The Little Missouri River Study Unit

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While most of the Little Missouri drainage basin is in North Dakota, the upper parts are in Montana, South Dakota, and Wyoming. The North Dakota portion includes the dramatic landscapes of the Little Missouri Badlands.

Description of the Little Missouri River Study Unit

The total area of this Study Unit (SU) is 4,767 mi^2 as depicted in Figures 1.1 and 1.1A. Table 1.1 is a complete listing of the townships included in the SU. It comprises Billings, Bowman, Dunn, Golden Valley, McKenzie, and Slope counties.

Physiography

The pre-eminent terrain here is unquestionably the Little Missouri Badlands. The Badlands have been described summarily from an archaeological perspective by Kuehn (1982a). The eroding Badlands have left long finger ridges in places that extend for many miles from the rolling grasslands toward the Little Missouri River. Simon (1982) has considered these ridges as a system of pathways through the Badlands. Archaeological sites are certainly concentrated on these ridges (e.g., East et al. 1981, 1983, 1985; Floodman 2012a, 2012b; Simon et al. 1982).

The Little Missouri River Study Unit (LMRSU) may hold a greater variety of high quality lithic raw materials for flintknapping than any part of the state (cf. Kuehn 1982a). Fine cherts, quartzites, and chalcedonies that originated in the mountain west can be found here in deposits such as the Flaxville Gravels (cf. Collier and Thorn 1918), where there are "Big Plateau" gravels (Kuehn 1988a). There are 10-cm long cobbles of Knife River flint (KRF) in these Big Plateau Gravels (ibid.). "A silcrete indistinguishable from the coarser varieties of TRSS [Tongue River silicified sediment] is also found in the Taylor Bed, in the Bear Den Member of the Golden Valley Formation (Ahler and Christensen 1983; Clayton et al. 1980b; Wehrfritz 1978)" (Artz et al. 1987:2.6).

There is some porcellanite resultant from the metamorphic transformation of sedimentary layers of mudstones and siltstones by natural burns of lignite beds (cf. Fredlund 1976). Underground lignite burns have been ignited by range fires, lightning strikes, and spontaneous combustion. These burns are not rare occurrences. It is speculated that as much as 95% of all the lignite that ever existed in the West has been consumed by natural burns in the prehistoric past. In other words, lignite mining in the West is focused on a very small remnant of the lignite that was originally present. In October 1976, prairie fires in southwestern North Dakota started at least 30 lignite burns in a 7,000-acre area near Amidon, but most were extinguished within a few months (Bluemle 1988:29).

Figure 1.1: Map of the Little Missouri River Study Unit.

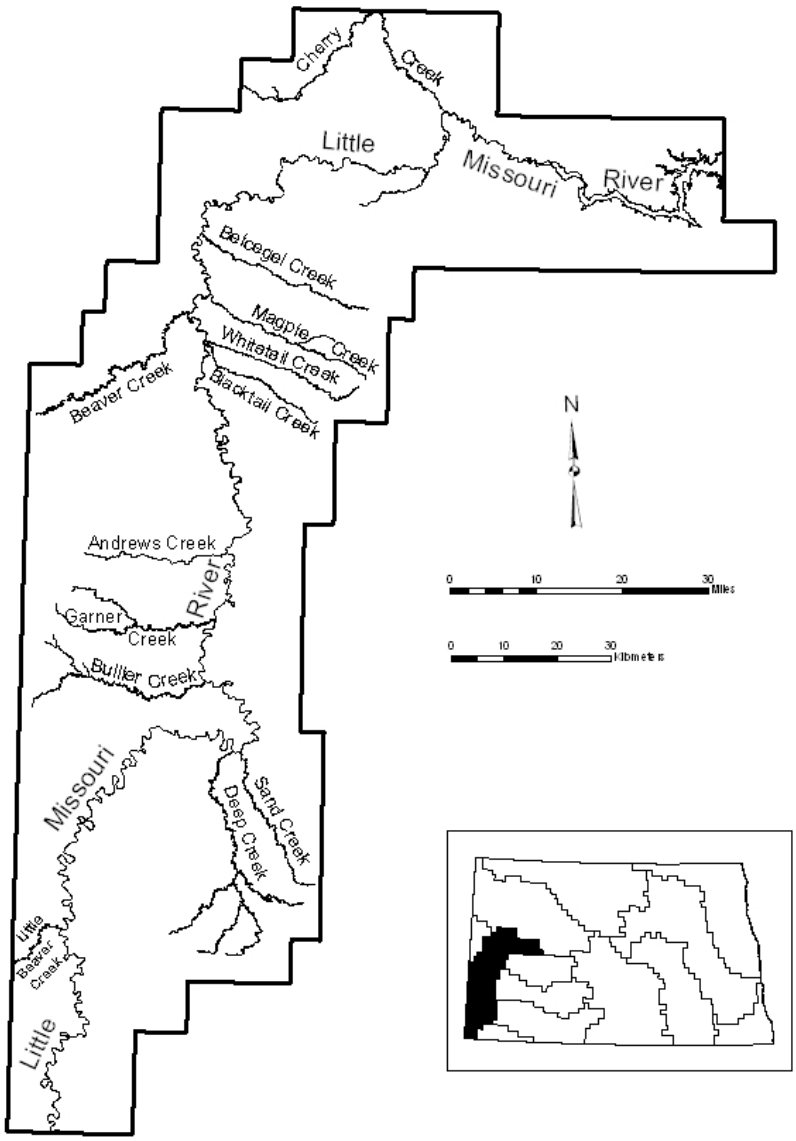

Figure 1.1A: Shaded Relief Map of the Little Missouri River Study Unit.

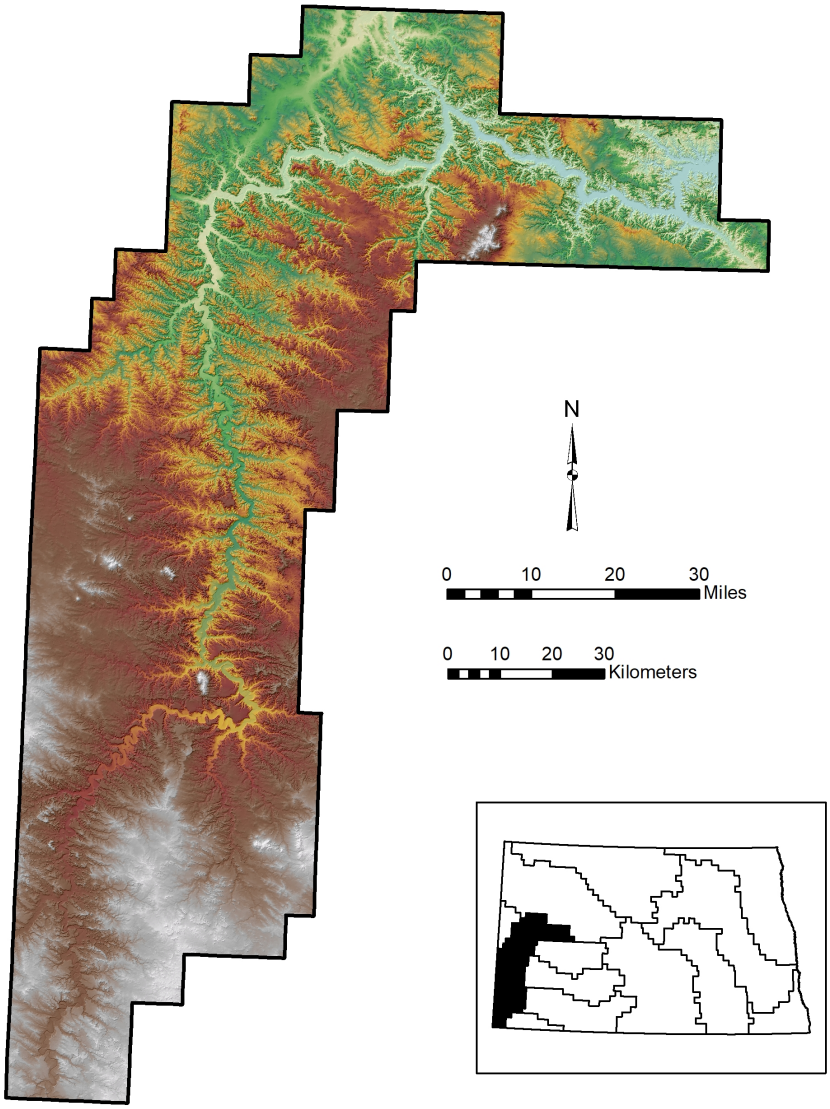

Table 1.1: Townships in the Little Missouri River Study Unit.

TOWNSHIP	RANGE
129	105
129	106
129	107
130	105
130	106
130	107
131	104
131	105
131	106
131	107
132	102
132	103
132	104
132	105
132	106
132	107
133	101
133	102
133	103
133	104
133	105
133	106
134	101
134	102
134	103
134	104
134	105
134	106
135	101
135	102
135	103
135	104
135	105
135	106
136	101
136	102
136	103
136	104
136	105
136	106
137	101
137	102
137	103
137	104
137	105
137	106
138	101
138	102
138	103
138	104

TOWNSHIP	RANGE
138	105
138	106
139	101
139	102
139	103
139	104
139	105
139	106
140	101
140	102
140	103
140	104
140	105
140	106
141	100
141	101
141	102
141	103
141	104
141	105
142	100
142	101
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143	99
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143	102
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143	104
143	105
144	99
144	100
144	101
144	102
144	103
144	104
145	98
145	99
145	100
145	101
145	102
145	103
146	91
146	92
146	93
146	94
146	95

TOWNSHIP	RANGE
46	96
146	97
146	98
146	99
146	100
146	101
146	102
147	92
147	93
147	94
147	95
147	96
147	97
147	98
147	99
147	100
147	101
147	102
148	92
148	93
148	94
148	95
148	96
148	97
148	98
148	99
148	100
148	101
148	102
149	96
149	97
149	98
149	99
149	100
150	96
150	97
150	98
150	99

"The term 'Miocene Flint' was coined by Clayton et al. (1970:288) to describe flint nodules found in lag deposits on top of Sentinel Butte, a prominent landform in Golden Valley County. This material is extremely homogeneous and contains no discernible internal structure. It is white to brownish gray in color, often with a faint pinkish tinge. Fractured surfaces exhibit a dull luster" (Artz et al. 1987:2.6). It is typically much clearer than other translucent stones found in North Dakota such as KRF and agatized woods. Miocene flint was first reported as a heavily procured prehistoric resource because of survey of the Southwest Pipeline corridor west of the Little Missouri River (ibid.:7.20-7.49). In recent years, Miocene flint alternately has been called Sentinel Butte flint (Blikre 1993; Wermers et al. 1991). Blikre (ibid.) conducted archaeological research of the Sentinel Butte flint source area. He focused on hunter-gatherer mobility and use patterns of Sentinel Butte flint. Huckell et al. (2011) provide results of neutron activation analysis of Sentinel Butte stone materials.

Drainage

The headwaters of the Little Missouri are in northeastern Wyoming. It flows northward through portions of South Dakota and Montana into North Dakota. The total length of the valley is about 300 miles with an average width of 0.75 miles (NDSPB 1937, vol.5). The channel meanders some 530 miles with an average drop of one foot per mile.

From south to north within the SU, named tributary streams include Skull Creek, Little Beaver Creek, Horse Creek, Bull Run Creek, Williams Creek, Deep Creek, Sand Creek, Third Creek, Bullier Creek, Bear Creek, Dance Creek, Garner Creek, Davis Creek, Andrews Creek, Wannagan Creek, Franks Creek, Ash Coulee, Blacktail Creek, Whitetail Creek, Beaver Creek, Magpie Creek, Cinnamon Creek, Sand Creek, Bicycle Creek, Bennett Creek, Redwing Creek, Dry Creek, Big Gulch Creek, Cherry Creek, Jim Creek, Bans Creek, and Moccasin Creek. Most tributary streams carry water only a few weeks each year.

Two geologists have studied and reported upon investigations of tributary valley geomorphology in the South Unit of the Theodore Roosevelt National Park (the Park) (Kuehn 1988a). They concluded that the smaller, less developed tributary stream valleys are younger than the large, extensive ones. The large tributary valleys are more likely to hold older archaeological remains than the small ones (ibid.).

Availability of potable water would have been a significant factor in selecting settlement locations in most parts of this SU. During droughty years, the river ceases flowing. In the fall of 1988, for example, there was no flow. In the Marmarth locality, there were only scattered standing pools in the riverbed (Gregg, personal observation). Springs are another water source. There are perennial springs in some draws along Cinnamon Creek Ridge (East et al. 1988), a factor which may partially account for the large number of prehistoric settlements occurring on that landform. Additional information on floodplain formation and vegetation history in the LMRSU is presented in Miller and Friedman (2009) and Edmondson et al. (2014) and Meko et al. (2015), respectively.

Climate

The climate of the LMRSU is semiarid. Winters in the basin are long and cold, but they are normally quite dry. Summers are generally hot and dry. Annual precipitation averages about 14.40 inches per year with most of it falling between May and September, often during thunderstorms. Droughty conditions can result from consecutive years with inadequate moisture.

