PALEOINDIAN LIFEWAYS OF THE CODY COMPLEX

edited by
Edward J. Knell and Mark P. Muñiz

THE UNIVERSITY OF UTAH PRESS
Salt Lake City
2013

1

Introducing the Cody Complex

Edward J. Knell and Mark P. Muñiz

Mention of the "Cody complex" usually evokes certain thoughts among those familiar with this cultural complex: late Paleoindian period, Great Plains, stemmed Eden and Scottsbluff points, Cody knife, early Holocene, large bison kills, and a handful of key sites (e.g., Finley, Horner, Olsen-Chubbuck, MacHaffie, and Scottsbluff). These perceptions of the Cody complex developed through work conducted during the last seven decades, mostly from individual site-based treatments of Cody sites. These perceptions are true and reasonably characterize the Cody complex; however, a more nuanced understanding of Cody complex lifeways has not been elucidated, in part because until now a detailed, wide-ranging, behavior-oriented synthesis devoted to the Cody complex has not been written. Several such syntheses exist for Clovis and Folsom (e.g., Amick 1999; Bonnichsen et al. 2005; Bradley et al. 2010; Clark and Collins 2002), but none for the Cody complex. The lack of such a synthesis for Cody is significant considering that it is one of the longest-lasting North American Paleoindian traditions (~2,800 calendar years) and is second only to Clovis in geographic expanse (extending from the Great Basin to the St. Lawrence River and from the Canadian plains to the Texas Gulf Coast; see Figure 1.2). The contributors to this book seek to remedy the situation for the Cody complex by offering behavior-oriented syntheses that significantly expand knowledge of Cody complex lifeways. This expanded understanding would not be possible without prior research on the Cody complex, and we recognize and summarize previous important contributions to establish a framework that allows the chapters in this book to highlight new insights about the Cody complex rather than recapitulate past findings.

This chapter begins by summarizing prior knowledge of Cody complex technology, chronology, geographic range, subsistence practices, land use, and worldview. Then the new contributions to the Cody literature contained in this book are briefly introduced, providing a road map for the chapters that follow.

Lithic Technology and Chronology

Jepsen (1951:24) first coined the term "Cody complex" to describe the co-occurrence of Eden and Scottsbluff projectile points recovered from the Horner site near Cody, Wyoming. Previously, Eden and Scottsbluff points were subsumed under the broadly defined "Yuma" projectile point type (see discussion in Wormington 1957:103; also Wedel 1987). After Collateral Yuma points were found at the Finley site, located in the Eden Valley of Wyoming, and a second variety of Yuma point was found near Scottsbluff, Nebraska, called Scottsbluff Yuma, H. Marie Wormington (1948; also 1957:106) suggested dropping the term "Yuma" and simply renaming them "Eden" and "Scottsbluff," respectively. It was under this framework that in 1951 Jepsen suggested that the co-occurring Eden and Scottsbluff points at the

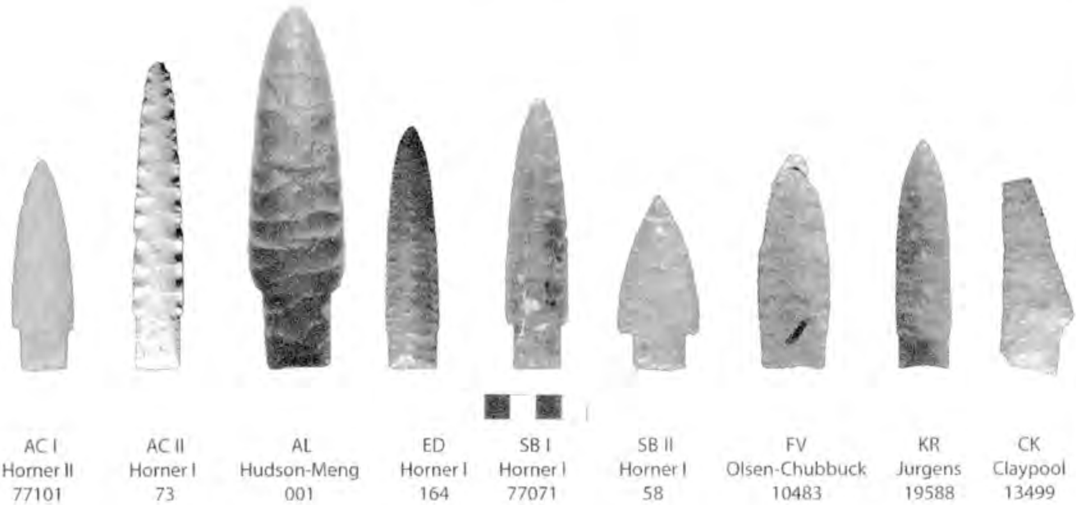

FIGURE 1.1. Primary projectile point styles comprising the Cody complex with site and catalog number: AC I = Alberta/Cody I; AC II = Alberta/Cody II; AL = Alberta; ED = Eden; SB I = Scottsbluff I; SB II = Scottsbluff II; FV = Firstview; KR = Kersey; CK = Cody knife. All photos are of original points, except Alberta point, which is a cast.

Horner site be considered part of a single cultural complex — the Cody complex. In 1957, Wormington further elaborated on the concept of a complex, which she defined as "a group of related traits or characteristics that combine to form a complete activity, process, or cultural unit. Lithic complexes are identified by the presence of several key implement or tool types in association" (p. 275). Wormington (1957) ultimately went on to identify the co-occurrence of Eden and Scottsbluff points and Cody knives as hallmark indicators of the Cody complex (Figure 1.1).

Since then, many researchers have considered the Alberta point type a distinct yet direct antecedent of the Cody complex (e.g., Agenbroad 1978; Bradley 1993, 2009, 2010; Frison 1991; Stanford 1999). However, results of detailed point production analyses (Bradley 1993, 2010; Bradley and Frison 1987) and the recognition that Alberta radiocarbon dates and geographic distribution overlap with Eden and Scottsbluff has led most archaeologists to include the Alberta point within the Cody complex (e.g., Agenbroad 1978; Amick, this volume; Bamforth 1991; Bradley 1993, 2009, 2010; Bradley and Frison 1987; Hofman and Graham 1998; Knell 2007; Muñiz 2005). For our purposes here, we consider the Cody complex to represent a taxonomic classification of early Holocene hunter-gatherers who shared distinctive projectile and knife technologies that set them apart from their contemporaries; these groups shared other important aspects of their lifeways, such as an emphasis on bison hunting and extensive long-term use of the Great Plains and Rocky Mountains. We make no assumptions about other cultural aspects such as language, ideology, or social organization, which may have varied between groups. Undoubtedly, smaller subdivisions of the Cody complex can be made depending on which characteristics are emphasized, and the researchers in this book may differ in their applications.

Projectile Point Technology

In the decades following Wormington's seminal publication, researchers named many more "types" of Cody projectile points, generally basing the distinctions on variations in degree of shouldering, blade outline shape, length of stem, and final rounds of pressure flaking (Agenbroad 1978; Bamforth 1991; Beck and Jones 1997; Bradley and Frison 1987; Bradley and Stanford 1987; Forbis 1968; Frison 1991; M. G. Hill et al. 1995; Hofman and Graham 1998; Justice 1987; Mason 1997; Stanford 1999; Theler and Boszhardt 2003; Wheat 1972, 1979; also see Knudson, this volume; Bamforth, this volume). For example, Wheat (1972) added the Firstview type and provided a particularly informative description of the subtle differences between the Eden, Scottsbluff, Firstview, San Jon, and Milnesand types on the Great Plains. Hofman and Graham (1998) noted a potential association between Cody and Milnesand points from the southern Plains, and LaBelle (2002) documented a co-occurrence with James Allen points in eastern Colorado; however, we do not consider Milnesand or James Allen part of the Cody complex. Thus, the primary named point types associated with the Cody complex throughout the Great Plains, Rocky Mountains, and Great Basin are Alberta, Alberta/Cody I, Alberta/Cody II, Kersey, Firstview, Eden, Scottsbluff I, and Scottsbluff II (Figure 1.1). Other named Cody point variants include the enigmatic Scottsbluff III (Great Plains and Rocky Mountains), Eared Scottsbluff/Eden and Renier variants (western Great Lakes), San Jon (Llano Estacado region), and Texas Scottsbluff (southern Texas). The Hardin point type from the central Midwest is considered by many (Justice 1987; Mason 1997; Theler and Boszhardt 2003) to be either a stylistic variant or direct descendant of the Scottsbluff type. Some Holland points from the central Midwest have characteristic Cody point attributes (Holland 1971), but many researchers consider them Dalton variants (Justice 1987). Around the western Great Lakes, archaeologists have named several cultural phases and complexes (e.g., Interlakes composite, Lakehead complex, Minocqua phase, Reservoir Lakes complex) that include Cody points and variants (Fox 1975; Harrison et al. 1995; Ross 1997; Salzer 1974; Steinbring 1974). However, these complexes also include unrelated, nonfluted Paleoindian point styles (e.g., Agate Basin, Hell Gap, Angostura, and variants) that lack exclusively Cody traits.

Regardless of the specific named type, the basic Cody complex projectile point has a straight-sided (sometimes slightly expanding or contracting) squared base that may range from slightly convex to flat to slightly concave, squared to rounded shoulders that are occasionally subtle when ground or absent (e.g., Firstview), a lanceolate parallel-sided blade (that may range from convex to triangular) often with well-executed parallel collateral flaking (sometimes irregular), and a cross section ranging from biconvex (sometimes flattened) to median ridged (sometimes diamond shaped). In the Midwest, the Eared Scottsbluff/Eden type has small ears extending outward from the bottom of the base (as do some Holland points, to a much lesser extent), and Hardin points have broad corner-notches and a pronounced expanding stem.

Cody Knife

The Cody knife is the other diagnostic artifact type for the Cody complex (Figure 1.1) and, like the projectile points, has a plethora of morphological varieties (Agenbroad 1978; Blackmar 1998; Bradley and Frison 1987; Bradley and Stanford 1987; Dick and Mountain 1960; Wormington 1957). Cody knives generally have square bases and asymmetrical blades, and are usually—but not always—stemmed on at least one margin. Blackmar (1998) noted that within the Great Plains, Colorado ($n = 15$) and Wyoming ($n = 15$) have the most frequent occurrence of the classic Cody knife as defined by Wormington. Furthermore, Blackmar found that the majority of knives recovered from the two states came from the Claypool site in Colorado ($n = 11$) and the Horner site in Wyoming ($n = 8$). More recently, three Cody knives were found at the Osprey Beach site, Yellowstone National Park, Wyoming (Johnson et al. 2004). Unlike the case of projectile points, our understanding of Cody knives remains somewhat enigmatic because this artifact type has received less discussion regarding its morphological variability or chronological or cultural implications. Recent high-magnification use-wear analyses by Muñiz (2005) on several Cody knives from the western and northwestern Plains identify these tools as butchering implements—a pattern consistent with their frequent recovery from bison kill sites.

Radiocarbon Chronology

The chronometric relationship between the various projectile point styles is complex because of several factors: the paucity of radiocarbon dates associated with all the point styles except Eden and Scottsbluff, the implications of reversals and plateaus in the radiocarbon calibration curve, and variability in the morphological continuum exhibited by many of the point styles. With these limitations in mind, we briefly analyze chronological and geographic trends in the development

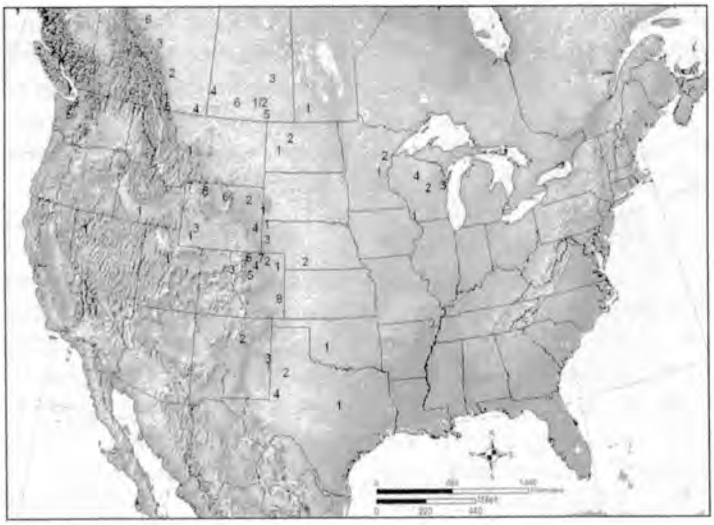

FIGURE 1.2. Map of selected Cody complex sites. Site names are listed in Table 1.2.

of Cody complex point styles. Radiocarbon dates are presented throughout this book, followed (in most cases) by the two standard error (95 percent confidence interval) calibrated year BP date range as appropriate. The radiocarbon dates were calibrated using CALIB 6.0.2 based on the INTCAL09 calibration curve (Reimer et al. 2009).

