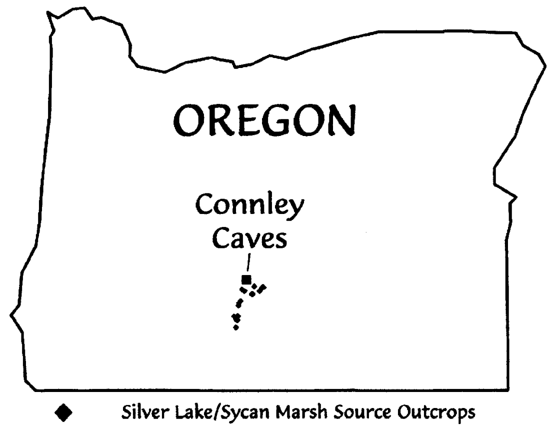

Figure 3. Location of the Connley Caves and primary and secondary deposits of obsidian from the Silver Lake/Sycan Marsh obsidian source.

Obsidian from the Silver Lake/Sycan Marsh source can be found at many outcrops in the highlands to the south of the Connley Caves and is also found in lacustrine gravels and lakeshore deposits along the southern margin of the lake basin (Figure 3). The nearest recorded occurrence of geologic obsidian from the source is located approximately 13 km (8 miles) southeast of the caves. Although it is likely that pluvially-transported obsidian nodules are located even closer to the site, we have been unable to find any naturally-occurring obsidian in surface deposits in the immediate vicinity of the caves.

Obsidian Hydration Analysis

After Beck and Jones suggested that specimen 5B-29/3-1 was fluted, the extreme antiquity of the artifact was tested using obsidian hydration analysis. Establishing the obsidian hydration age of the specimen would also test its association with the radiocarbon dates and other artifacts obtained from the Lower pre-Mazama component of Connley Cave 5. While rim measurements were not converted to calendar dates[1], the rim value can be used as evidence of the age of the artifact and provides a good point of relative comparison against which other artifacts from the Silver Lake/Sycan Marsh source can be chronologically placed.

Working on the assumption that the basal thinning of the point occurred during the original

Figure 4. Placement of cuts made on specimen 5B-29/3-1 for obsidian hydration analysis.

manufacture of the tool, a small slice of obsidian was removed from the center of the base by cutting two parallel slices into the edge of the artifact using a lapidary saw equipped with 4-inch diameter diamond-impregnated .004" thick blades (Figure 4). The resultant cross-section of the artifact (approximately one millimeter thick) was removed and mounted on a petrographic microscope slide with Lakeside thermoplastic cement and was then ground to a final thickness of 30-50 microns. The resultant prepared specimen was measured using an Olympus BHT petrographic microscope fitted with a filar screw micrometer eyepiece. In this manner, it was possible to measure visible hydration rims on the dorsal and ventral sides of the artifact employing a single thin section. The specimen slide indicated that identical hydration rims measuring 5.9±0.1 Fm are found on both the dorsal and ventral surfaces of the point base.

A search of the Northwest Research laboratory artifact database indicated that hydration rim measurements for 134 Fort Rock Basin artifacts correlated with the Silver Lake/Sycan Marsh obsidian source had been carried out. The hydration rim values range from 1.3 to 8.7 Fm with a mean rim measurement of 4.3 Fm. The hydration measurement of the artifact in the current investigation falls within the upper quartile of the 134 hydration values (25 of the 134 rims are of greater width) and apparently confirms the considerable age of the artifact (Figure 5).[2]

In sum, the results of the trace element and hydration analysis of the obsidian specimen are not particularly remarkable in any way. The source of the point, Silver Lake/Sycan Marsh, is one of the most commonly encountered sources among characterized Fort Rock Basin artifacts and is also the closest available obsidian raw material source of adequate size for manufacture of the specimen. The hydration rim measurement of 5.9±0.1 Fm suggests that the artifact is of considerable antiquity but is not unusual when compared to other hydration rim measurements of artifacts from the Silver Lake/Sycan Marsh source.

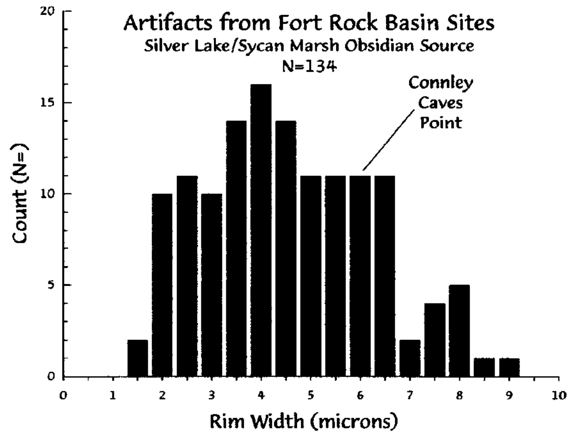

Figure 5. Frequency of obsidian hydration measurements for Silver Lake/Scycan Marsh artifacts from Fort Rock Basin sites.

Context and Dating: Investigations in Connley Cave 5

The Connley Caves are located in the Fort Rock Basin in south-central Oregon (Figure 3). Situated on the west side of the Connley Hills, roughly two kilometers north of Paulina Marsh, the site is composed of eight wave-cut rockshelters and caves in a south-facing cliff of volcanic tuff. The caves were first investigated by Stephen Bedwell (1970, 1973) in 1967 as a part of his doctoral dissertation research. It was primarily with data from this site that Bedwell defined the Western Pluvial Lakes Tradition, a period of time between ca. 13,000 and 8900 cal. BP (11,000 and 8000 RCYBP) when Great Basin cultures were theoretically heavily focused on marsh resources for subsistence.