Landform and Soils

The LMRSU is better known for its dramatic landforms than most other parts of North Dakota (Murphy et al. 1993). In addition to the Badlands, there are numerous large buttes, all of which are erosional remnants. Prominent named buttes, from south to north, include Black Butte, White Butte, Chalky Buttes, Bullion Butte, Sentinel Butte, Flat Top Butte, Grassy Butte, Lone Butte, Sperati Point, Stocke Butte, Morman Butte, Tepee Buttes, and the Killdeer Mountains. The Killdeers, forming part of the divide between the Little Missouri and Knife rivers, are the largest of these buttes. The highest point of elevation in North Dakota is in this SU about 70 miles south of the Killdeers atop White Butte at 3,506 feet. In fact, the southern portion of the SU contains the highest elevations in the state. These uneroded highlands have good prospects for holding overlook sites of all time periods from Paleo-Indian (Paleo) to Equestrian. Many of these landforms were inventoried for archaeological sites as reported in *Cultural Resource Survey on the Little Missouri Buttes and Adjacent Areas, Western North Dakota* (Loendorf et al. 1982).

Laird et al. (1942) identified four Little Missouri terraces (Kuehn 1988a). The oldest are T4 and T3 which are 80 m and 35 m above river level. T2 is three to four meters above river level, about 2,500 years old. The lowest terrace is not old at all. Even very recent sites on the lowest terrace are buried by alluvium (ibid.).

Within the Little Missouri valley, there are tracts ranging from 50-700 acres in extent with dark fertile loam soils (NDSPB 1937:Volume 5). However, soils are generally quite thin, and exposures of pre-Pleistocene sediments cap portions of the tops of many elevated landforms. Nevertheless, buried topsoils from Holocene times can be found in some areas, especially on the lee sides of hills and ridges (cf. Jorstad et al. 1986:165) and in swales in upland areas such as at the Tysver-Olson site (32DU605) (Kuehn 1984). Much of the elevated terrain in the Badlands was stripped of early Holocene soils during the Altithermal, and it is rare to encounter paleosols of the Aggie Brown Member of the Oahe Formation in the Badlands.

Natural Resources Conservation Service (NRCS) official soil survey resources are available online (NRCS 2021 a, b).

- Electronic Field Office Technical Guide: https://efotg.sc.egov.usda.gov/#/
- Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Flora and Fauna

The Little Missouri Badlands region is characterized by greater floral and faunal diversity than the surrounding plains. Much of the LMRSU encompasses the Badlands terrain. The dominant floral community in the Badlands comprises the western wheatgrass-sagebrush (*Apropyron smithii-Artemisia cana*) ecosystem (cf. Brown et al. 1983; Dodds 1979; Stevens 1963). Several perennial grasses grow on the upland prairies, while sagebrush, prickly pear cactus (*Opuntia polyacantha*) and some grasses occur on buttes and ephemeral creek bottoms. Cottonwood forest grows along some stretches of bottomlands in the Little Missouri valley.

The Badlands are also home to a variety of large and small mammals, birds, and reptiles. Bison, elk, pronghorn antelope, mule deer, and white-tailed deer were common in the basin during early historic times. Wolves, coyotes, jackrabbits, and prairie dogs were common also. Many of these species can still be found in protected havens such as Theodore Roosevelt National Park (cf. Kuehn 1988a). Numerous fish species inhabit the lower reaches of the Little Missouri River.

Other Natural Resource Potential

Locally available lithic resources in the basin would have provided Native groups with knappable stones for making chipped stone and ground stone tools. These include KRF, clear chalcedony, porcellanite, TRSS, Miocene flint, and Antelope Creek chert (previously called McKenzie County chert) (cf. Beckes and Burge 1983; Kuehn 1988a). Some occur in surface contexts as stream gravels, others as near-surface lag deposits.

The recovery of ceramic remains from an increasing number of sites in the LMRSU suggests that local clay sources may have been used to make some pottery. Data are not presently available to support or refute this notion.

Timber resources such as juniper (*Juniperus* sp.) found in the Badlands served as construction material for conical timbered lodges. These types of structures have been reported from several locations in the LMRSU (cf. Allen 1982; Field Murray 2011; Kuehn 1988a).

In 2021 the South Dakota State Historical Society published *Tool Stone Found at South Dakota Archaeological Sites* edited by Renee M. Boen. The document contains information, photographs, and maps on raw stone materials found at archaeological sites in South Dakota and will be a valuable reference for archaeologists in North Dakota as well. Craig Johnson's *Chipped Stone Technological Organization: Central Place Foraging and Exchange on the Northern Great Plains* (2019) is likewise a valuable resource regarding lithics resources and provides important research questions for future studies.

Overview of Previous Archaeological Work

The quantity of cultural resources work conducted in this SU has the second-most archaeological sites, behind the Garrison SU, because of the great amount of oil and gas exploration and development carried out on federal lands. Floodman (2012) provides an overview of prehistory in the area including tracts within the LMRSU.

Inventory Projects

As of 31 December 2020, there were 2,659 archaeological sites, and 2,601 archaeological site leads and isolated finds documented in the North Dakota Cultural Resource Survey (NDCRS) for the LMRSU. With the SU area of 4,767 mi^2, the density of recorded sites at that time was one site per 1.79 mi^2. It ranks with the Knife River SU and Garrison SU where vast areas have been inventoried in prospective energy development areas, and site densities are high because of the location of the KRF primary source area, heavy use by Plains Villagers, and relatively extensive areas surveyed. As of 31 December 2020, the total area surveyed in the LMRSU was 523,982.97 acres. Therefore, the density of archaeological sites per acres surveyed is approximately one site per 197.06 acres.

The archaeology of the LMRSU has benefited from a variety of types of site surveys, including:

1. numerous 40-acre-block well pad surveys, many on land managed by the U.S. Forest Service
2. sampling surveys of large blocks of land such as (a) the North and South Units of the Park (Kuehn 1988a), (b) Bureau of Land Management (BLM) coal study areas (Metcalf et al. 1988), (c) coal lease lands managed by the Dickinson District of the BLM (Fox and Schweigert 1982), and (d) an extensive Bowman County block survey related to energy development (Bleier 2005a)
3. concentrated surveys of specific landforms such as buttes (Loendorf et al. 1982)
4. lengthy transects across the drainage including (a) the Southwest Pipeline (Artz et al. 1987; Gregg et al. 1985), (b) the Northern Border Pipeline (Root and Gregg 1983), (c) the Exxon CO_2 pipeline (Metcalf and Schweigert 1987), and (d) numerous seismic surveys
5. shorter transects of access roads and other pipelines.

The variety of different kinds of survey should have resulted in a sample of recorded sites which is more likely representative of what occurs throughout the SU than is the case in other SU where the diversity of site survey methodologies has been more limited.

Table 1.2: Feature Type by Landform of Recorded Archaeological Resources in the Little Missouri River Study Unit, 31 December 2020.

SU 1	Cairn	Conical	CMS	Eagle	Village	Earth	Grave	Hearth	Jump	Mound	ORF	Pit	Quarry	Art	Shelter	Circle	Trail	Misc	TOTAL
Alluvial fan			3										1					1	**5**
Beach/ Riverbank	1		28	1	4			2				2	2			2	1	1	**44**
Beachline (glacial)			4																**4**
Butte	11	1	51	11	1		1	3			5	21	5	2	2	6		5	**125**
Canyon		1	3					1						1		1			**7**
Delta			2					1											**3**
Draw	2	1	55		1		1	3			2					3		1	**69**
Floodplain	2	2	20								1	1	1			1		3	**31**
Hill/Knoll/ Bluff	100	1	613	5		1	2	13	3		34	12	28		2	67	1	3	**885**
Island			1																**1**
Other	1	1	23					5					1						**31**
Ridge	89	2	808	27			7	37			31	67	22	1	2	79	3	5	**1,180**
Saddle	3		43					4			3	2	2			6			**63**
Sandbar			1																**1**
Spur	8		100	1				6	1		3	3	2		1	6			**131**
Swale			9													1			**10**
Terrace	7	3	395		2			59	1	1	3	8	12		2	16	3	4	**516**
Upland plain	18		206	2			3	6	2		9	5	8			26	1	3	**289**
Valley wall foot slope	1	1	62			1	1	2										1	**69**
TOTAL	**243**	**13**	**2,427**	**47**	**8**	**2**	**15**	**142**	**7**	**1**	**91**	**121**	**84**	**4**	**9**	**214**	**9**	**27**	**3,464**

Conical=Conical Timber Lodge; CMS=Cultural Material Scatter; Eagle=Eagle Trapping Pit; Village=Earthlodge Village; Earth=Earthwork; ORF=Other Rock Feature; Art=Rock Art; Shelter=Rock Shelter; Circle=Stone Circle; Misc= Miscellaneous

Cultural/Temporal Affiliation

Of the 5,260 archaeological resources recorded in the LMRSU, 607 have a cultural/temporal affiliation *coded* in the NDCRS database. Table 1.3 lists archaeological periods and provides tallies of cultural/temporal affiliation.

Table 1.3: Cultural/Temporal Affiliation of Archaeological Resources in the Little Missouri River Study Unit, 31 December 2020.

Paleo-Indian	
Unspecified	17
Clovis	1
Folsom	3
Agate Basin	5
Plano (Cody)	15
Total	**41**
Archaic	
Unspecified	101
Early Large Side-Notched	27
Logan Creek	1
Hawken	3
Oxbow	19
McKean/Duncan/Hanna	77
Yonkee	1
Pelican Lake	79
Total	**308**
Woodland	
Unspecified	5
Early Woodland	1
Sonota/Besant	50
Avonlea	12
Middle Woodland	3
Late Woodland	12
Total	**83**
Late Prehistoric	
Unspecified	137
Devils Lake/Sourisford	1
Plains Village	25
Plains Equestrian	12
Total	**175**
TOTAL	**607**

The BLM sampling survey of five western North Dakota Coal Study Areas (CSA) included six 160-acre sample units in the Bowman-Gascoyne CSA in the extreme southern part of the LMRSU south of Black Butte and east of Deep Creek (Metcalf et al. 1988). Three sites were recorded yielding a density of one site per 320 acres surveyed.

A Class III block survey of approximately 4,536 acres was conducted during the autumn of 2004 to allow an energy production company to plan development over a vast area of the Little Missouri badlands in Bowman County (Bleier 2005a). Newly recorded cultural resources included 33 sites and 76 isolated finds. As expected, most of the cultural resources were lithic scatters observed on uplands and in areas with good ground surface visibility. Where found, diagnostic materials dated from Plains Archaic through Historic periods. The following table (Bleier 2005a:Table 4) summarizes site density by terrain type.

Variables	Floodplain & Terraces	Uplands	Badlands	Total
Total Acres	975	1,160	2,401	4,536
# of Sites	7	5	21	33
Site Density (site/acre)	1/139	1/232	1/114	1/137

Most sites in the LMRSU are on public land. Hill (1988) analyzed the distribution of sites across different landforms and environments. The summary of this analysis presented by Hill is useful for gaining a general understanding of site locations in this SU.

Allen and Dibenedetto (1988) observed that there is an inordinately low percentage of bison kill sites in the large sample of recorded sites in this part of the Northwestern Plains. Kuehn (1988a) suggested that one favorable setting for communal bison kills in the Badlands region is along the Little Missouri Escarpment after he recorded a kill site in that setting within the Theodore Roosevelt National Park. The paucity of communal bison kill sites in the Badlands may be accounted for by the broken terrain in which it is "very difficult if not impossible" to drive, trap, or pound large numbers of bison (Allen and Dibenedetto 1988). Individual stalking may have been the primary mode of taking bison in the Badlands (ibid.).

As part of background studies for large-scale inventory projects, researchers should attempt to make use of Landsat imagery of groundcover available for North Dakota (cf. Reid and Johnson 1978) supplemented by aerial photographic coverage (cf. USDA 1937). LIDAR coverage, if available, should be reviewed. Recent digital imagery is available from several internet sources including the North Dakota GIS Hub (2021), https://www.gis.nd.gov/.

In general, site avoidance, rather than formal testing and/or mitigation, has been the choice of applicants. The result is initial documentation of many new sites but relatively few evaluative investigations, and therefore little new knowledge about the prehistory of North Dakota.

Formal Test Excavation Projects

There have been more test excavations conducted in this SU than in any other because there has been more Section 106 compliance work here than elsewhere. This has been a result of the great amount of oil, gas, and coal exploration and development due to the location of mineral deposits within the Williston basin coupled with the vast tracts of public land. Table 1.4 lists the *formal* testing projects conducted within the LMRSU.