Several of the stemmed projectile point types from the Plateau and Great Basin have radiocarbon dates prior to 11,000 ^{14}C yrs BP (see dates in Beck and Jones 2010), and may have been precursors to the stemmed point varieties on the Great Plains that appear around 10,000 ^{14}C yrs BP (11,600–11,340 cal BP). The cultural and chronological relationships between Cody complex peoples from the Great Basin, Great Plains, Plateau, and Rocky Mountains are underresearched topics that hold great importance for understanding Cody complex origins (but see Amick, this volume), the stability of this early Holocene cultural tradition, and relationships with descendant early Archaic groups.

To explore the date range of the Cody complex, we provide summary data that include 64 radiocarbon dates from 41 Cody complex components at 31 sites (Table 1.1). We attempted to focus on single components as much as possible to reduce complications from mixed assemblages, although undoubtedly some components are mixed. The 31 sites we use to evaluate the Cody chronological record are generally located on the western Great Plains and Rocky Mountains, as most Cody complex research has been conducted there; the resulting analysis is probably affected by this bias. Despite the bias, the ten U.S. states and two Canadian provinces containing radiocarbon-dated sites (Figure 1.2, Tables 1.1 and 1.2) represent a wide swath of North America that should allow for the identification of temporal patterning resulting from large-scale geographical trends in occupation and possible colonization of territory by Cody groups.

A second potential source of bias in understanding time-space systematics for the Cody complex comes from the continuous nature of the technological attributes used to classify the diagnostic point styles. For example, identifying an extra round of pressure shaping or the emphasis a specific researcher places on degree of development and shape of shoulders may result in a slightly different point style classification. Generally, we relied on the typological classifications made by the original investigators with the understanding that different researchers may create slightly different groupings.

To assess the current state of the Cody chronology and to provide a chronological baseline for the chapters that follow, we developed a ranking system to organize the radiocarbon dates in Table 1.1. We included only those published radiocarbon dates that are most directly associated with each cultural deposit. The degree of association (from most to least associated) was ranked in the following tiers:

1. The dated material is in direct association with the cultural deposit in the form of a cultural feature (e.g., hearth, bonebed), and consists of charcoal, seed, or bone collagen (preferably dated in the mid-1990s or later due to advancements in bone dating techniques that occurred during this time).
2. The dated material is in indirect association with the cultural deposit because the sample is from the same stratum (either geologic or pedogenic) but spatially separated from the deposit and the dated material consists of charcoal, seed, or bone collagen (preferably dated in the mid-1990s or later).
3. The dated material is bulk sediment (e.g., humates, humic acid, "residue") in either direct or indirect association with the cultural deposit.

In order to better understand the chronological trends for specific point styles, we further analyzed the tier 1 and 2 dates (82.8 percent of the sample). The tier 3 samples lack direct association with the cultural deposit because they are bulk samples subject to the mixing effects of younger pedogenic processes; consequently, we excluded them from analysis. Also excluded were bracketing dates from super- or subjacent strata. Although Wheat's (1972) original date for Olsen-Chubbuck was made directly on bone from the bonebed, it was excluded both because of the very large standard error (500 years) and because the site was redated by Holliday and colleagues (1999) using better techniques.

Figure 1.3 illustrates the distribution of the 53 tier 1 and 2 uncalibrated radiocarbon dates by point style with a two-sigma error. When we consider single point styles from unmixed components, the Alberta/Cody components from the Horner II and Wallmann Bison sites (10,500–9620 ^{14}C yrs BP; 12,590–10,870 cal BP) are oldest; however, this very small sample may not fully represent Alberta/Cody and must be considered cautiously. Alberta points are the next oldest, based on seven dates from five sites; when a two-sigma range is used, this point style dates from 10,065 to 8135 ^{14}C yrs BP (11,720–9020 cal BP). The youngest date, from Swan Landing, Alberta, is an extreme outlier, and if it is removed, the range terminates at 9440 ^{14}C yrs BP (ca. 10,655 cal BP). Following Alberta and Alberta/Cody is a florescence of point styles that include Eden, Scottsbluff, Firstview, and Kersey.

Two sites from Alberta, Canada—Fletcher and DjPm-1—provide data relevant to the termination of the Alberta phase and the initiation of Scottsbluff. The Fletcher site has a mixed Alberta and Scottsbluff component that was recently dated to 9540 ± 110 ^{14}C yrs BP (11,185–10,575 cal BP) (see Dawe, this volume), a date that overlaps with the previously reported maximum bracketing age of 9380 ± 110 ^{14}C yrs BP (10,265–11,072 cal BP) (Vickers and Beaudoin 1989). The new Fletcher date is also one of the earliest dates yet recorded for Scottsbluff. A minimum bracketing date of 9410 ± 95 ^{14}C yrs BP (11,083–10,300 cal BP) was determined for the Alberta component at Locality I, Hell Gap (Haynes 2009) and provides further support for a terminal date for the Alberta style of about 9440 ^{14}C yrs BP (ca. 10,655 cal BP). Site DjPm-16 produced two dates—9600 ± 210 and 9450 ± 230 ^{14}C yrs BP—on a mixed Alberta and Scottsbluff component that average 9525 ^{14}C yrs BP (see Dawe, this volume). Although large standard errors exist for the DjPm-16 dates, they provide further support for a pre-9500 ^{14}C yr BP origin for the Scottsbluff style.

The earliest components with only Scottsbluff points occur at two sites in Alberta (EgPn-480, EkPu-8) and the Malin Fishing Hole site in Montana, which together range from 9910 to 9400 ^{14}C yrs BP (11,320–10,580 cal BP). These sites are separated by 321 radiocarbon years (442 calendar years) from the remaining Scottsbluff component sites and possibly suggest that the Scottsbluff style originated in Alberta before spreading southward; more data are needed to evaluate this issue (see Dawe, this volume).

The four other sites with Scottsbluff-only components date from 9109 to 7500 ^{14}C yrs BP (10,250–8330 cal BP). The youngest date, from MacHaffie, was run shortly after the advent of radiocarbon dating and has a large standard error (Forbis and Sperry 1952). As Figure 1.3 shows, several of the youngest Scottsbluff dates (MacHaffie, Red Rock Canyon) have large errors; we feel that a terminal date closer to 8000 ^{14}C yrs BP (8990–8785 cal BP) is more likely.

The date range for single-component Eden occupations is much narrower than for Scottsbluff.

TABLE 1.1. Cody Complex Radiocarbon Dates Used for Spatio-Temporal Analysis.

Site	Point Type[a]	Date	Error	Lab ID	Material	Tier	Reference
Benz, ND	AL	9540	50	UCR-3466	charcoal	2	Root 1992, 1998
	SB	8910	70	SMU-1271	humates	2	Root 1992, 1998
	SB	8700	70	SMU-1282	humates	2	Root 1992, 1998
Blackwater Draw, NM	FV	8970	60	SMU-1672	humates	2	Holliday et al. 1999
	FV	8830	160	Y-2488	sediment organic residue	2	Holliday et al. 1999
	FV	8690	70	SMU-1671	humates	2	Holliday et al. 1999
Blue Point, WY	AL	9540	40	Beta 133208	charcoal	1	Johnson and Pastor 2003
DjPm-16, Alberta	AL; SB	9600	210	AECV-746C	bone	2	Van Dyke et al. 1989 (in Dawe, this volume)
	AL; SB	9450	230	BIS-17	bone	2	Van Dyke et al. 1989 (in Dawe, this volume)
EgPn-480, Alberta	SB	9540	70	Beta-127235	bone	1	De Mille and Head 2001 (in Dawe, this volume)
EkPu-8, Alberta	SB	9750	80	TO-2999	bison metacarpal	2	Ronaghan 1993 (in Dawe, this volume)
Finley, WY	ED; SB	9026	118	SMU-250	bison apatite	1	Frison 1991
	ED; SB	8950	220	RL-574	bison apatite	1	Frison 1991
Fletcher, Alberta	AL; SB	9540	110	CAMS-42980	seed	1	Beaudoin et al. 2000 (in Dawe, this volume)
	AL; SB	9380	110	TO-1097	seed	3	Vickers and Beaudoin 1989
Frasca, CO	ED; SB	8910	90	SI-4848	bone	1	Fulgham and Stanford 1982
Hell Gap, Loc. I, WY	AL	10,560	80	AA-20545	charcoal	3	Haynes 2009
	AL	9410	95	AA-28774	charcoal	3	Haynes 2009
	ED; SB	9120	490	AA-27675	charcoal	2	Haynes 2009
Hell Gap, Loc. V, WY	ED	9050	160	A-753C3	apatite	1	Haynes 1968, 2009; Knell et al. 2002
	ED	8890	110	A-753A	apatite	1	Haynes 1968, 2009; Knell et al. 2002
	ED	8685	70	A-35655	bulk residue	3	Haynes 1968, 2009; Knell et al. 2002
Heron Eden, Saskatchewan	ED	9210	110	S-3308	bison bone	1	Corbeil 1995
	ED	8930	120	S-3114	bison bone	1	Corbeil 1995
	ED	8920	130	S-3309	bison bone	1	Corbeil 1995
Horner I, WY	AC; ED; SB	9390	75	SI-4851	charcoal	3	Frison 1987
	AC; ED; SB	8840	140	UCLA-697A	bison bone	1	Frison 1987
	AC; ED; SB	8750	120	UCLA-697A	bison bone	1	Frison 1987
Horner II, WY	AC	10,060	220	I-10900	charcoal	2	Frison 1987
	AC	9875	85	SI-4851A	charcoal	2	Frison 1987
Hudson-Meng, NE	AL	9920	72.5	4 dates avg.[1]	charcoal	2	Todd and Rapson 1994
	AL	9820	160	SMU-224	charcoal	2	Agenbroad 1978
	AL	9675	70	2 dates avg.[2]	bone collagen	1	Todd and Rapson 1994

	ED	9539	55	NZA 29717	bone collagen	1	Muñiz 2008
Jerry Craig, CO	ED; SB	9310	50	Beta-109467	charcoal	2	Hill and Kornfeld 1999; Richings-Germain 2002
Jim Pitts, SD	AL; SB; CK	9390	65	AA-23779	wood	3	Sellet 2009
Jurgens, CO	KR	9070	90	SI-3726	charcoal	2	Wheat 1979
Lamb Spring, CO	ED; SB	8870	350	M-1463	bison collagen	1	Rancier et al. 1982; Stanford et al. 1981
Lindenmeier, CO	AL	9880	100	TO-339	charcoal	2	Haynes et al. 1992
	ED; SB	9690	60	TO-341	charcoal	2	Haynes et al. 1992
Lubbock Lake, TX	FV	8655	90	SI-4177	residue	2	Holliday et al. 1983
	FV	8210	240	SMU-830	humates	2	Holliday et al. 1983
	FV	7980	180	SMU-827	humates	2	Holliday et al. 1983
MacHaffie, MT	SB	8620	200	GX-15152	wood	2	Davis et al. 1991; Forbis and Sperry 1952
	SB	8280	120	GX-15153-G	bone collagen	1	Davis et al. 1991; Forbis and Sperry 1952
	SB	8100	300	L-578A	wood	2	Davis et al. 1991; Forbis and Sperry 1952
Malin Fishing Hole, MT	CK	8880	50	n/a	n/a	2	Vivian 2005
	SB	9530	50	Beta-196111	n/a	2	Vivian 2005
Mammoth Meadow, MT	ED; SB	9390	90	TO-1976	charcoal	2	Bonnichsen et al. 1992
Medicine Lodge Creek, WY	ED; AC?	9360	380	RL-150	bone	3	Frison and Walker 2007
	ED; AC?	9030	470	RL-439	bone	2	Frison and Walker 2007
	ED; AC?	8830	470	RL-446	charcoal	2	Frison 1991; Frison and Walker 2007
Nelson, CO	ED; SB	9260	20	UCIAMS-26939	bone	1	Kornfeld et al. 2007
	ED; SB	7995	80	SI-4898	bone (bad date?)	1	Cassells 1997
Olsen-Chubbuck, CO	FV	10,150	500	A-744	bone collagen	1[b]	Wheat 1972
	FV	9395	20	7 dates avg.[3]	bison bone gelatin	1	Holliday et al. 1999
Osprey Beach, WY	ED; SB	9360	60	Beta-148567	charcoal	2	Johnson et al. 2004
Red Rock Canyon, Alberta	SB	8220	260	GX-1435	charcoal	2	Dawe, this volume
San Jon, NM	FV	8275	65	A-7438.1	humates	2	Holliday et al. 1999
Scottsbluff, NE	SB	8939	85	AA-67443	bison collagen	1	Hill 2008
	SB	8680	85	AA-67442	bison collagen	1	Hill 2008
Swan Landing, Alberta	AL	8675	270	S-2178	charcoal	2	Dawe, this volume
	AL	8630	100	AEVC-10cx	charcoal	3	Dawe, this volume
Wallmann Bison, NV	AC	9770	50	UCR-3782/CAMS 59156	bison amino acids	1	Dansie and Jerrems 2004 (in Amick, this volume)

[a] AC (Alberta/Cody), AL (Alberta), CK (Cody knife), ED (Eden), FV (Firstview), KR (Kersey), SB (Scottsbluff).

