1. NAME OF PROPERTY

Historic Name: 48GO305[1]

Other Name/Site Number: Hell Gap Paleoindian Site; 'He-Thei-none- Nee daw-xaw-gath-it' or 'Buffalo Crossing' (Northern Arapaho)

2. LOCATION

Street & Number: Not for publication: X

City/Town: Guernsey Vicinity:

State: Wyoming County: Goshen Code: 015 Zip Code: 82212

3. CLASSIFICATION

Ownership of Property		Category of Property	
Private:	X	Building(s):	
Public-Local:		District:	
Public-State:		Site:	X
Public-Federal:		Structure:	
		Object:	

Number of Resources within Property

Contributing	Noncontributing	
	1	building
1		sites
	5	structures
		objects
1	6	Total

Number of Contributing Resources Previously Listed in the National Register: 0

Name of Related Multiple Property Listing: N/A

[1] This is the Smithsonian trinomial assigned to the archeology site commonly referenced in the literature as the Hell Gap Paleoindian Site.

4. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ____ nomination ____ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ____ meets ____ does not meet the National Register Criteria.

_____ _____

Signature of Certifying Official Date

_____

State or Federal Agency and Bureau

In my opinion, the property ____ meets ____ does not meet the National Register criteria.

_____ _____

Signature of Commenting or Other Official Date

_____

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

___ Entered in the National Register
___ Determined eligible for the National Register
___ Determined not eligible for the National Register
___ Removed from the National Register
___ Other (explain): _____

_____ _____

Signature of Keeper Date of Action

6. FUNCTION OR USE

Historic: Domestic Sub: Camp

Current: Landscape Sub: Forest

7. DESCRIPTION

ARCHITECTURAL CLASSIFICATION: N/A

MATERIALS: N/A
Foundation: N/A
Walls: N/A
Roof: N/A
Other: N/A

INTRODUCTORY SUMMARY

48GO305, commonly referenced in archeological literature as Hell Gap[2], is a Paleoindian site unique in the U.S. for its continuous residential occupations over several millennia. 48GO305 provides a nationally significant and exceptional record of environmental, technological, and subsistence change over most of the Paleoindian period (11,000–6,500 BCE) that is otherwise not found at a single site location on the Great Plains and the greater U.S. Other Great Plains sites contain domestic deposits, but 48GO305 is the only Paleoindian site to show evidence of repeated domestic occupations for this 4,500 year period of significance. In this nomination, although Clovis and Early Archaic cultural aspects are described as a background for the historic context of 48GO305, the site's historic significance is, for the purposes of this NHL nomination, linked solely to the Paleoindian periods post-dating Clovis, from 11,000–6,500 BCE. The national significance of 48GO305 is based on stratigraphic duration and integrity of its deposits; the expanded perspective it provides on Paleoindian cultures beyond big-game hunting that are reflected in the settlement and subsistence of its domestic components; and the use of local (lithic) resources signifying long-term settlement at a single locale.

INTRODUCTION

48GO305 (Hell Gap Paleoindian Site), occupied between circa 11,000-6,500 BCE[3], is a nationally important Paleoindian[4] camp site that provides a continuous stratigraphic record of approximately 4,500 years of Paleoindian subsistence economies. Hell Gap is a breakthrough site in establishing the chronological relationships of many Paleoindian complexes on the Great Plains and across much of the North America.[5] Prior to the site's testing in 1959, Paleoindian cultures of the Great Plains were established largely from surface collections or from single-component, short-term occupation animal kill sites whose chronology and sequential relationships were unknown. With the discovery and excavation of Hell Gap, researchers could place the identified Paleoindian complexes (and two new complexes discovered at Hell Gap) into a sequence based on the site's stratified deposits.

The site also provides some of the earliest evidence recovered of longer-term residential occupations by Paleoindian groups, as well as a variety of domestic activities not usually present at short use duration, single-function big game kills.[6] Such domestic activities, too numerous to list individually, include food preparation, food consumption, resource sharing, production and maintenance of tools, child rearing, and taking care of elders or infirm band members. 48GO305 provided researchers with an unprecedented perspective on Paleoindian camp life of nine successive cultural groups, which surpasses the number of complexes found at most, if not all, other Paleoindian sites. 48GO305 drove the development of an alternative way of thinking about Paleoindian lifeways. The site demonstrated that Paleoindians were not strictly big game specialists, but

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[2] See pages 12 and 13, Tribal Consultation and Naming Places in the West, for an explanation of naming practices used for this site and adapted in this NHL documentation. This property is referred to by the Smithsonian trinomial 48GO305 throughout the text except when referencing the following: 1) the Hell Gap type site, identified as such in archeological literature and in disciplinary history, 2) the group of researchers known for their work at the site, referred to in disciplinary literature as "the Hell Gap researchers," 3) the Hell Gap Paleoindian complex and its associated components referred to in archeological literature, 4) the projectile points associated with this complex, and 5) the occupational period identified at 48GO305 and at other sites known as Hell Gap.

[3] BCE—Before Common Era, which is interchangeable with BC.

[4] Paleoindian is the classification term given to the first peoples who entered, and subsequently inhabited, the American continents during the final glacial episodes of the late Pleistocene epoch (approximately 16,000 to 10,500 BCE).

[5] "Great Plains" is a twentieth-century term for a region variously defined between—and within—the disciplines of geography, ecology, archeology, and history, but can be broadly defined as the vast, flat-to-rolling plains of North America that expand north-south from Canada to Texas, and east-west from the 98th Meridian to the Rocky Mountains . Although some archeological studies cite "Plains" and/or "High Plains" in reference to Paleoindian culture in the Great Plains region, for clarity, this study makes consistent use of the term "Great Plains" (see map, "Hell Gap Site in the Great Plains Region").

[6] In this nomination, the term "residential" means the locus of a group such as a band. Residential sites are located at task specific locations for resource procurement such as animal kill and plant collection loci.

also diverse and adaptable foragers. The combination of preserved faunal remains and lithics with extensive geoarcheological analysis provides a continuous record of thousands of years of Paleoindian subsistence economies, as well as evidence of changing environmental conditions during the terminal Pleistocene/early Holocene. As such, 48GO305 has proven to be critically important in defining Paleoindian adaptations that arose in response to changing climatic conditions during the terminal Pleistocene/early Holocene[7], the period at the end of the last ice age between about 12,000 and 7,000 BCE.

LOCATION AND SETTING (Haynes 2009; Irwin-Williams et al. 1973; Larson 2009a)

48GO305 is located within Hell Gap valley, approximately 22 miles northeast of the town of Guernsey, Wyoming, between the plains of eastern Wyoming and the hills of the Hartville Uplift. Hell Gap is in the eastern portion of the Hartville Uplift, an area called Haystack Range, at the border between the Great Plains to the east and the Rocky Mountains to the west. Paleoindian archeological localities are on the Hell Gap valley bottom, adjacent to the twists of an ephemeral drainage referred to as Hell Gap Creek (Figure 1).

The Hartville Uplift is one of several "islands" on the Great Plains (e.g., Kornfeld and Osborn 2003). Like other islands on the plains (the Black Hills are a classic example), the topographic relief of the Hartville Uplift provides a diversity of plants, wildlife, and precipitation not found on the open plains. Four vegetation communities are immediately accessible from 48GO305: 1) riparian or creek-side dominated by willow (*Salix* spp.), cottonwood (*Populus* spp.), and box elder (*Acer negundo*) (Irwin-Williams et al. 1973); 2) juniper/ponderosa pine woodland dominated by ponderosa pine (*Pinus ponderosa*), Juniper (*Juniperus scopularum*), currant (*Ribes cereum*), mountain mahogany (*Cercocarpus montanus*) and sagebrush (*Artemisia* spp.) (Rocky Mountain Herbarium 2012); 3) mixed-grass prairie containing green needle grass (*Nassell viridula*), silver sagebrush (*Artemisia cana*), larkspur (*Delphinium bicolor*), and bee balm (*Monarda fistulosa*) (Rocky Mountain Herbarium 2012); and 4) ponderosa pine savanna containing ponderosa pine, sagebrush and various grasses and forbs (Knight 1994:140-143). Each community provides its own set of economic plants and animals. 48GO305 exemplifies a pattern of Paleoindian site locations noted across the Great Plains and Central Rocky Mountains (e.g., Bamforth 2007; Frison and Walker 2007) where substantial residential sites are often located at the ecotone between the various types of grasslands and the adjacent arboreal dominated ecozones.

For Paleoindian occupants, the site would have provided easy access to firewood, water, high-quality lithic materials, small game, and medium and large ungulates, including bison (*Bison* spp.). The zigzags of the valley meant Paleoindian campsites were hidden from other contemporary bands and from game animals on the plains to the east (Agogino 2009; Irwin 1968). Paleoindian sites are known from all ecological zones on the Great Plains, but a relationship likely exists between ecological setting and site type (i.e., kill site, lithic procurement, and residential camp; Hill 2008; Kornfeld and Larson 2008). This hypothesis, though untested, makes intuitive sense for a site like 48GO305, which is at the intersection of several habitat types.

48GO305's location and others like it (e.g., Medicine Lodge Creek site; Frison and Walker 2007; Galvan 2007), placed human groups in positions to obtain diverse plant and animal resources as they became available at different times of the year. Because many big game animals move up and down in elevation with the changing seasons, game abundance would have varied with season among the plains, foothills, and higher elevations. As such, game would have been accessible at all times of the year to hunting parties based out of 48GO305, which was located at the intersection of these three zones. Similar variability in zone plant exploitation would have

[7] The Holocene is a geological epoch which began at the end of the Pleistocene at around 9,700 BCE and continues to the present. It is identified with the current warm period, and considered an interglacial period following the last ice age based on that evidence. The Holocene also encompasses the growth and impacts of humans worldwide.

existed as the first edible plants would have ripened on the open plains and south-facing slopes early in the spring and at higher elevations as the season progressed.

As a locale from which to hunt bison, 48GO305 is ideal. Its protected location meant that human activity in the valley would have been unlikely to disturb nearby herds, while at the same time its extreme proximity to the open plains meant that herds could be monitored on a daily basis simply by climbing the sides of the valley to any number of vantage points (Agogino 2009; Irwin 1968:29). Bison bone dominates the Paleoindian faunal assemblages at 48GO305, evidencing what appears to be individual/small group procurement of these animals (Rapson and Niven 2009:119). Small streams draining the Hartville Uplift and the nearby North Platte River would have provided ample forage and water for bison and other big game, likely keeping many animals in close proximity to the foothills throughout the year.

Geology of the Site (Haynes 2009)

Hell Gap Creek drains east from a catchment area on top of the Paleozoic (about 542–241 million years ago) limestone and quartzite plateau of the Hartville Uplift. From there the creek cuts down into a narrow canyon at a north-south fault zone between Paleozoic and Precambrian (prior to about 542 million years ago) rocks at the edge of the Hartville Uplift (Haynes 2009). The creek next enters the portion of the valley containing Paleoindian-age sediment and flows along the base of a highly fractured granite ridge. The creek makes a sharp southeast turn around the toe of the ridge, then flows to the valley mouth at which point it turns east, crossing out of the fault. After passing out of the Hartville Uplift and onto the plains of eastern Wyoming, the creek terminates in a shallow internally drained basin that, when breeched, contributes to the headwaters of Cottonwood Creek.

48GO305 is located on Precambrian granite bedrock overlain by aeolian, alluvial, and colluvial sediment deposited during the late Pleistocene and early Holocene. Alluvial sedimentation was driven by the cutting of Hell Gap Creek as it meandered within the confines of the Hell Gap valley. Alluvial sedimentation and erosion, although variable in its intensity and nature through time, was a constant process throughout the Pleistocene and Holocene (although the most intense fluvial action occurred before known human occupation of the valley). Gravity-driven colluvial sedimentation from the valley slopes was a constant process as well. Aeolian deposition, on the other hand, appears to have been more periodic in nature, occurring as a small number of major episodes which have been taken as evidence of arid conditions (Haynes 2009).

The Mississippian limestone of the Hartville Uplift contains abundant high-quality chert[8] and quartzite deposits. These were utilized extensively as tool stone by the Paleoindians and more recent occupants of Hell Gap and were likely a major draw for precontact peoples. To put this in perspective, fewer than 200 pieces of exotic (i.e., non-Hartville Uplift) lithic raw materials have been recovered, representing about 1% of the entire Paleoindian debitage assemblage from Hell Gap Locality I (Larson 2009b:232). The local chert is typically called “Hartville Uplift chert”; it formed as beds and nodules in a marine environment of the Mississippian Hartville Formation (Miller 2009). Local Dakota formation quartzite is referred to as “Spanish Diggings quartzite” after the massive precontact quarry complex located north of 48GO305 in the Hartville Uplift. It typically occurs in massive, bedded deposits.

OWNERSHIP AND MANAGEMENT

In 1988, most of the Hell Gap site was acquired by the Wyoming Archeological Foundation (WAF), a research foundation that draws its membership from the Wyoming Archeological Society. The WAF purchased one parcel of 220 acres containing most of the archeological site from the Frederick family and received a donation

[8] Chert is a fine-grained, silica-rich sedimentary rock.

of another 125 acres from the Gorman family (Frison 2009). Throughout its investigative history, loci of concentrated cultural materials at 48GO305 were referred to as localities. There are currently five localities at 48GO305: I, II, III, IV, and V. The WAF owns Localities I and II (which comprise the proposed National Historic Landmark), as well as Locality IV. Localities III and V are on the neighboring landowner's property.

Although excavation has occurred at all of these localities, Localities I and II have been subject to the most intensive investigation and have yielded the most significant Paleoindian results (e.g., Larson et al 2009); as such, they are the only two localities within the National Historic Landmark boundary. Locality IV was briefly tested in the 1960s, but found to contain only Late Prehistoric and Late Archaic materials. (When investigations were reopened in the 1990s, the precise location of Locality IV could not be determined but the general location is known from brief mentions in early publications.) Localities III and V contain Paleoindian materials, but both are located outside the land administered by the WAF. These two localities, therefore, have not been investigated as fully as the localities found on the land owned by WAF.

INTEGRITY

Although 48GO305 has been subject to impacts from erosion and taphonomic processes that affect all archeological sites to various extents, these impacts have been minor and the site retains very strong integrity of materials and design as evidenced by the geologic and cultural stratigraphy. Similarly, 48GO305 has, since its discovery and initial investigation, been associated with cutting-edge research in the field of Paleoindian archeology and this remains the case today. Integrity of association remains strong at 48GO305.

48GO305 maintains its integrity of setting although the immediate vicinity has been subject to minor historic and modern development. The view from the hills above the site provides a panoramic view of the plains to the east, essentially unmarred by modern development other than gravel and two-track roads. Within the valley itself, the remains of a historic homestead, two-track road, power line, and one modern building and one modern structure are the only impacts. A laboratory building and excavation structure at Locality I serve as the base of operations for the University of Wyoming's current excavations and public outreach endeavors. Both are metal buildings; one was brought to the site in the 1980s to serve as the laboratory for excavations and the other, the "Fenn-Mullins Building," was constructed in 2001 to cover the open excavation block at this locality. Despite these historic and modern additions, the majority of the Hell Gap valley retains strong integrity of location, setting, and feeling. The site strongly conveys the feeling of a protected valley at the Great Plains/Rocky Mountain boundary. In fact, the presence of the laboratory and excavation structure at Locality I, obscured behind the turns in the small hills and the vegetation along Hell Gap Creek, serves to emphasize just how hidden the occupations would have been to all visitors from the east.

In summary, 48GO305 imparts a national level of archeological significance through its intact stratified deposits and the materials contained therein. Since the 1960s, the site has been central in significant developments in the field of Paleoindian archeology and it continues to play an important role in the present day. Due to the horizontal and vertical integrity of its stratified Paleoindian-aged deposits, the potential for future scientific investigation at the site remains. 48GO305 retains strong integrity of setting, location, and feeling as a protected valley at the Great Plains/Rocky Mountains boundary. The site effectively conveys association and a sense of feeling and association with past aboriginal life during the late Pleistocene/early Holocene.

GEOLOGIC AND CULTURAL STRATIGRAPHY (Haynes 2009; Larson 2009a; Rapson and Niven 2009)

The oldest Pleistocene deposits in the Hell Gap valley are remnants of alluvial gravel *strath terraces* (a type of terrace resulting from fluvial down-cutting) situated above the valley floor. These have been interpreted by Haynes (2009) as being the remains of abandoned river channels. More recent Pleistocene deposits are contained in strata A, B, C and D on the valley floor. The earliest cultural materials were observed in stratum E, which dates to the Pleistocene/Holocene transition. Early Holocene sediments are contained in stratum F and middle-to-late Holocene sediments in stratum G.

Strata A-D

The oldest strata present on the valley floor contain no cultural remains. Stratum A is a basal gravel; B is a greenish-gray silt-clay; C a banded light greenish-gray to yellow alluvial sand; D1 a light yellowish-brown loess; D2 a greenish-gray clay, and D3 a reworked loess. These strata were deposited in a relatively cool and wet environment sometime after the last glacial maximum (approximately 16,000 BCE). Although the youngest of these deposits contain Clovis-age sediments, archeologists have yet to find a stratified Clovis occupation at 48GO305. Radiocarbon[9] dating of small pieces of charcoal found at the interface of strata D2 and E produced a date range of approximately 10,750-9,400 BCE, slightly older than Clovis-age; however, there were no associated artifacts.

Stratum E (Substrata E1-E5)

In general, stratum E is made up of alluvial massive fine sands and silts, shown to be loess from stratum D, reworked by slope wash (Miller and Goldberg 2009). Haynes (2009) has divided this stratum into a lower (E1-E3) portion containing Goshen, Folsom, Midland, Agate Basin and Hell Gap occupations, and an upper portion (E4-E5) containing Alberta and Eden/Scottsbluff occupations.

E1

Substratum E1 formed during cool wet conditions when there were plentiful grasses in the valley between approximately 10,000 and 11,000 BCE. Reider's (2009) soil 5 is found primarily within this substratum and contains Goshen, Folsom and Midland components—the oldest cultural materials at 48GO305. During this period a wet meadow was present in the bottom of the Hell Gap valley. These earliest occupations also correspond to the Younger Dryas[10] climatic episode (Haynes 2008). At Hell Gap, the Younger Dryas produced cool conditions with decreased evapotranspiration.

Goshen cultural materials are found in the lower part of substratum E1, with Folsom and Midland overlying them in the upper portion of E1 at Locality I. Haynes (2009:44) allows for the possibility of an older Folsom component, perhaps overlapping with Goshen, but the data presently available are insufficient to test this hypothesis. The stratigraphic sequence originally developed by Irwin-Williams et al. (1973) for Hell Gap had all the Paleoindian complexes from Goshen to Lusk succeeding each other with no overlap (Irwin and Wormington 1970:24). This was, in part, a result of the principal investigators' interpretation of cultural strata as single-component "living floors" and, in part, a result of the way archeologists tend to think about cultural complexes—as discrete, non-overlapping entities (c.f., Bradley and Frison 1996). Recent analysis of the materials excavated during the 1960s has suggested the possibility of overlap between these five earliest Paleoindian complexes (Goshen, Folsom, Midland, Agate Basin, and Hell Gap) which may be supported by

[9] Radiocarbon dating uses the amount of Carbon 14 (^{14}C) available in living organisms as a measuring stick. All living things maintain a content of ^{14}C in equilibrium with that available in the atmosphere, right up to the moment of death. When an organism dies, the amount of ^{14}C available within it begins to decay at a half-life rate of 5,730 years; i.e., it takes 5,730 years for ½ of the ^{14}C available in the organism to decay. Comparing the amount of ^{14}C in a dead organism to available levels in the atmosphere produces an estimate of when that organism died.

[10] The Younger Dryas stadial (also known as "The Big Freeze") was a geologically brief (1,300 +/- 70 years) period of cold conditions and drought which occurred between approximately 10,900-9,200 BCE. The Younger Dryas stadial is thought to have been caused by the collapse of the North American ice sheets, although rival theories have been proposed.

radiocarbon records from across the Great Plains (Sellet 1999). Further elucidation of the absolute temporal relationships between the Early and Middle Paleoindian cultural complexes is a target of future work at 48GO305.

The Goshen lithic assemblage contains a diverse tool kit, including scrapers, perforators, utilized flakes, bifacial knives and blades in addition to diagnostic projectile points (Irwin 1968; Irwin-Williams et al. 1973). Goshen people also left behind massive bifacial-thinning flakes, the largest seen for any period at 48GO305 (Larson 2009b). Faunal remains are dominated by bison limb elements, indicating these groups were killing bison somewhere nearby and transporting the meatiest carcass parts back to a residential camp at 48GO305 (Rapson and Niven 2009).

Folsom and Midland occupations are present in the upper portions of substratum E1 at Localities I and II. The Folsom lithic assemblage contains a disproportionate number of tools with complex/multifunctional edges, likely a result of a long occupation span at 48GO305 during which Folsom people engaged in a multitude of activities and heavily re-used and re-sharpened their tools (Kornfeld 2009). The Folsom faunal assemblage is similar to Goshen in that it is dominated by bison limb elements. Sufficient bison mandibles and maxilla were present in the Folsom deposits to establish a season of death in the fall or winter, perhaps indicating use of the site as an over-wintering camp during this period (Rapson and Niven 2009).

The Midland level at Locality II produced evidence for two of the oldest structures in North America in the form of circular patterns of post-molds (Figure 2c and 2d). Little is known about the Midland components at Localities I and II, partly due to mixing with Folsom materials. The structures are so far the most significant feature of these occupations. Further excavation and analysis targeted at isolating the Midland component would be relevant not only to an increased understanding of this complex at 48GO305 but also across the Great Plains and Rockies (e.g., Agogino 1969; Hofman 1992; Judge 1970).

E2

Between approximately 10,300 and 9,800 BCE, and coincident with early Agate Basin occupations, precipitation began to increase. Agate Basin materials show up in the very upper portion of substratum E1 and continue into the bottom of E2 at Localities I and II. Although the earliest Agate Basin occupations occurred during a wet period at the end of the Younger Dryas, this was followed by increasing aridity (Reider 2009). It was likely during late Agate Basin times that the flow of Hell Gap Creek decreased and it became an ephemeral or seasonal drainage like it is today (Miller and Goldberg 2009).

With the exception of the Frederick component, the Agate Basin component contains more artifacts than any other Paleoindian component at 48GO305, all in the form of lithic artifacts and faunal remains (Irwin-Williams et al. 1973). Similar to earlier occupations, the Agate Basin faunal assemblages from Localities I and II are dominated by bison remains, which were brought to the site from nearby kills (Rapson and Niven 2009). The Agate Basin component also contains the remains of at least one mule deer (*Odocoileus hemionus*) and one pronghorn antelope (*Antilocapra americana*), potentially signaling a slightly broader diet (or just better preservation of these smaller bones) than earlier groups (Rapson and Niven 2009).

The Agate Basin component at 48GO305 is a palimpsest[11], which makes the length and number of the individual occupations difficult to determine (Irwin-Williams et al. 1973:44; Sellet 1999:238). Intensive processing of faunal remains, re-sharpening of tools, and the construction of two structures indicated by patterns of post-molds (Figure 2b) indicate some long-term occupation.

[11]As defined by archeologists, a palimpsest is a combination of multiple human occupations collapsed onto each other.

E3

Substratum E3 contains Hell Gap complex cultural materials, and dates to between approximately 10,300 and 8,780 BCE. The Hell Gap artifacts were deposited in an environment of more rapid deposition characterized by higher temperatures and increased precipitation (Fredlund 2009) that may have been manifested as fluctuating wet and dry conditions (Reider 2009). Due to rapid deposition, these components appear less dense than other levels, but this is the result of natural—not cultural—processes (Larson 2009a:305; Reider 2009).

The faunal and lithic assemblages indicate that the site was occupied repeatedly by highly mobile groups of bison hunters during this time. The formal tools are dominated by projectile points and gravers, and debitage[12] pieces are generally smaller than for all other levels with the exception of Alberta (also the result of occupation by a highly mobile group or groups) (Knell 2009; Kornfeld 2009; Larson 2009b). Whereas most other levels showed a clear and consistent butchering pattern, the 48GO305 faunal assemblage does not, indicating high diversity in butchering techniques and strategies during this period (Rapson and Niven 2009), and further suggesting multiple short-term occupations.