One physiographic feature of the LMRSU is the Miocene flint procurement area, Sentinel Butte. Miocene flint has been called Sentinel Butte flint (Blikre 1993; Wermers et al. 1991). Testing of 32GV97, located atop Sentinel Butte, was conducted by UNDAR-West for the BLM during the summer of 1990. According to investigators, site "32GV97 is the major lithic procurement site within the Little Missouri drainage in western North Dakota" (Wermers et al. 1991:56). Sentinel Butte flint (SBF) occurs as nodules on the butte and stream gravels near the butte (ibid.:14). Other locally available lithic raw materials were present in the assemblage but in relatively low quantities, likely the result of tool maintenance and/or discard. Tools recovered from the site include the basal portion of a Late Prehistoric projectile point, four scrapers, five bifaces, one patterned tool, 20 cores, and 36 tested raw material pieces (ibid.:35). Numerous heat-treated artifacts were identified. The presence of such artifacts suggests high alteration of stone at the SBF source area (ibid.:36). In addition to lithic procurement, the site was used for observation during hunting activities. There are two depressions located on the butte. Speculations have been made as to the purpose of the two depressions. Suggested uses include eagle trapping pits, vision quest structures, or quarry pits. The depressions were not tested. Wermers et al. (ibid.: 37-41) give no conclusive statement concerning the depressions but favor eagle trapping pits as the feature type.

In 2010, formal testing was conducted for a proposed communications building atop Sentinel Butte, near the microwave tower (Banks 2010). Four shovel probes and eight excavation units yielded 103 pieces of chipped stone flaking debris, two pieces of tested raw material, one core, and one surface-collected, reworked mid-section of a KRF projectile point (ibid.:10-13). Most of the artifacts were located 10-15 cm below surface, with an average of 5-10 artifacts per level. On-site archaeological and geoarchaeological investigations revealed that the project area of potential effect previously been disturbed (ibid.:15). No conclusions were drawn concerning cultural or temporal affiliation.

Proposed upgrades for an existing two-track road for access and pipeline installation prompted evaluative testing at cultural material scatter 32MZ213 (Stine 2012). Archaeological investigations in 2012 revealed artifact concentrations, two hearths, and a paleosol. Artifacts recovered were chipped stone flaking debris (including obsidian), chipped stone tools, faunal bone fragments, a concentration of 19 potsherds, and fire-cracked rock. The obsidian flakes were sourced to the Rocky Mountains (ibid:14). Test units were placed over each of the hearth features. Feature 1, located five centimeters below surface, dated the hearth to the Late Archaic (2050±30 BP conventional radiocarbon age) (ibid.:12-14). A test unit was excavated over the second hearth, located 40-45 cm below surface. Charcoal, ash, and burned earth were present.

Table 1.4: Formal Testing Projects in the Little Missouri River Study Unit, 31 December 2020.

Year	First Author	Second Author	Title	Sites Tested	MS #
1979	Allen, W.		USFS Cultural Resources Inventory: Pullin Shallow Pipeline & Test Excavation Addendum Report, Golden Valley Co., ND	32GV6	1937
1979	Kuehn, D.		A Proposal to Conduct Site Significance Testing at 32MZ38	32MZ38	1924
1980	Lau, S.		Subsurface Testing at Archaeological Site 32MZ38, McKenzie Co., ND	32MZ38	958
1980	Lau, S.		Subsurface Testing on the Amoco Federal "B" Well Location, McKenzie County, ND	32MZ80	1022
1980	Tate, M.		Addendum to Tenneco 3-13 Morhle: A Report on Limited Testing, Billings Co., ND	32BI94	1878
1980	Tate, M.		Addendum to Conoco Hansen 8-1: Conoco Federal-Hansen 8-1 Testing Report, Billings Co., ND	32BI130	1882
1981	Rippeteau, B.		Cultural Resource Management Report, Little Tank Prospect Addendum Testing Report for Well Pad, McKenzie Co., ND	32MZ491	1824
1981	Rippeteau, B.		Cultural Resource Management Report, Addendum to Apache 15-2; Testing & Monitoring, Billings Co., ND	32BI272	1825
1981	Rippeteau, B.		Addendum, Apache 2-3 Federal: Testing Report, Billings Co., ND	32BI241, 32BI242	1851
1981	Rippeteau, B.		Addendum Apache 2-4 Federal Testing Report, Billings Co., ND	32BI250	1856
1981	Fox, R.		Results of the Testing Investigations at the Anderson Coulee Site 32BI21, Billings Co., ND	32BI21	2223
1981	Rippeteau, B.		Patrick Petroleum Harris Federal 1-30 Testing Report, Billings Co., ND	32GV52	2360
1981	Rippeteau, B.		Apache 2-3 Federal Addendum Testing Report, Billings Co., ND	32BI241, 32BI242	2377
1981	Rippeteau, B.		Apache 2-4 Federal Addendum Testing Report, Billings Co., ND	32BI250	2378
1981	Rippeteau, B.		Apache 15-2 Addendum Report: Testing and Monitoring, Billings Co., ND	32BI272	2380
1981	Rippeteau, B.		Pennzoil Little Tank Prospect Addendum Testing Report for Well Pad, McKenzie Co., ND	32MZ491	2403
1981	Rippeteau, B.		Testing of Site 32MZ549, Little Tank 19-21 BN, McKenzie Co., ND	32MZ549	2405

Year	First Author	Second Author	Title	Sites Tested	MS #
1981	Rippeteau, B.		Ladd Petroleum Federal 1-14 Testing Report on Site 32BI214	32MZ214	2442
1981	MacDonald, L.		Final Report of Test Excavations at Site 32MZ422, Concentration One, McKenzie Co., ND	32MZ422	2460
1981	Simon, A.	J. Borchert	Archaeological Test Excavations Sunday Sage Site-32BI22, Billings, Co., ND	32BI22	2461
1981	Simon, A.	J. Borchert	Final Report of Test Excavations at Site 32MZ422, C-Two through C-Five, McKenzie Co., ND	32MZ422	2463
1981	Van Hoy, T.		Final Report of Test Excavations at the Dune Site, 32MZ502, McKenzie Co., ND	32MZ502	2466
1981	East, T.	J. Adovasio	Archaeological Reconnaissance & Testing on Cinnamon Creek Ridge, McKenzie Co., ND: Interim Report on Phase I	32MZ224, 32MZ257 to 258, 32MZ260 to 261	2575
1981	Simon, A.	J. Borchert	Archaeological Test Investigations, Ice Box Canyon Ridge Site, 32MZ38, McKenzie Co., ND	32MZ38	2769
1982	Moore, G.		Archaeological Test Excavations at Sites 32BI286 & 32BI312, Tenneco Production Company, Billings Co., ND	32BI286, 32BI312	1955
1982	Van Hoy, T.		Test Excavations at 32DU117, Dunn Co., ND	32DU117	2465
1982	Kuehn, D.	A. Simon	Archaeological Testing at 32DU577, Dunn Co., ND	32DU577	2467
1982	Van Hoy, T.	A. Simon	Archaeological Investigations at Mike's Creek Ridge, Billings Co., ND	32BI235, 32BI258, 32BI260	2474
1982	Simon, A.	C. Sheldon	Anderson Divide Archaeological Test Excavations, Billings Co., ND	32BI246 to 249, 32BI317 to 319	2753
1982	Borchert, J.	S. Montgomery	The Blacktail Bottom Site 32BI273, Billings Co., ND	32BI273	2767
1982	Kuehn, D.		Archaeological Investigations at Anderson Coulee, Billings Co., ND	32BI21, 32BI249, 32BI274	2768
1982	Floodman, M.	M. Tate et al.	Archaeological Investigations at Prehistoric Sites 32MZ333 & 32MZ334, McKenzie Co., ND	32MZ334	2831
1982	Overland Archaeology Inc.		Archaeological Evaluation & Mitigation of Site 32BI286, Tenneco Production Company: Preliminary Report	32BI286	2904
1982	Moore, G.		Testing of Tenneco Overton Access Road, McKenzie Co., ND	32MZ73	2932

Year	First Author	Second Author	Title	Sites Tested	MS #
1982	Borchert, J.	D. Hungerford	Archaeological Investigations of Sites 32MZ333, 32MZ334, & 32MZ573 McKenzie Co., ND	32MZ334, 32MZ573	4507
1983	Borchert, J.	R. Birnie	Archaeological Investigations at 32GV404	32GV404	2760
1983	East, T.	J. Adovasio	Archaeological Investigations on Lone Butte McKenzie Co., ND	32MZ391, 32MZ537	3243
1983	East, T.	J. Adovasio	The Identification & Evaluation of Archaeological Resources on Selected State-Owned Properties in Billings, Golden Valley, & McKenzie Counties in the Badlands of the Little Missouri River, ND	32BI340 to 342, 32MZ635 to 637, 32MZ641 to 642	4190
1983	Floodman, M.		Ulteig Engineers Testing of Elkhorn Substation (32BI356)	32BI356	2820
1983	Floodman, M.		Veigel Engineering Sentinel Butte Step I Facility Report on Testing at Site 32GV32, Golden Valley Co., ND	32GV32	3296
1983	Root, M.	M. Gregg	Archaeology of the Northern Border Pipeline, North Dakota: Vol. 3, Test Excavations, McIntosh, Emmons, Morton, Stark, Mercer, Dunn, McKenzie, & Williams Counties, ND	32DU99, 32DU274 to 275, 32MZ487	3456
1984	Kuehn, D.		Intensive Cultural Resource Inventory & Subsurface Testing at the Proposed First Creek Bridge Replacement, Slope Co., ND	32SL33	3277
1984	Simon, A.	S. Dockter	Archaeological Testing at 32MZ38, C-One McKenzie Co., ND	32MZ38	3367
1984	Kuehn, D.		Preliminary Report on the Archaeological & Historical Investigation Along the Voight Bay Road, Dunn Co., ND	32DU174 to 175	3415
1984	Borchert, J.		Archaeological Testing Through 32GV404 & the Isolate 1 Area of the Proposed Cities Service Oil Co. Access Route to the Federal DK #1 Location	32GV404	3416
1984	Kuehn, D.	J. Wyckoff	Test Excavations at the Tyser-Olson Site (32DU605) & Norred Creek Site (32DU593), Dunn Co., ND	32DU593, 32DU605	3546
1984	Borchert, J.	A. Simon	The Rena Wynne Site Test Excavations at 32BI332, Billings Co., ND	32BI332	3549
1984	Floodman, M.		Getty Oil Company Covered Bridge A 10-6: Report on Preliminary Shovel Testing at Site 32MZ706	32MZ706	3675
1985	Kuehn, D.		Letter Report: Testing at Site 32BI428 for Proposed Billings County West River Road Improvement.	32BI428	3556

Year	First Author	Second Author	Title	Sites Tested	MS #
1985	Borchert, J.		Addendum to the Blacktail Bottom Site 32BI273, Billings Co., ND	32BI273	3562
1985	Kuehn, D.		Archaeological Evaluation at a Portion of 32BI358 & 32BI359, Ladd Petroleum Access Road, Billings Co., ND	32BI358 to 359	3644
1985	Floodman, M.		Milestone Petroleum, Inc. Preliminary Report, Archaeological Testing, Site 32MZ714, 34-19 Federal, McKenzie Co., ND	32MZ714	3683
1985	Blikre, L.	D. Kuehn	Final Report on Archaeological Evaluative Testing at Sites 32DU304, 305 & 306, Fort Berthold Indian Reservation, Dunn Co., ND	32DU304 to 306	3864
1985	East, T.	T. Jorstad	Archaeological Investigations on Cinnamon Creek Ridge, McKenzie Co., ND	32MZ224, 32MZ257 to 258, 32MZ260 to 261 32MZ319, 32MZ380	4056
1986	Blikre, L.	D. Kuehn	Blacktail Creek Road Improvement Testing of Site 32BI473	32BI473	4130
1986	Kuehn, D.	L. Perry	Archaeological & Historical Investigations Along the Voigt Bay Road, Dunn Co., ND	32DU174, 32DU175	4151
1986	Kuehn, D.		Final Report on Archaeological Testing at the Fantail Creek Ridge Site (32BI423 & 32MZ729): A Multiple Component Stone Circle Site in the Little Missouri Badlands of ND	32BI423, 32MZ729	4244
1987	Kuehn, D.	A. Porsche	Final Report on the Archaeological Testing Conducted at the Square Butte Site, 32GV17, Golden Valley Co., ND	32GV17	4245
1987	Shaw, T.	L. Loendorf	Results of Testing at 32GV137 a Sparse Lithic Scatter Within the Proposed Right-of-Way for Improvements Along West River Road Golden Valley Co., ND	32GV137	4248
1987	Blikre, L.	D. Kuehn	Subsurface Archaeological Testing of 32BI131, East River Road-Ash Coulee, Billings Co., ND	32BI131	4263
1987	Borchert, J.	K. Dowdy	Archaeological Testing 32DU303 Dunn Co. ND	32DU303	4268
1987	Kuehn, D.		Final Report Archaeological Testing at The Moody Plateau Site, 32BI450: A Lithic Raw Material Procurement; Workshop, & Campsite in the Little Missouri Badlands	32BI450	4269
1987	Shaw, T.	D. Kuehn	Results of Testing at 32SL44 Slope County Davis Dam Road Construction Project Slope Co., ND	32SL44	4315
1987	Kuehn, D.	L. Blikre	Final Report Archaeological Testing at 32BI459, Upper Magpie Road Improvement, Billings Co., ND	32BI459	4322
1987	Smith, G.		Archaeological Testing of 32BO84 & 32BO85	32BO84 to 85	4404