[b] Date (Wheat 1972) not used for this analysis because of very large standard error and redating of site by Holliday et al. 1999.

[1] Beta-64318; Beta-64320; Beta-65276; Beta-65277.

[2] CAMS-10364; CAMS-12841.

[3] NSRL-2801 CAMS-31812; NSRL-2797 CAMS-31813; NSRL-2797 CAMS-32682; NSRL-2799 CAMS-32683; NSRL-2798 CAMS24968; NSRL-2801 CAMS-32684; NSRL-2799 CAMS-31814.

TABLE 1.2. Key Cody Complex Sites Shown in Figure 1.2 by State/Province.

State/Province	Site Name	Figure 1.2 Map #	Date?	Reference
Alberta	DjPm-16	1	yes	Van Dyke et al. 1989 (in Dawe, this volume)
	EgPn-480	2	yes	De Mille and Head 2001 (in Dawe, this volume)
	EkPu-8	3	yes	Ronaghan 1993 (in Dawe, this volume)
	Fletcher	4	yes	Forbis 1968
	Red Rock Canyon	5	yes	Reeves 1972 and Reeves and Bourges 2002 (in Dawe, this volume)
	Swan Landing	6	yes	Ball 1983, 1986 and Dawe 1983 (in Dawe, this volume)
Colorado	Claypool	1	no	Dick and Mountain 1960
	Frasca	2	yes	Fulgham and Stanford 1982
	Jerry Craig	3	yes	Richings-Germain 2002
	Jurgens	4	yes	Wheat 1979
	Lamb Spring	5	yes	Wedel 1963
	Lindenmeier	6	yes	Wilmsen and Roberts 1978
	Nelson	7	yes	Kornfeld et al. 2007
	Olsen-Chubbuck	8	yes	Wheat 1972
Idaho	Wilson Butte Cave	1	no	Gruhn 1961
Manitoba	Carberry Plain	1	no	Pettipas 1970
Minnesota	Bradbury Brook	1	yes	Malik and Bakken 1993, 1999
	Reservoir Lakes	2	no	Harrison et al. 1995; Steinbring 1974
Montana	MacHaffie	1	yes	Forbis and Sperry 1952
	Mammoth Meadow	2	yes	Bonnichsen et al. 1992
Nebraska	Hudson-Meng	1	yes	Agenbroad 1978
	Medicine Creek Sites	2	no	Davis 1962; Bamforth 2007
	Scottsbluff	3	yes	Barbour and Schultz 1932
Nevada	Wallman Square-Base and Bison Site	1	yes	Amick, this volume
New Mexico	Blackwater Draw	1	yes	Hester 1972
	R-6	2	no	Stanford and Patten 1984
	San Jon	3	yes	Roberts 1942
North Dakota	Benz	1	yes	Root 1992
	Max	2	no	Root et al., this volume
Oklahoma	Cedar Creek	1	no	Hofman 1990; see Blackmar and Hofman 1997 for distribution in Oklahoma
Ontario	Sheguiandah	1	yes	Julig 2002
Saskatchewan	DjNf-8	1	yes	Ebell 1975
	Dunn	2	no	Ebell 1988
	Haskey Area	3	no	Novecosky 2002
	Heron Eden	4	yes	Corbeil 1995
	McLeod	5	no	Joyes 1997, 2000
	Niska	6	no	Meyer 1985
South Dakota	Jim Pitts	1	yes	Sellet 2009
Texas	Horn Shelter	1	no	Redder 1985
	Lubbock Lake	2	yes	Johnson 1987
	McFaddin Beach	3	no	Long 1977
	Seminole Rose	4	no	Collins et al. 1997
Utah	Martin	1	no	Janetski 2001

TABLE 1.2. (cont'd.) Key Cody Complex Sites Shown in Figure 1.2 by State/Province.

State/Province	Site Name	Figure 1.2 Map #	Date?	Reference
Wisconsin	Bass	1	no	Stoltman 1997; Theler and Boszhardt 2003
	Pope	2	no	Ritzenthaler 1972
	Renier	3	no	Mason and Irwin 1960; Mason 1981
	Robinson	4	no	Salzer 1974
Wyoming	Blue Point	1	yes	Johnson and Pastor 2003
	Carter/Kerr-McGee	2	no	Frison 1984
	Finley	3	yes	Moss et al. 1951
	Hell Gap	4	yes	Irwin-Williams et al. 1973; Knell 2009; Knell et al. 2009; Larson et al. 2009
	Horner	5	yes	Frison and Todd 1987
	Medicine Lodge Creek	6	yes	Frison and Walker 2007
	Osprey Beach	7	yes	Johnson et al. 2004

Three sites (Hell Gap Locality V, Heron Eden, Hudson-Meng) with six single-component Eden occupations range in age from 9649 to 8660 ^{14}C yrs BP (11,160–9525 cal BP). The raw dates (without errors) indicate that these components are generally older than single-component Scottsbluff sites, although there is considerable overlap. The oldest Eden date is from Hudson-Meng (9539 ± 55 ^{14}C yrs BP; 10,679–11,105 cal BP) (Muñiz 2010) and is essentially identical to the oldest Scottsbluff dates. Although the sample size is small, the data lead to the hypothesis that Scottsbluff and Eden developed contemporaneously, with Scottsbluff to the north (southern Alberta and Montana) and Eden to the south (Nebraska–central High Plains).

Examples of both Eden and Scottsbluff projectile points in the same component occur in ten components at nine sites, and range from 10,100 to 8140 ^{14}C yrs BP (11,760–9020 cal BP). The oldest date, from Locality I at Hell Gap, has a large standard error (Haynes 2009); thus, a more accurate estimate for the maximum date may be the 9810 ^{14}C yr BP (11,240–11,220 cal BP) date from Lindenmeier (Haynes et al. 1992). As Figure 1.3 illustrates, the termination of the co-occurring Eden-Scottsbluff occupations appears to correlate with the end of Eden, since the Scottsbluff style continues for many centuries afterward.

Radiocarbon dates for eight Firstview components at four sites (Blackwater Draw, Lubbock Lake, Olsen-Chubbuck, San Jon) largely mirror those for the later Scottsbluff grouping. The majority (75 percent) of these dated components are from just two sites: Blackwater Draw and Lubbock Lake. The similarity in temporal range to the more northerly Scottsbluff sites may indicate distinct regional foci for groups making these styles (Firstview in the south; Scottsbluff in the north), as noted by Bamforth (1991) and Holliday (1997). If we take into consideration the temporal overlap at the end of Eden and beginning of Firstview, the lack of distinctive shouldering that typifies both styles, and the general southerly orientation in relation to Scottsbluff, the intriguing possibility is raised that Firstview evolved from an Eden precursor. Detailed technological analyses should be conducted to evaluate this possibility.

The final dated components in the sample include mixed deposits with Alberta/Cody, Eden, and Scottsbluff points, and the Kersey type as defined by Wheat (1979) at the Jurgens site. The mixed components at Horner I include Alberta/Cody, Eden, and Scottsbluff points that date to ca. 8800 ^{14}C yrs BP (ca. 9905–9740 cal BP). Frison et al. (1987) noted the possibility that the Horner I deposit represents a palimpsest accumulation and that the Alberta/Cody points may date an older occupation. Otherwise, the Alberta/Cody component at Horner I is at least 500 ^{14}C years younger than expected; however, the small Alberta/Cody sample may significantly bias this interpretation. The two dates from Medicine Lodge Creek are from a stratum with Eden and possibly Alberta/Cody points. The dates are more consistent with Eden, but as with Horner I, the lack of Alberta/Cody sites in the database may cause this

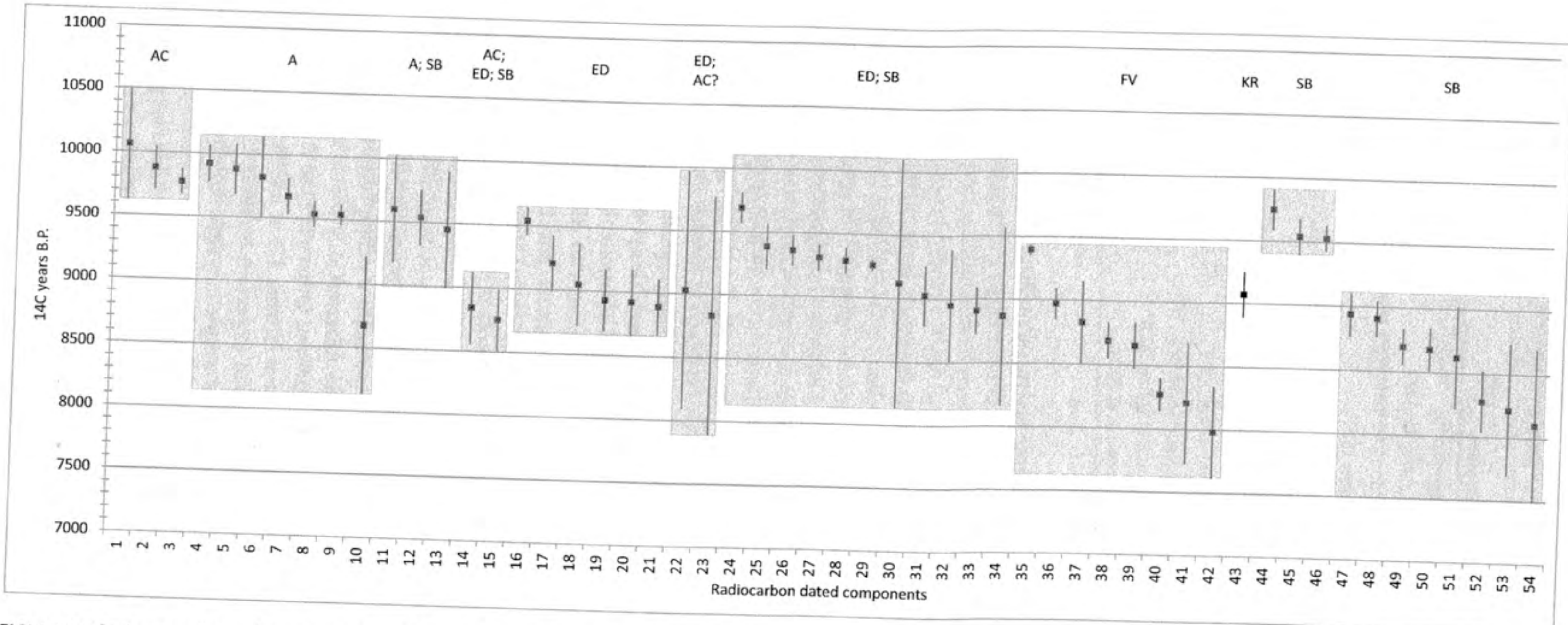

FIGURE 1.3. Cody complex radiocarbon dates: AC = Alberta/Cody; A = Alberta; ED = Eden; SB = Scottsbluff (I and II); FV = Firstview; KR = Kersey; combinations also indicated.

apparent anomaly. Finally, the radiocarbon date for the "Kersey component" at the Jurgens site fits well with both Eden and Scottsbluff dates and, as several researchers have noted (Bradley 1993, 2010; Muñiz 2005; Stanford 1999), represents a local stylistic variant rather than a separate cultural complex as originally proposed by Wheat (1979).