E4

The early Holocene portion of stratum E (E4-E5) is difficult to separate in some cases because the contacts between substrata are often unclear. However, some distinctive features of substratum E4 can be discussed. Grass phytoliths[13] indicate continued warm temperatures (Fredlund 2009) while micromorphology is consistent either with increased aridity or the alternation of wet and dry periods (Miller and Goldberg 2009). As a rough measure of paleoclimates, Walker's (2009) analysis of small mammal remains indicates the presence of similar open forest and grassland in the Hell Gap valley beginning around this time and persisting throughout the Holocene.

Substratum E4 contains Alberta materials at Locality I that are likely associated with a date between approximately 8,850 and 8,500 BCE. The Alberta component is unique at 48GO305, representing an unambiguous single occupation by a highly mobile group (Knell 2009). Sixty percent of the Alberta debitage is from a chert source in the Green River Basin, some 200 km to the west (Knell 2009). Furthermore, the Alberta occupation contains the smallest debitage of any level, demonstrating evidence of tool re-sharpening and maintenance but very little of the intensive production seen during other, longer-term, occupations (Knell 2009; Larson 2009b).

E5

Substratum E5 contains Eden/Scottsbluff cultural materials at Locality I dating to between approximately 8,850 and 7,570 BCE. This period was characterized by intermediate moisture levels (Fredlund 2009; Reider 2009), lower than those seen during the Younger Dryas but higher than those seen during subsequent early Holocene occupations.

The Eden/Scottsbluff occupations mark a return to the more typical longer-term residential use of the Hell Gap valley. The lithic assemblage is once again dominated by local tool stone with ample evidence of production activities. The Eden/Scottsbluff faunal remains are dominated by bison but also contain a small number of medium-sized mammals, likely mule deer or pronghorn (Knell et al. 2009). Dentition analysis suggests a late

[12] Debitage is the collective term used by archeologists to refer to the sharp-edge waste material left over when someone creates a stone tool.

[13] Some plants can take up silica in the soil, whereupon it is deposited within different intracellular and extracellular structures of the plant. After these plants decay, silica is re-deposited in the soil in the form of phytoliths, which are ridged, microscopic structures of varying sizes and shapes. Archeobotanists analyze phytolith assemblages in order to track historic plant use and plant domestication, and as a means of vegetation reconstruction.

spring/early summer to fall season of death for those specimens sufficiently well-preserved to undergo analysis (Rapson and Niven 2009). Bison remains indicate that only high-utility portions of animals were brought to 48GO305 from nearby kills (Knell et al. 2009).

Stratum F

An erosion event between approximately 7,900 and 6,900 BCE marks the lower boundary of stratum F and indicates heavy precipitation during this period (Haynes 2009). The Frederick occupations occur in this stratum at Localities I and II, associated with a date between approximately 8,200 and 7,300 BCE at Locality I. The Lusk component is contained in the upper portion of stratum F at Locality II. Lusk material consists of low densities of charcoal and stone artifacts, including four projectile points (Irwin 1968:47), and it is not associated with a radiocarbon date (Irwin-Williams et al. 1973; Larson 2009b:307). Temperatures increased during the early Holocene but it is possible that summer precipitation was high as well (Bryson and Bryson 2009; Fredlund 2009).

The Frederick component at 48GO305 is large and it yields yet another instance of a Paleoindian structure from the site—this time a stone circle (Figure 2a). The artifact assemblage indicates long-term occupation of 48GO305 by Frederick complex peoples (Larson 2009a:307). There is extensive evidence of stone tool production, and high diversity in the types of macroscopic use-wear on formal tools indicates a broad range of activities (Kornfeld 2009:256). Faunal remains provide evidence for the removal and processing of fat and marrow from bison, as well as an increased reliance on medium-sized ungulates (likely deer) and smaller game (Byrnes 2009; Irwin-Williams et al. 1973; Rapson and Niven 2009:123).

Frederick marks a significant shift in Paleoindian subsistence patterns at 48GO305—and across the western Great Plains (Frison 1973, 1991, 1992; Kornfeld et al. 2010), from Early and Middle Paleoindian bison hunters toward a more broad-based subsistence strategy. Frederick peoples at 48GO305 were the first to incorporate significant amounts of medium and small game into their diets (Irwin-Williams et al. 1973), and Bradley (2009) notes that Frederick, and the subsequent Lusk component, show a sharp upswing in the use of local quartzite compared to local cherts and exotic tool stones. An increasing preference for quartzite during this period is noted across the northern (Bradley 2010; Kornfeld et al. 2001) and southern (Pitblado 2003) Great Plains and Rockies.

The Lusk occupations at Locality II (and suspected Lusk occupations at Locality I) are small, diffuse, and poorly understood, possibly because they coincide with an extended hiatus in sediment deposition caused by major down-cutting at the strata F/G interface (approximately 7,300-4,800 BCE) (Haynes 2009). No radiocarbon dates are definitely associated with the Lusk component but it falls above Frederick and below more recent Early Archaic materials in the stratigraphic column. This is consistent with radiocarbon dates from the Betty Greene site, the only other Lusk occupation known from the region (Greene 1967).

Stratum G (Substrata G1-G5)

The mid-late Holocene stratum G sedimentation begins during or just after the sedimentation hiatus at the strata F/G interface. These substrata derive from the alluvial erosion of older strata. Erosion and sediment formation during the middle-to-late Holocene in the Hell Gap valley is characterized by cyclic cutting and filling.

CONTRIBUTING AND NONCONTRIBUTING RESOURCES

Contributing Resource:

48GO305 (Hell Gap Site), HG-1: The 23.3-acre archeological site that encompasses Localities I and II, as described above.

Noncontributing Resources: One Building and Five Structures

Road, HG-2: A two-track dirt access road, approximately 0.4 miles long, runs through 48GO305, roughly following the bends of Hell Gap Creek. Heading northwest, the road enters the site's eastern boundary. After approximately 350 feet, the road passes Locality I. The road continues another quarter mile, southwest then north, to Locality II. The road continues north another 0.1 miles to the property's northern boundary. The construction date for the road is unknown. It is a noncontributing structure.

Laboratory, HG-3: This rectangular, pre-fabricated building measures 46 feet x 10 feet, has aluminum siding and a flat roof. A narrow concrete ramp leads to the entrance. It is located east of the road near Locality I. The laboratory building was brought to the site in the 1980s and, along with the Fenn-Mullins Building, serves as the base of operations for the University of Wyoming's current excavations and public outreach endeavors at 48GO305. Built outside the period of significance, it is a noncontributing building.

"Fenn-Mullins Building," HG-4: This rectangular, pre-fabricated structure measures 51 feet x 28 feet and has a side gabled roof. It has white aluminum siding except for the south elevation, which is open. Four wooden posts divide the south elevation into five open bays. Located south of the road, the Fenn-Mullins Building was constructed in 2001 to completely cover the open excavation block at Locality I. A small shed-roof addition was added to the structure's east elevation between 2012 and 2015. Along with the laboratory building, the Fenn-Mullins Building serves as the base of operations for the University of Wyoming's excavations and public outreach endeavors. Built outside the period of significance, it is a noncontributing structure.

Concrete slab, HG-5: Just south of the laboratory building, a rectangular concrete slab measuring 8 feet x 18 feet holds two portable toilets. Built outside the period of significance, it is a noncontributing structure.

Power line system, HG-6: A power line system runs along roughly the same route as the road. It comprises wooden poles that are approximately 35 feet tall. The construction date for the power line system is unknown. It is a noncontributing structure.

Shelter frame, HG-7: A temporary metal frame sits near Locality IIW (west of Locality II) in the event that excavation will occur at a future time. Initial testing at this site revealed the high potential for nationally significant findings. Brought to the site in 2009, long after the period of significance, it is a noncontributing structure.

TRIBAL CONSULTATION

The Heritage Partnerships Program (HPP), NPS, Intermountain Region, worked with the Wyoming State Historic Preservation Office and the Office of Indian Affairs and American Culture, NPS, Intermountain Region, to identify 26 American Indian tribes that have an interest in the region where 48GO305 is located. The tribes are Blackfeet, Cheyenne and Arapaho, Cheyenne River Sioux, Comanche, Crow, Eastern Shoshone, Fort Peck Assiniboine and Sioux, Northern Arapaho, Northern Cheyenne, Oglala Sioux, Rosebud Sioux, Sisseton-Wahpeton Oyate, Yankton Sioux, Standing Rock Sioux, Santee Sioux, Crow Creek Sioux, Lower Brule Sioux, Flandreau Santee Sioux, Lower Sioux Indian Community, Prairie Island Indian Community, Shakopee, Mdewakanton Sioux Community, Spirit Lake Tribe, and Upper Sioux Community. The initial tribal consultation process confirmed a connection to, and interest in, 48GO305 by modern-day tribes. Jimmy Arterberry, Tribal Historic Preservation Officer, Comanche Nation, commented on the site's enduring

connection to tribes today. In addition to the archeological remains, he underscored that tribes associated with this history can provide insight into the continuation of events that began at 48GO305 thousands of years ago.[14] This continuum is evident in tribal names for the area in which 48GO305 is located. One of these connections is captured in the Northern Arapaho name for the area: "He-Thei-none- Nee daw-xaw-gath-it" or "Buffalo Crossing."[15] Many Arapaho used the area for sustenance including hunting buffalo. The area is important to the tribe for many reasons, which are supported by archeological data and evidence present at the site.[16]

Naming Places in the West

By the time archeologists named the site "Hell Gap" in the 1960s, the Wyoming landscape was dotted with names borrowed from the devil's domain, such as Devils Tower and Colter's Hell.[17] Beginning as early as the sixteenth century and extending into the nineteenth century, Euro-American visitors imposed this "infernal vocabulary" on the arid West because to them it was wilderness; that is, as historian Roderick Nash explained, "a moral and physical wasteland."[18] Often, this notion of uncivilized wilderness, and the compulsion to conquer it, transferred directly to the Indian tribes who inhabited the region.[19] Of course, tribal people saw and named the landscape through a very different lens and cultural perspective.[20] "There was no wilderness;" recognized Chief Standing Bear of the Oglala Sioux, "since nature was not dangerous but hospitable; not forbidding but friendly."[21]

Throughout millennia, abundant game brought numerous tribes into the area around 48GO305, bringing with them varying perspectives and names for the place. Today, many tribes claim affiliation with the region and its long history. Although we do not know what the actual site was called during its Paleoindian occupation, the listing of other names in the nomination, including Buffalo Crossing, recognizes the area's connection to tribes

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[14] Jimmy Arterberry, Tribal Historic Preservation Office, Comanche Nation, phone interview by Christy Dickinson, National Park Service, Intermountain Regional Office, November 3, 2015.

[15] During the Fall 2015 meeting of the Landmarks Committee of the National Park System Advisory Board, the committee asked about the origins of the name "Hell Gap" and whether there are tribal names for the site. HPP and the Wyoming State Historic Preservation Office initiated further consultation with the tribes. During this consultation, the Crow shared that they do not have a specific name for the archeological site known as Hell Gap because its occupation predates their language by 2,000 years. They also recommended that only tribes who are direct decedents of the people who occupied Hell Gap should provide a tribal name for the site itself. HPP continued to learn and seek tribal guidance on tribal names for the specific site, and also the general area, to better understand tribal connections to the site today. From December 2015 to August 2016, HPP sent letters and made phone calls to the associated tribes, requesting, if appropriate, to learn their name for the area in which 48GO305 is located. The letter included a map and the short description "Place Naming in the West," which is now included in the 48GO305 NHL nomination. During this process, HPP learned the Northern Arapaho name for the area, Buffalo Crossing.

[16] Letter from Yufna Soldier Wolf, Northern Arapaho Tribal Historic Preservation Officer, to the National Park Service, January 4, 2016.

[17] Mae Urbanek, *Wyoming Place Names* (Missoula: Mountain Press Publishing Company, 1988), 95. According to *Wyoming Place Names*, the name "Hell Gap" first appeared on an early map of Fort Laramie. The date and location of the old map is unknown. The earliest scholarship on the Paleoindian site refers to the site's location as the "Hell Gap valley" and explains that it "contains a type of projectile point for which the name Hell Gap is proposed" (Agogino, 1961).

[18] In 1540, the Coronado Expedition named the 250-mile road from Mexico to present-day Arizona, "El Camino del Diablo," translated as "The Devil's Highway;" Nathaniel Langford's 1871 articles for *Scribner's Monthly* quoted in Michael D. Barton, "'Between Heaven and Hell': Religious Language in Early Descriptions of Yellowstone," *Yellowstone Science*, vol. 16, no. 3 (2008), http://www.nps.gov/yell/learn/upload/YS_16_3_sm.pdf (Accessed January 19, 2016), 19; Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1982), xii.

[19] Mark David Spence, *Dispossessing the Wilderness: Indian Removal and the Making of the National Parks* (New York: Oxford University Press, 2005), 3-4.

[20] For more on this topic, see Lloyd Burton and David Ruppert, "Bear's Lodge or Devils Tower: Intercultural Relations, Legal Pluralism, and the Management of Sacred Sites on Public Lands," in *Cornell Journal of Law and Public Policy*, vol. 8: iss. 2 (Winter 1999), http://scholarship.law.cornell.edu/cjlpp/vol8/iss2/1.

[21] Standing Bear, *Land of the Spotted Eagle* (Boston, 1933), pp. 38, 196, quoted in Nash, xiii.

today.

8. STATEMENT OF SIGNIFICANCE

Certifying official has considered the significance of this property in relation to other properties:
Nationally: X Statewide: _ Locally:

Applicable National Register Criteria:	A_ B_ C_ D X
Criteria Considerations (Exceptions):	A_ B_ C_ D_ E_ F_ G
NHL Criterion:	6
NHL Theme(s):	I. Peopling Places V. Developing the American Economy VI. Expanding Science and Technology VII. Transforming the Environment
Areas of Significance:	Archeology – Precontact
Period(s) of Significance:	11,000-6,500 BCE
Significant Dates:	N/A
Significant Person(s):	N/A
Cultural Affiliation:	Paleoindian: Goshen, Folsom, Midland, Agate Basin, Hell Gap, Alberta, Eden/Scottsbluff, Frederick, Lusk.
Architect/Builder:	N/A
Historic Context:	I. Cultural Developments: Indigenous American Populations C. Prehistoric Archeology: Topical Facets 1. Prehistoric Architecture/Shelter/Housing 2. Prehistoric Technology

NARRATIVE STATEMENT OF SIGNIFICANCE

Summary

48GO305 is nationally significant under National Historic Landmark Criterion 6 within the themes of *Peopling Places*, *Developing the American Economy*, *Expanding Science and Technology*, and *Transforming the Environment*. Located in the transition zone between the Great Plains and the Rocky Mountains, 48GO305 was occupied repeatedly during the terminal Pleistocene/early Holocene by peoples representing nine cultural complexes. The site, commonly referred to in archeological literature as the Hell Gap site, fundamentally changed how archaeologists viewed Paleoindian foragers because, as a residential campsite, it showed a diversity of human activities including medium game hunting, tool stone acquisition, and personal ornamentation – none of which were evident at the big game kill sites and surface scatters that had dominated the Paleoindian archaeological record up to that point. The incredible density and extent of stratified archaeological deposits at 48GO305, coupled with the ingenuity of its early investigators, made it a central site in the development of a more refined and nuanced understanding of Paleoindian lifeways during the second half of the twentieth century. Prior to the 1960s excavations at 48GO305, Paleoindians were seen as highly specialized big game hunters who were constantly on the move, hunting mammoth and bison. Data from 48GO305 showed, beyond a doubt, that Paleoindians were, in fact, more generalized foragers who had far more in common with their ethnographically documented descendants than previously realized. Further analyses of excavated materials and further excavations at the site have the potential to answer nationally significant questions concerning Paleoindian subsistence, the organization of technology, and the relationship between these two topics, as well as the changing environments of the terminal Pleistocene/early Holocene of North America. The period of significance for 48GO305 is 11,000-6,500 BCE, the date range of Paleoindian occupation of the site.

Discovery and initial excavation of the 48GO305 site led to a major refinement of the Paleoindian chronology in the Great Plains region for several reasons:

1. Hell Gap was, and still is, the only site in North America to contain an uninterrupted sequence of Paleoindian complexes that span more than 4,500 years. The nine complexes (if we recognize Alberta and Eden/Scottsbluff as separate complexes within Cody) are clearly located within distinct geological substrata.

2. Hell Gap was a crucial site for Paleoindian chronology almost from the day of its discovery because, in addition to demonstrating the relationships between known complexes, the investigators determined placement of three newly identified complexes within the emerging Paleoindian chronology: Goshen, Hell Gap, and Frederick.

3. The radiocarbon revolution of the 1950s allowed Hell Gap investigators to put the stratigraphic sequence of projectile points and campsites into a sequence of known age, helping to cement our knowledge of the duration of Paleoindian occupation of North America. Hell Gap investigators George Agogino and C. Vance Haynes, Jr., both recognized the utility, and pitfalls, of the newly introduced method of radiocarbon dating. They were committed to obtaining radiocarbon dates undisputedly associated with cultural remains and well-defined geologic contexts (Knudson 2009:29-30).

4. By continuing the approach utilized at sites such as Blackwater Draw (Bouldourian and Cotter 1999; Cotter 1937; Hester 1972), Lindenmeier (Wilmsen and Roberts 1978) and Medicine Creek (Bamforth 2007: Holder and Wike 1949), Hell Gap investigators during the 1960s employed a holistic, multi-

disciplinary approach that incorporated palynology, pedology, and the emerging subfields of zooarcheology and geoarcheology.

5. The Hell Gap site obliged archeologists to reconsider the nature of Paleoindian subsistence because it contained extensive evidence of occupations at several residential campsites, whereas most Paleoindian sites discovered up to that point were big game kills. The residential nature of Hell Gap provided extensive evidence of the aspects of Paleoindian economies beyond big game hunting, including medium-sized game hunting and tool stone acquisition and reduction.

6. With the variability and richness represented by the zooarcheological and chipped stone remains, as well as artifacts more common to residential occupations than hunting camps, the site presented an opportunity for archeologists to delve into previously unknown aspects of Paleoindian lifeways, such as medium game procurement, tool stone acquisition, housing, and personal ornamentation. Hell Gap was not solely responsible for these shifts in Paleoindian archeology, but since no other site presents this combination of archeological wealth, outstanding physical integrity of stratified deposits, and the ingenuity and influence of the archeologists involved in its excavation, it is more significant than any other single site in precipitating a major change in how Paleoindians were understood.

48GO305 provides a nationally significant and exceptional record of environmental, technological, and subsistence change over time at a single location, something lacking for the entire Paleoindian period on the Great Plains. Although some sites yielded radiocarbon dates that span lengths of time similar to Hell Gap, the other sites contain occupations that were often sporadic or nonexistent in the centuries or millennia between the earliest and latest dates. Hell Gap, on the other hand, was the first Paleoindian site to show evidence of repeated occupation of a single location for domestic activities. Furthermore, no Paleoindian site on the Great Plains contains as many sequential cultural complexes with repeated occupations as Hell Gap. While other sites are significant to Paleoindian archeology because they, too, provide records of change over time, no site has yet to match the number of Paleoindian complexes, consistent record of occupation, and archeological integrity present at a single location.

Hell Gap also was the research domain of some of the most prominent archeologists and institutions in the country. It was initially discovered by two avocational archaeologists who brought it to the attention of George Agogino of the University of Wyoming (later of Eastern New Mexico University), who was a prominent and prolific Paleoindian scholar during the 1960s and beyond. After hearing about the site discovery, H. Marie Wormington of the Denver Museum of Natural History, “the mother of Paleoindian archaeology” and the first female president of the Society for American Archaeology (SAA), quickly engaged her protégés Henry and Cynthia Irwin with the project. Guided by dissertation advisor John O. Brew (then president of the SAA, Harvard University professor of Anthropology, and director of the Peabody Museum), Henry Irwin wrote his dissertation at Harvard on the site (Irwin 1968).

Even before completion of Henry Irwin’s dissertation, the importance of the site surfaced in publications; Gordon Willey (Harvard University) incorporated the new Paleoindian chronology, as interpreted from the Hell Gap site, into his chronological scheme in his compendium of North American archeology (Willey 1966). Henry Irwin’s dissertation was the model of prehistoric studies for perhaps 20 years beyond its publication, and continues to be significant today. Cynthia Irwin-Williams (Eastern New Mexico University) became the second female president of the SAA in 1977-1979, as well as one of the most important researchers in the Archaic of southwestern North America. Finally, C. Vance Haynes, Jr. (University of Arizona) and George C. Frison (University of Wyoming), who are two of the most prominent Paleoindian scholars of the last 50 years, reinitiated investigation at the site with a cadre of younger colleagues. The Hell Gap site has thus drawn in

some of the leading scholars of the twentieth and twenty-first centuries. These scholars initiated cutting-edge theoretical and methodological approaches to studying the site, which is generating nationally significant avenues of research regarding Paleoindian lifeways.

COMPARABLE PROPERTIES

The significance of 48GO305 is based on stratigraphic duration and integrity of the deposit, the expanded perspective on settlement and subsistence, the residential nature of the site with its domestic activities, and the use of local (lithic) resources. While some other archaeological sites throughout North America are stratified, 48GO305 is unique in the accretion of Paleoindian age sediment, relatively uninterrupted by erosional episodes (Haynes 2009). And while other sites—e.g., Bull Brook and possibly Shoop (Robinson and Ort 2013; Carr et al. 2013) — may have domestic structures, these are of a single occupation, while the Hell Gap structures occur in different Paleoindian components (Midland, Agate Basin, and Frederick; Irwin-William et al. 1973). Furthermore, when first investigated, Hell Gap was one of a few residential (known at the time as camp) sites in a sea of big-game kill sites. To date, over 20 Paleoindian components identified at 48GO305 have yielded evidence of intensive camping activity in a small restricted valley; a situation unlike any other Paleoindian site save Allen in Nebraska, with far fewer components and occupations over a larger area (Bamforth 2007). And finally, while Paleoindian use of exotic (long distance) raw material sources is commonly evoked to argue for high mobility (e.g., Hofman 1992), 48GO305—now along with some other sites such as Hanson (Frison and Bradley 1980) and Barger Gulch (Surovell and Waguespack 2007)—has shown that more often than not local resources dominate tool production and use. Each of these rare or unique characteristics of 48GO305 is addressed below and compared to other similar resources, but it is the amalgamation of these traits that makes 48GO305 a unique, nationally significant resource.

Other sites such as Agate Basin (Wyoming), Carter/Kerr-McGee (Wyoming), Indian Creek (Montana), Lubbock Lake National Historic Landmark (Texas), Gault (Texas), Blackwater Draw National Historic Landmark (New Mexico), Graham Cave (Missouri), and Dust Cave (Alabama) also contain stratified, multiple component and possibly multiple Paleoindian occupations. However, compared to other sites, 48GO305 has more components and associated cultural material present in a continuous stratigraphic sequence without major erosional sediment loss than any of the other known sites. As such, 48GO305 has yielded, and promises to yield, data far more relevant to several nationally important archeological research questions concerning Paleoindian subsistence, social systems, organization of technology, and the changing environment during the terminal Pleistocene/early Holocene of North America.

The early works published by Agogino, Irwin, and Irwin-Williams (Agogino 1961, 1963; Irwin 1968; Irwin-Williams et al. 1973) showed not only the temporal relationships between known and new Paleoindian complexes, but also that Paleoindian subsistence and settlement were more diverse than once thought and incorporated longer term camps with semi-permanent structures. The traditional view of Paleoindian subsistence and mobility described the earliest Americans as highly mobile, big game-oriented groups whose lithic assemblages were dominated by exotic raw materials. This view was dominant in North American archeology throughout the first half of the twentieth century and into the 1980s, despite evidence to the contrary from 48GO305 and other sites. Much of Paleoindian archeology throughout the twentieth century supported the traditional view because most of the best-known Paleoindian sites were thought to be big game kills (Kornfeld 2007), and also because so many were thought to contain large proportions of non-local tool stone. 48GO305 and other Paleoindian residential campsites remained less visible than spectacular mammoth and bison kills, and it is only since the 1980s that campsites have become better integrated into models of Paleoindian settlement and subsistence.