Year	First Author	Second Author	Title	Sites Tested	MS #
1987	Borchert, J.	T. Shaw	Evaluation of 32DU177, 32DU178 & 32DU179, Dunn Co., ND	32DU177 to 179	4425
1987	Borchert, J.		Test Excavations at 32MZ841-Conducted for Belle Fourche Pipeline - Section 8, T147N, R102W.	32MZ841	4450
1989	Peterson, L.		Subsurface Testing of 32BI737, 32BI738, 32BI739, 32BI740, and 32BI741 Along the Proposed Meridian 21-3H (s) Project	32BI737 to 741	4913
1989	Sanders, P.	K. Kempton	Archaeological Evaluation of Fifteen Sites Located Along Lake Sakakawea, Dunn Co., ND	32DU406, 32DU637, 32DU655, 32DU669, 32DU735, 32DU764, 32DU769 to 770	4924
1989	Fox, R.		Results of the Testing at Four Sites on Upper Magpie Road, Billings Co., ND (32BI460, 32BI461, 32BI462, & 32BI463)	32BI460 to 463	5032
1989	Newberry, G.	G. Tucker, Jr.	Results of Evaluative Testing at Archaeological Sites 32MZ936 & 32DU909 Along the Figure 4 Road, Fort Berthold Indian Reservation, McKenzie & Dunn Counties, ND	32DU909	5053
1990	Klinner, D.	J. Borchert	32BI632 Final Report on Evaluative Testing	32BI632	4738
1990	Blikre, L.		Final Report on the Evaluation of Site 32BI753 in Preparation for the Meridian 21-23 Well Pad Access Road	32BI753	5114
1991	Newberry, G.	B. Olson	Western Area Power Administration Charlie Creek-Belfield Transmission Line Project: Results of Limited Testing at Four Prehistoric Sites in Billings & McKenzie Counties, ND	32MZ1005 to 1006	5161
1991	Olson, B.		North Dakota Department of Transportation Evaluative Testing at Site 32DU1026, Along State Highway 22, Cultural Resources Inventory Dunn Co., ND	32DU1026	5523
1991	Toom, D.		Progress Report on the 1990 Archaeological Investigations at the Doaks Butte Site (32BO222), Bowman Co., ND	32BO222	5550
1991	Olson, B.		Evaluative Testing at Site 32DU1026, Along State Highway 22, Dunn Co., ND	32DU1026	5558
1991	Borchert, J.	D. Klinner	The Pretty Butte Site 32SL100	32SL100	5575
1991	Wermers, G.	L. Blikre	32GV97, The Sentinel Butte Flint Procurement Location: Final Testing Report	32GV97	5582
1991	Christensen, R.		Camel Hump Evaluative Excavation, 32GV159 & 32GV157	32GV157,	5590

Year	First Author	Second Author	Title	Sites Tested	MS #
				32GV159	
1992	Borchert, J.		32BI794 Evaluative Testing, Billings Co., ND	32BI794	5695
1992	Stine, E.	R. Christensen	Camel Hump Test Excavations of 32GV157 & 32GV159 Golden Valley Co., ND	32GV157, 32GV159	5824
1993	Blikre, L.	J. Borchert	32BI825 Evaluative Testing	32BI825	5927
1993	Kurtz, W.		Evaluative Testing of Site 32BI809	32BI809	5984
1994	Borchert, J.	G. Wermers	32MZ1184 Evaluative Testing	32MZ1184	6244
1994	McCarthy, M.		Evaluative Testing at Site 32MZ1182	32MZ1182	6258
1994	Borchert, J.	G. Wermers	32SL208 and 32SL210 Evaluative Testing Final	32SL208, 32SL210	6271
1995	Hilman, R.	C. Oliver	Results of Test Excavations at 32DU413, Dunn Co., ND	32DU413	6637
1996	Pool, K.		Meridian Oil's Steig 31-23H Well Pad & Access Road: Testing of 32BO195 & 32BO196, Bowman Co., ND	32BO195 to 196	6829
1997	Klinner, D.		Archaeological Testing of Site 32BI860 in Billings Co., ND	32BI860	6937
1998	Floodman, M.		Salvage Excavation at Two Sites on the McKenzie District, Little Missouri National Grasslands, McKenzie Co., ND	32MZ394	7192
1999	Olson, B.	G. Newberry	Final Report of Evaluative Testing of Sites Impacted by the Dakota Gasification Company CO_2 Pipeline: Mercer, Dunn, McKenzie, & Williams Counties, ND	32DU342, 32DU357, 32DU359, 32DU1176	7299
2000	Floodman, M.		Test Excavations at 32GSV211 Golden Valley Co., ND	32GV211	7568
2000	Klinner, D.	G. Wermers	Evaluative Testing at 32MZ1447, 32MZ1484, & 32MZx85	32MZ1447, 32MZ1484, 32MZX85	7941
2001	Floodman, M.		Test Excavation & Salvage at Two Sites on the Medora Ranger District, Slope & Golden Valley Counties, ND	32GV158, 32SL218	7886
2001	Klinner, D.	G. Wermers	Evaluative Testing at 32BO136, Bowman Co., ND, 2001 Field Season	32BO136	8020
2002	Wermers, G.		Evaluative Testing at 32GV216 & 32SL244	32GV216, 32SL244	8130
2003	Wermers, G.	J. Hertaus	Results of the Auger Probing Project at Sites 32BI829 & 32BI831, Billings Co., ND	32BI829, 32BI831	8625
2003	Wermers, G.		Southwest Pipeline Project-Medora to Beach Phase, Results of Shovel Probing at Sites 32GV79 & 32GV110 Along the Proposed Main Transmission Line, Golden Valley Co., ND	32GV79, 32GV110	8698

Year	First Author	Second Author	Title	Sites Tested	MS #
2005	Stine, E.	D. Hiemstra	Grasslands Pipeline: Archaeological Investigations in Billings, Dunn, Golden Valley & Stark Counties, ND	32BI936, 32BI937	9154
2005	Bluemle, W.		Evaluative Testing of 32BO324, Bowman Co., ND	32BO324	9295
2007	Toom, D.		Site 32BI249 Locality B Archaeological Test Excavations in the Little Missouri National Grasslands, Billings Co., ND	32BI249	10024
2007	Stine, E.		Evaluative Testing at 32MZ1827 McKenzie Co., ND	32MZ1827	10263
2008	Morrison, J.	J. Harty	Cinnamon Creek 1-30H: A Class III Cultural Resource Inventory & Evaluative Testing of Site 32MZ1196, McKenzie Co., ND	32MZ1196	10311
2010	Toom, D.	M. Jackson	Prehistoric Site 32BI1057 Archaeological Test Excavations in the Little Missouri National Grassland, Billings Co., ND	32BI1057	11415
2010	Banks, K.		Data Recovery at Archaeological Site 32GV97 for the Proposed Construction of a Control Structure at Western's Sentinel Butte Microwave Station in Golden Valley Co., ND: Management Summary	32GV97	11557
2010	Bluemle, W.	D. Reinhart	Burlington Resources Atlantic Express 11-30H Reroute: Class III Inventory & Evaluative Testing at 32DU30 & 32DU1555, Dunn Co., ND	32DU30, 32DU1555	12166
2012	Stine, E.		Burlington Access: Results of Test Excavations at 32MZ213 & Surrounding Area in McKenzie County, ND	32MZ213	13190
2014	Robinson, A.	M. Hull	Oscar Stohler #41-4H Well Pad Expansion: A Phase 2 Evaluative Testing & Magnetic Gradiometry Survey of 32DU1142 in Dunn County, ND	32DU1142	15367
2014	Kinsey, M.		Burlington Resources' CCU Mainstreeter 14-24MBH: Evaluative Testing at 32DU1481 in Dunn County, ND	32DU1481	15385
2014	Burns, C.		Evaluative Test Excavation of Site 32DU1199, Dunn County, ND	32DU1199	15567
2014	Klinner, D.		Evaluative Testing at 32GV302, BRO-0017(014), PCN 20421, Golden Valley County, ND	32GV302	15594
2015	Harty J.	K. Troendle	Killdeer Lateral NGL Transmission Line: A Class III Cultural Resource Inventory in Dunn County, North Dakota	32DU2216	16298
2016	Lange Mueller, A.		Bear Creek Natural Gas Liquids Pipeline Project Evaluative Testing: 32MZ487, 32DU99, 32DU2289, 32DU2290, 32DU2292, 32DU2295, and 32DU2299, McKenzie and Dunn Counties, North Dakota	32DU2289, 32DU2290, 32DU2292, 32DU2295,	16638

Year	First Author	Second Author	Title	Sites Tested	MS #
				32DU2299 32MZ487	
2016	Klinner, D.	A. Robinson	U.S. Highway 85 From the I-94 Belfield Interchange to the Watford City Bypass, NH-9-085(085)075, PCN 20046: A Class III Cultural Resource Inventory in Billings, McKenzie, and Stark Counties, North Dakota, Part 1	32MZ1446, 32MZ1473, 32MZ1754, 32MZ1755	17244
2017	Robinson, A.	D. Klinner	U.S. Highway 85, 9-085(085)075, PCN 20046: Evaluative Testing of Seven Sites on Federal Land in Billings and McKenzie Counties, North Dakota	32BI251, 32BI252, 32MZ1137, 32MZ1138, 32MZ1139, 32MZ3025, 32MZ3034	17638
2016	Klinner, D.		Evaluative Testing at 32BI713 for the Little Missouri River Crossing, FHO-02-04(001), PCN 16970: Billings County, North Dakota	32BI713	18430
2019	Madson, M.		Class I and Class III Intensive Cultural Resource Inventory of the Bear Creek Gas Plant Expansion Project, Dunn County, North Dakota	32DU2405	18478
2019	Varah, C.	C. Cook	National Register of Historic Places Evaluation of 32BO245 for Denbury's Cedar Hills South Unit CO_2 Lateral Pipeline, Bowman County, North Dakota	32BO245	18536
2019	Shaw, A.	A. Robinson	Watford City Municipal Airport: Evaluative Testing of Site 32MZ3021 in McKenzie County, North Dakota	32MZ3021	18687
2020	Robinson, A.		LK-BICE-147-96-0631H-4, 5, 6, 7, 8, 9 Well Pad, Production Pad, and Access Road Project: A Class III Cultural Resource Inventory and Evaluative Testing for Site 32DU2397 in Dunn County, North Dakota	32DU2397	18701
2020	Reich. A.		Evaluative Testing of Site 32DU1075 in Dunn County, North Dakota	32DU1075	18999

Radiocarbon dating yielded a conventional age of 2460±30 BP (late Middle Plains Archaic to Late Plains Archaic period) (ibid.:15-17). No cultural material was present in the paleosol; however, a soil sample returned a date of 6440±50 BP (Early Plains Archaic) (ibid.:18). Cultural materials and features indicated four potential areas of activity over different periods of time.

Limited testing was conducted at the Jim Creek Quarry site (32DU2216) in 2015 (Harty et al. 2015). The site is a medium density lithic scatter with observed artifacts representing all stages of KRF procurement activities. Geomorphic analysis and trenching of the site indicate three terraces (T1, T2, and T3) (ibid.:Figure 17). Testing revealed three zones: Zone 1 comprises two occupations in T1 and T2; Zone 2 is one occupation spanning a plowed area on T2 and T3; and Zone 3 consists of a single occupation across intact prairie on T2 and T3 (ibid.:70). Zones 1 and 3 are recommended eligible for listing in the NRHP.

Stone Circle and Cairn Sites

As of 31 December 2020, 214 stone circle sites have been identified during surveys (see Table 1.2) in this SU but only 8 (3.7%) have been formally tested. Table 1.5 lists the stone ring sites that have been tested or excavated. For sites to be listed in this table there had to be **formal testing (at least one 1-x-1-m unit)** at the site. Review of the literature reveals the changing research questions addressed over time for stone circles. Table 1.5 was developed so these data are readily available for researchers.

The monograph on stone circle sites in *Plains Anthropologist Memoir 19* is a valuable source of information (Davis 1983). Compilations of radiocarbon dates from sites in McLean, Mercer, and Oliver counties can be found in Strait and Peterson (2007:4.6-4.8), in Mclean County (Thomas and Peterson 2010:6.2-6.3) and from Besant/Sonota sites in Deaver and Deaver (1987). A useful discussion of single stone circle site function based on ethnographic accounts is available in Gregg et al. (1983:[3]864-869). An assessment of nomadic settlement-subsistence structure and bison ecology is discussed by Hanson (1983b:1342-1417). Additional references for stone features sites can be found in the reference section of the Cultural Heritage Form.

A total of 243 stone cairn sites have been recorded in the LMRSU (see Table 1.2). Suggested uses of cairns include markers for events and travel routes, bracing poles for a variety of camp structures, caches, drive lines, or covering a burial. Hecker (1937-1950:161) reports that piles of stones were placed over buffalo chip fireplaces to heat stones used to dry meat.