The Bradbury Brook site in east-central Minnesota was not included in this analysis but produced a date of 9220 ± 75 (10,568–10,240 cal BP) from charcoal in association with a Cody complex point base (Malik and Bakken 1999). The site has a dense lithic deposit with more than 125,000 artifacts from stone tool manufacturing, and represents the presence of Cody complex peoples in the upper Midwest woodlands. The projectile point (base and proximal blade fragment) was originally identified as Alberta (Malik and Bakken 1999) but could be Scottsbluff, which would make the radiocarbon date consistent with this attribution.

The Hardin point type occurs along the eastern Plains and southern Midwest and is estimated to date between 10,000 and 7500 ^{14}C yrs BP (Justice 1987). Based on similarities in production strategy, flake scar patterns, and overall morphology, many Midwest researchers interpret the Hardin point style as deriving directly from Scottsbluff (Justice 1987; Mason 1997; Theler and Boszhardt 2003). If this is the case, then Hardin may be one of the final vestiges of the Cody complex and may represent an adaptation to the prairie-woodland environment of the lower Midwest that extended into the early Archaic period. However, the frequency of beveled blade edges through resharpening is reminiscent of southeastern early Archaic point styles; the cultural connection between Hardin points and the Cody complex thus remains enigmatic.

Generally, then, for the Great Plains and Rocky Mountain region, Alberta/Cody, Alberta, Eden, Scottsbluff, and Firstview depict temporal continuity between about 10,000 and 8000 ^{14}C yrs BP, a period that spans some 2,815 calendar years (11,600–8785 cal BP), making it one of the longest known Paleoindian cultural traditions. If stemmed point sites from the Great Basin and Plateau, and Hardin sites from the Midwest, are added to this, the temporal range could expand at least another 700 radiocarbon years earlier (but see Amick, this volume) and perhaps another 600 radiocarbon years later.

Assuming that the many plateaus and reversals in the radiocarbon curve are not artificially structuring the chronological relationship of the various Cody point styles, it seems likely that for well over 2,500 years there were continuous Cody cultural "neighborhoods" or populations that covered vast territories and probably interacted with their surroundings in different ways. The use of different adaptive strategies by Cody peoples living in different environmental settings resulted in the unique and regionally specific mobility and subsistence strategies noted in the literature and in the chapters in this book.

The recognition that there were almost certainly contemporaneous groups making slightly different projectile points and practicing slightly different subsistence-settlement strategies (see Knudson, this volume) raises very important questions: how did Cody peoples vary their approaches to negotiating the social landscape and how did different settlement-subsistence strategies influence the development of social networks during the Cody era? Some of these issues are addressed below and in the chapters that follow.

Geography

The Cody complex is a widespread cultural phenomenon; however, examination of Figure 1.2 (also see Table 1.2) makes clear that most excavated Cody sites are located in the Great Plains and Rocky Mountains. Cody sites occur on the grasslands/rolling hills and alluvial valleys of the Great Plains, extending from Alberta and Saskatchewan in the north to the Gulf Coast of Texas in the south, and from the Rocky Mountain Front Range on the west to Illinois on the east (e.g., Dawe, this volume; Frison et al. 1996; Hofman 1996; Hofman and Graham 1998; Justice 1987). Many other Cody sites occur in the foothills (mostly east of the Continental Divide) of the North, Central, and Southern Rocky Mountain Front Range as well as higher mountain zones (e.g., Brunswig 2007; Hill and Knell, this volume; Jodry 1999; Pitblado 2003). Outside the Great Plains, Cody projectiles and sites have been recovered from the Black Rock Desert in northern Nevada, in Idaho, and as far east as the Great Lakes woodlands of Minnesota, Wisconsin, southern Manitoba, and Ontario, as well as into New England (e.g., Amick, this volume; Beck and Jones 1997; Cox 2001; C. L. Hill 2007; M. G. Hill 1994; M. G. Hill et al. 1998; Julig 1994, 2002; Malik and Bakken 1999; Mason 1981; Mason and Irwin 1960; Pettipas 1970; Salzer 1974; Stoltman 1997; Theler and Boszhardt 2003; Wallman and Amick 1991). This geographic range is vast and encompasses considerable variation: in latitude and longitude and thus significant variability in temperature and precipitation; in elevation; in vegetation and fauna and how Cody peoples respond to environmental change; in availability of water, wood, and toolstone; and probably also in differential rates of population pressure. Cody complex sites occur across several biomes and throughout many ecozones with differing resource structure, which, as research has demonstrated time and again, influences Paleoindian subsistence and land-use strategies (e.g., Amick 1994; M. E. Hill 2007; Knell 2007, this volume; Knell and Hill 2012; LaBelle 2005). Consequently, it is not surprising that prior (e.g., Blackmar 2001; Johnson 1989; Knell 2007; Knell and Hill 2012; Muñiz 2005; Pitblado 2003) and current (Amick; Dawe; Hill; Hill and Knell; Muñiz; and Root et al., this volume) studies demonstrate considerable variability in Cody subsistence and land-use patterning across space.

The widespread distribution of Cody complex projectile points across much of North America is also fairly unique among Paleoindian cultural complexes. This distribution is on par with that of Clovis, making the Cody complex one of the most geographically expansive cultural complexes in the prehistory of North America. The reasons for this widespread distribution are not entirely understood; however, some authors in this book (Amick; Dawe; Muñiz [Chapter 2]) suggest that the expansion occurred as Cody peoples sought new niches during favorable times of the early Holocene.

Subsistence

The extremely wide geographic expanse of Cody site distributions and the associated variability in plants and animals that must accompany such a geographic range indicate that Cody peoples developed successful subsistence strategies wherever they lived — whether the Great Basin, Rocky Mountains, Great Plains, Texas Hill Country, eastern prairies, Great Lakes region of the Upper Midwest, or Midwest woodlands. Common to the subsistence strategy in all these areas is an emphasis on bison, which clearly played an important part (but not an exclusive one, as we see below) in the Cody economic strategy.

To demonstrate this point, we acquired subsistence data from 23 Cody complex sites in the Rocky Mountains and greater northwestern and northern Great Plains (Table 1.3). Of these sites, all but one (Blue Point) has identifiable bison remains, and in all cases the minimum number of individual (MNI) bison is higher than for any other faunal type. The average bison MNI for these sites is 51.6 (excluding Hudson-Meng), a number that is skewed by some extremely large kill/processing sites on the grassland plains (e.g., Jurgens [n = 68], Olsen-Chubbuck [n = 190]). (This average estimate for bison MNI is very close to that reported by Hill [this volume] for a larger sample of Cody sites.) The average bison MNI drops drastically in the foothills-mountains and uplifts, where Jerry Craig has an MNI of seven (Richings-Germain 2002), as does Hell Gap Locality V (Knell et al. 2009); large, lower-elevation basins in the foothills-mountains zone seem to portray a different pattern, as indicated by the large bison kills at Horner I and II (Frison and Todd 1987). While the low MNI values at Jerry Craig and Hell Gap may not readily suggest an emphasis on bison, it is still the case that Cody people preferentially hunted bison in the mountains to a greater extent than did contemporary late Paleoindian groups (see Hill and Knell, this volume).

Little is said here regarding bison seasonality data obtained from analyses of bison maxillary and mandibular dentitions because Hill (this volume) covers this topic in considerably more detail. However, using the data in Table 1.4 and Figure 1.4, we briefly note some general trends. These data indicate that Cody hunter-gatherers dispatched bison throughout the year, with much of the hunting occurring in fall and early winter, and to some extent late summer. Cody subsistence strategies outside the Great Plains and Rocky Mountains are unknown; however, Hill's (this volume) finding that bison hunting patterns varied between the northern and southern Great

TABLE 1.3. Minimum Number of Individuals (MNI; bold) and Number of Identified Specimens (NISP; in parentheses) from Cody Complex Sites in the Northwestern and Northern Plains.

Site	Environmental Zone	Bison	Pronghorn	Mule Deer	Deer sp.	Bighorn Sheep	Elk	Lagomorph	Canid sp.	Bird	Owl (horned)	Beaver	Marmot	Muskrat	Fish	Turtle	Species Richness
Benz	PGR	? (1)															1
Blue Point	PGR							**2** (17)									1
Carter/ Kerr-McGee	PGR	**47** (?)															1
Claypool	PGR	X															1
Finley (Station B)	PGR	**82** (8,033)															1
Fletcher	PGR	X															1
Frasca	PGR	**56** (7,780)							X								1
Hell Gap I (Alberta)	FHM	X															1
Hell Gap I (Cody)	FHM	X															1
Hell Gap V	FHM	**7** (334)		? (1)				? (1)	? (7)								3
Heron Eden	PGR	**37** (22,898)	? (1)						? (2)								2
Horner I	PAV	**100** (?)	**1** (3)	**2** (10)				**1** (1)		**1** (1)	**1** (2)					**1** (3)	7
Horner II	PAV	**65** (1,102)	**1** (5)	**2** (7)				**1** (5)	**1** (3)	**2** (4)							5
Jerry Craig	FHM	**7** (55)															1
Jurgens 1–3	PAV	**68** (5,497)	**9** (112)	**2** (12)	? (1)		**3** (5)	**3** (10)	**1** (4)	**3** (5)		**1** (3)	**1** (1)	**1** (1)	**1** (3)	**1** (3)	12
Lamb Spring	PGR	**27** (1,990)															1
Lime Creek	PAV	6	2		X		1	1	1	5		5				1	8
MacHaffie	FHM	X		X					X								2
Nelson	PGR	**5** (212)															1
Niska	PGR	X															1
Olsen-Chubbuck	PGR	**190** (4,264)															1
Osprey Beach	FHM	X			X	X		X	X								4
Scottsbluff	PGR	26 (1,461)															
MNI Average		51.6	3.3	2	—	—	2	1.6	1	2.8	1	2	1	1	1	1	

Note: Species richness excludes canid remains. Environmental zone: FHM = foothills-mountains, PGR = plains grasslands, PAV = plains alluvial valleys.

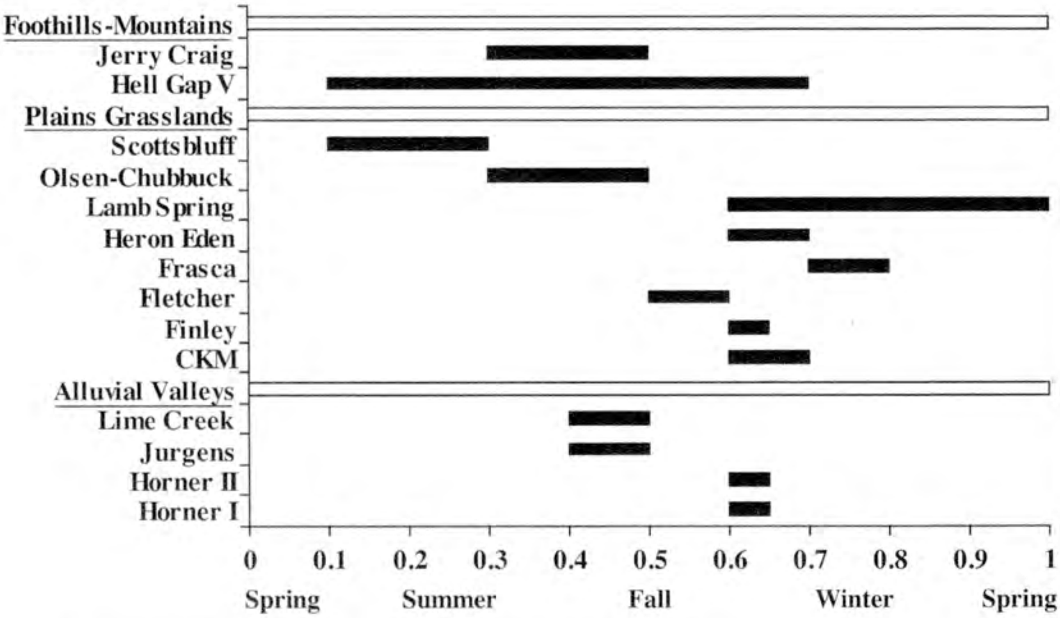

FIGURE 1.4. Bison season of death based on tooth eruption and wear patterns.

TABLE 1.4. Bison Seasonality Determinations.