Bedwell's Investigations

Stephen Bedwell's crew recovered the specimen of interest here (5B-29/3-1) from excavation unit 5B, located against the north-central wall of Cave 5. Excavations began in this 2x2 meter unit after the upper 220 cm of disturbed deposits and primary Mazama tephra deposits were removed with the aid of a backhoe. Remnants of Mazama tephra left by the backhoe were manually shoveled off the top of the unit before excavations were begun in Level 23 (-220 to 230 cm) at roughly -223 cm. Recovered in Level 29 (-280 to 290 cm) the specimen is associated with Bedwell's (1970:41-42) Stratum II. Excavations in this unit were terminated in Level 35 (-340 to 350 cm) in sterile Stratum I deposits.

Bedwell (1970:41-42) contends there is little difference between the stratigraphic sequences encountered in the majority of the Connley Caves:

> The stratigraphy of all the Connley Caves is remarkably similar. . . . There are four basic stratigraphic units present. The basal member, Stratum I, consists of water-worn gravels and cobbles in a fine, dark brown silt matrix with occasional diatoms present. Stratum II overlying this is a lighter brown sandy silt matrix containing sand-size pumice grains of unknown origin and organic matter in varying proportions. Two components of this are sometimes distinguishable, the lower component, however, is differentiated only by larger amounts of angular roof-fall materials. Overlying this is Stratum III which consists of an essentially unbroken layer of pure Mazama pumice, usually about fifteen to twenty centimeters thick. Above this lies Stratum IV which is a light tan sandy silt containing angular roof-fall materials and considerable amounts of Mazama pumice.

Bedwell dated these strata with 21 radiocarbon samples (Table 2). Stratum I ranged in age from 13,200 to 8650 cal. BP (11,200 to 7900 RCYBP) Stratum II from 11,200 to 8000 cal. BP (9800 to 7240 RCYBP), Stratum III from 4870 to 3350 cal. BP (4350 to 3140 RCYBP), and Stratum IV from 3660 to 3300 cal. BP (3420 to 3080 RCYBP). While these dates clearly trend from oldest at the bottom to youngest at the top, there are a number of stratigraphically inverted dates among them, indicating mixing of the cultural deposits. Though Bedwell (1970:57) strenuously denied any significant contamination of his dating samples, the cave floors are clearly natural carbon traps continuously accumulating wood, bone, feces, and urine deposited in the site by woodrats, raptors, carnivores, ungulates, and humans. During field school investigation of the caves, we observed several large rat middens that had recently burned, resulting in large mounds of fine, acrid smelling ash, charcoal, burned bone, and stone artifacts.

Bedwell clearly did not adequately account for the natural and cultural site formation processes at work in the formation of the archaeological record at the Connley Caves. Since he did not generally

Table 2. Radiocarbon dates reported by Bedwell (1970:55-56) for the Connley Caves.

Lab Number	Cave	Depth (cm)	Strat	^{14}C Age	Calibrated Age (BP) at 2 Sigma[1]
Gak-2144	3	160-170	1	3080"140	3633 (3321-3270) 2860
Gak-1739	3	230-240	3	8290"310	9920 (9256) 8410
Gak-1740	4A	130-140	1	3420"140	4060 (3670-3610) 3360
Gak-2138	4A	150-160	2	3730"90	4400 (4080-4000) 3780
Gak-2137	4A	170-180	2	3140"80	3550 (3380-3360) 3060
Gak-1741	4A	270-280	4	7900"170	9220 (8640-8610) 8340
Gak-2140	4B	290-300	3	7240"150	8330 (7990) 7700
Gak-2136	4A	300-310	4	9150"150	10,470 (10,040) 9880
Gak-2141	4B	310-320	4	11,200"200	13,560 (13,110) 12,710
Gak-2142	4B	330-340	4	9670"180	11,450 (10,920) 10,230
Gak-1742	4A	340-350	4	10,100"400	12,830 (11,680) 10,220
Gak-2143	4B	370-380	4	10,600"190	12,910 (12,530) 11,960
Gak-2133	5A	110-120	1	3330"110	3830 (3550-3510) 3270
Gak-2134	5A	170-180	2	4320"100	5280 (4860) 4590
Gak-2135	5B	260-270	3	7430"140	8420 (8170) 7930
Gak-1743	5A	260-270	3	9800"250	12,180 (10,990) 10,220
Gak-1744	5B	320-330	3	9540"260	11,570 (10,790-10,550) 9980
Gak-2130	6	60-70	2	3720"270	4840 (4080-3990) 3360
Gak-2131	6	160-170	2	4350"100	5290 (4870) 4590
Gak-2132	6	190-200	4	4720"200	5910 (5570-5340) 4860
Gak-1745	6	210-220	4	9710"880	13,390 (10,950) 8680

[1]Stuiver and Reimer 1993.