Investigations in the 1990s and 2000s have broken down long-held beliefs. First, evidence of campsites, quarries, lithic scatters, and other much more ephemeral occupations became evident with the large amount of work done on non-bison kill sites, partially the result of cultural resource management work done after 1980 and the shift of emphasis by academic archeologists away from kill sites. Second, taphonomic investigations at sites thought to be bison kills indicated that the formation of the archeological record was much more complex than once thought. Upon further analysis some sites remain classified as kill sites, but others were classified as natural deaths, multiple separate kills of fewer individual animals, or camp sites. In-depth analyses of the chipped stone remains from bison bone beds showed that while many projectile points were made from non-local raw materials, the small numbers of tools used to dismember and butcher the animals were often very local in origin. Furthermore, investigations at other Paleoindian sites showed that the exotic nature of tool stone was merely a product of worn-out pieces being discarded, while other local sources were used to manufacture tools that were taken away with the group when they left.

Of great national importance is the fact that 48GO305 is a combination of residential and task specific locations, not a big game kill, giving researchers a perspective of Paleoindian domestic life. Campsites are particularly valuable for archeologists because they were occupied by many people who participated in a variety of tasks and were not just focused on the pursuit of big game. At campsites, therefore, the archeological remains and the activities they represent are typically more extensive and diverse than those found at big game kill sites.

48GO305 exemplifies stone tool production from local raw materials, which was thought to be very rare among Paleoindian sites at the time 48GO305 was initially excavated. Many well-known Paleoindian camp sites that had been previously reported on contained lithic assemblages dominated by exotic raw materials, e.g., the Shoop site (Witthoft 1952); the Debert site (MacDonald 1968); the Lubbock Lake site (Bamforth 1985); and the Cattle Guard site (Emery and Stanford 1982). . Re-analysis and further excavation at these seminal Paleoindian sites indicate that the concept of high mobility based on the presence of exotic raw materials in the archeological assemblage is no longer tenable and is far more nuanced. The nature of raw material source types is dependent on a myriad of factors. The availability of local raw materials, the need for retooling, the duration of residential occupation, on-site activities, and future plans played a much larger role in determining what raw material sources appear in the archeological record. The shift in perspectives from Paleoindian big-game hunters ranging widely throughout an unknown countryside has changed to a perspective of foragers who were intimately familiar with their environments and, therefore, restricted themselves to much smaller territories throughout much of their yearly cycle (Lee and DeVore 1968). While bison hunting still played an important part in Late Pleistocene/early Holocene lifeways, the in-depth analysis of sites, especially 48GO305, is providing a much more solid conceptualization of how these people lived.

48GO305 is within a select group of archeological sites that demonstrate the domestic side of Paleoindiain life. In addition to 48GO305, this group includes Lindenmeier Site National Historic Landmark in Colorado (Labelle 2012; Wilmsen and Roberts 1978); the Barger Gulch site in Colorado (Surovell and Waguespack 2007); the Topper site in South Carolina (Goodyear and Charles 1984; Goodyear and Steffy 2003); the Thunderbird site in Virginia (Gardner 1974); the Bull Brook site in Massachusetts (Robinson and Ort 2013); and the Shoop site in Pennsylvania (Carr et al. 2013). 48GO305 provides extensive evidence of residential activities, the exploitation of medium-sized game and plant foods, and the use of local lithic raw materials in various parts of the Early, Middle, and Late Paleoindian Period on the Great Plains. Despite the fact that Clovis cultural material is absent in the deposits at the site, the presence of Clovis-aged dirt (Haynes 2009) at 48GO305 (see strata A-D discussion above) suggests many fascinating research questions. The simplest explanation for the lack of Clovis artifacts at 48GO305 is that no one dropped any there; not all dirt contains archaeological remains. Other explanations for Clovis absence include low population densities, a shift in lifeways at the Clovis/Goshen/Folsom divide related to the disappearance of mammoth, or major shifts as yet not understood in climatic conditions of the time.

The discussion of significance in the following pages refers to Localities I and II at 48GO305. These localities are the most substantial, most significant, most heavily researched, and best-understood parts of the site. It is from Localities I and II that nationally significant data have been recovered and are expected to be recovered in the future (Larson 2009a). Localities I and II at 48GO305 provide an unprecedented stratified record of human occupation on the Great Plains during the Paleoindian period.

Table 1: 48GO305 and Comparable Paleoindian Sites (Note: Typically, the earliest and latest dates on Paleoindian occupation are shown. They do not necessarily represent all components or all published dates).

Site	Paleoindian complexes	Site Type	Calibrated ^{14}C Dates (unless noted)	NHL [22]	TS [23]	SMC [24]	Reference
48GO305 (Hell Gap), WY	Goshen, Folsom, Midland, Agate Basin, Hell Gap, Alberta, Cody, Frederick, Lusk	Camp	7,754±466 – 10,908±128 BCE		X	X	Larson et al. 2009
Agate Basin/ Sheaman, WY	Clovis, Folsom, Agate Basin, Hell Gap	Bison processing and Camp	9,938 ±904 – 10,758±140 BCE		X	X	Frison and Stanford 1982
Carter/Kerr-McGee, WY	Clovis/Goshen, Folsom, Agate Basin-Hell Gap, Cody	Bison Kill	10,000 ±770 BCE			X	Frison 1984
Finley, WY	Cody	Bison Kill	6,038±295 –6,133±118 BCE		X		Frison 1991; Moss et al. 1951
Horner, WY	Cody	Bison Kill	7,077±1522 – 9,721±383 BCE	X	X		Frison and Todd 1987
James Allen, WY	James Allen	Bison Kill	7,455±17 BCE		X		Knudson and Kornfeld 2007; Mulloy 1959
Betty Green, WY	Lusk	Camp	6,808±481 BCE		X		Frison 1991; Greene 1967
Casper, WY	Hell Gap	Bison Kill	9,373±573- 9,685±311 BCE				Frison 1974
Hanson, WY	Folsom	Camp	9,764±530 – 10,336±870 BCE				Frison and Bradley 1980
Colby, WY	Clovis	Mammoth Kill	10,847±130 – 11,107±20 BCE				Frison and Todd 1986
Lange-Ferguson, SD	Clovis	Mammoth Kill	8,399±699 – 9,043±165 BCE				Hannus 1990
Jim Pitts, SD	Goshen, Folsom, Agate Basin, Fishtail, Alberta, Cody, James Allen	Camp	8,620±77 – 10,034±401 BCE			X	Sellet et al. 2009
Lindenmeier, CO	Folsom, Cody	Camp	5,411±634 – 9,137±400 BCE	X		X	Wilmsen and Roberts 1978
Jurgens, CO	Cody	Bison Kill	8,242±124 BCE				Wheat 1979
Olsen-Chubbuck, CO	Firstview, San Jon	Bison kill	7,183±599 – 9,757±714 BCE	X			Wheat 1972
Allen, NE	Agate Basin, Hell Gap	Camp	7,268±615 – 10,234±805 BCE			X	Bamforth 2007
Scottsbluff, NE	Cody	Bison Kill	N/A		X		Barbour and Schultz 1932
MacHaffie, MT	Folsom, Cody	Camp	6,836±485 – 10,324±172 BCE			X	Davis et al. 1991, 2002; Forbis and Sperry 1952

[22] Sites designated as National Historic Landmarks.
[23] Type sites.
[24] Stratified multiple component sites.

Site	Paleoindian complexes	Site Type	Calibrated ^{14}C Dates (unless noted)	NHL 22	TS 23	SMC 24	Reference
Indian Creek, MT	Clovis, Folsom, Agate Basin, Hell Gap,	Camp	10,405±384 – 11,032±160 BCE			X	Davis and Greiser 1992 Mehringer et al.1984
Lubbock Lake, TX	Clovis, Folsom, Plainview, Firstview	Processing	6,872±237 – 10,275±209 BCE	X		X	Holliday et al. 1999; Johnson 1987
Gault, TX	Clovis, Folsom, Midland, Angostura	Camp	7,100±510 – 11,220±740 (Uncal. OSL dates) BCE			X	Waters et al. 2011
Midland, TX	Midland	Camp?	6,036±1105 BCE		X		Wendorf et al. 1955
Plainview, TX	Plainview	Bison Kill	9,343±750 BCE	X	X		Haynes 1964; Sellards et al. 1947
Blackwater Draw, NM	Clovis, Folsom, Agate Basin, Cody, Portales	Camp + ?	9,949±511 – 11,111±348 BCE	X	X	X	Bouldurian and Cotter 1999; Haynes 1964
Folsom, NM	Folsom	Bison Kill	10,055±286 – 10,962±127 BCE	X	X		Figgins 1927; Meltzer 2006
Shoop, PA	Clovis	Camp	N/A				Witthoft 1952; Carr, Adovasio et al. 2013
Shawnee-Minisink, PA	Clovis, later Paleoindian	Camp	10,900±40			X	Gingerich 2013
Bull Brook, MA	Clovis	Camp	10,410±60 BCE				Robinson and Ort 2013
Thunderbird, VA	Clovis, Late Paleoindian	Camp	9900±340	X			Carr, Stewart et al. 2013; Gradner1974
Graham Cave, MO	Dalton and Archaic	Cave	N/A	X			Logan 1952
Dust Cave, AL	Mid Paleoindian	Cave	10,650 to 9200			X	Sherwood et al. 2004

CULTURAL CONTEXT (Kornfeld et al. 2010)

The Paleoindian Period on the Great Plains and Rocky Mountains

Paleoindians were the first human occupants of the Americas, and are sometimes referred to as "the First Americans." Current evidence indicates that the earliest Paleoindian hunter-gatherers entered North America via the Bering Strait sometime between 13,000 and 11,000 BCE (although other scenarios have recently been proposed, Madsen 2015). These people quickly spread through the Americas, reaching the east coast of North America and the tip of South America within just a few hundred years. Clovis complex Paleoindians were the first to occupy the Great Plains and the Rocky Mountains where they appeared at approximately 11,200 BCE. In this region the Paleoindian period occurs between approximately 11,200 and 7,000 BCE.

Paleoindians on the Great Plains and Rocky Mountains lived as hunter-gatherers who moved across the landscape in search of plant and animal resources. During this period, several different cultural groups occupied the area. The degree to which these groups overlapped spatially and temporally is not entirely clear. For archeologists, these cultural groups, termed *complexes*, are distinguishable first and foremost by the different styles of projectile points they crafted. Each group seems to have had one, or at most two (see Eden/Scottsbluff), styles of points that they made exclusively. These points would have been hafted onto both thrusting spears and spear thrower (*atlatl*) darts. Although their primary use was as hunting weapons, these points were likely used in a variety of cutting tasks as well. The temporal duration of each Paleoindian complex has been established though extensive radiocarbon dating of stratified archeological sites containing the various point types as well as other materials (e.g., Frison 1991).

The buried components of 48GO305 span nearly the entire Paleoindian period on the Great Plains; only Clovis has not been found *in situ* to date. [25] This period, between approximately 11,000 and 7,000 BCE, encompasses the terminal Pleistocene/early Holocene transition. This was a time when climatic conditions and plant and animal communities in North America were unlike anything seen in modern times (Eren 2012; Haynes 2008). Environmental conditions at the Great Plains/Rocky Mountains boundary were generally wetter during the Early and Middle Paleoindian periods, with aridity increasing toward the Paleoindian/Archaic transition, about 7,200 BCE in most areas (Larson 2012). Paleoindians on the Great Plains hunted now-extinct herbivores such as mammoth (*Mammuthus columbi*, *Mammuthus imperator*, and *Mammuthus primogenius*), mastodon (*Mammut americanum*) and two species of extinct bison (*Bison antiquus* and *Bison occidentalis*), and exploited a variety of smaller fauna and plants.

Many of the Paleoindian sites discovered in the first half of the twentieth century were first identified by the bones of large extinct mammals with the human association being discovered only later (e.g., Barbour and Schultz 1932; Cotter 1937; Figgins 1927; Sellards et al. 1947). In this fashion, an understanding of a Paleoindian lifeway as mobile and one that revolved around the hunting and killing of big game quickly developed and was supported by the fact that many of these sites were dominated by large projectile points made from non-local stone. Prior to the establishment of radiocarbon dating, the direct association of these points with extinct animals was the only reliable way of identifying them as ancient, that is, Paleoindian. Residential sites like 48GO305 were simply less visible and less likely to be encountered because they did not contain massive amounts of huge, often minimally processed, bison or mammoth bones. However, in the second half of the twentieth century, Paleoindian residential sites began to be discovered and incorporated into subsistence models. Although understandings of Paleoindian lifeways are still evolving, it is apparent that, although big game was important for Paleoindians on the Great Plains, these groups had more in common with the balanced hunting and gathering lifeway of later Native American groups than archeologists had once believed.

Goshen (about 10,900 BCE[26])

Hell Gap is the type site for the Goshen complex (Irwin 1968). The diagnostic projectile point is morphologically similar to Plainview—a Paleoindian projectile point and cultural complex known from the southern Great Plains. Plainview and Goshen may be regional names for the same projectile point (Haynes 1991a; Sellet 1999) but radiocarbon dates and stratigraphic positions indicate a temporal separation, with Goshen predating Folsom (with some overlap) and Plainview occurring later than Folsom (Bousman 1998; Frison et al. 1996).

Goshen is known from only a small number of sites in Colorado, Wyoming, Montana, and South Dakota (Frison 1996; Irwin 1968; Kornfeld et al. 1999; Sellet et al. 2009). The subsistence of Goshen groups incorporated communal bison hunting, but the degree to which it was relied on is unknown. The Mill Iron site in Montana and the Upper Twin Mountain site in Colorado both contain bison-bone beds believed to be the result of single mass kills. Mill Iron contains the remains of at least 29 individual bison (Todd et al. 1996), and Upper Twin Mountain, at least 15 bison (Kornfeld et al. 1999). There is no evidence of communal hunting in the Goshen faunal assemblage from 48GO305 (Rapson and Niven 2009).

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[25] *In situ* (Latin phrase, translated "in place"). In Archeology, in situ refers to an artifact that has not been moved from its original place of deposition. An artifact in situ is critical to the interpretation of that artifact, and consequently of the culture that fabricated it. An artifact that is discovered not in situ is considered out of context and as not providing an accurate picture of the associated culture.

[26] Dates for Paleoindian complexes are compiled from Frison (1991) and were calibrated with the CalPal program on 1/20/05 for original publication in the 2005 Wyoming Archeology Month poster.

Folsom (about 10,500 BCE)
Folsom projectile points are known from northern Mexico in the south to southern Canada in the north, and from Idaho, Utah and Arizona in the west to Wisconsin, Iowa and Illinois in the east (Figure 2.1 in Surovell 2009), University of Arizona Press, Tucson, AZ, 2009). The common element in this broad environmental range may have been the presence of *Bison antiquus* (Munson 1990) and the expanded range of these animals during the Younger Dryas (Jodry 1999). Folsom sites across the Great Plains and Rockies show evidence of communal procurement of these animals, as well as what may be opportunistic kills of single individuals (Bement 1999; Jodry 1999). Although at times they were highly mobile, Folsom groups also settled down into seasonal camps in the Rocky Mountains, like Hell Gap, Lindenmeier, and Barger Gulch (Frison and Bradley 1980; Irwin-Williams et al. 1973; Surovell and Waguespack 2007; Wilmsen and Roberts 1978).

The Folsom projectile point is frequently held up as the pinnacle of Paleoindian chipped stone craftsmanship (Bradley 2010:475-476). The removal of two flutes (thinning flakes emanating from the base of the point and traveling up its long access beyond the hafting element; see Folsom point in Figure 3) coupled with precise, high-quality pressure flaking around the margins of the point leave little doubt as to the skill of Folsom point manufacturers (Bradley 2010:475-481). This high level of craftsmanship extends to other Folsom stone and bone tools as well (Frison and Craig 1980).

Midland (about 10,400 BCE)
Midland is an enigmatic cultural complex first identified at the eponymous type site in western Texas by an assemblage of projectile points resembling unfluted Folsom points (Wendorf et al. 1955). It is unclear whether Midland points do in fact represent unfluted Folsom variants or preforms (Agogino 1969; Frison et al. 1996; Hofman 1992; Judge 1970), if they are related to Goshen and Plainview (Sellet 1999), or if they are diagnostic of an independent cultural complex (Irwin-Williams et al. 1973). However, following Irwin-Williams et al. (1973:47), Bradley (2009:260) argues that many of the points identified as Midland at 48GO305 "were produced using a different, distinguishable technology [from Folsom]."

The confusion between Midland and Folsom makes it difficult to discuss the characteristics of the Midland complex. Midland has not received the attention of other Early Paleoindian complexes because the diagnostic points are often misidentified as unfluted Folsom points. Moreover, Midland is very close chronologically to Folsom, and Midland-aged radiocarbon dates could easily be mistaken for Folsom dates. Dates from the Midland type site are contradictory and unreliable, and dates on Midland components at other sites are generally lacking (Holliday and Meltzer 1996).

Agate Basin (about 9,900 BCE)
Agate Basin is the oldest complex considered part of the Middle Paleoindian period on the Great Plains and Central Rocky Mountains (Kornfeld et al. 2010). It was first identified at the Agate Basin site in eastern Wyoming (Roberts 1951; Wheeler 1954). Frison (1991:57) has argued that the long, narrow Agate Basin projectile point presents an optimal design for penetrating the rib-cages of bison. Bradley (Figure 9.21 in Bradley 2010) has suggested the morphology of the Agate Basin point was such that the long point often broke into segments that could be reworked into smaller, but still effective, points. Agate Basin groups employed communal procurement of bison, with bone beds known from Wyoming, Colorado, and North Dakota (Ahler et al. 2006; Frison and Stanford 1982; Irwin-Williams et al. 1973; Wormington 1988). The Agate Basin complex is among the first in a long line of bison hunting groups on the Great Plains to systematically utilize landscape features such as arroyos and sand dunes as natural traps (Kornfeld et al. 2010:226), although there is no indication that the Agate Basin faunal assemblage from 48GO305 is the result of communal procurement (Rapson and Niven 2009).

Hell Gap (48GO305) (about 9,200 BCE)
The Hell Gap cultural complex was first identified at the Hell Gap site (48GO305) (Agogino 1961) and it is still primarily known from the western Great Plains and Intermontane Basins of Wyoming and Colorado (e.g., Frison 1974). However, Hell Gap finds in the Colorado Front Range (Benedict 1992), the Absaroka Range of western Wyoming (Frison 1983), and the Elkhorn Mountains of west-central Montana (Davis and Greiser 1992) demonstrate that this complex also incorporated high altitude resources into their subsistence patterns. Communal bison hunting continued during Hell Gap times, and several sites in Wyoming and Colorado provide evidence for the use of arroyos, sand dunes, and steep hillsides to trap these animals (Frison 1974; Frison and Stanford 1982; Stanford 1978). The Hell Gap faunal assemblage from 48GO305 does not appear to be the result of large-scale communal procurement.

Alberta (about 8,400 BCE)
Alberta projectile points are often grouped into the Cody complex along with Eden/Scottsbluff points and the diagnostic Cody knives. Here Alberta is discussed separately, following Irwin-Williams et al.'s (1973) treatment of the complex. Defined on the basis of a series of surface discoveries in southwestern Canada (Wormington 1957), Alberta is the first shouldered projectile point introduced on the Great Plains and it marks a shift away from the lanceolate style previously used. The Alberta point is just as effective for dispatching big game as earlier points but the force of impact is driven back into the shoulders of the point rather than into the basal end, as was the case for earlier lanceolate types (Kornfeld et al. 2010:86-88). Some changes in foreshaft and hafting technology, therefore, were likely required to make this an effective technology. At 48GO305 and other sites, the Alberta complex predates Eden/Scottsbluff (Irwin 1968; Irwin-Williams et al. 1973).

Eden/Scottsbluff (Cody) (about7,900 BCE)
The Cody complex was initially identified at the Horner Site National Historic Landmark in northwestern Wyoming (Frison and Todd 1987). Eden and Scottsbluff projectile points were originally described as two separate types, both within the Cody complex. Within the population of Eden and Scottsbluff points, however, the more pronounced shoulders of the classic Scottsbluff type subtly grade into the extremely delicate—almost non-existent—shoulders of the classic Eden type (Irwin 1968:231), hence the combination of the two into "Eden/Scottsbluff." It is important to note, however, that Bradley (2009:270) identified only points at the Eden end of the spectrum in his analysis of bifacial tools from 48GO305.

Cody is a diverse cultural complex and the more it is studied the more diverse its subsistence and land-use practices are found to be (e.g., Knell and Hill 2012). Originally known from lowland plains and basin settings, it is now apparent that Cody groups incorporated the foothills and mountains into their movements as well (Kornfeld 2013; Larson 2012; Pitblado 2003). There is even some indication of a Cody presence in the northwestern Great Basin (Amick 2007). At least across the Great Plains and Rockies, communal bison procurement was an important focus for Cody groups. Using similar techniques to earlier groups (i.e., incorporating natural landscape features as traps) large Cody bison kills are known from the plains of Nebraska and Wyoming to the high intermontane basins of the Wyoming and Colorado Rockies (Frison and Todd 1987; Kornfeld 2013) but the Cody faunal assemblage at 48GO305 is more consistent with hunting by individuals and small groups (Rapson and Niven 2009).

Frederick (about 7,200 BCE)
Hell Gap is the type site for the Frederick complex and it still represents the most extensive known Frederick occupation (Byrnes 2009). Frederick is the older Late Paleoindian cultural complex found at Hell Gap (Lusk is the younger). Diagnostic Frederick projectile points are similar to James Allen points known from the northern Great Plains in Wyoming to the southern Great Plains in Oklahoma during the same time period (LaBelle 2005; Mulloy 1959). It is unclear whether the two point types are legitimately different from each other or if they

simply represent slight variations of the same morphology and production technique (Bradley 2009; Byrnes 2009:218). Frederick, James Allen, Lusk and several other Late Paleoindian projectile point types are included in the Frontier complex first identified in the Medicine Creek area of southwestern Nebraska (Holder and Wike 1949). Bradley (2009:271) notes consistency in the method of projectile point manufacture within the Frontier complex, further suggesting connections between these Late Paleoindian point styles.

The confusion between Frederick and Frontier complex point types makes a discussion of Frederick subsistence difficult. Much of what is currently known about the Frederick complex comes from excavations at 48GO305. The Frederick component at Locality I is extensive and diverse, containing faunal remains from small, medium and large game, evidence of personal ornamentation, and the most intensive use of local quartzites of all the analyzed components (Byrnes 2009). Furthermore, the Frederick-age stone circle identified by Irwin-Williams et al. (1973) is the earliest such feature in Wyoming.

Lusk (about 6,800 BCE)

Lusk is another Late Paleoindian complex identified by a lanceolate, parallel-oblique-flaked projectile point that is included in the Frontier complex (Bradley 2009). The Lusk complex was first identified at the Betty Greene site in eastern Wyoming (Greene 1967) and is known only from that site and 48GO305 (Irwin 1968). Lusk points are easily differentiated from Frederick and James Allen by their narrow plan-view and thicker cross-section (Kornfeld et al. 2010:94). The Lusk points from 48GO305 were not found in directly datable contexts but radiocarbon dates from Betty Greene indicate that Lusk post-dates Frederick and is one of the latest Paleoindian complexes known from the Great Plains (Frison 1991; Greene 1967; Irwin 1968). Lusk appears, like Frederick and other Frontier complex groups, to incorporate a broad-based subsistence relative to Early and Middle Paleoindian groups (Greene 1967; Holder and Wike 1949; LaBelle 2005), although it is less well understood than these other complexes. Ground stone was recovered in clear association with Lusk artifacts at the Betty Greene site, indicating the earliest use of grinding technology on the western Great Plains (George C. Frison personal communication, 2012; Greene 1967).