Site Name	Site Type	Season	Dental Age	Reference
Carter/Kerr-McGee	Processing	Early winter	.6–.7	Frison 1984
Finley (Station B)	Kill	Late fall–early winter	.6	Todd et al. 1990
Fletcher	Kill	Fall?	Unknown	Wilson and MacWilliams 1988
Frasca	Kill	Early winter	Unknown	Fulgham and Stanford 1982
Hell Gap V	Camp	Late spring–early winter	.1–.7	Rapson and Niven 2009
Heron Eden	Kill	Winter	.6–.7	Corbeil 1995
Horner I	Processing	Late fall–early winter	.6	Todd and Hofman 1987
Horner II	Processing	Late fall–early winter	.6	Todd 1987
Jerry Craig	Kill	Late summer–early fall	.3–.5	Hill and Kornfeld 1999
Jurgens	Processing	Fall	.4–.5	Hill and Hill 2002
Lamb Spring	Kill	Early winter–spring	Unknown	McCartney 1983
Lime Creek	Camp	Fall	.4–.5	Davis 1962; Jones 1999
Nelson	Kill	Winter	.7–.8	Kornfeld et al. 2007
Olsen-Chubbuck	Kill	Late summer–early fall	.3–.5	Frison 1991
Scottsbluff	Unknown	Late spring–early summer	.1–.3	Hill 2008; Todd et al. 1990

Plains suggests that differences between regions are likely.

Though bison figured prominently in the Cody subsistence strategy, many other nonbison species such as elk, pronghorn, and mule deer were hunted, along with smaller animals such as beaver, marmot, lagomorphs, and rodents (Table 1.3). Avian and aquatic species also occur in some Cody assemblages. If we consider species richness counts by environmental zone (Figure 1.5), a wider variety of animals was taken in the alluvial valleys compared with the plains grasslands, where bison, and particularly bison kills, dominate the patterning. While Cody complex peoples were obviously highly skilled bison hunters, understanding of their subsistence strategies remains incomplete until we better comprehend the role nonbison prey and plant resources played,

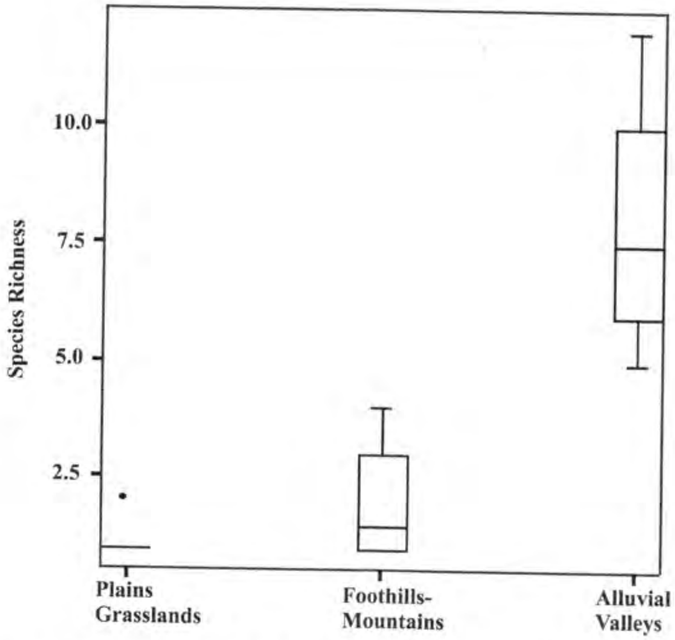

FIGURE 1.5. Boxplots of fauna species richness by environmental zone.

and until we identify a wider range of late winter through early summer occupations. Thus, the subsistence data mimic the projectile point data in terms of their defining influence on our understanding of the Cody complex. Despite the similarity among sites that show an emphasis on bison hunting, the variability around this trend indicates that Cody complex hunter-gatherers were dynamic and, above all, adaptable to local conditions. The ability to adjust to local conditions was critical to their survival, especially under the evolving climate and paleoenvironmental regimes they experienced during the early Holocene (see Muñiz, this volume [Chapter 2]; Widga, this volume) as well as changes in bison morphology and herd structure (increasing gregariousness; see Widga, this volume).

Land Use

Prior studies of Cody land-use patterns also shed light on important characteristics of the complex. To date, four main Cody complex land-use strategies have been postulated. First is the apparent focus on local regions or ecozones for lengthy periods, sometimes as part of a seasonal round. Evidence for the focus on local regions usually comes from the predominance of local toolstone recovered at sites and seasonality data that depict a long-term or overwintering strategy. On the regional scale, Blackmar (2001) suggests this pattern for the southern Plains, as do Knell and Hill (2012) for the northern and northwestern Plains. At the site scale, Johnson et al. (2004) identify this pattern for the Osprey Beach site in Yellowstone National Park, Wyoming; Knell (2007, this volume) for the Hell Gap site; and Richings-Germain (2002) for the Jerry Craig site in Middle Park, Colorado. It thus appears that in some places and situations Cody complex peoples restricted their land use to specific ecozones for a considerable length of time.

Second, some Cody groups responded to variations in resource structure by preferentially exploiting the Rocky Mountain foothills habitats and the wider variety of resources available there during certain seasons (Amick 1994; Frison 1992; Frison and Bonnichsen 1996; Johnson et al. 2004; Knell and Hill 2012; also see Hill and Knell, this volume). Johnson et al. (2004) suggest, for example, that cold stress increased the likelihood that Cody complex hunter-gatherers exploited the more biotically diverse foothills and adjacent plains rather than high mountains during the cold season. Amick (1994) identified altitudinal variation in Cody complex sites and isolated projectile points in the Basin and Range versus plains of New Mexico. Isolated projectile points in this area occur, on average, 365 m higher than the residential sites, placing the isolated points in upland settings where solitary game lived. In contrast, residential sites generally occur in lower-elevation Basin and Range settings closer to wetlands and grasslands, which provided a higher diversity of resources. Frison (1992; Frison and Bonnichsen 1996) proposed that early Holocene climatic warming (environmental stress) affected the availability and distribution of resources, leading Cody complex groups to increasingly exploit foothills-mountains habitats when bison herd size dwindled on the plains grasslands. Cody complex settlement and subsistence strategies thus varied in accordance with the distribution of biotic resources, which demonstrates Cody hunter-gatherers' ability to adjust their land use to accommodate local variations in resource structure (also see Amick; Hill and Knell; Knell; and Root et al., this volume).

The third pattern depicts Cody groups as having maintained a seasonally transhumant land-use strategy (Blackmar 2001; Johnson et al. 2004). Blackmar (2001) found that Cody groups on the southern High Plains regularly incorporated marginal environments into their land-use strategy, likely during times of environmental stress (but see Johnson 1989). Despite suggestions of a seasonally transhumant land-use pattern, these studies are limited in scope and require additional large, regional-scale studies that more fully tie the patterning into variations in resource structure and bison seasonality data.

The fourth pattern of Cody land use occurs among High Plains sites older than 9000 ^{14}C yrs BP (10,220–10,185 cal BP) that document long-distance travel from opposing directions across the western Plains and converge on large-scale bison kill sites during the fall. Muñiz (2005) interprets this convergent pattern as evidence for seasonal communal bison hunting on the western Plains at the Claypool, Jurgens, and Olsen-Chubbuck sites. Based on distance to lithic raw material sources, Muñiz documents that after 9000 ^{14}C yrs BP, Cody groups reduced the maximum distance traveled (or traded) before a bison kill by 340 km on average; in addition, travel from opposite directions to a bison kill ceased. The post-9000 ^{14}C yrs BP decrease in travel and trade probably reflects range restrictions on the western Plains in response to deteriorating grassland environments resulting from climate change (Muñiz 2005).

A significant gap exists in our understanding of Cody land-use strategies for the Great Lakes and Midwest. Sites such as Bradbury Brook (Minnesota); Robinson, Renier, and Pope (Wisconsin); Sheguiandah (Ontario); and areas with abundant isolated finds such as Reservoir Lakes (Minnesota) and Carberry Plain (Manitoba) indicate extensive use of the region by Cody groups. Researchers have noted general late Paleoindian movement between the Thunder Bay (Ontario) and Boundary Waters (Minnesota) regions along the north shore of Lake Superior (Fox 1975; Julig 1994; Ross 1997), and what appears to be extensive use of local aquatic and woodland resources in northern Wisconsin (Kuehn 1998; Salzer 1974). However, patterns specific to the Cody complex have not yet been clearly identified.

A theme commonly used to explain Cody land-use organization is macrogroup-level adaptation to variations in biotic resource structure, primarily adjustments to the distribution and availability of bison. These resource structure–based explanations fall into three types. The first includes those that view human and animal movements as responses to cold stress, with animals and thus humans congregating in lower-elevation foothills and basins during the cold season (e.g., Johnson et al. 2004; Pitblado 2003). The second group views climatic stress as influencing resource structure, with Cody complex hunter-gatherers responding to major fluctuations in grassland productivity and, ultimately, the distribution of bison (Amick, this volume; Blackmar 2001; Frison 1992; Frison and Bonnichsen 1996; Johnson 1989; Muñiz 2005; Stanford 1999). The third perspective uses optimal foraging theory, particularly diet breadth, to explain why Cody complex hunter-gatherers positioned their residential campsites closer to a wide, rather than narrow, diversity of resources (Amick 1994; Knell and Hill 2012). With the exception of Amick's and Knell and Hill's optimal foraging–based studies, these Cody land-use reconstructions lack an overtly theoretical explanatory framework. Several chapters in this book — Hill and Knell; Knell; Muñiz (Chapter 10); and Root et al. — seek to address this issue.

Social Organization/Worldview

Little, if anything, concrete is known about Cody social organization or worldview. Nearly five decades ago, Mason and Irwin (1960) published a description of a Cody complex cremation burial in northeastern Wisconsin, called the Renier site. The Renier site contained the cremated remains of an adolescent that had been interred along a low sandy ridge overlooking the shore of modern Green Bay on the east coast of Wisconsin. In association with the cremated remains were 11 points — two Eden, eight Scottsbluff, and one St. Charles/Thebes — that were also badly burned. Another probable association between Scottsbluff and Eden points and a cremation burial comes from the Pope site in east-central Wisconsin (Ritzenthaler 1972).

The only clear example of Cody artwork comes from the Jurgens site. Wheat (1979:137–138) recovered a bison ulna with a series of linear and geometrical engravings that occur in pairs and triplets across the lateral and medial faces. The ulna was intentionally decorated, but unfortunately the image is unclear and one can only speculate as to its meaning.

Jurgens also produced the only known example of a Cody pipe (Wheat 1979:129). The implement was shaped from a naturally hollow iron silicate concretion that shows a high degree of polish from use. We can only guess what role a pipe may have played in the social or religious life of Cody people. The pipe demonstrates, however, that pipe smoking extends back to the Paleoindian period.

Aside from these brief glimpses of how Cody complex peoples treated their dead, created art, and used pipes, we have almost no understanding of their spirituality or ideology. The lack of emphasis in this direction naturally results from the unavailability of pertinent analogies, artifacts, and human remains, though there is no reason why researchers could not begin thinking along these lines. Comprehending the Cody worldview obviously would improve our understanding of Cody lifeways as a whole.

Organization of the Book

The chapters in this book use behavior-oriented approaches to expand our current understanding of the Cody complex. While the Cody complex is one of the better-represented and geographically widespread Great Plains Paleoindian cultural complexes, this volume is the first major attempt at a synthesis. Before this book, the only major behavior-based analyses of the Cody complex were the dissertations by Muñiz (2005) and Knell (2007). Predating these dissertations, of course, is the Horner site monograph by Frison and Todd (1987), which is a detailed site report. We hope that the current volume places the Cody complex among the better-understood Paleoindian cultural complexes.

The first set of chapters, by Muñiz and Widga, reconstructs the early Holocene environment faced by Cody complex peoples and examines the impacts of climate on Cody lifeways. In reconstructing the early Holocene environment, these authors use multiple types of proxy data: fire frequency, gastropods, sand dune geomorphology, insects, isotopes, macrofossils, packrat middens, phytoliths, pollen, soil development, and sympatry of small mammalian assemblages. More specifically, Muñiz (Chapter 2) finds that the first half of the Cody era (~10,000–9000 ^{14}C yrs BP; 11,600–10,185 cal BP) was generally conducive to abundant biotic production in a variety of ecozones throughout the central and northern U.S. Great Plains and adjacent Rocky Mountains. After about 9000 ^{14}C yrs BP (10,220–10,185 cal BP), some regions began to dry out, and this trend became substantially amplified after 8500 ^{14}C yrs BP (9530–9490 cal BP). Cody groups repeatedly selected for ecotonal settings that combined springs, streams, and riverbanks with grassland and foothill habitats. As many ecosystems substantially dried after 8500 ^{14}C yrs BP (9530–9490 cal BP), the number of Cody sites also "dried up." This apparent correlation leads to the hypothesis that Cody complex peoples on the Great Plains and in the adjacent Rocky Mountains made significant adaptive changes to meet substantial environmental challenges.