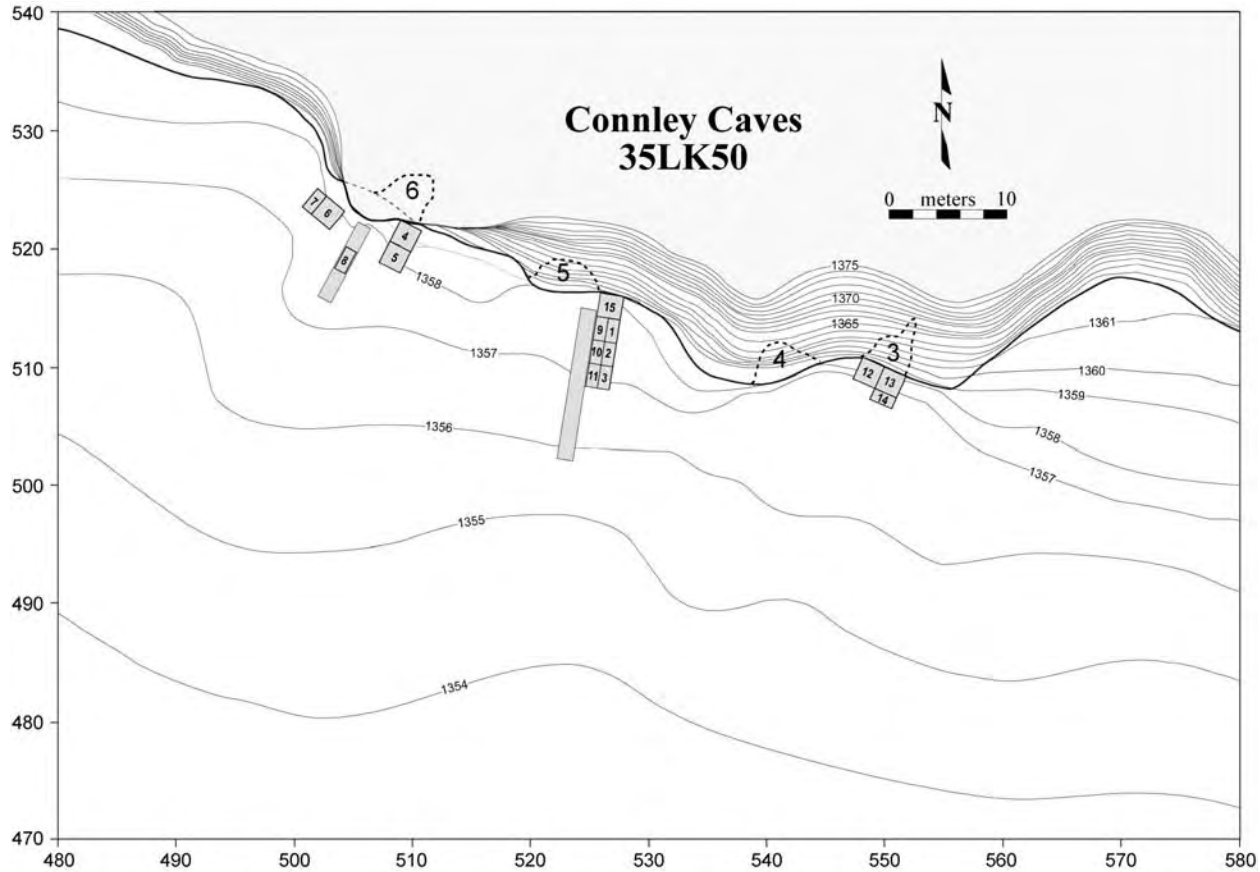

Figure 6. Connley Caves site map.

encounter datable cultural features at the site he selected charcoal samples for dating based on the availability of large chunks of charcoal and the presence of increased quantities of artifacts (Bedwell 1970:53). While this method basically provided adequate dating for the deposits, it casts doubt on the results of specific radiocarbon samples.

University of Oregon Field School (1999-2001) Investigations

Recent University of Oregon (UO) field school investigations at the Connley Caves involved excavations adjoining Bedwell's units at the mouth of caves 3, 5, and 6 (Figure 6). After a brief phase of auger testing, conducted in 1999 to verify the presence of intact cultural deposits, we began excavations in the summer of 2000 by digging bachkoe trenches in front of caves 5 and 6. Provenience controlled excavations were then conducted during the summers of 2000 and 2001. Manual excavations proceeded in arbitrary five centimeter levels that followed natural stratigraphy as much as possible. Excavated soil was passed through eighth-inch wire mesh and all cultural materials were recovered.

Excavations in front of Cave 5 involved an excavation block roughly three by five meters with a 2x2 meter excavation unit attached to the north end of the block that reached to the cliff face. Provenience controlled excavations continued to a maximum depth of 390 cm in one 1x1 meter unit and uncontrolled probing continued along the east wall of this unit in an area 1 meter by 50 cm through culturally sterile beach deposits to bedrock at a depth of ca. 440 cm. The combined total area and volume of controlled excavations in front of Cave 5 was 15.5 m² and 36.35 m³, respectively.

Seven strata were identified, numbered I through VII from top to bottom of the deposits (Figure 7), and dated between 200 and 11,000 cal. BP (Table 3). [All UO radiocarbon dates are cited as calibrated dates because of their use in establishing obsidian hydration dates—see below. However, both radiocarbon and calibrated dates are presented in Table 3.] The upper

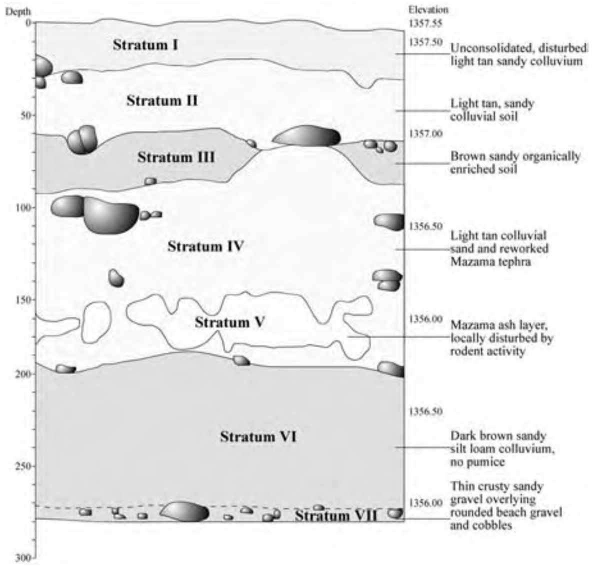

Figure 7. Cave 5 stratigraphy.

four strata are primarily colluvium composed of angular pinkish-tan volcanic tuffs and dark gray andesite nodules liberally mixed with reworked Mazama tephra to a depth of roughly 170 cm. Strata I-IV all exhibit a measure of disturbance caused by rodent burrowing, prehistoric human activities, modern pot-hunting, and Bedwell's investigations. Consequently, sample selections for AMS radiocarbon determinations in these strata focused primarily on basketry, fishing net, and human feces. One sample of bitterbrush charcoal, recovered *in situ* from the floor of an excavation unit in Stratum III, produced a date of 2000 cal. BP. The other seven radiocarbon samples from Stratum III included four human coprolites, two basketry fragments, and one fish net. These samples indicate that Stratum III dates between 2000 and 5880 cal. BP (Table 3).