Lusk, and the larger Frontier complex, highlight some important continuities between the Paleoindian and Archaic periods. Lusk is considered a Paleoindian complex even though the subsistence practices of Lusk people may be more in line with a typical Archaic focus on diverse plant and animal foods. Chronologically, Lusk exists on the cusp of the Early Archaic but its diagnostic lanceolate projectile points fit better with Late Paleoindian point types. Based on the limited data available, Lusk appears to be a truly transitional complex, perhaps even more so than other Late Paleoindian complexes, which also show a trend of increasing diet-breadth toward the Early Archaic (LaBelle 2005).

48GO305 (Hell Gap) ARCHEOLOGICAL INVESTIGATIONS

1958-1966

Two avocational archeologists, James Duguid and Malcolm McKnight, discovered the Hell Gap site in the spring of 1958. Duguid brought it to the attention of University of Wyoming Professor George Agogino, who visited and first tested the site in the fall of 1959 (Agogino 2009). More extensive excavations occurred in the spring and summer of 1960 under the direction of Agogino with crews from the University of Wyoming that included students and avocational volunteers. During this first full season, Agogino supervised the excavation of several 5-foot by 5-foot units at Localities I, II and III, identifying Folsom, Agate Basin, Hell Gap, and Eden/Scottsbluff occupations and recovering a radiocarbon date of 8,850 ±550 ^{14}C years BCE (10,550 ±716 BCE) from charcoal thought to be associated with the newly identified Hell Gap complex (Agogino 1961). It was also during this summer that geoarcheologist C. Vance Haynes first examined the site stratigraphy and took

charcoal samples for radiocarbon dating. Haynes would remain a consistent element of investigations at the site for the next 50 years.

In 1961, Harvard Professor John O. Brew and graduate students Henry Irwin and Cynthia Irwin (later Irwin-Williams) began working at Hell Gap after being alerted by H. Marie Wormington of the Denver Museum of Natural History. Brew and the Irwins received financial support from the Peabody Museum and the National Geographic Society. The Irwins rooted their excavation techniques in the French model developed by Françoise Bordes (Irwin 1968; Irwin and Wormington 1970). This type of excavation focused on the exposure of large horizontal expanses of single stratigraphic layers. These layers were typically interpreted as single occupations and much emphasis was placed on the spatial distribution of artifacts and the definition of activity areas. Subsequent analysis has shown this assumption to be incorrect in the majority of cases (Sellet 1999), and most stratigraphic layers are now understood to represent multiple occupations.

Today we understand that when time between occupational deposits was short and little intervening sedimentation occurred, overlapping occupations may actually appear to have been deposited in single strata. Additionally, the archeological record has been altered by many things, such as sedimentation, burrowing animals, and erosion, before it is excavated. One of the strengths of the most recent Hell Gap excavations is the detailed analysis of site formation and taphonomy[27], allowing a much clearer separation between the activities of the original inhabitants and the processes that have affected the archeological deposits over the past 13,000 years. The 1961 work consisted of further testing at Localities I and III. In 1961, Agogino published the first description of the Hell Gap projectile point and its context (Agogino 1961). Agogino continued to be involved in Hell Gap throughout the 1960s, as did local volunteers and students from the University of Wyoming.

In 1962, excavations occurred at Localities I, II and III. As work at Locality I focused on the newly identified Frederick cultural complex, researchers identified the first known Frederick point *in situ* as well as a stone circle believed to be the remains of a structure (Figure 2a). This stone circle represents one of the first Paleoindian structures identified in North America.[28]

In 1963, the research focused at Localities I and II, particularly the remainder of the Frederick component from Locality I. Excavation also began that summer in the Eden/Scottsbluff and Alberta deposits below the Frederick level. At Locality II, researchers excavated Agate Basin and Midland deposits. Seven new radiocarbon dates were obtained from Localities I and II. That same year Agogino published a new synthesis of Paleoindian culture history for North America, incorporating data and new cultural complexes from Hell Gap (Agogino 1963). It speaks to the significance of the site that after only three years of work there, Agogino felt the data recovered were important enough to warrant publication in a continent-wide synthesis of Paleoindian chronology.

In 1964, work continued in the Eden/Scottsbluff levels at Locality I, and researchers recovered Alberta complex artifacts *in situ* (Figure 4). The Alberta complex had initially been identified by Wormington (1957) based on surface collections, so these represented the first such artifacts recovered from a stratified and datable context. New excavations at Locality V also discovered a rich Eden/Scottsbluff level during that season.

In 1965, the focus remained on Localities I and II, and excavators unearthed Hell Gap and Agate Basin deposits at Locality I. Two more cultural levels were identified at Locality I below Agate Basin: Folsom and a pre-

[27]In general, taphonomy is the study of the process regarding how fauna and flora become part of the fossil record. When archeologists use the term, they focus on defining and describing evidence of human use of fauna and flora, usually separating out natural processes from cultural processes.

[28] Similar structures from the Flint Run Complex in Virginia were soon to follow (Gardner 1974).

Folsom level that contained cultural material but no diagnostic artifacts. Work at Locality II identified Lusk complex artifacts (identified after the fact) and continued to excavate the Agate Basin and Midland components. The Locality II Agate Basin levels contained a circular pattern of post-molds, believed to be the remains of a structure (Figure 2b).

In 1966, as work continued at Localities I and II, a new type of projectile point was discovered in the pre-Folsom level from Locality I. The projectile point was stylistically similar to the Plainview point known from the southern Great Plains. Henry Irwin (1968) named the new point type "Goshen", after the county in Wyoming (Figure 3). Excavations at Locality II unearthed two circles of post-molds associated with Midland materials (Figure 2c and 2d). These features were interpreted as the remains of small structures (Irwin-Williams at el. 1973). In September 1966, excavators capped the open blocks with concrete, and the Army National Guard from Guernsey backfilled the open areas with bulldozers. The 1960s excavation blocks were not reopened until 1994.

1967-1992

From 1967 to 1980, work occurred only sporadically at Hell Gap. The most extensive fieldwork consisted of two backhoe trenches excavated in 1967. Data recovered from the two trenches were used in a regional paleo-environmental synthesis (Roberts 1970). The primary Hell Gap-related work during this period was collections analysis conducted by Henry Irwin. Irwin had completed his dissertation in 1968 and spent the next decade refining and augmenting his analyses for a series of publications that never materialized (Irwin died in 1978). No substantial fieldwork occurred at Hell Gap during the 1970s, and throughout the 1980s and the early 1990s only occasional salvage operations were mounted by Eastern Wyoming College (Torrington, WY) and the Western Heritage Center (Lingle, WY) to excavate features that were being eroded by the down-cutting and meandering of Hell Gap Creek (Knudson 2009).

1988-1999

In 1988, the majority of the Hell Gap site was acquired by the Wyoming Archeological Foundation (WAF) (Knudson 2009; Kornfeld and Larson 2009; Kornfeld et al. 2002). Shortly following acquisition of the site by the WAF, George Frison, a preeminent expert in the field of Paleoindian archeology, undertook the considerable task of bringing together at the University of Wyoming all the artifacts collected during the 1960s excavations. Although the 1960s researchers were primarily interested in projectile points and formal tools, they collected and documented chipped stone debitage and bone artifacts as well. This was one of the most remarkable things about the 1960s excavations because the convention among American archeologists at the time was to discard these "less important" items. The debitage and faunal collections from Hell Gap had never been analyzed, but the extensive field notes and maps, contained in twenty-two three-ring binders, meant their context was well enough understood that the potential for analysis still existed.

By 1988, the artifacts had been spread across the country and assembling them in Wyoming required Frison to travel to the Peabody Museum in Cambridge, Massachusetts, and to Washington State University in Pullman, Washington, to collect the lithic materials and soil samples. Meanwhile, George Zeimens of Eastern Wyoming College went to Madison, Wisconsin, to collect the faunal remains from the University of Wisconsin (Frison 2009). Analysis of the thousands of debitage pieces and faunal remains from the 1960s began at the University of Wyoming in the 1990s and continues today.

The recent University of Wyoming excavations were conducted in two phases: prior to 1999, researchers focused on reopening and studying the 1960s excavation blocks and stratigraphy as a means to better understand the context of previously excavated artifacts (Kornfeld and Larson 2009:9). Since 1999, fieldwork at 48GO305 has focused on new excavations, primarily at Locality I. During the 1990s, excavators removed

backdirt from Localities I, II and V by hand and with the help of heavy machinery. With the 1960s excavation block exposed, the researchers created a valley-wide metric grid system based on a single datum.

The re-exposed profiles were drawn by C. Vance Haynes who also took carbon samples to be submitted for dating. Haynes's close involvement in these renewed excavations is indicative of the importance placed on geoarcheology and formation processes by Frison, Larson and Kornfeld. The 1990s investigators also opened up seven backhoe trenches around the Hell Gap valley as a means of understanding quaternary sedimentation processes (and, in one case, to prevent flood damage to excavation blocks). Haynes profiled these trenches, and samples were taken for radiocarbon dating, sediment analysis, micromorphological analysis, and phytolith analysis.

The major focus of research between 1990 and 2000 was the excavation of a small portion of intact deposits at Locality I (Kornfeld et al. 2002:36). Eleven 1 x 1 m excavations units were completely or partially excavated during this period. These units were primarily located on a bench left unexcavated at the closing of the site in the fall of 1966 but a small number were excavated at other discrete locations at Locality I.

2001-2011

Since 1999, work at 48GO305 has focused on excavating the unexcavated block between the west side (Locality I) and the east side (Locality IE) of the area excavated at Locality I in the 1960s. This approximately 5 x 7 m area is being excavated at a relatively slow pace (an average of approximately 15 vertical centimeters is removed each season). All artifacts larger than 1 cm are piece-plotted with a total station mapping instrument. In twenty days of field work in 2001, excavators removed 3.15 cubic meters of sediment (Melanson et al. 2001).

In 2003, excavations continued at Locality I but testing also occurred at an area west of Locality II (Locality IIW) and the Baars Locality in a tributary drainage to the Hell Gap valley. The Baars Locality was the location of a Clovis point surface find (the Clovis culture represents the earliest known human groups to occupy the Great Plains) in 2001 (Lamberson et al. 2005). Also in 2003, additional backhoe trenching was implemented at various locations throughout the valley in an ongoing attempt to understand the local stratigraphy and recent (i.e., the last 15,000 years) geologic history (Lamberson et al. 2005). Additionally, arroyo walls were profiled at three locations southeast of Locality I within the NHL boundary (Lamberson et al. 2005:22).

Despite the identification of Clovis-age sediments at the Baars Locality, testing at the locality in 2003 and 2005 proved disappointing (Epstein et al. 2006; Lamberson et al. 2005; Laughlin 2005; Laughlin et al. 2004). A small amount of possible cultural material (<20 artifacts) was found associated with late Pleistocene sediments but no diagnostic artifacts or datable organic matter were recovered (Epstein et al. 2006:60-62). Currently, any Clovis use of the Hell Gap vicinity is speculative, given that it is based on one unprovenienced surface find.

Work in 2005 continued to focus on the Locality I excavation block with additional testing at Locality IIW and at the Baars Clovis Locality. Haynes continued his studies of the site and a pilot study examining the usefulness of ground-penetrating radar (GPR) was conducted (Epstein et al. 2006). As work at Locality IIW progressed it became apparent that there were significant Paleoindian and Archaic components present and, as a result, new, more meticulous mapping and excavation techniques were put in place (Epstein et al. 2006). Testing was completed at the Baars Clovis Locality with the results discussed above. Three transects were conducted with a GPR unit (one transect at Locality I and two at the Baars Clovis Locality). The GPR unit generally failed to penetrate deeply enough to reach Paleoindian-aged deposits, consistent with results at other archeological sites on the Great Plains (Epstein et al. 2006).

The 2007 and 2009 field seasons focused entirely on excavating Locality I. Time and crews were both limited during these seasons (Head et al. 2012). No diagnostic artifacts were recovered during these field seasons but, based on the known age of stratigraphic units, Frederick, Eden/Scottsbluff and Alberta levels were excavated (Head et al. 2012:19). This was the first time Middle Paleoindian components had been reached during the renewed excavations at Locality I (Head et al. 2012:34).

In 2011 excavation continued at Locality I, uncovering a limited number of stone and bone artifacts in substratum E4 believed to be associated with Alberta complex occupations (Pettigrew et al. 2012). The very bottom of the 2011 excavation units contains the beginning of a sediment change that may indicate a shift to Hell Gap-age levels (Pettigrew et al. 2012). Throughout the renewed excavations, backplots (maps of the vertical distribution) of stone and bone artifacts have clearly demonstrated episodic occupation by the different Paleoindian complexes. This is likely what the original excavators (Irwin 1968; Irwin-Williams et al. 1973) called living floors (i.e., single-occupation episodes). The current understanding of site formation processes indicates this early interpretation is likely incorrect for most periods (Larson 2009b; Pettigrew et al. 2012; Sellet 1999).

The significance of the 1960s excavations at Hell Gap was rooted in the development of chronology based on projectile points and radiocarbon dates. At the time, this represented the front lines of North American archeology, which was still heavily invested in the building of chronological sequences. The early researchers quickly recognized the national significance of Hell Gap because of its ability to refine, and in some ways rewrite, Wormington's (1957) Paleoindian chronology. The University of Wyoming investigations beginning in the 1990s represented the first examination of Hell Gap by archeologists interested in Paleoindian adaptive systems, the organization of technology, and subsistence strategies. This again reflected the state of North American archeology at the time, which was (and still is) rooted in a Processual paradigm that emphasized innovation in lithic and faunal analysis, paleoclimatic reconstructions, and the understanding of site formation processes.

Although scholarly publications on 48GO305 are limited, the site's national significance has been well-established by archeologists, as the statements that follow indicate:

> "Hell Gap represents the most complete sequence of remains of man's habitation of the Mountain Fringe-High Plains area" (Irwin 1968:29).
>
> "Prior to the Hell Gap investigations, the Paleoindian cultures of the High Plains were known largely from surface collections or from isolated animal kill-sites. Accordingly, their chronology and relationships, sequential or otherwise, were frequently obscure. In addition, with only kill-site materials available, no balanced view of Paleoindian culture was possible....The remarkable concentration of materials at Hell Gap makes possible the construction of the most complete sequence of Paleoindian cultures available to date and its placement in a dated geologic context" (Irwin-Williams et al. 1973:52).
>
> "August 1966 witnessed the end of a multiyear, well-funded investigation of the Hell Gap site 48GO305 in southeast Wyoming. The site was the scene of stratified evidence of numerous Paleoindian (then referred to as 'Early Man') occupations for a period of about 3,000 [radiocarbon] years. The evidence from the site established a chronology for the High Plains Paleoindian that has withstood the test of time surprisingly well" (Frison et al. 1996:205).

"Excavated by the University of Wyoming in 1960 and 1961 and in combination with Harvard's Peabody Museum from 1962 to 1966, the Hell Gap site was clearly of major significance to Paleoindian prehistory at the time, for several reasons:
1.) The field investigation provided the longest and most nearly complete stratigraphic sequence of late Pleistocene/early Holocene deposits associated with Paleoindian components in North America (and it remains so today).
2.) Hell Gap is the type site for three new Paleoindian complexes identified in the 1960s: Frederick, Hell Gap and Goshen.
3.) The site was (and still is) one of a few Paleoindian camps dominated by activities other than those centered on large-scale, communal game hunting" (Kornfeld and Larson 2009:3).

"…in a sea of previously excavated Paleoindian sites, almost all of which were bone beds of Pleistocene megafauna (e.g., Barbour and Schultz 1932; Moss and others 1951; Schultz 1943; Sellards 1952; see also Frison 1974; Frison and Bradley 1980; Frison and Stanford 1982), Hell Gap was a rare site, for most components yielded only limited quantities of bone, some of which were from small and medium-sized mammals. The site provided information on lifeways not available from the better-known bison 'kill' sites" (Kornfeld and Larson 2009:5).

"I strongly believe that for all the ups and downs experienced through the acquisition and reinvestigation of the Hell Gap site, it was a worthwhile venture and that the passage of time will eventually support this statement….With careful planning, there are enough data still in the ground at Hell Gap to provide research opportunities for many decades and possibly even centuries to come" (Frison 2009: xix).

48GO305 WITHIN THE NATIONAL HISTORIC LANDMARK THEMATIC FRAMEWORK

Within the theme of *Peopling Places*, 48GO305 is a unique location at the Great Plains/Rocky Mountains transition that was occupied repeatedly during the terminal Pleistocene/early Holocene by human groups who brought with them artifacts associated with nine Paleoindian complexes. Within the theme of *Developing the American Economy*, 48GO305 provides a record of changing Paleoindian economic systems over more than 4,500 years in well-stratified deposits at a single location. 48GO305 also reflects the theme *Expanding Science and Technology* because recovered artifacts at the site demonstrate expansion and change in the technologies used by Paleoindians to extract calories from their environment. Finally, past and present research at 48GO305 reflects the theme *Transforming the Environment* because paleoenvironmental and cultural data from the site can help scientists explore the relationship between changing climates and human adaptation during the terminal Pleistocene/early Holocene.

I. Peopling Places – the Draw of 48GO305

Once dominated by a few large mammal kills, the known Paleoindian record for the Great Plains region has expanded significantly and now consists of a large number of sites reflecting a high diversity of activities (e.g., Hurst and Hofman 2010; LaBelle 2005). Archeologists have come to realize that early interpretations of Paleoindians as specialized big game hunters may have been a result of the high visibility of bone beds rather than reflecting the real range of Paleoindian subsistence practices (Kornfeld 2007; Speth et al. 2010). Bone beds and kill sites are valuable for what they reveal about big game procurement and butchering behavior, just as a quarry site is valuable for what it can tell us about lithic procurement and early-stage tool production. Both site types provide valuable data concerning single aspects of Paleoindian life, but neither can be expected to provide the complete picture.

The same is true of residential camp sites like 48GO305, Lindenmeier, Hanson, and Barger Gulch; they do not provide a complete record of Paleoindian lifeways, but are some of the most valuable Paleoindian sites because of the diversity of activities they do represent. The large number of occupations and cultural complexes contained within 48GO305 make it extraordinarily significant, as most residential campsites contain only a few occupations.

V. Developing the American Economy—Paleoindian subsistence

The first Americans were hunting and gathering peoples. Whether or not Clovis represents a colonizing population, archeologists can be certain that early Native American groups made their livings off wild plant and animal resources. Hunting and gathering is the longest lasting American economic system and, on the Great Plains, Native Americans hunted and gathered for at least 13,000 years prior to European contact and colonization.

It is now obvious that all Paleoindians were not monolithic big game specialists but were instead diverse and flexible foragers who extracted subsistence resources from the environment in a variety of ways depending on the time of year, local and regional weather patterns, and their specific location on the landscape (Bamforth 2002; Cannon and Meltzer 2004, 2008; Kornfeld 2007; Speth et al. 2010). However, in the early days of Paleoindian archeology, a handful of key sites on the Great Plains helped to define an understanding of Paleoindians as specialized big game hunters. Sites such as Blackwater Draw, Folsom, Agate Basin, and Scottsbluff demonstrated contact between humans and now-extinct Pleistocene megafauna, typically in contexts leaving little doubt that humans had been hunting these animals (Barbour and Schultz 1932; Bouldurian and Cotter 1999; Figgins 1927; Frison and Stanford 1982). It has only been in recent decades that the diversity of tools and the presence of smaller species of game at some of these sites have weakened this argument (e.g., LaBelle 2005; Meltzer 1988), although the issue is far from dead (see Byers and Ugan 2005; Cannon and Meltzer 2004, 2008; Kornfeld 2007; Kornfeld and Larson 2008; Surovell and Waguespack 2008; Waguespack and Surovell 2003).

The traditional view of Paleoindian subsistence is seductively simple and easy to understand. However, in its simplicity, this concept ignores enough variation and nuance to make it untenable in the light of modern understandings of North American foragers. Hell Gap and other substantial residential sites were instrumental in the early development of an alternative way of thinking about Paleoindian subsistence, but the explosion of cultural resource management archeology beginning in the 1970s and continuing through the present has provided a larger and less biased record of Paleoindian sites (e.g., Frison 1984; Kornfeld and Larson 2008). With a more balanced record of Paleoindian sites to consider, it is clear on the Great Plains and elsewhere that the role of large mammal hunting may have been overestimated by earlier generations of archeologists (Cannon and Meltzer 2004, 2008; Kornfeld 2007).

Like all hunter-gatherer economic systems, Paleoindian economies focused on foods (plants and animals) and raw materials (plant, animal and lithic). The distribution and abundance of these resources varied through space and time on daily, seasonal, decadal, millennial and longer-term scales, and economic systems adapted accordingly. There is undoubtedly a relationship between environment, climate change, and human systems (Fagan 2008; Steward 1938) but it is by no means simple or straightforward. Climate change and resource availability places certain constraints on hunting and gathering populations but within these constraints there are an infinite number of possible directions in which a culture can adapt.

VI. Expanding Science and Technology—Paleoindian Chipped Stone Technology

The Paleoindian archeological record is dominated by lithic materials, with a smaller (although still considerable) number of sites containing well-preserved faunal remains. Thus, the study of Paleoindian

technology focuses largely on lithic artifacts. Although wood, hide, and plant fiber artifacts likely made up the majority of Paleoindian tool kits, these artifacts rarely survive in the ground. Traditionally, projectile points have received the lion's share of attention (e.g., Wormington 1957) but recent studies focus on other formal tools and debitage as well (Bamforth 2002; Surovell 2003, 2009).

Paleoindian complexes are always defined by a projectile point type but it is not entirely clear if these cultural complexes were comparable to ethnographic units. It has often been assumed, if not explicitly stated, that on some level, points equal people. In other words, the continuity in form and design of Folsom projectile points, for example, must in some way correspond to a shared set of traditions, perhaps a shared language, or even a common geographic origin. Regardless of the specifics, it is typically assumed that archeologically defined cultural complexes must reflect some shared social connection among their users if not reflecting precontact ethnographic cultures *per se*.

Bradley and colleagues (Bradley 2009, 2010; Bradley and Frison 1996; Bradley and Stanford 2012) have taken the perspective that relationships between different Paleoindian complexes may be evident through the morphology and method of manufacture of projectile points. The idea behind this perspective is that groups held together by a common origin, language, or set of beliefs are comfortable and proficient making projectile points in a certain way. Innovation is still possible but it may occur within a set of constraints stemming from some commonly held understanding of the nature of projectile point manufacture. In this view, the study of projectile point morphology is relevant to the colonization of the Americas as well as migration and inter-group dynamics among Paleoindians and later peoples (Bradley 2010; Bradley and Stanford 2012).

The overall organization of Paleoindian chipped stone technology has also been a focus of North American archeologists. Much of the discussion has been influenced by Kelly and Todd's (1988) seminal article in which they argued Early Paleoindian groups (Hell Gap and earlier complexes for the purpose of the current discussion) were highly mobile big game specialists. A preponderance of bison and mammoth kill sites, particularly on the Great Plains, and the dominance of exotic tool stone at Early Paleoindian sites, lends credence to Kelly and Todd's (1988) model. Furthermore, at the time, a highly mobile lifestyle appeared to be indicated by an Early Paleoindian emphasis on bifacial chipped stone technology, which Kelly (1988) argued was a more efficient technology for highly mobile groups than amorphous cores.

More recent evaluations of the organization of Paleoindian technology, however, question the degree to which early groups relied on bifaces relative to cores (Bamforth 2002; Collins 1999). Debitage analysis at Paleoindian sites has often identified flakes attributable to core reduction even if cores are rare in the site assemblage (Bamforth 2002:69; Bouldurian 1991; Frison and Bradley 1980; Hemmings 1987; Ingbar and Larson 1996). Further complicating the issue, Prasciunas (2007) has thrown into doubt Kelly's (1988) assumption that the biface is a more efficient alternative to the core for highly mobile people in the first place.