Table 1.5: Formally Tested Stone Feature Sites in the Little Missouri River Study Unit, 31 December 2020.

Site Number	Tested Feature Type	Test Unit Location	Cultural Material	Comments	Cultural/Temporal Affiliation	MS #
32BI423/ 32MZ729	Circles	Inside, outside	Yes	Hearth Radiocarbon dating	Plains Village/Plains Equestrian	4244
32BO136	Circles	Inside, outside	No			8020
32DU174	Circles	Inside	Yes			3415
32DU175	Circles	Inside, outside	Yes	Hearth Ceramics	Plains Village	
32DU175	Circles	Inside	Yes	Charcoal Radiocarbon dating Ceramics Thermoluminescence Obsidian hydration Pigment stone	Plains Village	4151
32DU655	Circle	Inside	Yes			4924
32MZ213	Circles	Inside	Yes	Hearth Radiocarbon dating Obsidian Ceramics	Plains Archaic Plains Village	13190

National Register of Historic Places

The Cinnamon Creek Archaeological District and the Custer Military Trail Historical Archaeological District are within the LMRSU. See the National Park Service website for a current list of sites listed in the NRHP within North Dakota.

Major Excavation Projects

Given the number of sites recorded, in comparison with other units, the percentage of major excavations here has been quite low (Table 1.6). This is because there has been more emphasis on avoiding significant sites in planning developments here than elsewhere. In other SU, significant sites have often been sought out and excavated. Here, developers and the land managing agencies have made great efforts to avoid damaging significant sites, although erosion and other natural forces in portions of the study area (e.g., badlands) continues to impact sites.

Mike Beckes (1988) selected six excavation reports as representative of stages in the development of archaeology within the Badlands portion of the LMRSU. He identified the work at the Grassy Butte site by Steve Lau (1981) as the first demonstration of the occurrence and research potential of multiple component sites in ridgetop settings. He noted the work by Simon and Borchert (1981b) at the Sunday Sage site (32BI22)—a site with remains from McKean, Pelican Lake, and Besant occupations—as the first to demonstrate that multiple component sites existed in lowland settings as well. He viewed the work at 32MZ333 and 32MZ334 as reported by Floodman et al. (1982) as the first to (1) yield samples of pottery sherds from Besant and late prehistoric components, (2) to

identify the remains of a possible residential structure other than a stone circle, (3) to obtain a small suite of C^{14} dates, and (4) to recognize there are components in the Badlands that are not classifiable within the presently defined range of named archaeological units. Work at the Ice Box Canyon site (32MZ38), with its distinct Pelican Lake cultural zone, was the first to reveal that multiple component sites on the ridgetops could be stratified and there are reasonable prospects for encountering single component Middle and Late Archaic deposits (Simon and Borchert 1981a). Then, Beckes singled out the work by the University of Pittsburgh's Cultural Resource Management Program on Cinnamon Creek Ridge as an exemplary large-scale multi-disciplinary effort, involving the expertise of soil scientists, geomorphologists, faunal analysts, and lithic analysts, which devoted attention to several sites as part of one program. It also resulted in the nomination and listing of a National Register district based upon the archaeological values (East et al. 1981, 1983, 1988). Finally, he identified Simon and Keim's (1983) work at the Marsh Hawk site (32BI317) as the culmination of archaeological research/management during the boom years of the early 1980s in the "oil patch" (Beckes 1988). The Marsh Hawk project again emphasized a multi-disciplinary approach. It resulted in the description of a cultural and environmental sequence spanning the past 5,000 years.

A large-scale excavation was conducted at 32DU1535 in 2011 because of a proposed pipeline gathering system (Altizer and Wandler 2012). Forty-four excavation units, dug to an average depth of 110 cm below surface, yielded 3,540 artifacts including chipped stone flaking debris, faunal bone fragments, chipped stone tools, and charcoal (ibid.:16-17). A possible hearth feature consisted of sandstone rocks. One projectile point fragment resembles the Archaic period Duncan style; four other projectile points suggest a Late Archaic occupation (ibid.). The preliminary analysis presented suggests the 32DU1535 is a camp or kill site dating to the Late Archaic. Only the portion of the site within the proposed project area was excavated. Further work is recommended for the site area extending north and south of the pipeline right-of-way.

In 2010, salvage excavations were conducted at the Government Creek site, 32BI135 (Toom and Jackson 2014). It is located on a stream terrace along Government Creek, a tributary of the Little Missouri River. Two block units were excavated at the center, revealing a cultural material scatter, two sandstone anvils, and a basin hearth. Medium-dense scatters of chipped stone artifacts and animal bone are not uncommon in the region, however, the recovery of the numerous sherds from two discernible ceramic vessels is not common. The vessels have been classified as Le Beau S-rim ware and Transitional S-rim ware (ibid.:5.8-5.13). Other artifacts of note include exotic chipped stone tools made from Spanish Diggings and Hartville Uplift chert (southeastern Wyoming) (ibid.:5.13-5.23). Radiocarbon and relative dating techniques chronologically place this field camp occupation in the AD 1500s or early 1600s, with the investigators speculating that the inhabitants were Hidatsa or Crow (ibid.:7.1).

Data recovery was undertaken at the Jim Creek Quarry site (32DU2216) in 2016 (Metcalf Archaeological Consultants 2018). Approximately 87 m^3 of material was excavated confirming the presence of a KRF quarry site (ibid.:i):

> Forty-six discrete cultural features were recovered during work at the Jim Creek Quarry Site, with seventeen individual features defined during data recovery excavations and another 29 features identified during the construction monitoring. Over 105,000 artifacts were identified and collected during this work including 119 bifaces; four Besant projectile points; 436 flake tools; 1,176 cores; 427 pieces of TRM; 102,965 pieces of debitage; 13 hammer stones; two anvils; one abrader and 44 pieces of bone. AMS dates on bone quarrying tools from 32DU2216indicate use of the site between 1970±30 and 1690±30 RCYBP.

Metcalf Archaeological Consultants recommends that further work include closer examination of sites in the LMRSU to refine our understanding of the transition from the Middle Plains Woodland period to the Late Plains Woodland period (ibid.:228). Extant portions of the Jim Creek Quarry site are recommended as eligible for listing in the NRHP under Criterion D.

Mitigation of site 32DU2237, including one 5-x-5-m excavation block, was conducted for the Dakota Access pipeline project in 2016 (Prouty et al. 2018). The natural setting is within a hilly area of the Missouri Plateau cut by ephemeral drainages of Jim Creek. Results reveal the site was a temporary camp used over centuries for activities including lithic tool production and maintenance. Obsidian sourced to Obsidian Cliff suggest interregional interaction (ibid.:i). Optically stimulated luminescence dates of sediments place camp use in the range of Middle Plains Archaic and Late Plains Archaic or Early Plains Woodland periods (ibid.:37). The unmitigated portion of 32DU2237 remains eligible for listing in the NRHP under Criterion D.

Table 1.6: Major Excavation Projects in the Little Missouri River Study Unit, 31 December 2020.

Year	First Author	Second Author	Title	Sites Excavated	MS #
1981	Aivazian, B.		Archaeological Mitigation at 32BI272, Billings County, North Dakota	32BI272	2452
1982	Simon, A.	A. Drybred et al.	Archaeological Investigations at 32MZ422, Concentrations Three & Five, McKenzie Co., ND	32MZ422	2759
1982	Campbell, J.		Archaeological Investigations at the Magpie Road Site (32BI286): An Occurrence of Blackduck Ceramics in the North Dakota Badlands, 1983	32BI286	2850
1983	Artz, J.	M. Root et al.	Archaeology of the Northern Border Pipeline, North Dakota: Vol. 5, Archaeological Investigations at 32DU37 & 32DU273: Two Sites Near the Killdeer Mountains in Dunn Co., ND	32DU37, 32DU273	3458
1983	Simon, A.	K. Keim et al.	The Marsh Hawk Site 32BI317, Billings Co., ND	32BI317	3550
1989	Larson, T.	D. Penny	The Highway 22 Project: Archaeological Excavations at 32DU178 & 32DU179, Dunn	32DU178, 32DU179	5096

Year	First Author	Second Author	Title	Sites Excavated	MS #
			Co., ND		
1990	Foster, J.		Vanvig Road Monitor & Salvage Excavation Results, Billings Co., ND	32BI751	5207
1992	Tucker, G.	B. Olson	The Figure Four Road Project: Data Recovery at Two Archaeological Sites on the Fort Berthold Indian Reservation, McKenzie & Dunn Counties, ND	32DU909	5931
1995	Klinner, D.		Results of the Subsurface Testing of a Portion of Site 32MZ841, McKenzie Co., ND	32MZ841	6524
2001	Toom, D.		Besant-Sonota on the Little Missouri River: The Doaks Butte Site (32BO222), Bowman Co., ND, Vols. 1 & 2	32BO222	7893
2005	Stine, E.	D. Hiemstra	Grasslands Pipeline: Archaeological Investigations in Billings, Dunn, Golden Valley & Stark Counties, ND	32BI936, 32BI937	9154
2012	Altizer, K.	C. Wandler	Archaeological Test Excavation of 32DU1535 in Association with the Proposed Arrow Fort Berthold #148-95-23D-14-1H, #148-95-26A-35-1H, #148-95-23D-14-2H, & #148-95-26A-35-2H Pipeline System, Dunn County, ND	32DU1535	13380
2014	Toom, D.	M. Jackson	Government Creek Site (32BI135) Archaeological Excavations in the Little Missouri National Grassland, Billings County, North Dakota	32BI135	19359
2018	Trader, P.	C. Kelly	Mitigation of Mitigation of Sites 32DU0930, 32DU1127, 32DU1326, 32DU2225, 32DU2237, 32DU2252, 32ME2599, and 32ME2617, Dunn and Mercer Counties, North Dakota for the North Dakota DAPL Project (8 volumes)	32DU930, 32DU1127, 32DU1326, 32DU2225, 32DU2237, 32DU2252, 32ME2599, 32ME2617	17832
2018	Rood, R.	K. Pool	The Jim Creek Quarry Site: Phased Testing and Mitigation at 32DU2216 in Dunn County, North Dakota	32DU2216	17940

Other Work

For a synthesis of archaeological investigations in the Dakota Prairie Grasslands, professional archaeologists, researchers, and students may consult Prehistory on the Dakota Prairie Grasslands: An Overview by Mervin G. Floodman (2012). The Dakota Prairie Grasslands, managed by the US Forest Service, comprises portions of the LMRSU, Yellowstone River Study Unit (YRSU), and the Garrison Study Unit (GSU). Floodman's overview spans the Paleo period through the Equestrian/Fur Trade period (9500 BC - AD 1880), compiling data from pedestrian surveys, evaluative testing, and larger-scale excavation. For each period, at least one site case study is provided, including: Pretty Butte (32SL100); Marsh Hawk (32BI317); Cinnamon Creek Ridge (complex of sites); Ice Box Canyon (32MZ38); Abraxas (32MZ333); Stone Circle (32MZ721); Magpie Road (32BI286); a complex of Mandan-Hidatsa eagle trapping sites;

Five Spades (32BI503); Fantail Creek (32BI423/32MZ729); and the Clear Creek project (32MZ1474 and 32MZ1475). Additionally, tables offer radiocarbon and obsidian hydration dates for the LMRSU and YRSU and radiocarbon dates for the GSU.

Publications

It is critical for archaeologists to publish their work to enhance public support and understanding of the value of conducting formal archaeological investigations. In the 2021 edition of the Archaeological Component of the State Plan, we include a table (Table 1.7) in each study unit of selected publications available to general audiences. Of particular interest may be the journal of the Plains Anthropological Society (*Plains Anthropologist*) and the journal of the North Dakota Archaeological Association (*North Dakota Archaeology*), in addition to published books.

Table 1.7: Selected Published References for the Little Missouri River Study Unit.

Author(s)	Year	Reference
Ahler, Stanley A.	1977	Lithic Resource Utilization Patterns in the Middle Missouri Subarea. In Trends in Middle Missouri Prehistory: A Festschrift Honoring the Contributions of Donald J. Lehmer, edited by W. R. Wood. *Plains Anthropologist* Memoir No. 13, Pt. 2. 22(78):132-150.
Allen, Walter E.	1982	Eagle Trapping in the Little Missouri Badlands. *Journal of the North Dakota Archaeological Association* 1:3-8.
Allen, Walter E.	1983	Eagle Trapping in the Little Missouri Badlands. *North Dakota History* 50(1):4-22.
Baugh, Timothy G., and Fred W. Nelson	1988	Archaeological Obsidian Recovered from Selected North Dakota Sites and Its Relationship to Changing Exchange Systems in the Plains. *Journal of the North Dakota Archaeological Association* 3:74-94.
Blikre, Lowell R.	1993	Cultural Implications of the Prehistoric Distribution of Sentinel Butte Flint in Western North Dakota. Master's thesis, Department of Anthropology, Northern Arizona University, Flagstaff.
Bowers, Alfred	1950	*Mandan Social and Ceremonial Organization*. University of Chicago Press, Chicago.
Bowers, Alfred	1963 [1992]	*Hidatsa Social & Ceremonial Organization.* University of Nebraska Press, Lincoln.
DeMallie, Raymond J.	2001	Teton. In *Handbook of North American Indians,* Vol. 13, edited by Raymond J. DeMallie. Smithsonian Institution, Washington, DC.
DeMaillie, Raymond J., and David Reed Miller	2001	Assiniboine. In *Handbook of North American Indians,* Vol. 13, edited by Raymond J. DeMallie. Smithsonian Institution, Washington, DC.
East, T., J.M. Adovasio, J. Donahue, T. Jorstad, and R. C. Carlisle	1983	Identification and Evaluation of Some Archeological Sites in Parts of McKenzie, Billings, and Golden Valley Counties, North Dakota. *North Dakota History* 50(2):23-31.
Floodman, Mervin G.	2012	*Prehistory of the Dakota Prairie Grasslands: An Overview*. US Forest Service, Bismarck, North Dakota.
Fox, Richard A. (editor)	1982	Abstracts of Unpublished Badlands Archaeology Papers. *Journal of the North Dakota Archaeology Association* 1:62.
Fredlund, Dale E.	1976	Fort Union Porcellanite and Fused Glass: Distinctive Lithic Materials of the Coal Burn Origin on the Northern Plains. *Plains Anthropologist* 21(73):207-212.