Below these strata, between 170 and 190 cm, is Stratum V, a dense deposit of Mazama tephra 10 to 20 cm thick which has generally been disturbed by rodent and anthropic activity, but has occasionally been preserved in nearly pure deposits. This stratum is dated to 7600 cal. BP throughout the region.

Stratum VI is a dark, moist, sandy-silt colluvium underlying the Mazama tephra and contrasting sharply with it. This stratum correlates well with Bedwell's Stratum 2. It can be subdivided into two cultural components, Upper and Lower pre-Mazama (Fort Rock and Lunette Lake period). We dated the Upper pre-Mazama component with two samples of charred sagebrush and cattail seeds between 9000 and 8500 cal. BP. The Lower pre-Mazama component (Fort Rock Period) was similarly dated with two sagebrush and rabbitbrush charcoal samples between 11,000 and 9800 cal. BP (Table 3).

At the bottom of the site is the undated Stratum VII sandy Pleistocene beach deposit that reaches to bedrock and incorporates large quantities of water rounded pebbles. The presence of water-rounded pebbles—originating from Stratum VII—in the

Table 3. Recently recovered UO field school radiocarbon dates for the Connley Caves.

Lab Number	Cave	Depth (cm)	Strat	C-14 Age	Calibrated Age (BP) at 2 Sigma[1]	Material
Beta-170204	5	50-60	III	3920±80	4540 (4400) 4140	coprolite
Beta-170205	5	60-70	III	3970±150	4840 (4420) 3980	coprolite
Beta-170207	5	wall fall	III	4460±90	5440 (5050) 4840	coprolite
Beta-170206	5	wall fall	III	4930±70	5880 (5640) 5580	coprolite
Beta-164958	5	80-90	III	4590±50	5460 (5310) 5060	basketry
Beta-160831	5	105-110	III	1970±40	2000 (1900) 1840	charcoal
Beta-164959	5	100-110	III	4520±40	5310 (5290-5150) 5040	fish net
Beta-164960	5	110-120	III	4240±50	4860 (4830) 4630	basketry
Beta-146867	5	205-210	VI	7950±40	8980 (8940-8680) 8560	charcoal
Beta-160829	5	280-285	VI	9430±80	11,070 (10,940) 10670	charcoal
OS-28994	6	90-95	I	770±40	280 (230-160) 0	shell bead[2]
Beta-160830	6	230-240	VI	7810±40	8640 (8590) 8460	charcoal
Beta-160827	6	265-270	VI	8960±90	10,240 (10,170) 9760	charcoal

[1]Stuiver and Reimer 1993.
[2]Date on shell bead, southern California 13c/12c adjustment rate applied in calibration of date.

overlying strata is a measure of the stratigraphic mixing that has occurred throughout the deposits of the site. In other words, rounded beach pebbles generally increase with depth at the site, but there is some quantity of Stratum VII materials in all of the strata. Understanding the pervasiveness of disturbance within the deposits is important to understanding the effect that site formation processes have on the proper use of available site data, particularly as it relates to the construction of a chronology for site deposits. Thus, we selected artifacts and human coprolites for radiocarbon dating whenever possible.

Application of Obsidian Hydration to Dating at Connley Caves

The same considerations concerning stratigraphic mixing must be applied when selecting specimens for obsidian hydration measurement correlations for the site strata, since it dictates the way that we order the data. Obsidian specimens with hydration measurements incongruent with acceptable radiocarbon dates, diagnostic artifact distributions, and ordered obsidian hydration measurements for each stratum must be rejected on the premise that they are out of stratigraphic order.

Adequate obsidian hydration dating depends in large measure on the comparison of associated radiocarbon ages with obsidian hydration rind measurements. To be accurately employed, this process requires the use of calibrated radiocarbon dates, which tend to be more linear than uncalibrated radiocarbon ages. The process also requires obsidian source characterization of each specimen, since individual volcanic sources exhibit unique chemical compositions that may hydrate at different rates.

UO field school obsidian studies include 86 tools and 96 flakes collected during the recent excavations. The sampling of these specimens was intended to provide for the comparison of obsidian source and hydration distributions throughout the deposits, top to bottom. Two to five specimens were selected from alternating levels in caves 5 and 6. Tools and flakes were selected from even-numbered levels beginning at the surface and continuing to the bottom of most Cave 5 excavation units at about 330 cm. In Cave 6, where mixing of the upper post-Mazama deposits was an unusually serious concern, tools alone were selected from upper deposits, and debitage was sampled from pre-Mazama strata between 165 and 275 cm.

Establishing the proper rate of obsidian hydration for these specimens was primarily a function of comparing mean hydration measurements of specimens recovered from the two most recently and reliably radiocarbon-dated pre-Mazama components in Cave 5. These specimens come from between 175 and 210 cm depths in the Upper pre-Mazama component, and between 240 and 280 cm in the Lower pre-Mazama component.

Upper pre-Mazama measurements ranged from 4.1 to 7.3 Fm (N=13). Recently obtained AMS dates for these deposits suggest that they date from about 8980 to 8560 cal. BP, and exhibit a mean age of about 8850 cal. BP. Employing the hydration rate of 3.3 Fm^2/1000 years proposed by Pettigrew and Hodges (1995:2-16) indicates that a mean reading of 5.4 Fm^2 would produce an age of 8840 cal. BP. It would seem most congruent to consider all specimens with hydration rinds <5.1 and >5.8 Fm to be out of stratigraphic sequence. This process results in a sample of seven acceptable specimens exhibiting a mean of 5.4 Fm.