Widga (Chapter 3) considers what the taxonomic diversity of small mammalian fauna indicates about past environments in the central and eastern United States between 21,000 and 8100

^{14}C yrs BP (25,000–9000 cal yrs BP), and what biometric analyses of bison crania and postcrania indicate about the physical and social evolution of bison populations on the Great Plains. His early Holocene paleoenvironmental reconstruction for the central and northwestern Great Plains indicates that the environment gradually warmed and precipitation decreased, leading to higher drought severity. In the Midwest, warmer and moister conditions persisted until ~8100 ^{14}C yr BP (~9000 cal yr BP), after which it warmed and dried considerably. Concurrent with the warming and drying was the establishment of modern bison morphology and behavior. Changes in bison horn-core size and shape modified dominance patterns, resulting in increased gregariousness and larger herds. The changes in climate and bison had implications for Cody lifeways.

Following the two chapters on the environment and the impact it had on Cody lifeways is the contribution by Hill (Chapter 4), which considers the organization of Cody bison procurement. Hill addresses three main issues. The first is whether Cody bison hunts were fortuitous events or part of an integrated subsistence strategy. He finds that Cody hunters systematically pursued bison, and did so by adjusting their hunting strategies to seasonal shifts in bison biology and ethology. The second issue is whether variability exists in the preferred season(s) of bison hunting in the northern versus southern Great Plains. Seasonality data indicate that bison hunting occurred throughout the year but that bison kills in the north were larger than in the south and usually occurred during midsummer through early winter rather than primarily in the spring. The third issue concerns variability in bison herd size and composition and, like prior studies, suggests a preference for female-dominated herds throughout most of the year. This fresh examination of Cody bison hunting provides an important understanding of how Cody peoples organized pursuit of arguably their most important subsistence resource.

The next set of chapters — Root et al.; Dawe; Hill and Knell; Amick — provides important site and regional-scale reconstructions of land-use and technological organization in the Great Plains, Rocky Mountains, and northern Great Basin. These chapters address Cody complex lifeways in the key geographic areas inhabited by Cody peoples; however, additional research in the southern Great Plains and Midwest would considerably round out this understanding.

Root et al. (Chapter 5) test a model of Cody land-use organization in western North Dakota and southern Saskatchewan. Lithic-based variables from several key Cody sites from the Knife River flint (KRF) quarry area, the Missouri Coteau, and Glaciated Plains are evaluated and applied to the land-use model. Root et al. find that Cody groups tethered their movements to the KRF region for parts of the year but in late summer and fall geared up with KRF for rapid, long-distance movements north of the Missouri River to hunt bison. Such movements fit the expectations of the land-use model evaluated in this chapter.

Dawe (Chapter 6) provides a substantial overview of the Cody complex in Alberta, Canada. This data-heavy chapter not only summarizes many unpublished and hard-to-access reports, making it a gold mine for documenting the Cody occupation of Alberta, but also significantly improves our understanding of the lifeways of Cody groups in the northern limits of their geographic range. Dawe suggests, based on the spatial and temporal distribution of Cody sites, that a transition occurred from an early reliance on exotic lithic materials to a later reliance on local lithic raw materials. Based on ecological considerations, he interprets this pattern as resulting from the earliest Alberta/Cody inhabitants of Alberta being unfamiliar with the region and reducing risk by relying on nonlocal stones, with later Cody groups settling into Alberta and using the locally available resources. Dawe thus characterizes how Cody complex peoples colonized the northern latitudes of their geographic range.

Chapter 7, by Hill and Knell, is the first of two chapters that directly consider Cody lifeways beyond the grasslands and rolling hills of the Great Plains. While specifically evaluating Cody subsistence and land-use organization in the Rocky Mountains, the authors compare this patterning with Cody sites in the Great Plains as well as with contemporaneous Paleoindian complexes in the Rocky Mountains and Great Plains. As in some other chapters in this book, these patterns are considered within the framework of a land-use model. The analyses suggest that Cody foragers in the Rocky Mountains more narrowly focused on bison hunting than did contemporaneous groups in the mountains (particularly during the summer and fall), and restricted their movements to this area for long periods of time, but less so than their non-Cody mountain counterparts. By highlighting how Cody groups interacted with their contemporaries, this chapter offers significant insights about Cody adaptive strategies.

The chapter by Amick (Chapter 8) on Cody in the northwestern Great Basin is unique to the book in its examination of Cody evidence from outside the Great Plains/Rocky Mountains heartland. Amick considers two main issues. The first concerns the typological and chronological position of Cody-style projectiles in the northwestern Great Basin compared with those from the Great Plains. Despite a paucity of data, he concludes in part that Cody complex occupations are present but rare, occurred later in the Cody period, and likely reflect sporadic use of the northwestern Great Basin. The second issue concerns patterns of land use, mobility, and subsistence. Amick finds that Cody peoples were highly adaptable foragers who made range extensions from the Great Plains into the Great Basin during times of declining grassland productivity and bison population size. Amick's chapter complements Dawe's in the sense that Amick too considers Cody complex colonization, or more aptly range expansion, into an area beyond the traditionally identified Cody heartland.

The next set of chapters, by Knell, Muñiz, and Knudson, develop and test models of Cody land-use and technological organization and reconsider how the Scottsbluff projectile point evolved into a temporal diagnostic. These chapters are less site-oriented than the prior group and are somewhat more synthetic in their attempts to establish theoretical frameworks or models that explain Cody complex lifeways.

In Chapter 9, Knell evaluates and tests an optimal foraging–inspired model of land use that predicts how Cody peoples organized their movements across multiple zones of the northern portion of the Great Plains. This model has been tested elsewhere at the regional scale (Knell and Hill 2012), but here Knell tests the model at the local scale (at the Hell Gap site, Wyoming). The analyses indicate that Cody complex hunter-gatherers in biotically productive uplifts with high-quality toolstone sources, much like those in the Hartville Uplift where the Hell Gap site is located, optimally tethered their land use to these areas for reasonably long periods of time. When using such a strategy at Hell Gap, the Cody hunter-gatherers repetitively and intensively exploited the locally available Hartville Uplift resources for a protracted portion of the year. This chapter contributes to our understanding of Cody land-use dynamics by identifying the local-scale archaeological signatures for a restricted land-use strategy, and then explaining the conditions of resource structure under which Cody hunter-gatherers optimally employed this strategy.

Muñiz (Chapter 10) analyzes the technological organization strategies employed at Jurgens and Hell Gap Locality V using a risk management model. The predictions of the optimization-based model are compared with the actual decisions Cody people made regarding tool manufacture and maintenance, hunting, butchery, and hide working. High-magnification microwear analysis and independent lines of geological and biological evidence are used to evaluate the closeness of fit between the model predictions and observed behaviors. Muñiz identifies aspects of the technological strategy in which Cody people optimally managed risk, and explores reasons why their behaviors sometimes diverged from model predictions.

Knudson (Chapter 11) considers the historical development of the Cody complex based on the evolution of Scottsbluff point typology, our understanding of the Scottsbluff Bison Quarry site, and other contemporaneous Paleoindian sites on the central Plains. Recent analyses of the bison bone, the original excavators' notes, and current geomorphological evidence lead Knudson to conclude that the Scottsbluff Bison Quarry was probably a single-component bison kill event. The implications of the morphological variability in the projectile points used for this single kill event lead Knudson to some important considerations about the archaeological construct called the "Cody complex." This variability also leads her to suggest that as we define and refine Paleoindian typologies and culture histories, we be mindful of local scale patterns and the fluidity of the social groups we study.

Finally, Bamforth (Chapter 12) offers insightful discussions and thoughtful directions for future research that will further the aims of the studies presented in this book. Bamforth notes the bias that results from basing our concept of the Cody complex on a single *fossile directeur* (e.g., Cody point or knife) and the meaning this has for how we conceive of the actual groups of people who created the "Cody" archaeological record. For Bamforth, the lack of fit between how archaeologists currently define Cody groups and the original intent of the taxonomic categories used to shape the definition of the complex results in a late Paleoindian cultural construct without ethnographic parallels. Bamforth discusses the ambiguity stemming from defining late Paleoindian sites as Cody, and he identifies important directions for future research that should focus on understanding the actual social organization reflected by our archaeological constructs. Does Cody represent a cohesive group of people who shared a broadly similar culture, a technological horizon that moved through existing populations, or some variable combination of the two? While Bamforth unites many of the themes addressed in the contributed chapters, he also leaves the reader with several potent questions that will provide archaeologists fodder for subsequent research on the Cody and other late Paleoindian complexes.

Together the chapters in this book provide an integrated and wide ranging understanding of the Cody complex that significantly improves our understanding of the lifeways that comprise what archaeologists know as the Cody complex. The long-overdue synthesis of the Cody complex has finally arrived.

References

Agenbroad, Larry D.
1978 *The Hudson-Meng Site: An Alberta Bison Kill in the Nebraska High Plains*. University Press of America, Washington, D.C.

Amick, Daniel S.
1994 *Folsom Diet Breadth and Land Use in the American Southwest*. Ph.D. dissertation, University of New Mexico, Albuquerque. University Microfilms, Ann Arbor, Michigan.
1999 *Folsom Lithic Technology: Explorations in Structure and Variation*. International Monographs in Prehistory Archaeological Series 12. Ann Arbor, Michigan.

Bamforth, Douglas B.
1991 Flintknapping Skill, Communal Hunting, and Paleoindian Projectile Point Typology. *Plains Anthropologist* 36:309–322.

Bamforth, Douglas B. (editor)
2007 *The Allen Site: A Paleoindian Camp in Southwestern Nebraska*. University of New Mexico Press, Albuquerque.

Barbour, E. H., and C. B. Schultz
1932 The Scottsbluff Bison Quarry and Its Artifacts. *Bulletin of the Nebraska State Museum* 1(34):283–286.

Beck, Charlotte, and George T. Jones
1997 The Terminal Pleistocene/Early Holocene Archaeology of the Great Basin. *Journal of World Prehistory* 11:161–236.
2010 Clovis and Western Stemmed: Population Migration and the Meeting of Two Technologies in the Intermountain West. *American Antiquity* 75:81–116.

Blackmar, Jeannette M.
1998 The Distribution of Cody Knives: A Distinctive Trait of the Cody Complex. *Current Research in the Pleistocene* 15:6–9.
2001 Regional Variability in Clovis, Folsom, and Cody Land Use. *Plains Anthropologist* 46: 65–94.

Blackmar, Jeannette M., and Jack L. Hofman
1997 Cody-Complex Artifacts in Oklahoma. *Current Research in the Pleistocene* 14:9–11.

Bonnichsen, Robson, Marvin Beatty, Mort D. Turner, Joanne C. Turner, and Diane Douglas
1992 Paleoindian Lithic Procurement at the South Fork of Everson Creek, Southwestern Montana: A Preliminary Statement. In *Ice Age Hunters of the Rockies*, edited by Dennis J. Stanford and Jane S. Day, pp. 285–321. University Press of Colorado, Niwot.

Bonnichsen, Robson, Bradley T. Lepper, Dennis Stanford, and Michael R. Waters
2005 *Paleoamerican Origins: Beyond Clovis*. Center for the Study of the First Americans. Texas A&M University Press, College Station.

Bradley, Bruce A.
1993 Paleo-Indian Flaked Stone Technology in the North American High Plains. In *From Kostenki to Clovis: Upper Paleolithic-*

Paleo-Indian Adaptations, edited by Olga Soffer and N. D. Praslov, pp. 251–262. Plenum Press, New York.

2009 Bifacial Technology and Paleoindian Projectile Points. In *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*, edited by M. L. Larson, M. Kornfeld, and G. C. Frison, pp. 259–273. University of Utah Press, Salt Lake City.

2010 Paleoindian Flaked Stone Technology on the Plains and in the Rockies. In *Prehistoric Hunters-Gatherers of the High Plains and Rockies*, 3rd ed., edited by Marcel Kornfeld, George C. Frison, and Mary Lou Larson, pp. 463–497. Left Coast Press, Walnut Creek, California.

Bradley, Bruce A., Michael C. Collins, and Andrew Hemmings

2010 *Clovis Technology.* International Monographs in Prehistory, Archaeological Series No. 17. Ann Arbor, Michigan.

Bradley, Bruce A., and George C. Frison

1987 Projectile Points and Specialized Bifaces from the Horner Site. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 199–231. Academic Press, Orlando, Florida.

Bradley, Bruce A., and Dennis J. Stanford

1987 The Claypool Study. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 405–434. Academic Press, Orlando, Florida.

Brunswig, Robert H.