The understanding of Paleoindian lithic raw material use has changed as well, with archeologists recognizing that as many Paleoindian sites are dominated by local lithic raw materials as those sites that contain high percentages of exotics (Bamforth 2002:69-71; Frison 2007; Gingerich 2012; Irwin-Williams et al. 1973; Surovell and Waguespack 2007). 48GO305, more than any other site, introduced archeologists to this fact in the 1960s, and its richness and the extent of reoccupation still make it unique even among sites dominated by local tool stone. The percentage of exotic lithic raw material in a site assemblage appears, in part, to be a function of the local or regional raw material landscape (Bamforth 2002). For instance, in areas with abundant local raw materials, such as the Hartville Uplift in Wyoming, sites often contain high percentages of local materials, but in areas lacking lithic raw material exposures, such as the central or eastern Great Plains, sites are dominated by exotics (Bamforth 2002:69-71). Hence, 48GO305 is one of those sites that has enriched

archeological understanding of hunter-gatherer technological organization by providing a different perspective on raw material use.

VII. Transforming the Environment—Paleoindians and Climate Change

The dominant paradigm in Paleoindian archeology today stresses the interrelationships of subsistence, mobility, and the organization of technology with local, regional, and global environmental change. It is no longer acceptable to study any hunter-gatherer archeological site in the absence of geoarcheological and paleoenvironmental studies. Paleoindians and later populations on the Great Plains were integrally tied to their environments, and when the environment changed they adapted. This necessitates a multi-disciplinary approach to studying these first Americans that incorporates geologists, palynologists, soil scientists, and researchers from many other fields. That approach has been applied at 48GO305 over the past two decades with productive results (Larson et al. 2009).

Native Americans who made their living from wild plants and animals were directly affected by any changes in the food chain. Drought is an illustrative example: two or three dry years in sequence will reduce plant production, which in turn reduces small animal populations and eventually, if dry conditions persist, large animal populations. Plant and small animal populations may recover quickly, with large animals following somewhat more slowly (Kornfeld et al. 2010:207), but human groups are forced to considerably alter their subsistence practices during the intervening lean years. Although undoubtedly important, variations on this small scale are difficult to discern in the archeological record and research has typically focused on correlating century and millennial scale climate change with human behavior.

The Paleoindian period in North America presented probably the most drastic environmental changes seen throughout the history of human habitation of the continent (Haynes 2008). Although the overall trend of the Pleistocene/ Holocene transition was toward warmer and dryer conditions, it would be a mistake to characterize the Paleoindian period as one of unidirectional warming and drying. As North America was de-glaciating in the late Pleistocene, conditions returned to near-glacial during Younger Dryas, and even during periods of steady glacial retreat, weather patterns were highly erratic and unpredictable (Haynes 2008).

The one-hundred-year period encompassing 10,900-10,800 BCE was one of tremendous natural and cultural change in North America – this brief period encapsulated the onset of Younger Dryas conditions, the end of the Clovis culture, and the *Rancholabrean*[29] megafaunal extinction (Haynes 2008). The disappearance of Pleistocene megafauna is a dramatic and highly visible event in the archeological record. Mammoth kills disappear and big game hunting shifts primarily to bison. The effects of massive climate change and shifts in the food chain on small game and plant procurement must have been profound as well, but these have been difficult to document archeologically because of the preservation bias in favor of large bones over small bones and plant remains. These drastic shifts in biotic communities would have necessitated rapid and dramatic adaptation by human groups, but the rate of environmental and cultural change was so fast that both appear instantaneous from an archeological perspective (Haynes 2008).

The concurrence in the archeological record of the disappearance of the Clovis complex, the extinction of Pleistocene megafauna, and the onset of Younger Dryas cooling are certainly not coincidental (c.f., Haynes 2008), but the relationships between these phenomena are complex and difficult to identify given the resolution of the terminal Pleistocene archeological record. It now seems likely, however, that North American megafaunal extinction had multiple causes including human predation and climate change (Haynes 1991b;

[29] The abrupt extinction of megafauna (mammoths, mastodons, horses, camels, dire wolves, American lions, short-faced bears, sloths, and tapirs) occurs at the Younger Dryas boundary. This is the *Rancholabrean Termination*. Only bison survived to the Younger Dryas, probably because they vastly outnumbered other species.

2008:6,524). The processes contributing to the end of the Clovis culture are little understood (Haynes 2008), and the role of Clovis hunters in the megafaunal extinction event is beyond the scope of this discussion (but see Grayson and Meltzer 2002, 2003; Grund et al. 2012; Haynes 1991b; Martin 1967, 2005: Surovell and Grund 2012; Surovell and Waguespack 2008).

Following the Younger Dryas, dramatic early Holocene climate change and the resulting cultural adaptations have been documented across North America (e.g., LaBelle 2005; Frison 1991). Culture change related to the Paleoindian/Archaic transition has often been attributed to higher temperatures and aridity during the early Holocene. The resulting reductions in plant and animal resources forced an expansion in diet-breadth to incorporate more abundant, but also more difficult to obtain, medium and small game and plant foods, which began in the Late Paleoindian period (Hill 2008; Hurst and Hofman 2010).

RESEARCH POTENTIAL OF 48GO305

The Hell Gap site fundamentally changed how archaeologists viewed Paleoindian lifeways. In addition, further analyses of excavated materials and further excavations at the site have the potential to answer nationally significant questions concerning Paleoindian subsistence, the organization of technology and the relationship between these two topics, and the changing environments of the terminal Pleistocene/early Holocene of North America, including:

1) How was the Hell Gap valley used by different Paleoindian groups throughout the terminal Pleistocene/early Holocene? How did the use of this single location change over time, and what does this indicate about broader patterns of Paleoindian land-use? (Theme: Peopling Places)

Once dominated by a few large mammal kills, the Paleoindian record for the Great Plains has shifted in the opposite direction in recent decades and now consists of a large number of sites reflecting a high diversity of activities (e.g., Hurst and Hofman 2010; LaBelle 2005). Archeologists have come to realize that early interpretations of Paleoindians as specialized big game hunters may have been a result of the high visibility of bone beds rather than the reality of Paleoindian subsistence (Kornfeld 2007; Speth et al. 2010). Bone beds and kill sites are valuable regarding big game procurement and butchering behavior, just as quarry sites provide information on lithic procurement and early-stage tool production. Both site types provide valuable data concerning single aspects of Paleoindian life but neither can be expected to provide the complete picture.

The same is true of residential camp sites like 48GO305, Lindenmeier Site National Historic Landmark, Hanson, and Barger Gulch, which are some of the most valuable Paleoindian sites because of the diversity of activities they represent. Campsites preserve a record of a broad set of activities relating to a more complete cross section of Paleoindian society than other site types. 48GO305 is that much more valuable than the other sites mentioned because it was re-occupied by a series of distinct cultural complexes over millennia, thereby allowing researchers to examine changes in residential activities through time.

The use of Hell Gap throughout the terminal Pleistocene/early Holocene was fairly consistent with a few notable exceptions. In general, the Hell Gap valley was occupied residentially by groups of Paleoindians at various times throughout the year (Rapson and Niven 2009). The site provides strong evidence for the decreased mobility of Paleoindians during certain seasons, and the use of overwintering locales in the foothills of the Rocky Mountains (Kornfeld 2009; Rapson and Niven 2009). The lithic, faunal and structural remains at 48GO305 provide evidence for types of activities that occurred at the site as well as the season of occupation and the mobility of Paleoindian residents (Irwin-Williams et al. 1973; Kornfeld 2009; Larson 2009b; Rapson and Niven 2009).

The Hell Gap Paleoindian occupations are complex and not easy to interpret (Haynes 2009; Larson 2009b; Sellet 1999), although it is evident that the majority of occupations were residential in nature. While almost all deposits are palimpsests, faunal, lithic, and geoarcheological analyses have given researchers a fair understanding of the numbers and types of occupations represented by the different Paleoindian complexes. The Alberta and Hell Gap components are anomalies because they represent short-term occupations that are in contrast with the longer-term occupations of earlier and later Paleoindian groups at the site (Knell 2009; Kornfeld 2009; Rapson and Niven 2009).

It is interesting, although by no means unprecedented, that use of the site changed so drastically during Hell Gap and Alberta times (about 9,200 and 8,400 BCE, respectively). Settlement systems and the use of specific locales may shift in time and space for any number of reasons (Binford 1981), and Hell Gap is no exception. Although the main focus of research at 48GO305 has been the nature of Paleoindian domestic life, the role of the site as a short-term campsite during Hell Gap and Alberta times is important as well. For instance, why was the Hell Gap valley appropriate for long-term occupation throughout so much of the terminal Pleistocene/early Holocene but not during the Hell Gap and Alberta periods? What was the nature of regional Paleoindian settlement on the western Great Plains during Hell Gap and Alberta times and was the pattern significantly different from earlier or later periods? Answering these questions necessitates a regional perspective that incorporates archeological and paleoclimatological data from across the western Great Plains.

The Frederick occupation at Locality I stands out not only as one the most substantial occupations at 48GO305 (along with Agate Basin at Localities I and II), but as the most substantial Frederick occupation in North America (Byrnes 2009; Irwin-Williams et al. 1973). As the type site for the Frederick complex and one of the sites that helped define a Late Paleoindian shift in land use patterns, Hell Gap is very important to the current understanding of this period. Across the Great Plains and Rockies, the Late Paleoindian period is characterized by broadening diet breadth and decreased mobility, coming together in a more intensive use of small home ranges by groups of foragers (LaBelle 2005; Larson 2012).

Relevant aspects include land use patterning and mobility. Late Paleoindian complexes show striking differences in land use patterning compared to Early and Middle Paleoindian groups (Eren 2012; Hurst and Hofman 2010; LaBelle 2005; Larson 2012). Middle Paleoindian Cody sites occur in intermontane basins, foothills, mountains, and the open plains. In contrast, many Late Paleoindian complexes are typically known from somewhat restricted environmental contexts (Knell and Hill 2012; Larson 2012). Frederick and James Allen groups appear to have specialized in the grasslands of the west-central Great Plains while Alder, Pryor Stemmed, Lovell Constricted, and certain other Late Paleoindian complexes focused their subsistence on the Rocky Mountains and their foothills (Frison 1991, 1992; Larson 2012:216). The Locality I Frederick occupation is completely consistent with an intensive, low-mobility use of the area surrounding 48GO305 (Byrnes 2009).

The use of 48GO305 as a residential campsite for approximately 4,500 years in the terminal Pleistocene/early Holocene is significant because it allows archeologists to study how the nature of domestic life changed over time. One ultimate goal of Paleoindian archeology is to create holistic models of regional and continent-wide land-use practices. This requires the excavation and analysis of sites representing the full spectrum of Paleoindian activities. 48GO305 is one node in a regional settlement system; however, like a few other reoccupied residential sites, the diversity of activities represented at this location makes it extremely valuable for understanding Paleoindian life and the use of place by these early Americans.

2) What is the nature of Paleoindian subsistence economy and how did it change through time? (Theme: Developing the American Economy)

On the Great Plains, the Paleoindian/Archaic division is identified by a shift from the use of lanceolate and stemmed projectile points to side and corner-notched points (Frison 1991; Husted 1969). In the past, archeologists have argued that the Paleoindian/Archaic transition was an abrupt shift from a narrow big game-focused (i.e., mammoth and bison) economy to a broad-based economy that incorporated small game and plant foods. The traditional view held that this was a result of the dry, harsh conditions of the Altithermal climatic episode in western North America (Antevs 1948, 1955), which drastically reduced big game populations on the Great Plains and elsewhere (Frison 1978; Husted 1969). Archeological and paleoenvironmental research in recent decades indicates that the complexity of both the Paleoindian and Archaic periods, as well as the interface between the two, has been drastically oversimplified (LaBelle 2005; Larson 2012; Smith 2010).

Although the idea of a universal hot and dry early Holocene Altithermal period across the American West is convenient, it is no longer tenable given the quality and detail available from more recent reconstructions of paleoenvironments (Benedict 1973; Minckley et al. 2002, 2012; Shuman 2012). The same could be said of the concept of a one-dimensional Paleoindian subsistence strategy that focused exclusively on big game such as mammoth and bison. Considerable variation existed within and between known Paleoindian cultural complexes as well as across time and space (LaBelle 2005).

The resources utilized by hunter-gatherers on the Great Plains can be divided into three categories: lithic, floral, and faunal. Lithic resources are the stone materials used by Great Plains groups to craft projectile points and other tools. On the Great Plains these are typically chert and quartzite, although others such as obsidian and basalt were available on the western margins of the region. Floral resources include edible plants and plants of other economic utility. The former are relatively self-explanatory; the latter include materials such as wood for fires, structures and tools or grasses and sedges for clothing or cordage. Faunal resources also include edible animal parts and parts of other economic utility. The meat, fat and organs of large and small animals are sources of calories, but hides, sinew, bones and antlers are also utilized for a variety of purposes. At 48GO305 lithic and bone artifacts are well preserved but other faunal remains, plant foods, and the organic aspects of technology are not. However, the use of organic materials as hafts for scrapers and bifaces is indicated by microscopic use-wear on some stone tools (Bamforth and Becker 2009).

The Paleoindian record at 48GO305 shows a mixture of change and continuity in economic systems. Certain resources such as bison appear to have been utilized consistently throughout the entire Paleoindian period although their proportions relative to other foods shifted (Rapson and Niven 2009). The Late Paleoindian Frederick occupation is notable because of a rise in the proportion of exploited medium-sized animals such as deer and pronghorn (Byrnes 2009; Rapson and Niven 2009). These trends are consistent with regional patterns in Paleoindian diets (e.g., Larson 2012). Early and Middle Paleoindians (i.e., Clovis, Goshen, Folsom/Midland, Agate Basin, Hell Gap, Alberta, and Eden/Scottsbluff) heavily (but not exclusively) targeted bison, whereas later groups exploited medium and small game as well as bison (Frison 1998).

The economic systems of Late Paleoindian groups represent a fundamental and unprecedented departure for foragers on the Great Plains (LaBelle 2005). Although we now understand that Paleoindian economies were not as specialized as we once thought, they did focus more on bison and other large game. The shift toward localized, broad-based economies of the Late Paleoindian period marks the first appearance of what has typically been referred to as the Archaic Period economic system (Larson 2012). This period has largely been overshadowed by an emphasis on the earlier Paleoindian groups, which left behind spectacular, high-visibility kill sites. Future work at 48GO305 is crucial to answering nationally significant research questions such as:

What was the relationship between climate change and changes in economic systems during the early Holocene? What is the relationship between the economic systems of the Paleoindian and Early Archaic periods? And, what is the nature and timing of the transition between these periods?

The Hell Gap stone tool and debitage assemblages are dominated by local Hartville Uplift chert, with the relative contribution of quartzite and other raw materials fluctuating over time. The proportion of local Spanish Diggings quartzite, although never high, increased steadily over time, peaking (at 9 percent) during the Frederick occupation at Locality I (Larson 2009b). The Frederick lithic assemblage is also unique at 48GO305 in that it contained less than one percent non-local materials, the lowest among all Paleoindian occupations (Byrnes 2009). This supports the interpretation that Frederick and other Late Paleoindian complexes were locally oriented in their subsistence and land use (Knell and Hill 2012; Larson 2012).

The mean size of flakes from Locality I at 48GO305 decreased from largest during Folsom and Goshen occupations to smallest during the Hell Gap and Alberta occupations (Larson 2009b). Mean flake size is roughly correlated with stage of tool production where later stages tend to produce smaller flakes. This is consistent with Rapson and Niven's (2009) assessment that the Hell Gap and Alberta components represent short-term camps. If hunting was the major focus of these occupations, group members would have focused on procuring game and re-sharpening hunting tools rather than procuring lithic raw materials and crafting new tools. Flake size also relates to the type of tools being manufactured. The large flakes from Goshen and Folsom levels may be indicative of the earlier stages of production but they also indicate the massive bifaces both these groups were crafting for export away from 48GO305 (Larson 2009b).

The Alberta occupation at Locality I is remarkable because it contains the highest proportion of exotic tool stone of any Paleoindian occupation at 48GO305: 60 percent Green River chert from southwestern Wyoming, northwestern Colorado, or northeastern Utah (Knell 2009). It is unclear whether this tool stone was obtained through direct procurement or trade but its presence is intriguing, particularly given the low proportions of non-local lithic materials in other Paleoindian levels. Furthermore, the presence of Green River chert suggests some type of connection to southwestern Wyoming and the Great Basin/Colorado Plateau periphery.

The lithic and faunal assemblages from 48GO305 have already contributed considerable data to studies of variability in Paleoindian economic systems (Irwin 1968; Irwin-Williams et al. 1973; Irwin and Wormington 1970; Larson et al. 2009; Sellet 1999, 2001). Both further analyses of excavated materials and future excavations should help answer some of the many remaining questions concerning change and continuity in Paleoindian economic systems.

3) What are the temporal and technological relationships between fluted and unfluted Paleoindian lanceolate projectile points on the Great Plains? What are the implications for migration and territory among Early Paleoindian groups? (Theme: Expanding Science and Technology)

Many questions remain about the relationships between fluted and unfluted Early Paleoindian projectile points on the Great Plains. The cultural complexes typically involved in these debates are Clovis, Goshen, Folsom, Midland, and Plainview. Clovis, Folsom and Plainview are all well-established and well-studied complexes; Goshen is currently becoming that way; and Midland is poorly established and under-studied, with much debate remaining as to its legitimacy (Frison et al. 1996:207; Hofman 1992). The relationships between these cultural complexes have significant implications for the dynamics of Early Paleoindian groups on the Great Plains. Based on radiocarbon dates there appears to be a good deal of temporal overlap between these early groups (see Frison et al. 1996; Sellet 1999), but whether this is indicative of the migration of different groups (with different point styles) from outside the area, or the development of new point styles from within is currently unknown.

Furthermore, the temporal overlap between these complexes is not supported by 48GO305 and other stratified sites, which consistently reaffirm the basic Paleoindian chronology on the Great Plains outlined by Irwin-Williams et al. (1973; Frison 1984; Sellet et al. 2009).

The Goshen cultural complex, first identified at Hell Gap, has been difficult to place among the better-studied Early Paleoindian complexes. Part of the problem is a commonly held view, supported by stratigraphic evidence, that archeological cultures succeed each other with no overlap in time (c.f., Frison et al. 1996:209). Therefore, Folsom is supposed to follow Clovis but not to overlap with it. Goshen on the northwestern Great Plains poses a problem to this line of thinking because it appears between Clovis and Folsom and it may overlap with both of them, and possibly even with the later Midland and Agate Basin complexes (Sellet 1999; but see Larson 2009b). Frison et al. (1996:209) and Larson (2012) argue that this notion of discrete, non-overlapping cultural complexes is likely not viable because a realistic appraisal of the radiocarbon record for the northwestern Great Plains shows several overlapping Paleoindian complexes.

The close stratigraphic grouping of Clovis, Goshen and Folsom as demonstrated by sites like Hell Gap, Agate Basin, and Carter/Kerr-McGee (Frison 1984; Frison and Stanford 1982; Larson et al. 2009) further confuses the relationships between these three cultural complexes. Based on his analysis of the 48GO305 site stratigraphy and materials, Sellet (1999) also notes overlap between the Midland and Agate Basin complexes. However, it should be noted that although Sellet's (1999:119) model is not contradicted by radiocarbon dates, it has not been borne out at other stratified sites with the possible exception of Blackwater Draw (Haynes and Agogino 1966:816-817).

A Clovis-Folsom lineage makes sense to most archeologists because these point styles appear to succeed each other temporally, and they are the only North American point types to exhibit fluting. Folsom takes Clovis fluting to its natural (if extreme) conclusion (Bradley and Frison 1996) and thus serves as a logical descendant of Clovis. Goshen complicates the matter because it appears between Clovis and Folsom and yet is unfluted, making a Clovis-Goshen-Folsom lineage unlikely (Bradley and Frison 1996). This quandary has lead Bradley and Frison (1996) to suggest the possibility of two diverging technological (and presumably cultural) lineages: a Clovis-Goshen lineage, which led to an unfluted lanceolate projectile point (Goshen), and a Clovis-Folsom lineage, which embraced fluting and took it far beyond anything seen in Clovis.

Goshen is also confusing due to its extremely local nature. The complex is currently known only from sites in eastern Wyoming, western South Dakota, north-central Colorado, and Montana (Frison 1996; Irwin 1968; Kornfeld et al. 1999; Sellet et al. 2009); this is an even more constrained range than many other complexes known only from the northwestern Great Plains. It is difficult to conceive of such a localized transitional form between Clovis and Folsom given the massive geographic range of both of those Paleoindian complexes. This geographic pattern is still consistent with Bradley and Frison's (1996) argument for Goshen and Folsom as two divergent descendants of Clovis—Goshen, a variant on the northwestern Great Plains only, and Folsom across the Great Plains, Rockies, and Southwest.

More recent analysis of Goshen materials from 48GO305 and Mill Iron (Bradley 2010) has identified some evidence for a connection between Goshen and Folsom but not necessarily between Clovis and Goshen (and therefore not between Clovis and Folsom either). However, these conclusions are restricted to the northwestern Great Plains and it is unclear the degree to which they can be extrapolated to Clovis and Folsom on a continent-wide scale (Bradley 2010). Bradley (2010:473) suggests that "Folsom derived from Goshen rather than Clovis, at least in the northwestern Great Plains and Rocky Mountains. The antecedent of Goshen could well be the elusive pre-Clovis indented-base point from the Great Lakes area, or even farther east." This is consistent with Sellet's (1999) model, which argues for continuity between Goshen, Folsom, Midland, and Plainview points,

perhaps as all products of the same cultural complex. As one of the few sites containing Goshen and Folsom components, and certainly the best-studied of such sites, 48GO305 has the potential to play a central role in the future exploration of the relationship between Clovis, Goshen, and Folsom.

Plainview is another early unfluted lanceolate point variant known from the southern Great Plains. Plainview points are essentially indistinguishable from Goshen points; the difference between the two appears to be chronological and geographic rather than technological (Holliday et al. 1999). Just as Goshen predates or overlaps with the older Folsom dates, Plainview postdates or overlaps with the youngest Folsom dates (Holliday et al. 1999). Both Goshen and Plainview groups appear to be adapted to western Great Plains environments, with bison the predominant fauna found in association with the two complexes.

There is nearly, but not quite, overlap between some of the youngest Goshen dates from the Mill Iron site (Frison et al. 1996) and the oldest dates on Plainview from the Plainview site in Texas (Holliday et al. 1999). This chronological relationship may hint at some continuity between Goshen groups in the north and Plainview groups in the south (see Sellet 1999:251), but much more analysis and excavation are needed. 48GO305 is an important piece in exploring this relationship, potentially through the chronology of southern Goshen sites in Colorado and Wyoming relative to northern Plainview sites in Colorado and the southern Great Plains.

It remains unclear whether Midland represents a distinct projectile point type from Folsom (Agogino 1969; Bradley 2009, 2010; Frison et al. 1996; Hofman 1992; Judge 1970; Sellet 1999). The technological difference between Midland points and unfluted Folsom points has only recently been articulated by Bradley (2010:475), and it is unclear what effect this will have on the treatment of previously excavated Folsom and Midland assemblages. Although Midland points are almost always found in stratified deposits with Folsom points, definitive evidence of contemporary occupation is lacking (Bradley 2010:474). Due to its vague status, Midland has rarely been included in discussion of the relationships between Early Paleoindian complexes. 48GO305 is an important site in the Midland/Folsom debate because it contains large samples of artifacts identified with both complexes. It was materials from Hell Gap on which Bradley (2010:474-475) based his justification for Midland as a distinct complex, and Irwin-Williams et al. (1973:47) noted a clear separation of Midland and Folsom at Localities I and II during the 1960s excavations.