The Lower pre-Mazama component sample, the component from which specimen 5B-29/3-1 was recovered, exhibited hydration measurements ranging from 5.0 to 7.7 Fm (N=22). Rejecting hydration readings <5.8 and >6.6 Fm as out of sequence, leaves a sample of 11 specimens exhibiting a mean of 6.4 Fm. A recently obtained AMS date suggests that these deposits date between 11,070 and 10,480 cal. BP, with a mean age of 10,670 cal. BP. Employing the hydration rate noted above indicates that the range of 6.0 to 6.6 Fm for the Lower pre-Mazama sample dates these deposits between 13,200 and10,900 cal. BP. Bedwell's oldest acceptable date exhibits an age range between 12,910 and 11,960 cal. BP (Table 1). Once again, the obsidian hydration rate proposed by Pettigrew and Hodges (1995:2-16) for south-central Oregon sources seems to fit remarkably well. Specimen 5B-29/3-1 with a hydration rind measurement of 5.9 " 0.1 Fm should date from about 10,910 to10,200 cal. BP, with a suggested mean age of 10,550 cal. BP.

Discussion

The data presented thus far are certainly not conclusive concerning whether the Connley Cave specimen is truly a fluted point. On the one hand, the technological attributes of the point indicate that it is, indeed, fluted; on the other hand, the radiocarbon dates from the recent excavations as well as the obsidian hydration data are not favorable, especially if we make the assumption that all fluted points in the Great Basin are coeval with Clovis. In the introduction it was pointed out that the two primary problems facing fluted point studies in the Great Basin concern, first, what actually constitutes fluting, and, second, the temporal placement of fluted points in this region. We turn now to a discussion of these issues.

What is a Flute?

Whether the twin medial flake scars on Side A of the Connley Cave specimen (Figure 2A) represent fluting depends on the fluting criteria one accepts. Bradley (1993:254), citing a 1988 personal communication with J. B. Sollberger, defines a flute as "any basal thinning flake(s) that traveled past the area of the hafting element." Warren and Phagan (1988:121), however, suggest that the term "fluted" has been increasingly applied to points that are simply basally-thinned (also see Musil, this volume). Callahan (1979:15) appears to be in at least some agreement with this statement, having written:

> I feel that the term "flute" should be restricted to the last flake or series of flakes intended to become the actual hafting accommodation scar. Accordingly, the term "flute" should not be used for end-thinning flake removal prior to this final stage. There are major differences in knapping approach between the two.

In an effort to restrict the term "fluting" to a more specific type of basal thinning, Warren and Phagan (1988) suggest a relatively simple set of criteria to distinguish fluting from basal thinning, which embodies aspects of the above definitions. They recommend (1988:121) that the term "fluting" be "restricted to a particular kind of basal thinning characterized by flake scars that:

1. are produced by base-to-tip directed force, and
2. are at least 1/4 the length of the point, and/or
3. are at least 1/3 the width of the point, and
4. are removed relatively late in the production sequence, such that they truncate at least some of the lateral edge-producing flake scars."

Warren and Phagan (1988:121-122) go on to say that "such a definition requires that fluting flakes be few (usually one, but never more than three per face), large, removed late in the production sequence, and producing major section alteration of the haft element."

Based on these criteria, the Connley Cave specimen should be considered fluted. Musil (this volume), however, argues for several more specific criteria, including

> the preparation of an isolated striking platform in the basal concavity for removal of a central flute-flake, guide flakes on either side of the central flute channel, or scratches in the flute channel, such as have been described as diagnostic attributes for the fluted points from the Dietz site...

While we appreciate Musil's desire for a more precise and reliable definition, his criteria appear overly restrictive. For example, we have observed scratches in the flute channel of some, but not all, of the Dietz fluted points. We have also observed such scratches on fluted points in other collections, but they are not visible even under low magnification on most specimens, especially those manufactured from chert.

Regarding guide flakes, certainly these flake scars are visible on some fluted points, but by no means all or even a majority. A quick perusal of the fluted point literature (e.g., Ahler and Geib 2000; Boldurian 1990; Boldurian and Cotter 1999; Deller and Ellis 1992; Frison and Bradley 1999; Judge 1973; Storck 1997) suggests the presence of guide flakes is relatively rare.

Finally, although a remnant of the fluting platform is sometimes visible on Folsom points, it is rarely visible on Clovis points, having been obliterated by subsequent basal retouch. As the fluted preforms in the Fenn Cache (Frison and Bradley 1999) illustrate, fluting may occur quite early in the shaping of the preform (see also, Deller and Ellis 1992; Shott 1993; Storck 1997). Even in the case of many Folsom points, this platform has been removed by other modifications to the basal concavity (see, for example, Boldurian 1990; Hoffman et al. 1990; Judge 1973). Thus, these three criteria, although one or more may apply to some specimens, are not *necessarily* present and thus can be used only as supportive, rather than definitive, criteria of fluting.