2007 Paleoindian Cultural Landscapes and Archaeology of North-Central Colorado's Southern Rockies. In *Frontiers in Colorado Paleoindian Archaeology: From the Dent Site to the Rocky Mountains*, edited by Robert H. Brunswig and Bonnie L. Pitblado, pp. 261–310. University of Colorado Press, Boulder.

Cassells, E. Steve

1997 *The Archaeology of Colorado.* 2nd ed. Johnson Books, Boulder, Colorado.

Clark, John E., and Michael B. Collins (editors)

2002 *Folsom Technology and Lifeways.* Special Publication No. 4. Department of Anthropology, University of Tulsa. Tulsa, Oklahoma.

Collins, Michael B., Dennis J. Stanford, Jack L. Hofman, Margaret A. Jodry, Richard O. Rose, Lawrence C. Todd, Karl Kibler, and Jeannette M. Blackmar

1997 Cody Down South: The Seminole-Rose Site in West Texas. *Current Research in the Pleistocene* 14:15–18.

Corbeil, Marcel Ronald

1995 The Archaeology and Taphonomy of the Heron Eden Site, Southwestern Saskatchewan. Unpublished Master's thesis, Department of Anthropology, University of Saskatchewan, Saskatoon.

Cox, Stephen J.

2001 The Paleo-Indian Period. In *Twelve Thousand Years: American Indians in Maine*, edited by B. J. Bourque, pp. 13–36. University of Nebraska Press, Lincoln.

Davis, E. Mott

1962 *Archaeology of the Lime Creek Site in Southwestern Nebraska.* Special Publication No. 3. University of Nebraska State Museum, Lincoln.

Davis, Leslie B., John P. Albanese, Linda Scott Cummings, and John W. Fisher Jr.

1991 Reappraisal of the MacHaffie Site Paleoindian Occupational Sequence. *Current Research in the Pleistocene* 8:17–20.

Dick, Herbert W., and Bert Mountain

1960 The Claypool Site: A Cody Complex Site in Northeastern Colorado. *American Antiquity* 26:223–235.

Ebell, S. Biron

1975 A Cody Complex Site in South-Central Saskatchewan (DjNf-8). *Saskatchewan Newsletter* 49:1–6.

1988 The Dunn Site. *Plains Anthropologist* 33:505–530.

Forbis, Richard G.

1968 Fletcher: A Paleo-Indian Site in Alberta. *American Antiquity* 33:1–10.

Forbis, Richard G., and John D. Sperry

1952 An Early Man Site in Montana. *American Antiquity* 18:127–133.

Fox, William A.

1975 The Paleo-Indian Lakehead Complex. In *Canadian Archaeological Association: Collected Papers*, edited by P. Nunn, pp. 29–53. Historical Sites Branch Research Report No. 6. Ontario Ministry of Natural Resources, Toronto.

Frison, George C.

1984 The Carter/Kerr-McGee Paleoindian Site: Cultural Resource Management and Archaeological Research. *American Antiquity* 49: 288–314.

1987 The University of Wyoming Investigations at the Horner Site. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Larry C. Todd, pp. 93–105. Academic Press, Orlando, Florida.

1991 *Prehistoric Hunters of the High Plains*. 2nd ed. Academic Press, San Diego.

1992 The Foothills-Mountains and Open Plains: The Dichotomy in Paleoindian Subsistence Strategies between Two Ecosystems. In *Ice Age Hunters of the Rockies*, edited by Dennis J. Stanford and Jane S. Day, pp. 323–342. University of Colorado Press, Niwot.

Frison, George C., and Robson Bonnichsen

1996 The Pleistocene-Holocene Transition on the Plains and Rocky Mountains of North America. In *Humans at the End of the Ice Age: The Archaeology of the Pleistocene-Holocene Transition*, edited by Lawrence G. Straus, Berit Valentin Eriksen, Jon M. Erlandson, and David R. Yesner, pp. 303–318. Plenum Press, New York.

Frison, George C., David Schwab, L. Adrien Hannus, Peter Winham, David Walter, and Robert C. Mainfort

1996 Archaeology of the Northwestern Plains. *In Archaeological and Bioarchaeological Resources of the Northern Plains*, edited by George C. Frison and Robert C. Mainfort, pp. 8–40. Arkansas Archaeological Survey Research Series No. 47. Fayetteville.

Frison, George C., and Lawrence C. Todd (editors)

1987 *The Horner Site: Type Site of the Cody Cultural Complex*. Academic Press, Orlando, Florida.

Frison, George C., Lawrence C. Todd, and Bruce A. Bradley

1987 Summary and Concluding Remarks. In *The Horner Site: Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 361–369. Academic Press, Orlando, Florida.

Frison, George C., and Danny N. Walker (editors)

2007 *Medicine Lodge Creek: Holocene Archaeology of the Eastern Big Horn Basin, Wyoming, Vol. 1*. Mark Mullins, Clovis Press.

Fulgham, Tommy, and Dennis J. Stanford

1982 The Frasca Site: A Preliminary Report. *Southwestern Lore* 48(1):1–9.

Gruhn, R.

1961 *The Archaeology of Wilson Butte Cave, South-Central Idaho.* Occasional Papers of the Idaho State College Museum No. 6. Pocatello.

Harrison, Christina, Elaine Redepenning, Christopher L. Hill, George Rapp Jr., Stanley E. Aschenbrenner, James K. Huber, and Susan C. Mulholland

1995 *The Paleo-Indian of Southern St. Louis County, Minnesota: The Reservoir Lakes Complex*. University of Minnesota–Duluth Interdisciplinary Archaeological Studies, University of Minnesota Monograph Series No. 4. Kendal/Hunt, Dubuque, Iowa.

Haynes, C. Vance, Jr.

1968 Radiocarbon: Analysis of Inorganic Carbon of Fossil Bone and Enamel. *Science* 161:687–688.

2009 Geochronology. In *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*, edited by M. L. Larson, M. Kornfeld, and G. C. Frison, pp. 39–71. University of Utah Press, Salt Lake City.

Haynes, C. Vance, Jr., Roelf P. Beukens, A. J. T. Jull, and Owen K. Davis

1992 New Radiocarbon Dates for Some Old Folsom Sites: Accelerator Technology. In *Ice Age Hunters of the Rockies*, edited by Dennis J. Stanford and Jane S. Day, pp. 83–100. University Press of Colorado, Niwot.

Hester, J.

1972 *Blackwater Locality No. 1: A Stratified, Early Man Site in Eastern New Mexico*. Fort Burgwin Research Center No. 8. Southern Methodist University, Dallas, Texas.

Hill, Christopher L.

2007 Geoarchaeology and Late Glacial Landscapes in the Western Lake Superior Region, Central North America. *Geoarchaeology* 22:15–47.

Hill, Matthew E., Jr.

2007 Causes of Regional and Temporal Variation in Paleoindian Diet in Western North America. Unpublished Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson.

2008 New Investigations of the Cody-Age Finley and Scottsbluff Bison Bone Beds. *Current Research in the Pleistocene* 25:90–93.

Hill, Matthew E., Jr., and Matthew Glenn Hill

2002 Season of Bison Mortality at the Jurgens Site, Weld County, Colorado. *Current Research in the Pleistocene* 19:104–106.

Hill, Matthew Glenn

1994 Paleoindian Projectile Points from the Vicinity of Silver Mound (47JA21), Jackson County, Wisconsin. *Midcontinental Journal of Archaeology* 19:223–259.

Hill, Matthew Glenn, Daniel S. Amick, and Thomas J. Loebel

1998 An Inventory of Wisconsin Paleoindian Projectile Points at the Milwaukee Public Museum. *Current Research in the Pleistocene* 15:18–20.

Hill, Matthew Glenn, Vance T. Holliday, and Dennis J. Stanford

1995 A Further Evaluation of the San Jon Site, New Mexico. *Plains Anthropologist* 40:369–390.

Hill, Matthew Glenn, and Marcel Kornfeld
1999 Inferring Season of Kill for a Cody-Complex Bonebed in Middle Park, Colorado. *Current Research in the Pleistocene* 16:30–32.
Hofman, Jack L.
1990 Cedar Creek: A Folsom Locality in Southwestern Oklahoma. *Current Research in the Pleistocene* 7:19–23.
1996 Early Hunter-Gatherers of the Central Great Plains: Paleoindian and Mesoindian (Archaic) Cultures. In *Archaeology and Paleoecology of the Central Great Plains*, edited by Jack L. Hofman, pp. 41–100. Arkansas Archaeological Survey Research Series No. 48. Fayetteville.
Hofman, Jack L., and Russell W. Graham
1998 The Paleo-Indian Cultures of the Great Plains. In *Archaeology on the Great Plains*, edited by W. Raymond Wood, pp. 87–139. University Press of Kansas, Lawrence.
Holland, Warren
1971 Dalton Type Cache Found. *Central States Archaeological Journal* 18(1):23–29.
Holliday, Vance T.
1997 *Paleoindian Geoarchaeology of the Southern High Plains*. University of Texas Press, Austin.
Holliday, Vance T., Eileen Johnson, Herbert Haas, and Robert Stuckenrath
1983 Radiocarbon Ages from the Lubbock Lake Site, 1950–1980: Framework for Cultural and Ecological Change on the Southern High Plains. *Plains Anthropologist* 28:165–182.
Holliday, Vance T., Eileen Johnson, and Thomas W. Stafford Jr.
1999 AMS Radiocarbon Dating of the Type Plainview and Firstview (Paleoindian) Assemblages: The Agony and the Ecstasy. *American Antiquity* 64:444–454.
Irwin-Williams, Cynthia, Henry T. Irwin, George A. Agogino, and C. Vance Haynes Jr.
1973 Hell Gap: A Paleo-Indian Occupation on the High Plains. *Plains Anthropologist* 18:40–52.
Janetski, Joel C.
2001 Late Paleoindian Artifacts from Utah Valley. *Utah Archaeology* 14(1):15–26.
Jepsen, Glenn L.
1951 Ancient Buffalo Hunters in Wyoming. *Archaeological Society of New Jersey Newsletter* 24:22–24.
Jodry, Margret A. B.
1999 Folsom Technological and Socioeconomic Strategies: Views from Stewart's Cattle Guard and the Upper Rio Grande Basin, Colorado. Unpublished Ph.D. dissertation, Department of Anthropology, American University, Washington, D.C.
Johnson, Ann, Brian Reeves, and Mack Shortt
2004 *Osprey Beach (Site 48YE409/410), Yellowstone National Park, Wyoming*. Lifeways of Canada. Submitted to Yellowstone Center for Resources, Yellowstone National Park, Cooperative Agreement No. CA-1268-1-9017 between Montana State University, Bozeman, and the National Park Service. Available from Yellowstone Center for Resources, Mammoth, Wyoming.
Johnson, David, and Jana Pastor
2003 *The Blue Point Site: Paleoindian/Archaic Transition in Southwest Wyoming*. Western Archaeological Services, Rock Springs, Wyoming.
Johnson, Eileen (editor)
1987 *Lubbock Lake: Late Quaternary Studies on the Southern High Plains*. Texas A&M University Press, College Station.
Johnson, LeRoy, Jr.
1989 *Great Plains Interlopers in the Eastern Woodlands during Late Paleo-Indian Times*. Texas Historical Commission, Office of the State Archaeologist, Report No. 36. Austin.
Jones, David Chadwick
1999 Late Paleoindian/Early Archaic Archaeology and Subsistence: A Taphonomic Analysis of the Lime Creek Site (25FT41), Southwest Nebraska. Unpublished Master's thesis, Colorado State University, Fort Collins.
Joyes, Dennis
1997 New Paleo-Indian Finds from Southern Saskatchewan. *Saskatchewan Archaeological Society Newsletter* 18:107–112.
2000 Cody Technology at the McLeod Site, Saskatchewan, Canada. *Current Research in the Pleistocene* 17:47–49.
Julig, Patrick J.
1994 *The Cummins Site Complex and Paleoindian Occupations in the Northwestern Lake Superior Region*. Ontario Archaeological Reports No. 2. Ontario Heritage Foundation, Toronto.
2002 *The Sheguiandah Site: Archaeological, Geological and Paleobotanical Studies at a Paleoindian Site on Manitoulin Island, Ontario*. Edited by Patrick J. Julig. Mercury Series, Archaeological Survey of Canada Paper No. 161. Canadian Museum of Civilization, Gatineau, Quebec.
Justice, Noel D.
1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States: A Modern Survey and Reference*. Indiana University Press, Bloomington.

Knell, Edward J.