Author(s)	Year	Reference
Fredlund, Glen G., Linea Sundstrom, and Rebecca Armstrong	1996	Crazy Mule's Maps of the Upper Missouri, 1877-1880. *Plains Anthropologist* 41(155):5-27.
Huckell, Bruce B.	2009	Beach: A Clovis Cache in Southwestern North Dakota. *Current Research in the Pleistocene* 26:68-70.
Huckell, Bruce B.	2014	But How Do We Know If It's Clovis? An Examination of Clovis Overshot Flaking of Bifaces and a North Dakota Cache. In *Recent Discoveries and New Research*. Albuquerque, New Mexico.
Huckell, Bruce B., J. David Kilby, Mathew Boulanger, and Michael Glascock	2011	Sentinel Butte: Neutron Activation Analysis of White River Group Chert from a Primary Source and Artifacts from a Clovis Cache in North Dakota, USA. *Journal of Archaeological Science* 38:965-976.
Keyser, James D., and John L. Fagan	1987	ESP: Procurement and Processing of Tongue River Silicified Sediment. *Plains Anthropologist* 32(117):153-194.
Larocque, F. A.	1910	*Journal of F.A. Larocque from the Assiniboine to the Yellowstone, 1805.* L. J. Burpee, editor. Canadian Archives Publications 3. Ottawa.
Loendorf, Lawrence L., David D. Kuehn, and Nels F. Forsman	1984	Rainy Buttes Silicified Wood: A Source of Lithic Raw Material in Western North Dakota. *Plains Anthropologist* 29:335-338.
Lowie, Robert H.	1922	The Material Culture of the Crow Indians. *Anthropological Papers of the American Museum of Natural History* 21(3). New York.
Kornfeld, Marcel, George C. Frison, and Mary Lou Larson	2010	*Prehistoric Hunter-Gatherers of the High Plains and Rockies, Third Edition*. Left Coast Press, Walnut Creek, California.
Kuehn, David D.	1982	Quaternary Erosion and the Availability of Lithic Resources within the Badlands of North Dakota. *Journal of the North Dakota Archaeological Association* 1:43-54.
Kuehn, David D.	1997	A Geoarchaeological Assessment of Bison Kill Site Preservation in the Little Missouri Badlands. *Plains Anthropologist* 42:319-328.
Murray, Wendi Field	2011	Feathers, Fasting, and the Eagle Complex: A Contemporary Analysis of the Eagle as a Cultural Resource on the Northern Plains. *Plains Anthropologist* 56(218):143-153.
Root, Matthew J.	1985	The Olsen Ranch Site: Settlement in the Northern Badlands of the Little Missouri River. *Journal of the North Dakota Archaeological Association* 2:91-119.
Simon, Arleyn	1982	Prehistoric Pathways Across the North Dakota Badlands. *Journal of the North Dakota Archaeological Association* 1:55-61.
Thurman, Melburn D.	1988	The Little Missouri River; A Source of Confusion for Plains Ethnohistory. *Plains Anthropologist* 33(122):429-447.
Voget, Fred W.	2001	Crow. In *Handbook of North American Indians,* Vol. 13, edited by Raymond J. DeMallie. Smithsonian Institution, Washington, DC.
Wilson, Gilbert L.	1924	*The Horse and the Dog in Hidatsa Culture.* Anthropological Papers of the American Museum of Natural History 30(4).
Wilson, Gilbert L.	1928	*Hidatsa Eagle Trapping*. Anthropological Papers 30 (Pt. 4). American Museum of Natural History.
Wood, W. Raymond	1956	A Woodland Site Near Williston, North Dakota. *Plains Anthropologist* 3(6):21-24.
Wood, W. Raymond	1969	The Middle Missouri Region: Typology and Concepts. *Plains Anthropologist* 14(44):144-14.

Paleo-Indian Period

At first, one would imagine that Paleo sites should be commonplace in an unglaciated part of the state which invited settlement and other use by the earliest people to explore the Northern Plains. However, intact Paleo deposits are not to be found throughout vast portions of this SU which have been drastically modified by Holocene geomorphological processes. Yet prospects remain very good for the occurrence of these old sites in the southernmost portions of the Little Missouri drainage in Slope and Bowman counties. There is a need to verify this proposition through more inventory work.

Paleoenvironmental Modeling

According to Running and Wyckoff (1988), there may be some isolated archaeological sites on uplands within the South Unit of the Park where buried surfaces and cultural remains from early Holocene contexts may remain intact. But for the most part, there is minimal potential in the Little Missouri Badlands for the discovery of uneroded early Holocene landscapes. It is quite a different matter in the southern portion of this SU south of the Badlands. Prospects are great there for encountering buried land surfaces dating to Paleo times. How much landscape of Paleo-age remains intact in the southern portion of the LMRSU versus the northern portion?

Cultural Chronology

Paleo and Early Plains Archaic sites have been recorded in the Badlands, including recordation of a Plano point at 32BI122 in the northwestern portion of the Theodore Roosevelt National Park. In addition, there is a date of 9330 BP on soil humates from a depth of three meters in a ridgetop setting reported by Kuehn (1988a).

It seems reasonable that sites of the Goshen complex should be anticipated in the southern portion of this SU. The Mill Iron site in Carter County, Montana, lies less than 15 miles away from the southwestern corner of Bowman County.

Folsom, Agate Basin, Hell Gap, Cody, and Parallel-Oblique Flaked materials are reported by Beckes and Keyser (1983:93, 95) to have been found on lands of the McKenzie Ranger District of the Little Missouri National Grassland. However, part of the McKenzie District extends northward and westward out of the LMRSU into the GSU and YRSU. Which Paleo complexes are represented by sites within the Badlands in comparison with sites outside the Badlands?

Settlement Behavior

Much of the landscape that was available for settlement more than 7,500 years ago has been removed by erosion, and there are probably types of sites which formerly existed that have been totally removed from the archaeological record. There is a total lack of identification of settlement types. When there is an opportunity to carry out

excavations at a Paleo site here, the site should be sampled to the extent that settlement type can be determined (perhaps 25% or more), and the remainder should be preserved for future investigation.

Native Subsistence Practices

Paleo hunter-gatherers in the Little Missouri basin probably exploited bison much the same as people with Goshen material culture did at the Mill Iron site (24CT30) located a short distance away in eastern Montana (cf. Frison 1987, 1988b). Environmental conditions at that time may have been such that rugged local terrain was suitable for trapping large prey.

Direct evidence of Paleo subsistence is virtually nonexistent in the SU. Investigations at 32SL100 produced little in the way of faunal or floral remains (Borchert and Loendorf 1986). Were there regional differences in Paleo subsistence practices within the Northern Plains at different times during the Early Holocene as the result of small-scale environmental changes?

Erosion is postulated to have removed much of the Early Holocene fill in the Badlands, although some intact stratigraphic sequences are thought to remain in some deeply buried ridgetop settings (Kuehn 1988a). The situation may be similar in Little Missouri River terrace settings. These contexts should be expected to have potential to yield floral and faunal remains which would shed light on Paleo subsistence resource availability.

Technologies

Stoneworking technologies of late Paleo groups at the Pretty Butte site (32SL100) included production and maintenance of lanceolate points similar to Frederick and Lusk (Borchert and Loendorf 1986:2-3). Locally available raw materials such as Miocene flint predominate in the lithic sample; KRF was a relative rare occurrence in the recovered tool and flaking debris aggregates. Knife River flint was commonly the knapping material preferred by Paleo peoples in western North Dakota (Schneider 1982d).

At the Beach Clovis Cache site (32GVX48), on the Montana border, archaeologists were able to determine patterns of mobility of hunter-gatherers by identifying the presence of specific lithic raw materials. (Huckell 2014; Huckell et al. 2011) The small group of people that camped at the site came from the south and west, traveling to present-day North Dakota from eastern Wyoming via western South Dakota. They stopped at Sentinel Butte to collect Miocene flint for toolmaking. The cache stored bifaces in anticipation of returning to the location to restock tools.

Other aspects of Paleo technology in the basin are poorly known. Future research should be addressed at filling data gaps concerning technological systems of these early hunter-gatherers.

Artifact Styles

Several styles of lanceolate points have been recovered from the LMRSU. These include one Folsom specimen, Plano materials, and Frederick/Lusk materials from 32SL100. Given the spatial proximity to the Mill Iron site (24CT30), Goshen and other earlier Paleo remains can be anticipated as research continues in the southern Little Missouri basin. Projectile points have been noted in the rolling upland grasslands of McKenzie County. A Hell Gap/Agate Basin-style projectile point was recovered at 32MZ1447 (Klinner and Wermers 2000). Hiemstra (2006) reports a Scottsbluff/Hell Gap/Agate Basin-style at 32MZ1647. Materials observed at 32MZ1447 and 32MZ1647 indicate that both are multi-component sites (Paleo and Late Prehistoric). The contextual integrity at 32MZ1447 has been compromised due to disturbances (Klinner and Wermers 2000). In contrast, buried, datable deposits may still exist at 32MZ1647, and further investigation is encouraged (Hiemstra 2006). Are unrecognized Paleo artifact forms likely to be identified in the LMRSU?

Regional Interaction

Paleo chipped stone artifacts reported from the LMRSU were generally local stones (e.g., Miocene flint) or materials such as KRF which were available in abundant quantities a short distance away (cf. Ahler 1986; Root et al. 1986). Lithic procurement seems to have focused on the selection of good quality raw materials. Nonlocal sources of Hartville Uplift, Spanish Diggings, and Black Hills outcrop occur also. Hunting territories of Paleo groups may have been quite large so that occupation within the Little Missouri basin was characterized by short periods of intense use (cf. Binford 1983b:49). Stylistic similarity in projectile point types from within and beyond the LMRSU may be one indication of this overall long-term mobility. What other indicators for regional interaction besides patterns of lithic raw material use and dimensions of artifact style can be identified in the archaeological record for the Paleo period? Develop a database of raw materials for all study units to advance our understanding of directional movement of peoples and land use strategies.

Historic Preservation Goals, Priorities, and Strategies

No intentional destruction of intact Paleo deposits should be allowed. It is a high priority to locate the deposits, conduct formal test and major excavations, and protect remaining portions. The top priority should be to get the properties identified. Contract research funded by private developers and the federal government (e.g., oil and gas exploration, production, and transportation companies and lands managed by the National Park Service, the USFS, and the BLM) should result in ample coverage of the central and northern portions of this SU. Grants may be sought to fund a well-designed sample survey of high probability spots in the southern portions of the LMRSU.

Plains Archaic Period

Cinnamon Creek Ridge is representative of many long ridgetops in the Badlands with an abundance of Archaic sites. There are several Oxbow components on Cinnamon Creek Ridge (East et al. 1981, 1983, 1988). At 32MZ388, stratum 2, there is an Early to Middle Plains Archaic deposit in undeveloped sediments between paleosols. All other deposits are in paleosols. The earliest absolutely dated intact deposit on Cinnamon Creek Ridge is from about 3400 BC (ibid.).

Paleoenvironmental Modeling

Middle Archaic components dating to late Holocene times are the earliest components that occur as intact deposits with any regularity in the Badlands. Such deposits are typically associated with buried topsoils that are sometimes exposed along the eroding edges of ridgetops. It is rare for earlier paleosols to be seen underlying Middle Archaic materials (Running and Wyckoff 1988). Modeling is quite well advanced in the heavily dissected Badlands portions of the SU. Information concerning the un-eroded southern portions is light in comparison. How well are the various Members of the Oahe Formation, as described by Clayton et al. (1976), represented in the Holocene sedimentary sequences of the southernmost portions of the LMRSU?