Dating Fluted Points in the Great Basin

Musil states also that the Connley Cave specimen occurs in a stratum that is too young, strengthening the argument against its being fluted; that is, because Lower Stratum VI at Connley Cave 5 dates to approximately 10,500 cal. BP (Table 3), the point cannot be fluted. This brings us to a second, probably more important, issue than the definition of fluting. Fluted points in the Great Basin are assumed by many,

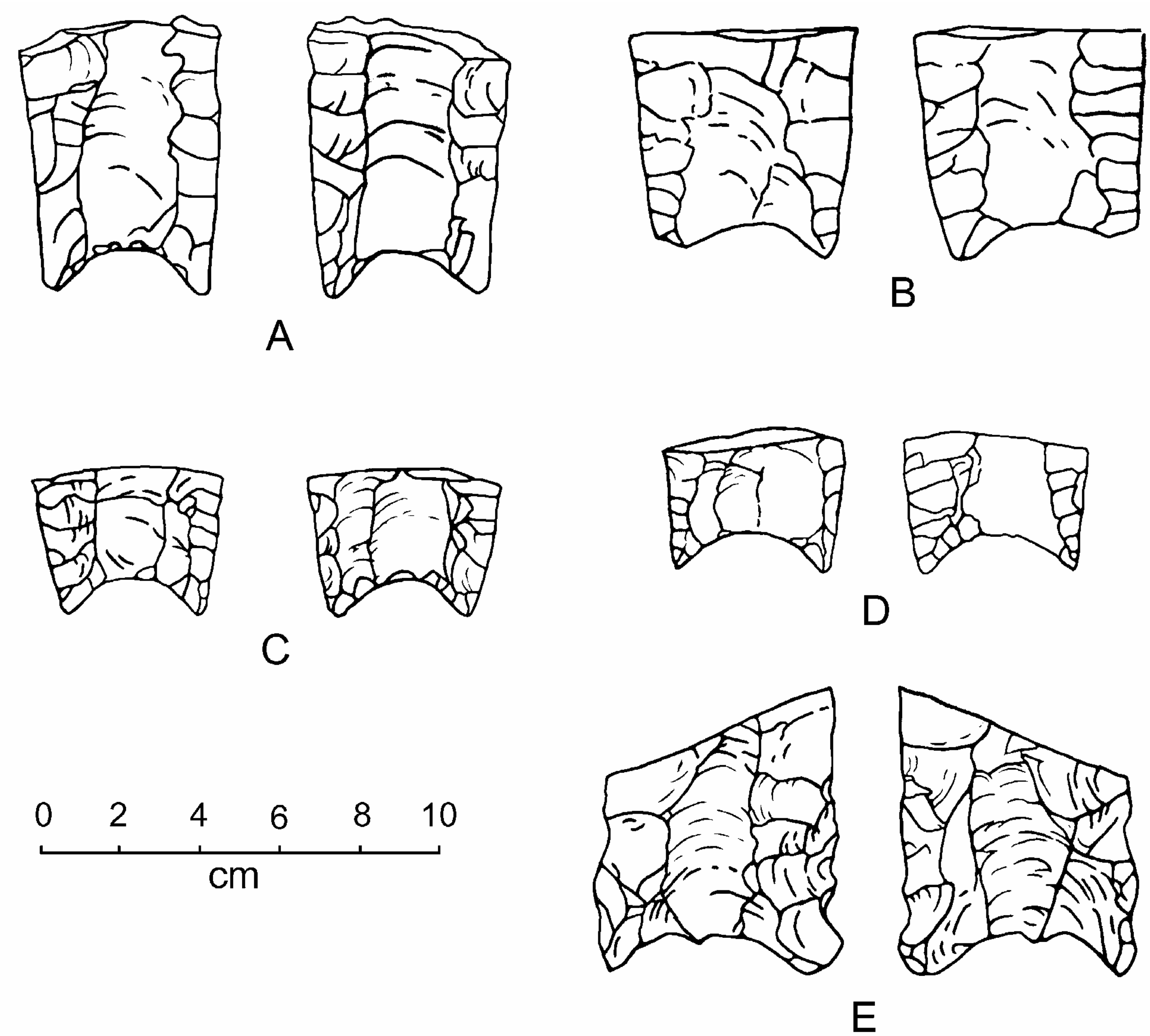

Figure 8. Drawings of four fluted points (A-D) and one fluted point preform (E) from the Sunshine Locality in eastern Nevada.

if not most, archaeologists to be the intermountain representation of Clovis and consequently the Clovis time period (e.g., ca. 13,300-12,800 cal. BP, or 11,200-10,900 RCYBP [R. E. Taylor et al. 1996]). In truth, however, no Clovis-aged radiocarbon dates have been associated with fluted points in the Great Basin; all of them are Folsom-age or younger. While none of these dates are unproblematic in their own right, they simply provide no basis for claiming that Great Basin fluted points *must* be of Clovis age. Further, no extensive, region-wide, systematic study of form, technology, or spatial distribution has ever been conducted for Great Basin fluted points (but see Davis and Shutler 1969; A. Taylor 2002; Tuohy 1969). Therefore, not only is the temporal placement of Great Basin fluted points largely unknown, but also whether or not more than a single fluted point form exists in this region is *also* unknown.

We believe that fluted points did appear early in the Great Basin, likely as early as Clovis appeared on the Plains and in the Southwest, and in fact, they probably are Clovis points. We also believe, however, there to be at least one (if not more) form of fluted point that occurred *after* Clovis (see also, Bryan 1988). Thus, dates of ca. 12,500 cal. BP (10,500 RCYBP) or even later would not surprise us. There is no reason to believe that the Great Basin differs from other regions, such as the Plains, the Southwest, the

North- and Southeast, in this respect. In the Southwest and on the Plains, Clovis is followed by Folsom; in the east there is a succession of fluted forms, such as Gainey, Holcombe, Burns, and Crowfield in the Northeast (Deller and Ellis 1992) and Cumberland, Simpson, Beaver Lake, Redstone, Suwanee, and Quad in the Southeast (Anderson et al. 1996; Meltzer 1988). The Late Paleoindian Period in the Southeast ends about 11,500 cal. BP (10,000 RCYBP) with Dalton, which occurs in both fluted and unfluted forms (Anderson et al. 1996; Goodyear 1982).