2007 The Organization of Late Paleoindian Cody Complex Land-Use on the North American Great Plains. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

2009 Cody Complex at Locality I. In *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*, edited by M. L. Larson, M. Kornfeld, and G. C. Frison, pp. 180–194. University of Utah Press, Salt Lake City.

Knell, Edward J., and Matthew E. Hill Jr.

2012 Linking Bones and Stones: Regional Variation in Late Paleoindian Cody Complex Land Use and Foraging Strategies. *American Antiquity* 77:40–70.

Knell, Edward J., Matthew G. Hill, and Andrés Izeta

2009 The Locality IIIS/V Eden Complex Component. In *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*, edited by M. L. Larson, M. Kornfeld, and G. C. Frison, pp. 157–179. University of Utah Press, Salt Lake City.

Knell, Edward J., Matthew G. Hill, Andrés Izeta, Marcel Kornfeld, C. Vance Haynes Jr., and George C. Frison

2002 The Cody-Complex Component at Locality V of the Hell Gap Site, Wyoming. *Current Research in the Pleistocene* 19:49–52.

Kornfeld, Marcel, Mary Lou Larson, Craig Arnold, Adam Wiewel, Mike Toft, and Dennis Stanford

2007 The Nelson Site, a Cody Occupation in Northeastern Colorado. *Plains Anthropologist* 52:257–278.

Kuehn, Steven R.

1998 New Evidence for Late Paleoindian–Early Archaic Subsistence Behavior in the Western Great Lakes. *American Antiquity* 63:457–476.

LaBelle, Jason Mitchel

2002 Slim Arrow, the Long-forgotten Yuma-type Site in Eastern Colorado. *Current Research in the Pleistocene* 19:52–55.

2005 *Hunter-Gatherer Foraging Variability during the Early Holocene of the Central Plains of North America*. Ph.D. dissertation, Southern Methodist University, Dallas. University Microfilms, Ann Arbor, Michigan.

Larson, Mary Lou, M. Kornfeld, and George C. Frison (editors)

2009 *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*. University of Utah Press, Salt Lake City.

Long, Russell J.

1977 *McFaddin Beach*. Patillo Higgins Series of Natural History and Anthropology No. 1. Spindletop Museum, Lamar University, Beaumont, Texas.

Malik, Riaz, and Kent Bakken

1993 *Archaeological Data Recovery at the Bradbury Brook Site, 21ML42, Mille Lacs County, Minnesota*. Minnesota Trunk Highway Archaeological Reconnaissance Survey (MTHARS) Report, Agreement 67340. Minnesota Historical Society, St. Paul.

1999 Bradbury Brook (21ML42): A Late Paleoindian Lithic Workshop in East-Central Michigan. *Minnesota Archaeologist* 58:136–171.

Mason, Ronald J.

1981 *Great Lakes Archaeology*. Academic Press, New York.

1997 The Paleo-Indian Tradition. *Wisconsin Archaeologist* 78(1/2):78–110.

Mason, Ronald J., and Carol Irwin

1960 An Eden-Scottsbluff Burial in Northeastern Wisconsin. *American Antiquity* 26:43–57.

McCartney, Peter Howard

1983 Archaeological Analysis of Bison Remains from the Cody Paleo-Indian Site of Lamb Spring, Colorado. Unpublished Master's thesis, Department of Anthropology, University of Arizona, Tucson.

Meyer, David

1985 A Component of the Scottsbluff Tradition: Excavations at the Niska Site. *Canadian Journal of Archaeology* 9:1–37.

Moss, John H., Kirk Bryan, G. William Holmes, Linton Satterthwaite Jr., Henry P. Hanson, C. Bertrand Schultz, and W. D. Frankforter

1951 *Early Man in the Eden Valley*. University of Pennsylvania Museum Monographs No. 6. Philadelphia.

Muñiz, Mark P.

2005 The Cody Complex Revisited: Landscape Use and Technological Organization on the Northwestern Plains. Unpublished Ph.D. dissertation, Department of Anthropology, University of Colorado, Boulder.

2008 *Results of 2007 Archaeological Field Season, Hudson-Meng (25SX115), Sioux County, Nebraska*. Report submitted to Heritage Resources Program, Nebraska National Forest, Chadron.

2010 *Results of 2008 Archaeological Investigations at the Hudson-Meng Site (25SX115), Sioux County, Nebraska*. Report submitted to Heritage Resources Program, Nebraska National Forest, Chadron.

Novecosky, Brad

2002 The Haskey Area, a Cody-Complex Site from the Quill Lakes Region, Saskatchewan, Canada. *Current Research in the Pleistocene* 19:73–74.

Pettipas, Leo
1970 Early Man in Manitoba. In *Ten Thousand Years: Archaeology in Manitoba*, edited by W. M. Hlady, pp. 5–28. Manitoba Centennial Corporation, Winnipeg.

Pitblado, Bonnie L.
2003 *Late Paleoindian Occupation of the Southern Rocky Mountains: Early Holocene Projectile Points and Land Use in the High Country.* University Press of Colorado, Boulder.

Rancier, James, Gary Haynes, and Dennis Stanford
1982 1981 Investigations of Lamb Spring. *Southwestern Lore* 48:1–17.

Rapson, David J., and Laura B. Niven
2009 Faunal Assemblage, 1960–1966. In *Hell Gap: A Stratified Paleoindian Campsite on the Edge of the Rockies*, edited by M. L. Larson, M. Kornfeld, and G. C. Frison, pp. 111–134. University of Utah Press, Salt Lake City.

Redder, Albert J.
1985 Horn Shelter Number 2: The South End; A Preliminary Report. *Journal of the Central Texas Archaeological Society* 10:37–65.

Reimer, P. J., M. G. L. Baillie, E. Bard, A. Bayliss, J. W. Beck, P. G. Blackwell, C. B. Ramsey, C. E. Buck, G. S. Burr, R. L. Edwards, M. Friedrich, P. M. Grootes, T. P. Guilderson, I. Hajdas, T. J. Heaton, A. G. Hogg, K. A. Hughen, K. F. Kaiser, B. Kromer, F. G. McCormac, S. W. Manning, R. W. Reimer, D. A. Richards, J. R. Southon, S. Talamo, C. S. M. Turney, J. van der Plicht, and C. E. Weyhenmeyer
2009 IntCal09 and Marine09 Radiocarbon Age Calibration Curves, 0–50,000 Years cal BP. *Radiocarbon* 51:1111–1150.

Richings-Germain, Sarah
2002 The Jerry Craig Site: A Paleoindian Bison Bonebed in the Colorado Rocky Mountains. Unpublished Master's thesis, Department of Anthropology, University of Wyoming, Laramie.

Ritzenthaler, Robert E.
1972 The Pope Site, a Scottsbluff Cremation in Waupaca County. *Wisconsin Archaeologist* 53:15–19.

Roberts, Frank H. H., Jr.
1942 *Archaeological and Geological Investigations in the San Jon District, Eastern New Mexico.* Smithsonian Miscellaneous Collections 103 (4). Smithsonian Institution, Washington, D.C.

Root, Matthew J.
1992 The Knife River Flint Quarries: The Organization of Stone Tool Production. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.
1998 Dating a Cody-Complex Occupation in the Knife River Flint Quarries. *Current Research in the Pleistocene* 15:62–64.

Ross, William
1997 The Interlakes Composite: A Re-definition of the Initial Settlement of the Agassiz-Minong Peninsula. *Wisconsin Archaeologist* 76:244–268.

Salzer, Robert J.
1974 The Wisconsin North Lakes Project: A Preliminary Report. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 40–54. Minnesota Prehistoric Archaeology Series No. 11. Minnesota Historical Society, St. Paul.

Sellet, Frederic
2009 *The Jim Pitts Site: A Multi-component Paleoindian Campsite in the Black Hills of South Dakota.* University of Northern Colorado School of Social Sciences Anthropology Program, UNC Archaeology Laboratory Technical Series No. 3. Submitted to the South Dakota Archaeological Research Center, Rapid City.

Stanford, Dennis
1999 Paleoindian Archaeology and Late Pleistocene Environments in the Plains and Southwestern United States. In *Ice Age Peoples of North America: Environments, Origins, and Adaptations*, edited by Robson Bonnichsen and Karen L. Turnmire, pp. 281–339. Center for the Study of the First Americans. Oregon State University Press, Corvallis.

Stanford, Dennis, and Robert Patten
1984 R-6: A Preliminary Report of a Cody Site in North-Central New Mexico. Papers of the Philmont Conference on the Archaeology of Northeastern New Mexico. *New Mexico Archaeological Council Proceedings* 6(1):189–199.

Stanford, Dennis, Waldo R. Wedel, and Glenn R. Scott
1981 Archaeological Investigations of the Lamb Spring Site. *Southwestern Lore* 47:14–27.

Steinbring, Jack
1974 The Preceramic Archaeology of Northern Minnesota. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 64–73. Minnesota Prehistoric Archaeology Series No. 11, Minnesota Historical Society, St. Paul.

Stoltman, James B.
1997 The Archaic Tradition. *Wisconsin Archaeologist* 78(1/2):112–139.

Theler, James L., and Robert F. Boszhardt
2003 *Twelve Millennia: Archaeology of the Upper Mississippi River Valley*. University of Iowa Press, Iowa City.

Todd, Lawrence C.
1987 Taphonomy of the Horner II Bone Bed. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 107–198. Academic Press, Orlando, Florida.
1991 Seasonality Studies and Paleoindian Subsistence Strategies. In *Human Predators and Prey Mortality*, edited by Mary C. Stiner, pp. 217–238. Westview Press, Boulder, Colorado.

Todd, Lawrence C., and Jack L. Hofman
1987 Bison Mandibles from the Horner and Finley Sites. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 493–539. Academic Press, Orlando, Florida.

Todd, Lawrence C., Jack L. Hofman, and C. Bertrand Schultz
1990 Seasonality of the Scottsbluff and Lipscomb Bison Bonebeds: Implications for Modeling Paleoindian Subsistence. *American Antiquity* 55:813–827.

Todd, Lawrence C., and David J. Rapson
1999 Formational Analysis of Bison Bonebeds and Interpretation of Paleoindian Subsistence. In *Le bison: Gibier et moyen de subsistance des hommes du Paléolithique aux Paléoindiens des Grandes Plaines*, edited by J. Brugal, F. David, J. G. Enloe, and J. Jaubert, pp. 479–499. APDCA, Antibes, France.

Todd, Lawrence C., and David J. Rapson (editors)
1994 *Hudson-Meng Bison Bonebed and Oglala National Grasslands 1993 Archaeological Research Design and Field Work Summary*. Report on file, Nebraska National Forest, Chadron.

Vickers, J. Roderick, and Alwynne B. Beaudoin
1989 A Limiting AMS Date for the Cody Complex Occupation at the Fletcher Site, Alberta, Canada. *Plains Anthropologist* 34:261–264.

Vivian, Brian C.
2005 Identifying a Cody Component at the Malin Fishing Hole Site (24YE353) in Yellowstone National Park. Paper presented at the 63rd Annual Plains Anthropological Conference, Edmonton, Alberta.

Wallman, S., and Daniel S. Amick
1991 Cody Complex Occupation in the Black Rock Desert, Nevada. *Current Research in the Pleistocene* 8:51–53.

Wedel, Waldo R.
1963 The High Plains and Their Utilization by the Indians. *American Antiquity* 29:1–16.
1987 History of the Princeton and Smithsonian Investigations at the Horner Site. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Larry C. Todd, pp. 19–38. Academic Press, Orlando, Florida.

Wheat, Joe Ben
1972 *The Olsen-Chubbuck Site: A Paleo-Indian Bison Kill*. Memoirs of the Society for American Archaeology No. 26. Washington, D.C.
1979 *The Jurgens Site*. Memoir No. 15. Plains Anthropologist, Lincoln, Nebraska.

Wilmsen, Edwin N., and Frank H. H. Roberts Jr.
1978 *Lindenmeier, 1934–1974: Concluding Report on Investigations*. Smithsonian Contributions to Anthropology No. 24. Smithsonian Institution Press, Washington, D.C.

Wilson, Michael C., and Arthur C. MacWilliams
1988 Preliminary Geoarchaeological Studies at the Fletcher Paleo-Indian Bison Kill Site (Alberta/Scottsbluff), Southern Alberta. *Alberta Archaeological Review* 14:12–15.

Wormington, H. M.
1948 *A Proposed Revision of Yuma Point Terminology*. Proceedings of the Colorado Museum of Natural History 18(2). Denver, Colorado.
1957 *Ancient Man in North America*. 4th ed. Popular Series No. 4. Denver Museum of Natural History, Denver, Colorado.