Cultural Chronology

Early Archaic components are indicated by finds of Simonsen and Oxbow points. A heavily patinated KRF Simonsen point was found as an isolated find near the headwaters of Cherry Creek in the extreme northern portion of the SU (Root 1983w: 669, 686). Another “large side notched” point was recovered from an intact deposit of Early Archaic materials of the Tysver-Olson site (32DU605) just west of the Killdeer Mountains, also in the northern part of the basin (Kuehn 1984: Figure 6g). An Early Archaic Oxbow point was surface collected from the Olsen Ranch site (32MZ487) (Root 1985).

Three Oxbow projectile point fragments were found during testing at 32MZ1184 (Borchert and Wermers 1994a). This multi-component site is situated in grassy uplands of the badlands. In addition to the Oxbow points, radiocarbon dates of charcoal samples indicate an occupation ca. 650±50 BP or the Late Prehistoric period (ibid.). The site appears to have been used for lithic procurement and tool maintenance and production. A variety of artifact and raw material types were recovered. Opportunity exists at the site for future research concerning the Oxbow complex.

Two of the 15 radiocarbon dates on humic acids from paleosols at sites on Cinnamon Creek Ridge are of late Early Plains Archaic period antiquity (Jorstad et al. 1986:Table 1). These dates, apparently uncorrected and uncalibrated, are 3405±100 BC and 3365±60 BC from 32MZ380A and 32MZ380C (ibid.). The dates are posited to be from the Lower Thompson paleosol, the earliest buried soil discovered by University of Pittsburgh archaeologists on Cinnamon Creek Ridge. There are another 10 radiocarbon

dates from 32MZ319 and 32MZ380 that probably represent age determinations for buried soils upon which Plains Archaic peoples dwelled. These dates span the era from 2570-155 BC (ibid.). While some of these dates may not be very accurate (there is a Duncan point from the soil that is dated 2570 BC), most of the buried soils contain some artifacts indicating recurrent occupations during the Middle and Late Plains Archaic periods. A soil dated to 870±70 BC at 32MZ380A yielded a Pelican Lake point (ibid.:176).

Middle Plains Archaic components are among the best sampled cultural deposits thus far investigated in the LMRSU. A McKean Lanceolate component was present at the multiple component Sunday Sage site (32BI22). The collection includes one heavily patinated Mallory point (Simon and Borchert 1981b:Figure 13d). Middle Archaic remains were also encountered at the Ice Box Canyon Ridge site (32MZ38). One date of 4130±120 RCYBP was obtained from hearth feature charcoal. Diagnostic artifacts included a KRF Hanna or Duncan point base (Simon and Borchert 1981a:Figure 6c).

Four McKean Lanceolate points were recovered from the Big Gulch-Chase site (32DU273) (Artz et al. 1983). A Hanna point and a McKean Lanceolate point were surface collected from a ridgetop setting at the Olsen Ranch site (32MZ487) (Root 1985). Survey work in the Theodore Roosevelt National Park has identified several additional Middle Archaic sites in the Badlands portion of the SU (Kuehn 1988a). One of these (32BI614) is a probable base camp.

A hearth eroding out of a cut at the Bottleneck site (32MZ394) was salvaged in 1997. Radiometric analysis dates a charcoal sample to 3550±60 BP (McKean Complex of the Middle Archaic) (Floodman 1998). Other cultural materials include surficial lithics and fire-cracked rock. Floodman (2001) salvaged a hearth from 32GV158, a site situated on a terrace overlooking Knutson Creek. The site is multi-component with McKean Complex projectile points recovered from the surface and a radiocarbon date range of AD 620-790, or the Old Women's phase of the Late Woodland, for the hearth (ibid.).

Two similar Middle and Late Archaic sites were recorded during testing along Lake Sakakawea in Dunn County (Sanders and Kempton 1989). Site 32DU132 is located at the former confluence of Jim Creek and the Little Missouri River. It appears the site was used for lithic reduction. One porcellanite basal stemmed projectile point and one KRF basal stemmed projectile point indicate a Middle Archaic occupation (ibid.). The Late Archaic occupation is evinced by one KRF corner-notched projectile point like the Pelican Lake style (ibid.). Point styles also date two occupations at 32DU770. A patinated KRF stemmed projectile point is reminiscent of the Middle Archaic (ibid.). The Late Archaic tool is a small, patinated white chalcedony corner-notched point (ibid.). The site is on a small knoll where two buried stratigraphic levels were revealed in the cutbank. Additional artifacts at the site include debitage, fire-cracked rock, bone, and seven pieces of obsidian. The obsidian was sourced to Yellowstone Park, Wyoming (ibid.).

Late Archaic Pelican Lake components have been reported from several important sites in the Little Missouri Badlands. These include radiocarbon dated deposits at the

Sunday Sage site (32BI22) (Simon and Borchert 1981b). Distinct Pelican Lake levels were encountered during excavations at the Ice Box Canyon Ridge site (32MZ38) (Simon and Borchert 1981a). Aivaizian (1981) reported dated materials from 32BI272. Pelican Lake components were also documented at the Big Gulch-Chase and Olsen Ranch sites (Artz et al. 1983; Root 1985). Kuehn (1988a) reported finding fewer Pelican Lake sites than earlier Middle Plains Archaic components in the Theodore Roosevelt National Park. Was occupational intensity in the LMRSU more intensive during the Middle Archaic period than during the Late Archaic period?

Settlement Behavior

Hill (1988) proposed that Middle Plains Archaic McKean settlement in the Badlands took the form of a core territory being utilized by a local group. He further postulated a centrally based circulating Archaic settlement system much like that hypothesized by Keyser and Davis (1984) for the Lightening Spring/Bowman Haley region in the Grand River SU and extending southward into South Dakota. In this type of settlement system, a series of smaller field camps were established in the territory around a long-term base camp. Kuehn (1988a) suggested this pattern may be represented in the Badlands areas within the Theodore Roosevelt National Park. Duncan and Hanna sites on Cinnamon Creek Ridge have been identified as hunting camps (cf. East et al. 1981, 1983, 1988). Securing representative samples of Middle Archaic deposits can present quite a challenge in some circumstances. For example, in one case at Cinnamon Creek Ridge, a Duncan point was found eroding from a paleosol buried seven feet (two meters) below the surface.

Pelican Lake settlement placement in the Badlands included both ridgetop and terrace settings (Hill 1988). Hill contends there was a settlement shift from Middle Plains Archaic times due to increased aridity making it necessary for Late Archaic groups to rely on a broader range of environmental settings for subsistence. Kuehn (1988a) has countered by suggesting that this suspected settlement feature may represent differential site preservation resultant from erosional degradation within unstable drainage basins. Large amounts of older sediment (>ca. 2,800 years) may have been removed and redeposited, possibly destroying some Middle Archaic sites and deeply burying others. This line of inquiry provides an impetus for continued settlement pattern research in the LMRSU. Was there a significant shift in settlement practices from Middle to Late Plains Archaic times in the Little Missouri basin?

Native Subsistence Practices

Subsistence practices at Middle Plains Archaic base camps and field camps are suspected to have included hunting and butchering of game animals such as bison, elk, deer, and antelope (cf. Keyser and Davis 1984; Syms 1969). Plant foods were likely being gathered and processed as evidenced by hearths and roasting pit features at ridgetop sites such as Sunday Sage (32BI22).

Late Plains Archaic Pelican Lake subsistence is postulated to have focused principally on bison procurement, relying much less on small game and plant foods in the diet than during the preceding Middle Plains Archaic period (Beckes and Keyser 1983:103). Bison remains have been identified from several Pelican Lake components including one at the Ice Box Canyon Ridge site (32MZ38) (Simon and Borchert 1981a). Additional investigations involving systematic use of fine-screen recovery techniques will be necessary to test this proposition concerning Plains Archaic diet and subsistence. Were there actually significant differences between Middle and Late Archaic subsistence practices in the LMRSU?

Technologies

Pelican Lake lithics are mainly nonlocal high quality KRF and porcellanite. Badlands porcellanite is generally poor in quality. However, there are some indications that local porcellanite was utilized not just for expedient purposes but also to fashion patterned tools. A porcellanite McKean Lanceolate point fractured during manufacture by a shot-through basal thinning flake removal suggests use of local material to make McKean Lanceolate points (cf. Root 1983x; 669, 708). However, the piece that was being worked might have been a preform derived from a Tongue River basin quarry source. What was the extent of utilization of local porcellanite by Early, Middle, and Late Archaic populations in the LMRSU?

Artifact Styles

Numerous Early, Middle, and Late Plains Archaic projectile point styles have proven to be reliable cultural/temporal indicators for relative dating in the SU. The existing radiocarbon chronology for the basin is in general agreement with the statewide model. It would be desirable for other diagnostic artifact types/styles to be identified to culturally classify even more lithic scatters and cultural material scatter sites in the basin. Are there diagnostic attributes of core or flake morphology which can be used to identify specific Archaic periods or complexes in lieu of diagnostic points?

Regional Interaction

Regional interaction in the LMRSU during Plains Archaic times is evinced by the recovery of nonlocal stone materials from sites containing dated deposits or culturally diagnostic artifacts. Kuehn (1988a) reported that an obsidian flake from a McKean component at 32BI614 along with other specimens from 32BI557 and 32BI567 were submitted for source affinity testing. Test results identify the origin of the specimen from the McKean component at 32BI614 as “Obsidian Ridge in Wyoming” (David D. Kuehn, personal communication to Gregg, January 14, 2008). The presence of obsidian indicates interaction with areas to the west in the Rocky Mountains (cf. Sappington 1984; Wright and Chaya 1985). Hughes (2006:371-372, Figure 20.4) notes the Treasure Cave site (39LA504) in the northern Black Hills where thousands of obsidian flakes are reported.

Most recognized Plains Archaic point styles represented in the LMRSU show closest stylistic affinities with Northern Plains archaeological complexes. Regional interaction during the Middle Plains Archaic is suspected to have been most frequent with adjacent areas such as the Grand River drainage basin to the southeast. Late Plains Archaic Pelican Lake groups may have been more mobile. What evidence is there for more extensive regional interactions during the Early, Middle, and Late Archaic periods?

Historic Preservation Goals, Priorities, and Strategies

The identification of additional Early Plains Archaic components in the SU remains a top priority. Middle and Late Plains Archaic cultural deposits are better known, and many of these have been preserved for future research. Well-structured research programs should be designed and implemented to gather more detailed information and test more refined research questions concerning Plains Archaic settlement patterns, subsistence practices, and technologies in the LMRSU.

Plains Woodland Period

Sites of the Middle and Late Woodland periods are known to occur here and should be anticipated throughout the SU except where sedimentary contexts of 2,000 years and less in age have been removed by erosion. The occurrence of Early Woodland sites here is questionable. However, many of the Pelican Lake components in this SU date to Early Woodland times, and some should eventually be found to contain potsherds. Very small, arrowpoint-sized corner-notched dart points seem to characterize Late Plains Archaic and Early Plains Woodland components dating to around 2500 RCYBP elsewhere in the Northern Plains. They do occur in the LMRSU.

There may be a question here regarding the classification of components dating to the Early, Middle, or Late Woodland period yet lacking ceramics. Such components should be classified according to the archaeological complex represented. They would then be assigned to one of the Woodland periods based on radiocarbon or other age determinations whether they contain sherds or not. An example is the 2016 data recovery at the Jim Creek Quarry site, 32DU2216 (Metcalf Archaeological Consultants 2018).

Paleoenvironmental Modeling

Mesic weather conditions during the Sub-Atlantic climatic episode (1000 BC-AD 400) are thought to have coincided with Besant/Sonota cultural developments in the LMRSU as has been proposed for most other adjoining regions of the Northern Plains. Further geoarchaeological and pedological research will surely aid in clarifying the nature of late Holocene landscape evolution in the Little Missouri Badlands during this period (cf. Kuehn 1988a). Running and Wyckoff (1988) have shown that buried soil horizons occur in upland settings within the Theodore Roosevelt National Park. Cultural deposits spanning all the Plains Woodland periods should be anticipated there. It is not clear if buried soil horizons and sediments of these ages occur within the Little Missouri

River terraces and bottomlands. Do Early and Middle Plains Woodland cultural deposits occur within buried soil horizons in the bottomlands of the Little Missouri valley?

Cultural Chronology

The earliest dated Woodland components in this SU are classified as Besant/Sonota, and they are numerous. There is a radiocarbon dated Besant/Sonota component at the Sunday Sage site (32BI22) (Simon and Borchert 1981b). Another Besant/Sonota component with pottery has been radiocarbon dated at 32MZ333 (Floodman et al. 1982). There are also late prehistoric components at 32MZ333 and 32MZ334 (Floodman et al. 1982).

During the summers of 1990 and 1991, UND conducted excavations for the BLM at the Doaks Butte site (32BO222) in Bowman County (Toom 2001). The primary question posed by investigators was whether the Besant and Sonota complexes were distinguishable from one another. The site is situated within badlands terrain, south and southwest of the butte at the confluence of the Little Missouri River and Box Elder Creek. It is in the extreme southwestern portion of the zone where the Besant and Sonota complexes overlap. The site appears to have been inhabited by bison hunters and gatherers, exploiting local raw materials, and importing higher quality KRF from the north. Based on site size (5.5 acres), the artifact styles and variety, and the two distinct occupation clusters in the main site area, an interpretation of a combined Besant/Sonota complex is suggested. Radiometric tests date the site to ca. AD 215 or the early Middle Woodland (ibid.:14.1). Essentially the site is Archaic except for the identifiable Woodland ceramics. Toom (ibid.) suggests a Besant/Sonota macroband occupation evinced by the site size, Sonota-related ceramics, and Besant-type projectile points (ibid.:14.4). He encourages future investigations of this hypothesis.