We have begun to examine this possibility with respect to the Sunshine Locality in eastern Nevada, from which a number of fluted points have been collected over the past 30 years (Beck and Jones n.d.; Huckleberry et al. 2001; Hutchinson 1988). We believe the Sunshine points represent a post-Clovis fluting technology that may be temporally concurrent with Folsom. A radiocarbon date of 10,340"60 RCYBP (ca. 12,200 cal. BP) was obtained on charcoal occurring 12 cm directly above the only subsurface specimen collected thus far from this site (Figure 8D; Huckleberry et al. 2001), providing a limiting date on the point. We offer a brief discussion of 17 fluted points from the Sunshine Locality, several of which are illustrated in Figure 8A-D, to show how they compare both formally and technologically with Clovis and Folsom points, using published data (e.g., Amick 1995; Boldurian 1990; Broilo 1971; Frison and Bradley 1999; Hofman and Wycoff 1991; Hofman et al. 1990; Judge 1973; Meltzer and Bever 1995; Tankersley 1994).

The Sunshine Locality Fluted Points

All of the Sunshine Locality fluted points are relatively small when compared with Clovis points. Table 4 shows several quantitative and qualitative measurements on the Sunshine points, while Tables 5 and 6 provide quantitative data for Clovis and Folsom points, respectively. All of the Sunshine points are fragmentary, and thus only certain metric variables are discussed here. The basal width of the Sunshine points ranges from 15.2 mm to 26. 8 mm, with a mean of 22.2 mm. As Table 5 shows, mean basal width of Clovis ranges between 22.9 mm and 32.9. The largest samples, however, are those in the Tankersly (1994) survey (n=305) and the Meltzer and Bever (1995) survey (n=260), for which the basal width means are 23.7 mm and 23.6 mm, respectively. The average basal width of Folsom points, by contrast, ranges between 16.3 mm and 19.6 mm (Table 6). The Sunshine mean lies between Clovis and Folsom, although closer to those of Clovis.

Among the Sunshine specimens, thickness ranges from 3.7 to 6.3 mm (Table 4), with a mean of 5.2 mm.

Table 4. Qualitative and quantitative measurements for 17 fluted points from the Sunshine Locality.[1]

Provenience	Fluting Face	Number Flutes	Type of Flaking	Pressure Flaking	Thickness	Basal Width	Maximum Width
SW-1893	Single	single	parallel	extensive	5.4	16.1	–
SW-1885	Both	single	parallel	extensive	4.2	15.2	18.9
SW-H-6N	Both	multiple	parallel	extensive	4.1	24.2	--
SW-1892	Both	single	parallel	extensive	6.3	22.0	22.5
SW-1911	Both	multiple	parallel	extensive	5.3	21.7	28.3
SW-1838	Both	multiple	parallel	extensive	6.1	26.2	--
SW-1894	Both	single	parallel	extensive	4.2	20.9	--
SW-1881	Single	multiple	various	extensive	6.0	22.1	26.1
SW93-2	Both	multiple	parallel	extensive	3.7	18.0	--
SW-1879	Both	single	parallel	extensive	4.7	22.2	28.2
SW-H-54	Single	single	--	extensive	4.7	22.5	--
SW95-11	Both	multiple	parallel	extensive	4.4	20.2	--
LVS-103	Both	single	parallel	extensive	5.4	21.4	26.2
SW-H-89	Single	multiple	parallel	extensive	6.3	26.8	27.1
SW-1891	Both	multiple	--	extensive	5.9	24.8	--
SW1-1904	Both	multiple	parallel	extensive	6.0	22.8	24.1
SW4-H-56	Single	single	parallel	extensive	5.1	--	–

[1]All measurements in mm.

Table 5. Summary of metric attributes for Clovis projectile points.[1]

Locality Statistics	Basal Indentation	Length	Maximum Width	Maximum Thickness	Basal Width
Texas[2]					
N	177	285	287	269	260
Range	0-8.0	11.0-164.0	17.1-48.9	3.0-12.0	13.8-45.0
Mean	2.8	61.4	27.5	7.3	23.6
sd	1.7	27.8	4.9	1.5	4.6
Fenn Cache[3]					
N	20	20	20	20	20
Range	0-11.8	76.8-212.5	26.6-53.8	6.6-11.7	24.7-45.7
Mean	4.3	112.8	37.5	7.9	32.9
sd	2.9	35.6	6.3	1.2	4.9
Oklahoma[4]					
N	–	57	79	60	68
Range	–	36.0-157.0	–	–	–
Mean	–	63.7	25.8	7.1	22.9
sd	–	–	–	–	–
IN/OH/KY[5]					
N	305	305	305	305	305
Range	0-14.0	26.0-197.0	3.0-54.0	4.0-11.0	12.0-44.0
Mean	3.9	67.5	26.6	7.3	23.7
sd	0.9	23.6	5.3	1.3	4.0
Rio Grande Valley[6]					
N	26	–	26	26	26
Range	1.5-7.1	–	22.0-32.2	4.1-9.0	19.1-29.2
Mean	3.5	–	26.4	5.8	23.9
sd	1.3	–	2.7	1.2	2.7

[1] Measurements in mm.
[2] Meltzer and Bever (1995:68)
[3] Frison and Bradley (1999:107); BI and BW not given, measurements taken on photographs.
[4] Hofman and Wycoff (1991:30)
[5] Tankersley (1994:503)
[6] Judge (1973:249)

Maximum thickness means among Clovis specimens range between 5.8 and 7.9 mm, with most being >7.0 mm (Table 5), while Folsom thickness means lie between 3.7 and 3.8 mm (Table 6). Once again, the Sunshine mean lies in-between.

While the flaking pattern of Clovis points is often irregular (Howard 1990), it is quite uniform among the Sunshine points, with all but one of the 15 that were measurable exhibiting precise parallel flake scars perpendicular to the lateral edges. In addition, all of the Sunshine points show extensive pressure flaking. The issue of pressure flaking on Clovis points is debated. Frison (1993) does not believe that pressure flaking was part of Clovis technology while Callahan (1979) is convinced that it was. Bradley (1993:253) states that

> In some cases the projectile points were mostly percussion finished with only minimal pressure retouch. In other cases, the projectile points underwent substantial pressure thinning and shaping, and on other points substantial marginal pressure retouch followed the pressure flaking.