4) How did Native Americans on the Great Plains cope with and adapt to rapidly changing climates during the late Pleistocene and early Holocene, and what impacts did these humans have on their environment? (Theme: Transforming the Environment)

48GO305 has thus far produced evidence for all post-Clovis Paleoindian complexes known from the Great Plains in stratified contexts. The combination of preserved faunal and lithic remains with extensive geoarcheological analysis provides a record of change over time in Paleoindian subsistence economies as well as environmental conditions on the northwestern Great Plains during the terminal Pleistocene/early Holocene (Larson et al. 2009). In concert with other stratified Paleoindian sites, 48GO305 has been important in defining Paleoindian adaptation to changing climates (e.g. Haynes 2008; Hill 2008). Current and future work at the site is expected to continue this trend. Thus far, 48GO305 has not produced strong evidence for the over-exploitation of local resources or other impacts by Paleoindians on their environment. This may be because regional human population densities were relatively low throughout the occupation of the site, or perhaps these impacts are present but have yet to be identified.

Hill (2008) includes 48GO305in an analysis of trends in Paleoindian diet throughout the terminal Pleistocene/early Holocene. He outlines a hypothesis linking climate change, animal populations, and human diet with increasing variety in Paleoindian diet – from very narrow Clovis diets to relatively broad Late

Paleoindian diets. After the megafaunal extinctions between approximately 10,700-10,900 BCE (Haynes 2008), Hill (2008:38) suggests bison populations may have grown rapidly because so many other large herbivores and carnivores had been removed from the environment. Bison populations remained very high for a short while before the beginning of the Holocene brought shifts in moisture, temperature and precipitation patterns that decreased the carrying capacity of many areas. It is at this point (the early Holocene) that Hill (2008) documents an expansion in diet variety among most Paleoindian groups.

Bison were always the major fauna exploited at 48GO305, but beginning during Agate Basin times there is evidence other species were also utilized (Rapson and Niven 2009). The Agate Basin deposits also provide the earliest evidence for more intensive processing of bison to obtain marrow and fat (Rapson and Niven 2009:122). Phytolith evidence (Fredlund 2009) indicates the local climate during this period was quite wet and it could be expected that herbivore populations would have been relatively high. The presence of deer and pronghorn and more intensive processing of bison are likely the result of longer-term occupation of Hell Gap. Longer periods of time spent in one place were more conducive to intensive animal processing, and more time spent in the area increased the odds of favorable encounters with a wider variety of prey animals.

Hell Gap and Alberta occupations mark a shift to the use of the valley as a short-term residential or logistical camp (Knell 2009; Kornfeld 2009; Larson 2009b; Rapson and Niven 2009). Climate continued to be generally wet with high production of cool season grasses (Fredlund 2009:95), but Haynes (2009) notes evidence for intense rain storms and periodic floods. These conditions may have made long-term occupation of the Hell Gap valley bottom by large groups unpleasant or this could simply be a coincidence, because later Eden/Scottsbluff occupations were apparently residential in nature and occurred during a period of similar storms and flooding (Haynes 2009; Larson 2009b; Rapson and Niven 2009).

Frederick and Lusk occupations occurred during the warmest and driest conditions documented for the entire Paleoindian period at 48GO305 (Fredlund 2009; Reider 2009). The extent and diversity of the Frederick lithic assemblage indicates one or more long-term camps and may represent a winter residential camp (Kornfeld 2009). Bison remains were processed for their marrow and fat during the Frederick occupations, and medium-sized ungulates (deer and pronghorn) were hunted regularly (Rapson and Niven 2009). The Lusk occupation occurred during similar environmental conditions but further work is necessary before its nature and extent is understood.

CONCLUSION

48GO305 is a “gem” in the history of American archeology. No other excavated Paleoindian site in North America contains a record that includes all of the cultural complexes known on the Great Plains spanning a time between 11,000 and 6,500 BCE (only the Clovis complex has not yet been found *in situ*). 48GO305 is unique among Paleoindian sites on the Great Plains that contain substantial residential occupations because it contains evidence of repeated occupations by nine Paleoindian cultural complexes in well-stratified deposits. In addition, extensive research potential still exists at 48GO305 to answer questions concerning Paleoindian land use, subsistence, organization of technology, and the changing environment during the terminal Pleistocene/early Holocene of North America. 48GO305 site still contains more unexcavated than excavated Paleoindian deposits as indicated by testing and current excavation (Larson 2009a:304); materials recovered in the 1960s still await further analysis; and recent excavations need to be tied into the earlier work done at the site. As stated by Larson (2009a:309):

> Hell Gap is a site without parallel simply in its continuous record of Paleoindian deposits…Although Harvard’s Peabody Museum and the University of Wyoming excavated large areas of the Valley in the

1960s, much still remains unexcavated….Hell Gap has provided and continues to provide information invaluable to our understanding of Paleoindian lifeways. The picture that emerges is of a well-watered valley close to stone sources and game which was occupied many times throughout the 3,000-plus years of the Paleoindian period and the subsequent 8,000 years. We have begun the task of interpreting the large amount of archeological remains excavated in the 1960s. We have only scratched the surface of the potential for future excavation, analysis, and interpretation of Hell Gap's secrets.

9. MAJOR BIBLIOGRAPHICAL REFERENCES

Agogino, George A.
1961 A New Point Type from Hell Gap Valley, Eastern Wyoming. *American Antiquity* 26(4):558-560.

1963 The Paleoindian Relative Age and Cultural Sequence. *Great Plains Journal* 3(1):17-24.

1969 The Midland Complex: Is It Valid? *American Anthropologist* 71:117-118.

2009 The First Two Years of Investigation, 1959-1961: The Discovery and How the Later Excavation Leadership Developed. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies* edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 316-320. The University of Utah Press, Salt Lake City, UT.

Ahler, Stanley A., Frederic Sellet, Stance Hurst, and Fern E. Swenson
2006 *Final Report on Pre-Field Planning and Fieldwork Under the Save America's Treasures Grant Program for Area A at the Beacon Island Site (32MN234), North Dakota.* Report submitted to the Historic Preservation Division of the State Historic Society of North Dakota.

Amick, Daniel S.
2007 Way out West: Cody Complex Occupations from the Northwestern Great Basin. Paper presented at the 65th Plains Anthropological Conference, Rapid City, South Dakota.

Antevs, Ernst
1948 Climatic Changes and Pre-White Man. *Bulletin of the University Utah* 38:168-191.

1955 Geologic Climate Dating in the West. *American Antiquity* 20(4):317-335.

Bamforth, Douglas B.
1985 The Technological Organization of Paleo-Indian Small Group Bison Hunting on the Llano Estacado. *Plains Anthropologist* 30:243-258.

2002 High Tech Foragers? Folsom and Later Paleoindian Groups on the Great Plains. *Journal of World Prehistory* 16(1):55-98.

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

Bamforth, Douglas B. and Mark Becker
2009 Microwear, Tools, and Handles: A Pilot Functional Investigation of the Chipped Stone Assemblage. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 285-299. University of Utah Press, Salt Lake City, UT.

Barbour, E.H. and C. Bertrand Schultz
1932 *The Scottsbluff Bison Quarry and Its Artifacts*. Bulletin No. 34. Nebraska State Museum, Lincoln, NE.

Bement, Leland
1999 *Bison Hunting at the Cooper Site: Where Lightning Bolts Drew Thundering Herds*. University of Oklahoma Press, Norman, OK.

Benedict, James B.
1973 Chronology of Cirque Glaciation, Colorado Front Range. *Quaternary Research* 3:584-599.

1992 Along the Great Divide: Paleoindian Archeology of the High Colorado Front Range. In *Ice Age Hunters of the Rockies*, edited by Dennis J. Stanford and Jane Stevenson Day, pp. 343-359. Denver Museum of Natural History and University Press of Colorado, Denver, CO.

Binford, Lewis R.
1981 Long-term Land Use Patterning: Some Implications for Archeology. Paper presented at the 46th annual meeting of the Society for American Archeology, San Diego, CA.

Bouldurian, Anthony
1991 Folsom Mobility and Organization of Technology: A View from Blackwater Draw, New Mexico. *Plains Anthropologist* 36:281-296.

Bouldurian, Anthony T. and John L. Cotter
1999 *Clovis Revisited*: *New Perspectives on Paleoindian Adaptations from Blackwater Draw, New Mexico*. The University Museum, University of Pennsylvania, Philadelphia, PA.

Bousman, C. Britt
1998 Late Paleoindian Archeology. In *Wilson-Leonard: An 11,000-Year Archeological Record of Hunter-Gatherers in Central Texas, Vol. 1: Introduction, Background, and Syntheses*, edited by Michael B. Collins, pp. 161-210. Studies in Archeology 31, Texas Archeological Research Laboratory, the University of Texas at Austin, Austin, TX.

Bradley, Bruce A.
2009 Bifacial Technology and Paleoindian Projectile Points. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 259-273. University of Utah Press, Salt Lake City, UT.

2010 Paleoindian Flaked Stone Technology on the Plains and in the Rockies. In *Prehistoric Hunter-Gatherers of the High Plains and Rockies*, edited by Marcel Kornfeld, George C. Frison and Mary Lou Larson, pp. 463-498. Left Coast Press, Walnut Creek, CA.

Bradley, Bruce B. and George C. Frison
1996 Flaked Stone and Worked Bone Artifacts from the Mill Iron Site. In *The Mill Iron Site*, edited by George C. Frison, pp. 43-70. University of New Mexico Press, Albuquerque, NM.

Bradley, Bruce B. and Dennis J. Stanford
2012 *Across Atlantic Ice: the Origin of America's Clovis Culture*. University of California Press, Berkeley, CA.

Bryson, Reid A. and Robert U. Bryson
2009 Site Specific High-Resolution Climate Models of Paleoindian Sites in the Plains. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 103-108. University of Utah Press, Salt Lake City, UT.

Byers, David A. and Andrew Ugan
2005 Should We Expect to See Large Game Specialization in the Late Pleistocene? An Optimal Foraging Examination of Early Paleoindian Prey Choice. *Journal of Archeological Science* 32:1624-1640.

Byrnes, Allison
2009 Frederick Component at Locality I. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 216-228. University of Utah Press, Salt Lake City, UT.

Cannon, Michael D. and David J. Meltzer
2004 Early Paleoindian Foraging: Examining the Faunal Evidence for Large Mammal Specialization and Regional Variability in Prey Choice. *Quaternary Science Reviews* 23:1955-1987.

2008 Explaining Variability in Early Paleoindian Foraging. *Quaternary International* 191:5-17.

Carr, Kurt W., J.M. Adovasio, and Frank J. Vento
2013 A Report on the 2008 Field Investigations at the Shoop Site (36DA20). In *The Eastern Fluted Point Tradition*, edited by Joseph A.M. Gingerich, pp. 75-103. University of Utah Press, Salt Lake City.

Carr, Kurt W., R. Michael Stewart, Dennis Stanford, and Michael Frank.
2013 The Flint Run Complex: A Quarry-Related Paleoindian Complex in the Great Valley of Northern Virginia. In *The Eastern Fluted Point Tradition*, edited by Joseph A.M. Gingerich, pp. 156-217. University of Utah Press, Salt Lake City.

Collins, Michael B.
1999 *Clovis Blade Technology*. University of Texas Press, Austin TX.

Cotter, John L.
1937 The Occurrence of Flints and Extinct Animals in Pluvial Deposits near Clovis, New Mexico, Part IV: Report on the Excavations at the Gravel Pit in 1936. *Proceedings of the Academy of Natural Sciences of Philadelphia* 89: 1-16.

Danzeglocke, U., O. Jöris and B.Weninger
2007 *CalPal-2007 Online*. http://www.calpal-online.de/. Accessed 11/21/2012.

Davis, Leslie B. and Sally T. Greiser
1992 Indian Creek Paleoindians: Early Occupation of the Elkhorn Mountains' Southeast Flank, West Central Montana. In *Ice Age Hunters of the Rockies* edited by Dennis J. Stanford and Jane S. Day, pp. 225 – 284. Denver Museum of Natural History and University of Colorado Press, Denver, CO.

Davis, Leslie B., John P. Albanese, Linda S. Cummings and John W. Fisher Jr.
1991 Reappraisal of the MacHaffie Site Paleoindian Occupational Sequence. *Current Research in the Pleistocene* 8:17-20.

Davis, Leslie B., Christopher L. Hill, and John W. Fisher Jr.
2002. Radiocarbon dates for Paleoindian components (Folsom, Scottsbluff) at the MacHaffie site, west-central Montana Rockies. *Current Research in the Pleistocene* 19:18-21.

Emery, Sloan and Dennis J. Stanford
1982 Preliminary Report on Archeological Investigations of the Cattle Guard Site, Alamosa County, Colorado. *Southwestern Lore* 48:10-19.

Epstein, Ethan, Sara Ewing, Matthew Kesterke, Victoria Rose and Michael Stites
2006 *Preliminary Results of 2005 Hell Gap Investigations*. George C. Frison Institute of Archeology and Anthropology Technical Report Series No. 39, Department of Anthropology University of Wyoming, Laramie, WY.

Eren, Metin I. (editor)
2012 *Hunter-Gatherer Behavior: Human Response during the Younger Dryas*. Left Coast Press, Walnut Creek, CA.

Fagan, Brian
2008 *The Great Warming: Climate Change and the Rise and Fall of Civilizations*. Bloomsbury Press, New York, NY.

Fenneman, N.M.
1931 *Physiography of the Western United States*. McGraw-Hill, New York, NY.

Figgins, Jesse D.
1927 The Antiquity of Man in America. *Natural History* 27(3):229-239.

Forbis, Richard G. and J.D. Sperry
1952 An Early Man Site in Montana. *American Antiquity* 18:127-133.

Fredlund, Glen
2009 Phytolith Evidence for Vegetation and Climate Change during the Pleistocene-Holocene Transition. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 90-98. University of Utah Press, Salt Lake City, UT.

Frison, George C.
1973 Early Period Marginal Cultural Groups in Wyoming. *Plains Anthropologist* 18(62):300-312.

1974 *The Casper Site: A Hell Gap Bison Kill on the High Plains*. Academic Press, New York, NY. (Editor)

1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York, NY.

1983 The Lookingbill Site. *Tebiwa* 20:1-16.

1984 The Carter/Kerr-McGee Paleoindian Site: Cultural Resource Management and Archeological Research. *American Antiquity* 49(2):288-314.

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

1992 The Foothills-Mountains and the Open Plains: The Dichotomy of 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. Denver Museum of Natural History and University Press of Colorado, Denver, CO.

1996 *The Mill Iron Site*. University of New Mexico Press, Albuquerque, NM. (Editor).

1998 Paleoindian Large Mammal Hunters on the Plains of North America. *Proceedings of the National Academy of Sciences* 95:14576-14583.

2007 Paleoindian Occupations. In *Medicine Lodge Creek: Holocene Archeology of the Eastern Bighorn Basin, Vol. 1*, edited by George C. Frison and Danny N. Walker, pp. 33-67. Clovis Press, Avondale, CO.

2009 Preface. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. xvii-xx. The University of Utah Press, Salt Lake City, UT.

Frison, George C. and Bruce A. Bradley
1980 *Folsom Tools and Technology of the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque, NM.

Frison, George C. and Carolyn Craig
1982 Bone, Antler, and Ivory Artifacts and Manufacture Technology. In *Agate Basin Site: a Record of the Paleoindian Occupation of the Northwestern High Plains*, edited by George C. Frison and Dennis J. Stanford. Academic Press, New York, NY.

Frison, George C., C. Vance Haynes Jr. and Mary Lou Larson
1996 Discussion and Conclusions. In *The Mill Iron Site*, edited by George C. Frison, pp. 205-216. University of New Mexico Press, Albuquerque, NM.

Frison, George C. and Dennis J. Stanford (Editors)
1982 *The Agate Basin Site: A Record of the Paleoindian Occupation of the Northwestern High Plains*. Academic Press, New York, NY.

Frison, George C. and Lawrence C. Todd Jr.(Editors)
1986 *The Colby Mammoth Site: Taphonomy and Archeology of a Clovis Kill in Northern Wyoming*. University of New Mexico Press, Albuquerque, NM.

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

Frison, George C. and Danny N. Walker (Editors)
2007 *Medicine Lodge Creek: Holocene Archeology of the Eastern Bighorn Basin, Volume 1*. Clovis Press, Avondale, CO.

Gardner, William M. (Editor)
1974 *The Flint Run Paleoindian Complex: A Preliminary Report of the 1971-1973 Seasons*. Archeology Laboratory, Department of Anthropology, Catholic University of America, Washington, D.C.

Galvan, Mary Elizabeth
2007 Vegetative Ecology. In *Medicine Lodge Creek: Holocene Archeology of the Eastern Bighorn Basin, Volume 1*, edited by George C. Frison and Danny N. Walker, pp. 155-175. Clovis Press, Avondale, CO.

Gingerich, Joseph A.M.
2012 Late Pleistocene Human Adaptations in Eastern North America: Evidence of Universal Adaptations. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wyoming, Laramie, WY.

2013 Revisiting Shawnee-Minisink. In The Eastern Fluted Point Tradition, edited by Joseph A.M. Gingerich, pp. 218-256. University of Utah Press, Salt Lake City.

Goodyear, Albert C. and T. Charles
1984 *An Archeological Survey of Chert Quarries in Western Allendale County, South Carolina*. University of South Carolina, Institute of Archeology and Anthropology, Research Manuscript Series 195, Columbia, SC.

Goodyear, Albert C. and Ken Steffy
2003 Evidence of a Clovis Occupation at the Topper Site, 38AL23, Allendale County, South Carolina. *Current Research in the Pleistocene* 20:23-25.

Grayson, Donald K. and David J. Meltzer
2002 Clovis Hunting and Large Mammal Extinction: A Critical Review of the Evidence. *Journal of World Prehistory* 16:313-359.

2003 A Requiem for North American Overkill. *Journal of Archeological Science* 30:585-593.

Greene, Ann M.
1967 The Betty Greene Site: A Late Paleo-Indian Site in Eastern Wyoming. Unpublished Master's Thesis, Department of Anthropology, University of Pennsylvania, Philadelphia, PA.

Grund, Brigid S., Todd A. Surovell, and S. Kathleen Lyons
2012 Range Sizes and Shifts of North American Pleistocene Mammals are not Consistent with a Climatic Explanation for Extinction. *World Archeology* 44(1):43-55.

Hannus, L. Adrien
1990 Mammoth Hunting in the New World. In *Hunters of the Recent Past*, edited by L.B. Davis and B.O.K. Reeves, pp. 47-67. Unwin-Hyman, London, UK.

Haynes, C. Vance Jr.
1964 Fluted Projectile Points: Their Age and Dispersion. *Science* 145(3639):1408-1413.

Haynes, C. Vance Jr.
1991a Clovis-Folsom-Midland-Plainview Geochronology. Paper presented at the 56th Annual Meeting of the Society for American Archeology, New Orleans, LA.

1991b Geoarcheological and Paleohydrological Evidence for a Clovis Age Drought in North America and Its Bearing on Extinction. *Quaternary Research* 35(3):438-450.

2008 Younger Dryas "Black Mats" and the Rancholabrean Termination in North America. *Proceedings of the National Academy of Sciences* 105(18):6520-6525.

2009 Geochronology. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies* edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 39-71. The University of Utah Press, Salt Lake City, UT.

Haynes, C. Vance Jr. and George A. Agogino
1966 Prehistoric Springs and Geochronology of the Clovis Site, New Mexico. *American Antiquity* 31(6):812-821.

Head, Brian R., Jeremy Meerkreebs, Renata Nizak, Jackie Burnett, Brigid Grund, Maris Krstovic, Pablo G. Messineo, Houston Martin, Nateal Graves, Olga Popova, Mary Lou Larson, and Marcel Kornfeld
2012 *Preliminary Results of 2007 and 2009 Hell Gap Investigations*. Manuscript on file, Department of Anthropology, University of Wyoming, Laramie, WY.

Hemmings, E. Thomas
1987 The Horner Site Debitage. In *The Horner Site*, edited by George C. Frison and Lawrence C. Todd, Jr., pp. 435-442. Academic Press, New York, NY.

Hester, James J.
1972 *Blackwater Locality No. 1: A Stratified Early Man Site in Eastern New Mexico*. Fort Burgwin Research Center, Publication No. 8, Ranchos de Taos, NM.

Hill, Matthew E.
2008 Variation in Paleoindian Fauna Use on the Great Plains and Rocky Mountains of North America. *Quaternary International* 191:34-52.

Hofman, Jack L.
1992 Recognition and Interpretation of Folsom Technological Variability on the Southern High Plains. In *Ice Age Hunters of the Rockies*, edited by Dennis J. Stanford and Jane S. Day, pp. 193-224. Denver Museum of Natural History and University Press of Colorado, Denver, CO.

Holder, Preston and Joyce Wike
1949 The Frontier Culture Complex: A Preliminary Report on a Hunter's Camp in Southwestern Nebraska. *American Antiquity* 14(4):260-265.

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(3):444-454.

Holliday, Vance T. and David J. Meltzer
1996 Geoarcheology of the Midland (Paleoindian) Site, Texas. *American Antiquity* 61(4):755-771.

Hurst, Stance C. and Jack L. Hofman (Editors)
2010 *Exploring Variability in Early Holocene Hunter-Gatherer Lifeways*. University of Kansas, Publications in Anthropology No. 25, Lawrence, KS.

Husted, Wilfred M.
1969 *Bighorn Canyon Archeology*. Smithsonian Institution River Basin Surveys, Publications in Salvage Archeology No. 12.

Ingbar, Eric and Mary Lou Larson
1996 Spatial Analysis of the Northwestern Block Excavation. In *The Mill Iron Site*, edited by George C. Frison, pp. 15-24. University of New Mexico Press, Albuquerque, NM.

Irwin, Henry T.
1968 The Itama. Unpublished PhD Dissertation, Department of Anthropology, Harvard University, Cambridge, MA.

Irwin, Henry T. and H.M. Wormington
1970 Paleoindian Tool Types in the Great Plains. *American Antiquity* 35(1):24-34.

Irwin-Williams, Cynthia, Henry T. Irwin, George A. Agogino and C. Vance Haynes Jr.
1973 Hell Gap: Paleoindian Occupation on the High Plains. *Plains Anthropologist* 18(59):40-53.

Jodry, M.A.
1999 Folsom Technological Organization and Socioeconomic Strategies. Unpublished PhD Dissertation, Department of Anthropology, American University, Washington D.C.

Johnson, Eileen (Editor)
1987 *Lubbock Lake: Late Quaternary Studies on the Southern High Plains*. Texas A&M Press, College Station, TX.

Judge, W. James
1970 Systems Analysis and the Folsom-Midland Question. *Southwestern Journal of Anthropology* 26(1):40-51.

Kelly, Robert L.
1988 The Three Sides of a Biface. *American Antiquity* 53(4):717-734.

Kelly, Robert L. and Lawrence C. Todd Jr.
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. *American Antiquity* 53(2):231-244.

Knell, Edward J.
2009 Cody Complex at Locality I. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies* edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 180-194. The University of Utah Press, Salt Lake City, UT.

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(1):40-70.

Knell, Edward J., Matthew G. Hill, and Andres D. Izeta
2009 The Locality IIIS/V Eden Complex Component. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies* edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 157-179. The University of Utah Press, Salt Lake City, UT.

Knight, Dennis H.
1994 *Mountains and Plains: The Ecology of Wyoming Landscapes*. Yale University Press, New Haven, CT.

Knudson, Ruthann
2009 The Early Expeditions: University of Wyoming, Harvard University, and the Peabody Museum. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies,* edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 14-35. The University of Utah Press, Salt Lake City, UT.

Knudson, Ruth Anne and Marcel Kornfeld
2007 A New Date for the James Allen Site, Laramie Basin, Wyoming. *Current Research in the Pleistocene* 24:112-114.

Kornfeld, Marcel
2007 Are Paleoindians of the Great Plains and the Rocky Mountains Subsistence Specialists? In *Foragers of the Terminal Pleistocene in North America*, edited by Renee B. Walker and Boyce N. Driskell, pp. 32-58. University of Nebraska Press, Lincoln, NE.

2009 Modified Chipped Stone and the Implications for Paleoindian Technology and Adaptation. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 243-258. University of Utah Press, Salt Lake City, UT.

2013 *The First Rocky Mountaineers: Coloradans before Colorado*. University of Utah Press, Salt Lake City, UT in Press.