Table 6. Summary of metric attributes for Folsom projectile points.[1]

Locality Statistics	Basal Indentation	Length	Maximum Width	Maximum Thickness	Basal Width
Shifting Sands[2]					
N	–	8	12	14	9
Range	–	16.3-52.8	13.1-24.7	2.9-7.1	12.3-21.5
Mean	–	35.7	18.8	3.7	16.3
sd	–	–	–	–	–
SW Plains[3]					
N	–	64	–	521	295
Range	–	–	–	–	–
Mean	–	32.8	–	3.7	18.5
sd	–	–	–	–	–
Rio Grande Valley[4]					
N	33	–	33	33	33
Range	2.0-6.0	–	18.5-25.0	3.1-5.0	17.2-22.0
Mean	2.9	–	21.5	3.8	19.4
sd	1.2	–	1.5	0.5	1.1
Mitchell Locality[5]					
N	10	–	–	–	10
Range	1.7-6.0	–	–	–	17.5-22.0
Mean	3.3	–	–	–	19.6
sd	1.4	–	–	–	1.7
Blackwater Draw[6]					
N	–	–	–	–	30
Range	–	–	–	–	16.0-22.0
Mean	–	–	–	–	18.8
sd	–	–	–	–	1.3

[1]Measurements in mm.
[2]Hofman et. al. (1990:241)
[3]Amick (1995:31)
[4] Judge (1973:165)
[5]Boldurian (1990:78)
[6] Broilo (1971), cited in Bouldarian (1990:165)

Frison (1993:241) argues that the Goshen point, which he believes succeeds Clovis in the northern Plains, represents a transition to consistent use of pressure flaking, which becomes very standardized in Folsom (see Ahler and Geib 2000). It appears that the *degree* and *consistency* of pressure flaking are the clues here. The high degree and consistency of pressure flaking on the Sunshine points suggests that they represent a phase of fluted point manufacture that followed Clovis.

Finally, the fluting technology of the Sunshine points appears to be more similar to that of Folsom than to that to that of Clovis. An 18th fluted specimen was collected from Sunshine, but was not included in the above discussions because it is an unfinished preform. As Figure 8E shows, this point is fluted on both sides, but a portion of the platform is still visible in the concavity. This platform suggests a fluting technology more like that of Folsom than that of Clovis. Had the point not been broken in manufacture, however, it is likely that pressure retouch would have been applied in the basal concavity, obliterating the platform.

In sum, the data we have reviewed suggest that the fluted points from the Sunshine Locality lie between Clovis and Folsom in size. They are more like Folsom points in regards to how the preform was prepared for fluting as well as the degree and consistency of pressure flaking present. They differ from Folsom, however, in the scale of the flute scar as well as in overall form. We believe them to represent a post-Clovis fluting technology that may be temporally concurrent with Folsom on the Plains and perhaps the Middle and Late Paleoindian periods in the east (ca. 10,800-10,000 RCYBP, or ca. 12,800-11,500 cal. BP).

Summary and Conclusion

So what do these data suggest concerning the Connley Cave point? The size and form of this point are consistent with the points from the Sunshine Locality. Its basal width and thickness fit neatly within the ranges of the Sunshine points. Further, the fluting technology appears similar as well. The fact that it has multiple flute scars on a single face does not argue against its being fluted. Table 4 shows that nine of the 17 Sunshine points have multiple flake scars on at least one face; further, five specimens are fluted only on a single face.

We believe that had the occurrence of the Connley Cave specimen been discovered in a stratum dating to ca. 12,500 cal. BP (10,500 RCYBP) rather than 1000 years later, there would be much less debate over its status as a fluted point. The assumption that all fluted points in the Great Basin represent Clovis, and thus must date between ca. 13,300 and 12,800 cal. BP (11,200 and 10,900 RCYBP), precludes consideration of any point occurring in later strata as being fluted. Based on its morphology, specimen 5B-29/3-1 qualifies as a fluted point. It exhibits twin flake scars originating in the base that travel distally at least 20 mm, much longer than typical of basal thinning flakes. Although not as large as prototypical Clovis specimens, it is larger than Folsom points. Disputes over its fluted status appear to originate less from the point's morphology than from the early Holocene affiliation suggested by the radiocarbon dates from the stratum in which it was discovered. We argue that very Early Holocene fluted point use cannot be dismissed out of hand. Although far from definitive, the radiocarbon evidence suggests that fluting may have, in fact, extended into the Early Holocene and thus we should entertain the possibility that at least some fluted points are contemporaneous with stemmed points.

In the absence of these artifacts in undisturbed stratigraphic, radiocarbon-dated context, we must attempt to address this problem using distributional and technological data. This requires a substantial effort to study fluted points, their contexts and associations, and their technological attributes, throughout the Great Basin. We suggest building a database to which anyone can submit data and also have access. Such a database was begun by Amanda Taylor in 2002 at Hamilton College. We are in the process of creating a website accessible to anyone interested where information can be added to as well as downloaded from the database. We hope this website will be available in the near future, possibly by the spring of 2004. We encourage any who are interested to go to the Hamilton College website (www.hamilton.edu) and then to Anthropology where there will be a link; check it out!

End Notes

[1]Skinner and Thatcher are uncomfortable with converting hydration rim measurements to calendar dates given the problems that exist with the calculation of both archaeological and laboratory-induced hydration rates.

[2]Additional details about specific analytical methods and procedures used for the analysis of the elements and the preparation and measurement of hydration rims are available at the Northwest Research Obsidian Studies Laboratory World Wide Web site at *www.obsidianlab.com.*

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