Kornfeld, Marcel, George C. Frison and Mary Lou Larson (Editors)
2010 *Prehistoric Hunter-Gatherers of the High Plains and Rockies* 3rd edition. Left Coast Press, Walnut Grove. CA.

Kornfeld, Marcel, George C. Frison, Mary Lou Larson, James C. Miller, and Jan Saysette
1999 Paleoindian Bison Procurement and Paleoenvironments in the Middle Park of Colorado. *Geoarcheology* 14(7):655-674.

Kornfeld, Marcel and Mary Lou Larson
2008 Bonebeds and Other Myths: Paleoindian to Archaic Transition on North American Great Plains and Rocky Mountains. *Quaternary International* 191:18-33.

2009 Reinvestigation in Context: Paleoindian Prehistory at the Edge of the Rockies. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 3-13. University of Utah Press, Salt Lake City, UT.

Kornfeld, Marcel, Mary Lou Larson, George C. Frison and C. Vance Haynes, Jr.
2002 *Hell Gap Renewed Field Investigations: The First 10 Years, 1990-2000*. George C. Frison Institute of Archeology and Anthropology Technical Report Series No. 22, Department of Anthropology University of Wyoming, Laramie, WY.

Kornfeld, Marcel, Mary Lou Larson, David J. Rapson and George C. Frison
2001 10,000 Years in the Rocky Mountains: the Helen Lookingbill Site. *Journal of Field Archeology* 28(3/4):307-324.

Kornfeld, Marcel and Alan J. Osborn (Editors)
2003 *Islands on the Plains: Ecological, Social, and Ritual Use of Landscapes*. University of Utah Press, Salt Lake City, UT.

LaBelle, Jason M.
2005 Hunter-Gatherer Foraging Variability during the Early Holocene of the Central Plains of North America. Unpublished PhD Dissertation, Department of Anthropology, Southern Methodist University, Dallas, TX.

2012 Hunter-Gatherer Adaptations of the Central Plains and Rocky Mountains of Western North America. In *Hunter-Gatherer Behavior: Human Response during the Younger Dryas*, edited by Metin I. Eren, pp. 139-164. Left Coast Press, Walnut Grove, CA.

Lamberson, Kristen, Mia Lyren, Derek Anderson, Lisa Rodgers, Mary Lou Larson, and Marcel Kornfeld
2005 *Preliminary Results of 2003 Field Studies: Hell Gap Investigations 2003.* George C. Frison Institute of Archeology and Anthropology Technical Report Series No. 38, Department of Anthropology University of Wyoming, Laramie, WY.

Larson, Mary Lou
2009a Hell Gap: Fifty Years On. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 303-310. University of Utah Press, Salt Lake City, UT.

2009b Site Formation and Technological Organization at Locality I. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 229-242. University of Utah Press, Salt Lake City, UT.

2012 Paleoindian to Archaic Transition: The Northwestern Plains and Central Rocky Mountains. In *The Paleoindian to Archaic Transition*, edited by Brad Vierra and Britt Bousman, pp. 197-241. Texas A&M Press, College Station, TX.

Larson, Mary Lou, Marcel Kornfeld, and George C. Frison
2009 Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies. University of Utah Press, Salt Lake City, UT.

Laughlin, John P.
2005 Baars Clovis Locality: 2003-2004. In *Preliminary Results of 2003 Field Studies: Hell Gap Investigations 2003*, by Kristen Lamberson, Mia Lyren, Derek Anderson, Lisa Rogers, Mary Lou Larson, and Marcel Kornfeld. George C. Frison Institute of Archeology and Anthropology Technical Report Series No. 38, Department of Anthropology University of Wyoming, Laramie, WY.

Laughlin, John P., Marcel Kornfeld, C. Vance Haynes Jr., Dewey Baars, George C. Frison, and Mary Lou Larson
2004 Clovis Testing at the Hell Gap Baars Locality, 2003-2004. *The Wyoming Archeologist* 48(1):38-48.

Lee, Richard B. and Irven DeVore (editors)
1968 *Man the Hunter*. Aldine, Chicago.

Logan, W.D.
1952 *Graham Cave, an Archaic Site in Montgomery County Missouri*. Memoir No. 2, Missouri Archaeological Society, Columbia.

MacDonald, George F.
1968 *Debert: A Paleo-Indian Site in Central Nova Scotia*. Anthropological Paper 16. National Museum of Canada, Ottawa, Ontario.

Madsen, David B.
2015 A Framework for the Initial Occupation of the Americas. *PaleoAmerica* 1(3): 217-250.

Martin, Paul S.
1967 Prehistoric Overkill. In *Pleistocene Extinctions: the Search for a Cause*, edited by Paul S. Martin and Herbert E. Wright, Jr., pp.75-120. Yale University Press, New Haven, CT.

2005 *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*. University of California Press, Berkeley, CA.

Mehringer, Peter J., John C. Sheppard and Franklin F. Foit Jr.
1984 The Age of Glacier Peak Tephra in West-Central Montana. *Quaternary Research* 21:36-41.

Melanson, Julia N., Britt M. Starkovich, Cheryl K. Fogel, George C. Roberts, Mary Lou Larson, Marcel Kornfeld, Brett Bergstrom and George C. Frison
2001 *Preliminary Results of 2001 Field Studies: Hell Gap Investigations 2001*. George C. Frison Institute of Archeology and Anthropology Technical Report Series No. 20d, Department of Anthropology University of Wyoming, Laramie, WY.

Meltzer, David J.
1988 Late Pleistocene Human Adaptations in Eastern North America. *Journal of World Prehistory* 2:1-52.

2006 *Folsom: New Archeological Investigations of a Classic Paleoindian Bison Kill.* University of California Press, Berkeley, CA.

Miller, Christopher E. and Paul Goldberg
2009 Micromorphology and Paleoenvironments. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 72-89. University of Utah Press, Salt Lake City, UT.

Miller, James C.
2009 Preliminary Analysis of Lithic Materials. Appendix J in *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 411-413. University of Utah Press, Salt Lake City, UT.

Minckley, Thomas A., Patrick J. Bartlein and Jacqueline J. Shinker
2002 Paleoecological Response to Climatic Change in the Great Basin since the Last Glacial Maximum. In *Early and Middle Holocene Archeology of the Northern Great Basin*, edited by Dennis L. Jenkins, Thomas J. Connolly and C. Melvin Aikens, pp. 21-30. University of Oregon Anthropological Papers No. 62. Eugene, OR.

Minckley, Thomas A., Robert K. Shriver and Bryan Shuman
2012 Resilience and Regime Change in a Southern Rocky Mountain Ecosystem during the Past 17,000 Years. *Ecological Monographs* 82(1):49-68.

Moss, John H., Kirk Bryan, G. William Holmes, Linton Satterthwaite, Jr., Henry P. Hansen, C. Bertrand Schultz and W.D. Frankforter
1951 *Early Man in the Eden Valley*. University Museum Monographs No. 6. University of Pennsylvania Museum of Archeology and Anthropology, Philadelphia, PA.

Mulloy, William
1959 The James Allen Site, near Laramie, Wyoming. *American Antiquity* 25(1):112-116.

Munson, Patrick J.
1990 Folsom Fluted Projectile Points East of the Great Plains and their Biogeographical Correlates. *North American Archeologist* II:255-272.

Pettigrew, Devin, Krista Evans and Joanna Wurst
2012 Hell Gap: Renewed Excavations: Where are We Now? Poster presented at the annual meeting of the Wyoming Archeological Society, April 27-29 2012, Gillette, WY.

Pitblado, Bonnie L.
2003 *Late Paleoindian Occupation of the Southern Rocky Mountains*. University of Colorado Press, Boulder, CO.

Prasciunas, Mary M.
2007 Bifacial Cores and Flake Production Efficiency: An Experimental Test of Technological Assumptions. *American Antiquity* 72(2):334-348.

Rapson, David J. and Laura B. Niven
2009 Faunal Assemblage, 1960-1966. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 111-134. University of Utah Press, Salt Lake City, UT.

Reider, Richard G.
2009 Soil Development. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 53-71. University of Utah Press, Salt Lake City, UT.

Roberts, Frank H.H.
1951 The Early Americans. *Scientific American* 184(2):15-19.

Roberts, M. Foster
1970 Late Glacial and Post-Glacial Environments in Southeast Wyoming. *Paleogeography, Paleoclimatology, and Paleoecology* 8:5-17.

Robinson, Brian S., and Jennifer C. Ort
2013 Spatial Organization at Bull Brook. In *The Eastern Fluted Point Tradition*, edited by Joseph A.M. Gingerich, pp. 104-120. University of Utah Press, Salt Lake City

Rocky Mountain Herbarium
2012 RM Plant Specimen Database. Accessed online 10/24/2012. Rocky Mountain Herbarium, University of Wyoming, Laramie, WY.

Schultz, C.Bertrand
1943 Some Artifact Sites of Early Man in the Great Plains and Adjacent Areas. *American Antiquity* 8(3): 242-249.

Sellards, Elias H., Glen L. Evans and Grayson E. Meade
1947 Fossil Bison and Associated Artifacts from Plainview, Texas. *Bulletin of the Geological Society of America* 58:927-954.

Sellards, Elias H.
1952 *Early Man in North America*. University of Texas Press, Austin, TX.

Sellet, Frederic
1999 A Dynamic View of Paleoindian Assemblages at the Hell Gap Site: Reconstructing Lithic Technology Systems. Unpublished PhD Dissertation, Department of Anthropology, Southern Methodist University, Dallas, TX.

2001 A Changing Perspective on Paleoindian Technology and Typology: A View from the Northwestern Plains. *Arctic Anthropology* 38(2): 48-63.

Sherwood, Sarah C. Boyce N. Driskell, Assa R. Randall, and Scott C. Meeks
2004 Chronology and Stratigraphy at Dust Cave, Alabama. *American Antiquity* 69(3):533-554.

Sellet, Frederic, James Donohue, and Matthew G. Hill
2009 The Jim Pitts Site: A Stratified Paleoindian Site in the Black Hills of South Dakota. *American Antiquity* 74(4): 735-758.

Shuman, Bryan
2012 Recent Wyoming temperature trends, their drivers, and impacts in a 14,000-year context. *Climate Change* 112(2):429-447.

Smith, Geoffrey M.
2010 Through Stones and Bones: A Review of Lithic and Faunal Evidence for a Paleoindian-Archaic Transition in the Great Basin. Unpublished PhD Dissertation, Department of Anthropology, University of Wyoming, Laramie, WY.

Speth, John D., Khori Newlander, Andrew A. White, Ashley K. Lemke and Lars E. Anderson
2010 Early Paleoindian Big Game Hunting in North America: Provisioning or Politics? *Quaternary International* in Press.

Stanford, Dennis J.
1978 The Jones-Miller Site: An Example of Hell Gap Bison Procurement Strategy. In *Bison Procurement and Utilization: a Symposium*, edited by Leslie B. Davis and Michael Wilson, pp. 90-97. Plains Anthropologist Memoir No. 14, Lincoln, NE.

Steward, Julian
1938 *Basin-Plateau Aboriginal Sociopolitical Groups*. Bureau of American Ethnology Bulletin 120. Washington D.C.

Surovell, Todd A.
2003 The Behavioral Ecology of Folsom Lithic Technology. Unpublished PhD Dissertation, Department of Anthropology, University of Arizona, Tucson, AZ.

2009 *Toward a Behavioral Ecology of Lithic Technology: Cases from Paleoindian Archeology*. University of Arizona Press, Tucson, AZ.

Surovell, Todd A. and Brigid S. Grund
2012 The Associational Critique of Overkill and Why It is Largely Irrelevant to the Extinction Debate. *American Antiquity* 77(4):672-687.

Surovell, Todd A. and Nicole M. Waguespack
2007 Folsom Hearth-Centered Use of Space at Barger Gulch, Locality B. In *Frontiers in Colorado Paleoindian Archeology*, edited by Robert H. Brunswig and Bonnie L. Pitblado, pp. 219-259, University of Colorado Press, Boulder, CO.

2008 How Many Elephant Kills are 14? Clovis Mammoth and Mastodon Kills in Context. *Quaternary International* 191:82-97.

Todd, Lawrence C. Jr., David J. Rapson and Jack L. Hoffman
1996 Dentition Studies of the Mill Iron and Other Early Paleoindian Bison Bonebed Sites. In *The Mill Iron Site*, edited by George C. Frison. University of New Mexico Press, Albuquerque, NM.

Waguespack, Nicole M. and Todd A. Surovell
2003 Clovis Hunting Strategies, or How to Make Out on Plentiful Resources. *American Antiquity* 38(2):33-352.

Walker, Danny N.
2009 Small Mammals from Locality I: A Paleoenvironmental Reassessment. In *Hell Gap: A Stratified Paleoindian Campsite at the Edge of the Rockies*, edited by Mary Lou Larson, Marcel Kornfeld and George C. Frison, pp. 429-433. University of Utah Press, Salt Lake City, UT.

Waters, Michael R., Charlotte D. Pevny and David L. Carlson (Editors)
2011 *Clovis Lithic Technology: Investigation of a Stratified Workshop at the Gault Site, Texas*. Texas A&M University Press, College Station, TX.

Wedel, Waldo
1961 *Prehistoric Man on the Great Plains*. University of Oklahoma Press, Norman, OK.

Wendorf, Fred, A.D. Krieger, C.C. Albritton
1955 *The Midland Discovery: A Report on the Pleistocene Human Remains from Midland, Texas*. University of Texas Press, Austin, TX.

Wheat, Joe Ben
1972 *The Olson-Chubbock Site: A Paleoindian Bison Kill*. Memoir No. 26, Society for American Archeology. Washington D.C.

1979 *The Jurgens Site*. Plains Anthropologist Memoir No. 15. Lincoln, NE.

Wheeler, Richard P.
1954 Selected Projectile Point Types of the United States: 2. *Bulletin of the Oklahoma Anthropological Society* 2:1-5.

Willey, Gordon R.
1966 *An Introduction to American Archeology: North and Middle America*. Prentice-Hall, Englewood Cliffs, NJ.

Wilmsen, Edwin N. and Frank H. H. Robert Jr.
1978 *Lindenmeier, 1934-1974*. Smithsonian Contributions to Anthropology No. 24, Washington D.C.

Witthoft, John
1952 A Paleo-Indian Site in Eastern Pennsylvania: An Early Hunting Culture. *Proceedings of the American Philosophical Society* 96:464-495. Philadelphia, PA.

Wormington, Hannah Marie
1957 *Ancient Man in North America* 4th edition. Denver Museum of Natural History, Denver, CO.

1988 The Frazier Site, Colorado. In *Guidebook to Archeological Geology of the Colorado Piedmont and High Plains of Southeastern Wyoming*, edited by Vance T. Holliday, pp. 85-90. Department of Geography, University of Wisconsin, Madison.

Previous documentation on file (NPS):

__ Preliminary Determination of Individual Listing (36 CFR 67) has been requested.
__ Previously Listed in the National Register.
__ Previously Determined Eligible by the National Register.
__ Designated a National Historic Landmark.
__ Recorded by Historic American Buildings Survey: #

__ Recorded by Historic American Engineering Record: #

Primary Location of Additional Data:

_X_ State Historic Preservation Office
__ Other State Agency
__ Federal Agency
__ Local Government
__ University
__ Other (Specify Repository):

10. GEOGRAPHICAL DATA

Acreage of Property: 23.3

Verbal Boundary Description: The boundary is the polygon whose vertices are marked by the following UTM reference points:

Zone 13

	Easting	Northing
A	529603	4695466
B	529663	4695464
C	529680	4695245
D	529698	4695239
E	529825	4695360
F	529954	4695287
G	529920	4695199
H	529831	4695207
I	529753	4695134
J	529644	4695084
K	529424	4695189
L	529480	4695268
M	529540	4695293

Boundary Justification: The National Historic Landmark boundary of Hell Gap surrounds a 23.3-acre portion of the 345-acre property owned by the Wyoming Archeological Foundation. The northernmost segment of the NHL boundary is also the property boundary. The remaining NHL boundary lines were drawn to include Localities I and II, plus immediately surrounding areas that, according to visible surface scatter and expert recommendations, have high potential to yield nationally significant Paleoindian finds. Although all five localities at the Hell Gap site are significant to varying degrees, Localities I and II are the only portions of the site whose significance rises to the national level.

11. FORM PREPARED BY

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NATIONAL HISTORIC LANDMARKS PROGRAM
November 2, 2016

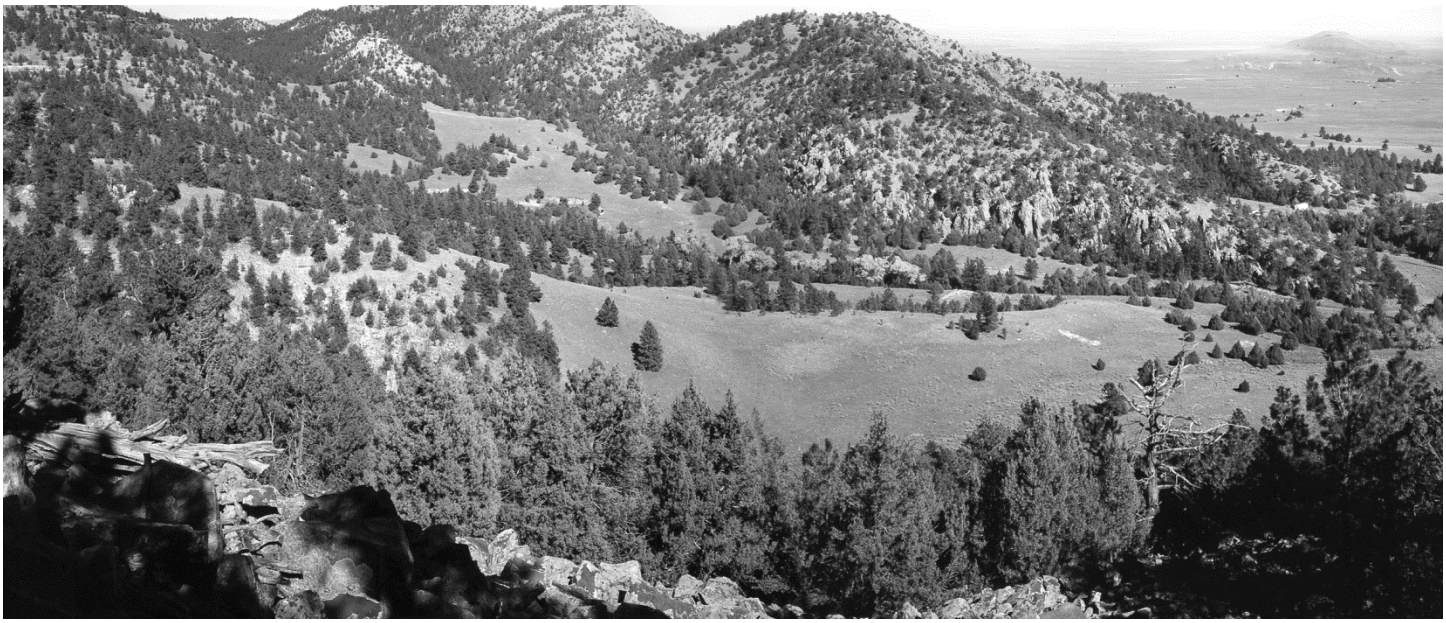
Fenn-Mullins building over Locality I East. View to WSW (above).
Excavation Block in Fenn-Mullins building, Locality I East. View to NE (below).
Photographs by Richard Collier, September 15, 2012.

Excavation Block in Fenn-Mullins building, Locality I East. View to NW (above).
Locality II along two track. View to NNE (below).
Photographs by Richard Collier, September 15, 2012.

Locality II, looking down two track. View to NNE (above).
Close-up, Locality II. View to NNE (below).
Photographs by Richard Collier, September 15, 2012.

View of erosion along two track, Locality II. View to east (above).
Locality III. View to north (below).
Photographs by Richard Collier, September 15, 2012.

Field with Tepee Rings. View to east (above).
Panorama. View to east (below).
Photographs by Richard Collier, September 15, 2012.



Fenn-Mullins Building covering Locality I. View to NNW (above).
Metal tent frame near Locality IIW. View to west (below).
Photographs by Charles Haecker, July 2015.

FIGURES

Figure 1: Aerial photo of the 48GO305 (Hell Gap Site) area (source: Microsoft, 2011; contributing sources: Esri, DigitalGlobe, GeoEye, Earthstar).

Figure 2: Paleoindian Structural Remains at 48GO305: (a) Frederick level stone circle found in 1962 at Locality I; (b) Agate Basin level post molds found in 1965 at Locality II; (c and d) Midland level post molds found in 1966 at Locality II (Knudson 2009: Figure 2.9; originally presented in Irwin (1968: Figures 4, 5, and 6) and Irwin-Williams et al. 1973: Figures 7, 8, 9, and 10).

Figure 3: Locality I stratigraphy and diagnostic projectile points; the “Clovis” level was also referred to as Plainview and finally recognized as Goshen (Kornfeld and Larson 2009: Figure 1.6).

Figure 4: Alberta Point *In Situ* (Haynes 2009: Figure 3.14).

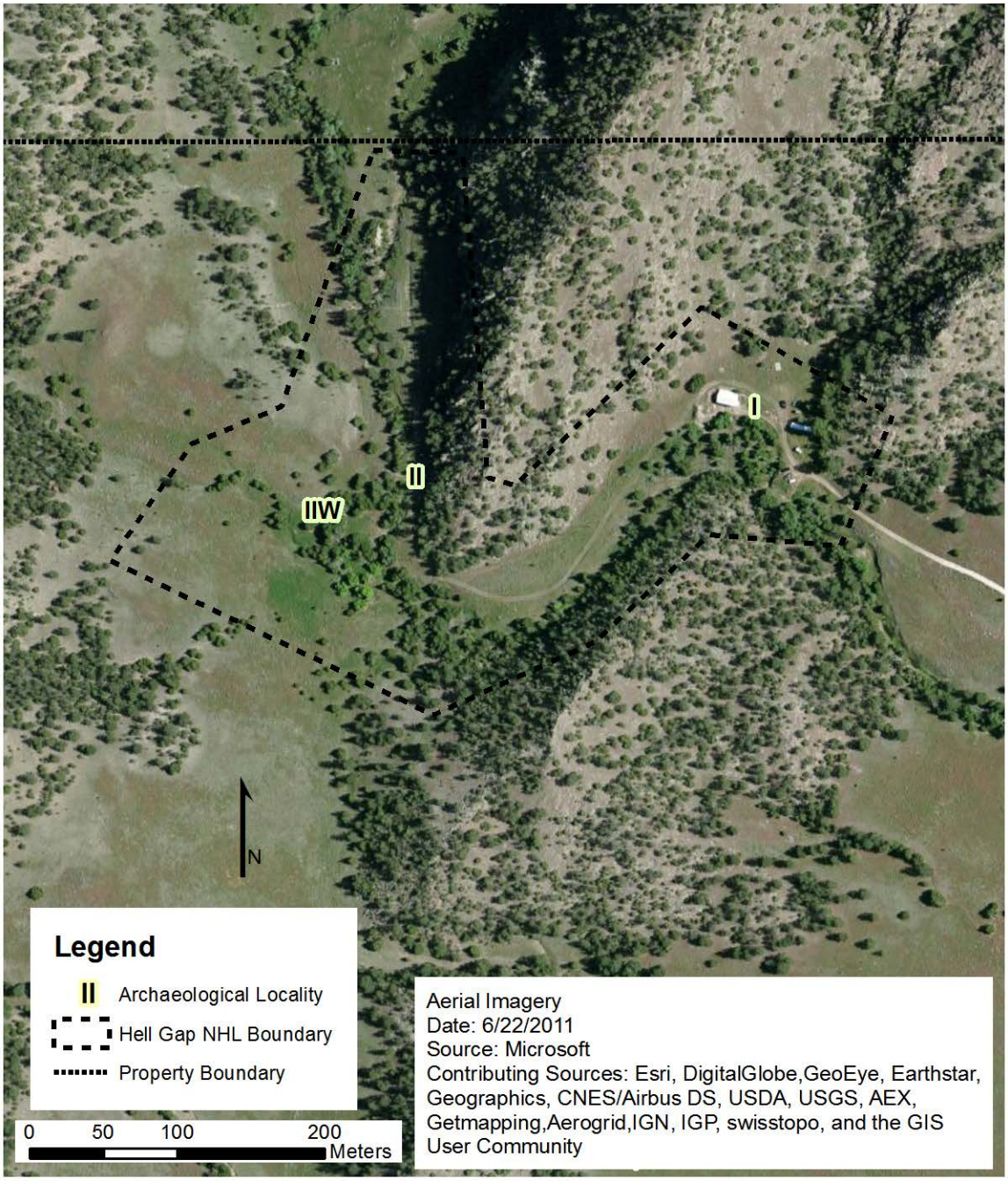


Figure 1. Aerial photo of the 48GO305 (Hell Gap Site) site area (source: Microsoft, 2011; contributing sources: Esri, DigitalGlobe, GeoEye, Earthstar).

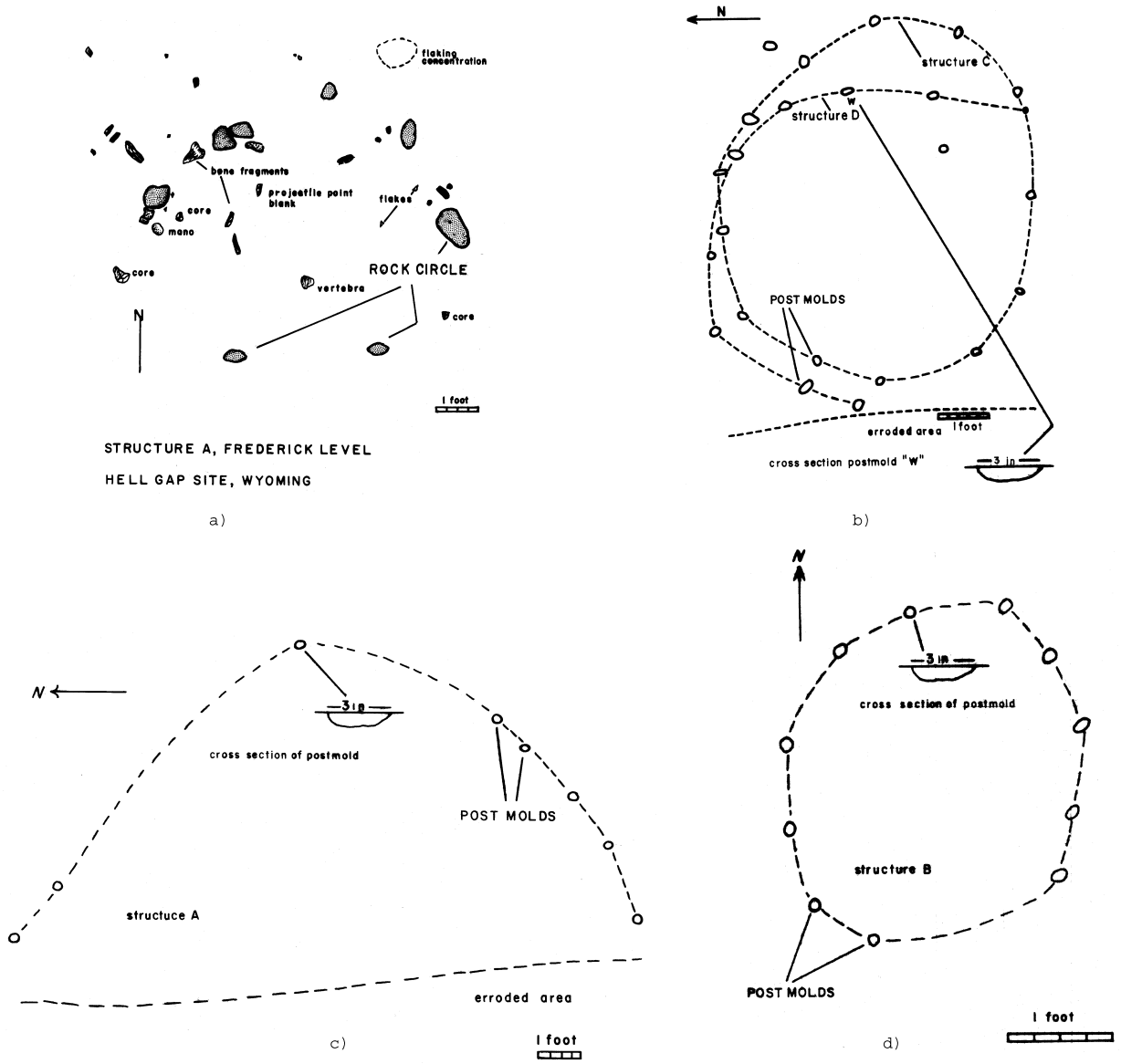
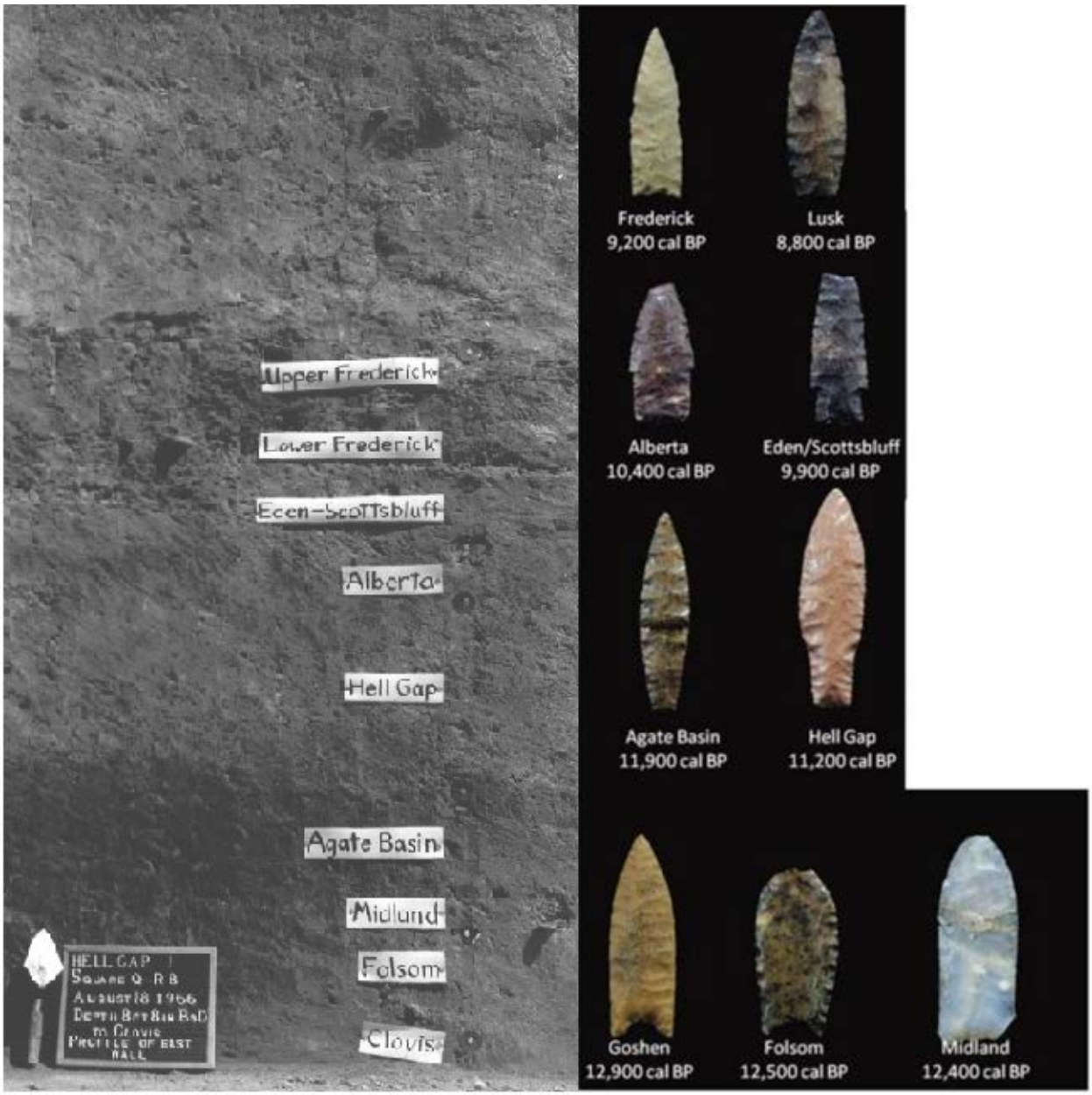


Figure 2. Paleoindian Structural Remains at 48GO305: (a) Frederick level stone circle found in 1962 at Locality I; (b) Agate Basin level post molds found in 1965 at Locality II; (c and d) Midland level post molds found in 1966 at Locality II (Knudson 2009: Figure 2.9; originally presented in Irwin (1968: Figures 4, 5, and 6) and Irwin-Williams et al. 1973: Figures 7, 8, 9, and 10).



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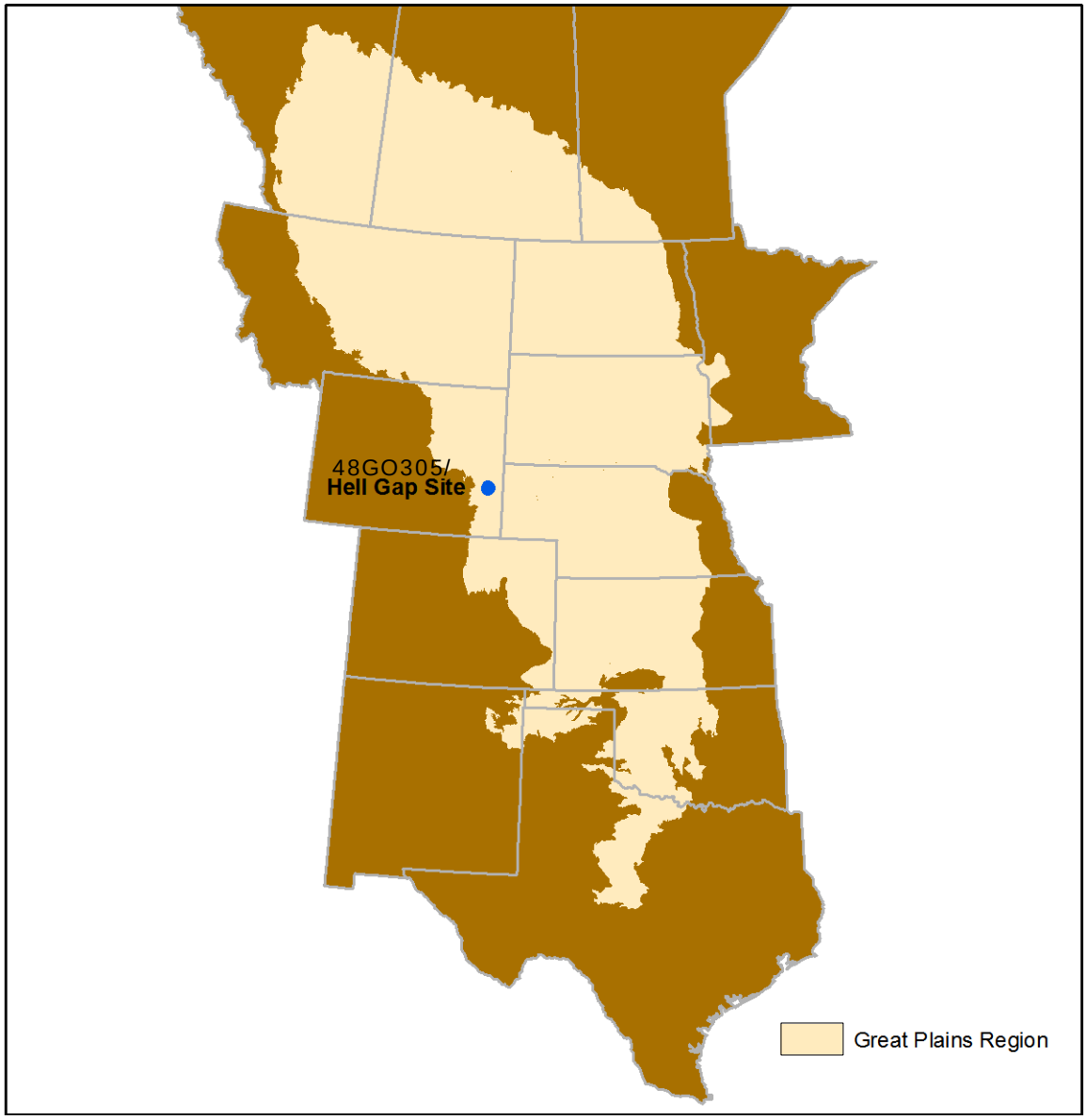
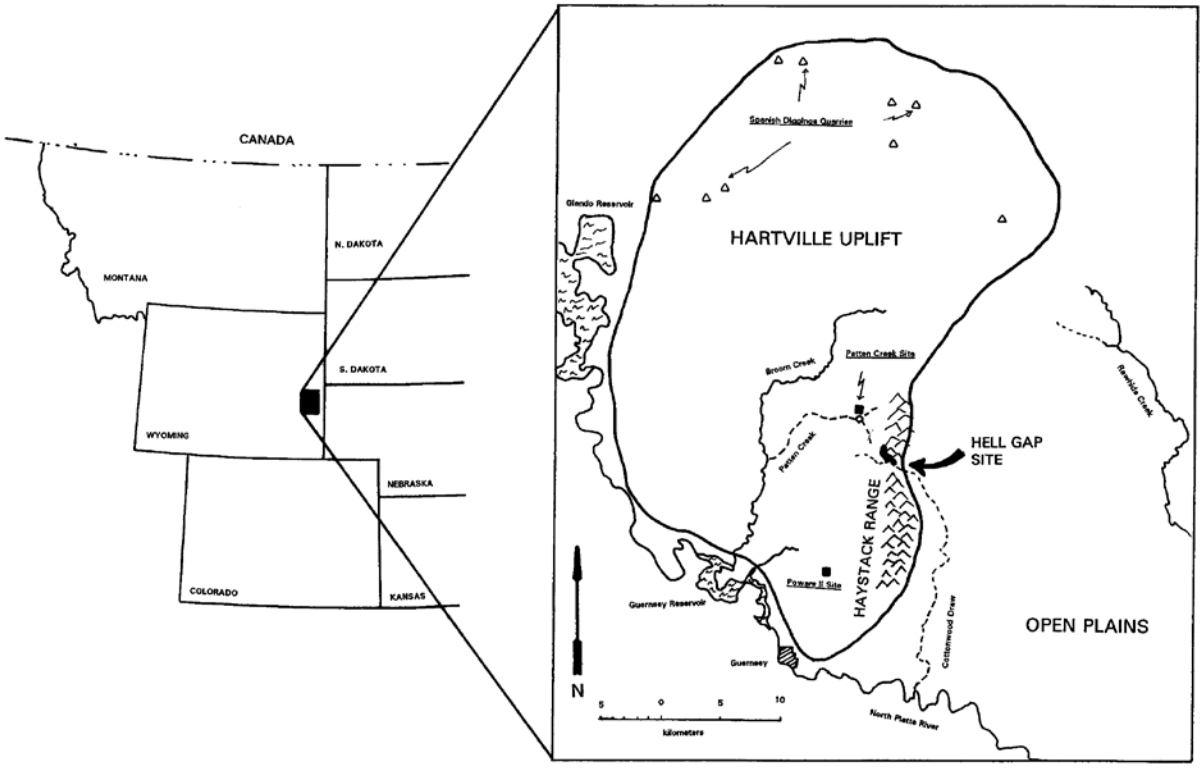
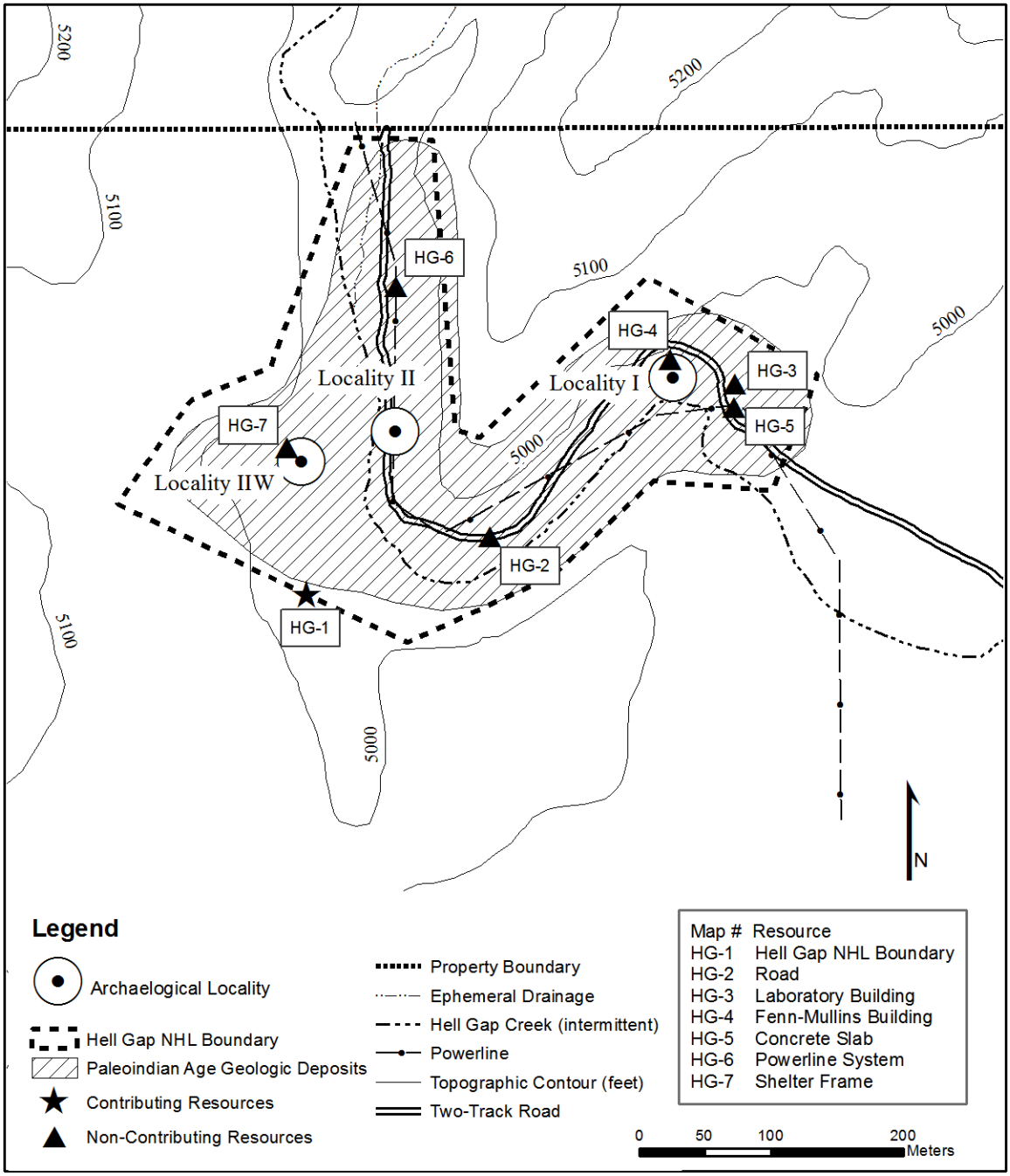


48GO305 (Hell Gap Site) in the Great Plains Region

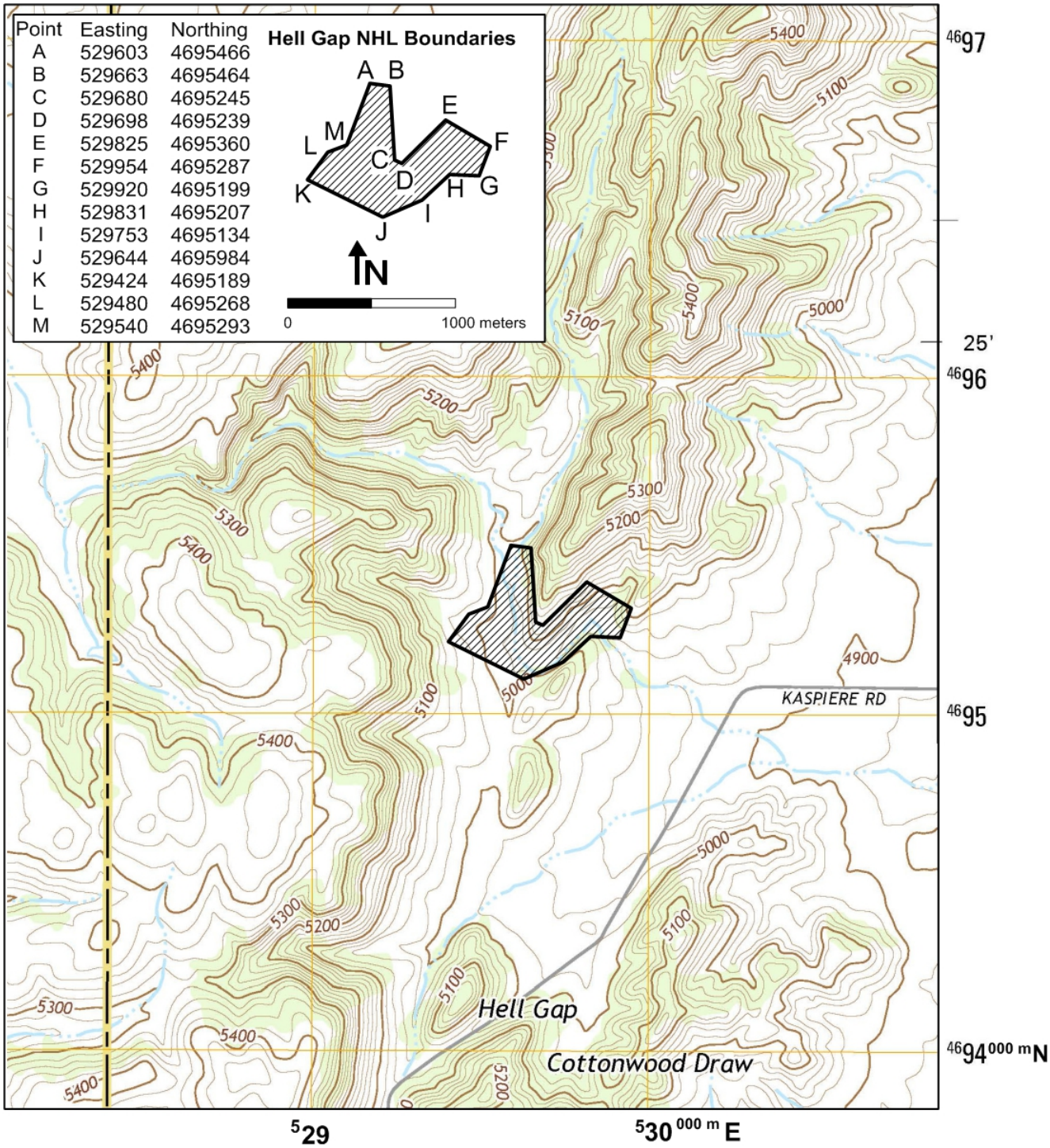
Derived from US Ecoregion Levels III and IV, North American (CEC) Ecoregion Levels I, II, III
U.S. Environmental Protection Agency
http://www.epa.gov/wed/pages/ecoregions.htm



48GO305 (Hell Gap Site) and Vicinity Location Map (Kornfeld and Larson 2009: Figure 1.1)



Sketch map of 48GO305 (Hell Gap Site) showing Paleoindian-age geologic deposits, select archaeological localities, and the National Historic Landmark boundary.



Hell Gap 7.5' USGS Quad, 2015 (NAD83) downloaded from USGS site with UTM reference points outlining portions of 48GO305 showing NHL boundaries in Section 10, T28N, R65W, Goshen County, Wyoming.