There seems to be relatively little in the way of Avonlea points or Avonlea ceramics in the Badlands or in western North Dakota in general (Johnson 1988). That seems odd with the Goheen site located not far to the west and several Avonlea ceramic sites to the north in the Garrison SU.

Settlement Behavior

Early Plains Woodland components, if they do exist this far west in North Dakota, may share similarities in settlement preferences with preceding Late Archaic Pelican Lake and subsequent Besant/Sonota cultures in the basin.

Besant/Sonota sites are very well represented. These include stone circle sites, large base camps, and hunting camps (Hill 1988). A group of three Besant/Sonota sites (32MZ954, 32MZ946, 32MZ957) containing ceramic remains were in the Mandal Spring locality within the Theodore Roosevelt National Park. These appear to be single component sites, suggesting some degree of temporal contemporaneity (cf. Kuehn 1988a). Middle Plains Woodland settlement practices in the Little Missouri Badlands were undoubtedly linked with dependable water supplies. Do Besant/Sonota settlement

systems reflect a core territory being occupied by a local Badlands group with base camp and satellite field camp locations, like that proposed for Duncan groups by Keyser (1984) and Hill (1988)?

Late Plains Woodland settlement practices in the LMRSU are not well known. A Late Woodland vessel was recovered from a ridgetop field camp along Magpie Road (Campbell et al. 1983). Are there any Late Plains Woodland/Formative Village complexes represented in the basin?

Native Subsistence Practices

Bison are thought to have been the single most important food resource available to Plains Woodland groups in the Little Missouri basin. Identified Besant/Sonota base camps in the Badlands such as 32MZ954 contain faunal remains (Kuehn 1988a). Bison and antelope bones have been identified in Besant components on USFS lands (Hill 1988). The role of plant resources in the diet of these peoples remains to be demonstrated. Fine-screen recovery aimed at collecting botanical remains will provide some much-needed hard data concerning Middle Plains Woodland subsistence in the basin. Future analyses of organic residues found adhering to ceramic sherd interiors should provide important new clues concerning the nature of Plains Woodland dietary preferences. Were there significant differences in the roles of plant/vegetal foods in the diets of Besant/Sonota groups in the LMRSU compared with the diet of Besant/Sonota groups who lived along the Missouri River and waterways further east such as the James River?

Technologies

Middle Plains Woodland pottery was the oldest identified in the Badlands as of 1989. Many of the Besant/Sonota sites contain ceramics. However, none of the Badlands Middle Plains Woodland pottery yet discovered displays any affinity to Midwestern Woodland ceramics (Johnson 1988). Ceramic influences or traits from Middle Woodland cultures using the prairie-woodland ecotone in Manitoba or Minnesota should eventually be identified here.

Lithic technologies of Besant/Sonota groups in the SU involved heavy utilization of KRF procured from the quarries supplemented with stones found in the Badlands (cf. Kuehn 1988a). This general pattern of lithic resource use appears to have been characteristic for the Middle Plains Woodland period in general (cf. Clark 1984). Did any of the local stones from Badlands sources serve special purposes in Besant/Sonota lithic technological systems?

The occurrence of substantial quantities of fire-cracked rock at several investigated Besant/Sonota sites suggests a long-term reliance on hot rocks for heat transfer. Stone boiling and baking with hot rocks were associated with food production at both temporary camps and base camps such as the Sunday Sage site (32BI22) (cf. Floodman et al. 1982; Simon and Borchert 1981b:101).

Artifact Styles

Large Besant side-notched dart points have been recovered at several sites including 32MZ954 in the Theodore Roosevelt National Park (cf. Kuehn 1988a, 1989). This site produced large side-notched bilateral cutting tools of an unusual style not previously reported in the literature. This unique tool style may prove to be a Middle Plains Woodland period temporal indicator in the basin.

Middle Plains Woodland potsherds found at three sites in the Theodore Roosevelt National Park are stylistically like other pottery from regional sites such as Abraxis (32MZ333) (Floodman et al. 1982) and High Butte (32MZ2) (Wood and Johnson 1973). Sherd samples have been too small to do much in the way of stylistic descriptions or analyses.

Nonlocal shell and metal artifacts are very rare occurrences in Besant/Sonota assemblages in the basin. A portion of a Gulf Coast conch was surface collected from a site in the Theodore Roosevelt Park (Kuehn 1988a); however, the age and cultural affiliation of the find are not known. Do distinctive styles of exotic stone, shell, and metal artifacts occur in Besant/Sonota cultural deposits in the Little Missouri basin?

Regional Interaction

During the Middle Woodland period especially, there was movement of flintknapping materials across this area. Knife River flint was transported westward, and obsidian moved eastward. Is there evidence in the form of greater quantities of stage 3 and stage 4 KRF bifaces and biface fragments (cf. Callahan 1979) on Besant/Sonota sites in this SU to support the proposition of increased westward flow of this material at that time? What nonlocal materials are found in Woodland components of different ages in the Little Missouri basin?

There is need to compile a comprehensive list of the nonlocal materials and exotic artifacts that have been recovered from dated Woodland contexts in the LMRSU.

Other stones such as exotic cherts from the Rocky Mountain region may have been involved as well. A flake of a nonlocal bright green chert (probably from a western source) was found in association with Besant side-notched points and ceramics at 32MZ954 (Kuehn 1988a). A portion of a conch shell from a Gulf Coast source was found at 32BI625 within the Theodore Roosevelt National Park (ibid.). Unfortunately, other diagnostic artifacts were not recovered. This specimen may represent exchange relations dating to the Middle Plains Woodland period or possibly the Plains Village period (cf. Lehmer 1971; Neuman 1975). Were any of the ridgetop "pathways" across the Badlands (cf. Simon 1982) integral components of long-distance Middle Woodland travel routes which linked the Rockies and the Midwest?

Historic Preservation Goals, Priorities, and Strategies

The identification of cemetery locations used by people with Besant/Sonota material culture in the LMRSU is a goal which merits further attention. The presence of base camps as well as temporary camps in the basin suggests that Middle Plains Woodland groups may, at times, have had core territories which included all or part of the basin. If this is the case, there might very well be mortuary sites in the basin.

Plains Village Period

Excavations at the Connell Ranch site (32BI439) were reported by Metcalf (1988). This site is situated in overbank deposits on the eastern bank of the Little Missouri River and has been covered by up to one meter of slopewash clays. There has been 29 m^2 of excavation which sampled a variety of depositional contexts including sheet midden. Recovered artifacts included butchered bison bone, Plains Village ceramics, chipped stone flaking debris, stone tools, and a stone bead. Fetal bison bones indicate butchering events occurred here during February and April. Based on cross dating of ceramic vessel forms and decorations, the site is estimated to have been occupied during the AD 1600s or 1700s. Ann Johnson has identified the pottery as "Extended Coalescent." Most of the stone artifacts are KRF indicating group use of other portions of western North Dakota. Bone grease is thought to have been rendered in pots heated directly over fires and not using hot stones because excavations recovered abundant fragmented bone but no fire-cracked rock. On the other hand, this could be a matter of sampling error, especially because only 29 m^2 were excavated.

Paleoenvironmental Modeling

A model covering the climatic history of the Little Missouri valley during the Plains Village period needs to be developed and formally tested using data collected from archaeological sites in the basin. It is important to know if the valley was used continuously or only occasionally during Plains Village times. What were the effects of the "Little Ice Age" (Neo-Boreal climatic episode) on Plains Village use of the LMRSU?

Cultural Chronology

Site 32MZ380D on Cinnamon Creek Ridge has been reported to hold an Initial Middle Missouri deposit within a cultural zone overlying a paleosol dated AD 1285±40 (Jorstad et al. 1986:179). The Initial Middle Missouri cultural classification is based on potsherd attributes (ibid.). This would not be too surprising given the occurrence of a vessel classifiable as Anderson Low Rim ware from the Mondrian Tree site (32MZ58) to the north along the Missouri River (Craig Johnson 1983). There is a need to describe ceramic samples such as these using attributes and terminology employed in more recent Plains Village ceramic studies in North Dakota (i.e., Ahler and Swenson 1985a; Johnson 1980). In this way, narrative descriptions can be used to supplement illustrations in conducting worthwhile comparative analyses through library research. What chronological considerations are required to appropriately extend the use of a named

archaeological unit such as Initial Middle Missouri to a region removed from the southern Middle Missouri subarea where it was defined?

Settlement Behavior

On the Little Missouri Grasslands, Plains Village sites are found primarily on high ridgetops (see NDCRS files). The lack of variety in site settings prompted Hill (1988) to suggest that the settlements established by Villagers in this area were primarily the result of special purpose visits to the Badlands.

A stone circle excavation at the Bear Den site (32DU175) on a hilltop overlooking the Little Missouri valley yielded 1,542 pieces of flaking debris, 19 chipped stone tools, 1,400 sherds, 500 g of bone (mostly from a 4–5-year-old bison), 28 kg of fire-cracked rock, shell, ground stone, pigment stone, and manuports in a 30 m^2 excavated area (Kuehn and Perry 1986:75). One Knife River Plain ware vessel and one Knife River Fine ware vessel were represented. Excavation was primarily within the stone circle. Flintknapping debris was concentrated in the northern portion of the ring interior, while food preparation refuse was concentrated in the southern and central parts of the ring interior (ibid.: 172). Three thermoluminescence dates on sherds yielded a weighted average age of AD 1770±18 which agrees with the ceramic typological date of AD 1750-1861 based on the Knife River Plain vessel (ibid.). This site very likely represents a field camp used by a family group out (1) hunting and gathering subsistence resources, (2) collecting stone raw material for toolmaking, and (3) perhaps gathering or collecting other technological resources.

Some of the conical timber lodges in the Badlands were used by Villagers (cf. Allen 1982; Sperry 1981). Some of these may have been used by people who were living a mixed Village/Euro-American lifeway. Four apparently modern-age conical timber lodges have been found in the Theodore Roosevelt National Park (Kuehn 1988a).

The Plains Village eagle trapping site complex is treated by Allen (1982). Eagle trapping was a traditional activity which was conducted in traditional ways (Field Murray 2011; cf. Wilson 1928). How far back into prehistory can complexes of sites associated with eagle trapping be traced?

Native Subsistence Practices

The Connell Ranch site (32BI439) collection contains one of the largest faunal samples recovered from a tested Plains Village campsite in the SU. Bison remains (both mature and fetal specimens) were best represented. Do faunal remains from Plains Village sites, such as the Connell Ranch, support Hill's (1988) proposition that Plains Village use of the Badlands region was primarily "special purpose" in nature? Hurt's (1969) seasonal economic model for the Arikara, and research by Bowers (1950, 1965) and Wilson (1917) among the Hidatsas and Mandans, provide important baseline information which will serve future Plains Village subsistence research in the SU.

Technologies

There is Extended Middle Missouri pottery from several sites in and around this SU (Craig Johnson 1988). There are several specimens in the Ekalaka (Montana) museum. The apparent lack or paucity of Riggs ware is curious. Sperry (1981) noted Fort Yates S-Rim ware from excavation at a conical timber lodge. Testing at 32MZ1005 recovered two Talking Crow ware rim sherds, dating one component of the site to the Extended Coalescent Variant (Newberry and Olson 1991). An earlier occupation was dated by obsidian hydration to 240 BC±67 (Plains Woodland) (ibid.). The ceramic assemblage and obsidian presence at 32MZ1005 is like the Nollmeyer Village (24RL1225). Nollmeyer is a fortified Extended Coalescent, site with 10 known earthlodges within view of the Badlands, in Montana. Sites 32MZ1005 and 24RL1225 are part of a series of sites indicative of past peoples traveling between the Yellowstone River valley and the Missouri Coteau (ibid.). The Connell Ranch site (32BI439) ceramics are like Mortlach in some ways. Western South Dakota has a fuller range of Plains Village sites than western North Dakota. After AD 1500, there was a heavy Arikara/Coalescent influence in western North Dakota according to Johnson (1988). Is it possible that some of this Coalescent material is from Cheyenne settlements?

Artifact Styles

Plains Village pottery has been recovered from several sites in the Badlands. Ceramics showing affinities to Knife River ware have been found at the Connell Ranch site (32BI439) (Metcalf and Schweigert 1987) and 32SL208 (Borchert and Wermers 1994b). Shaw and Kuehn (1987) reported a small collection of sherds from the Davis Dam site (32SL4). Check stamped and simple stamped pottery has been found at a few sites in the Theodore Roosevelt National Park (Kuehn 1988a). Are ceramic remains like those identified as Mortlach more common than actual Plains Village remains in the LMRSU?

Regional Interaction

Site 32BI503, located in the Medora Ranger District of the Little Missouri National Grassland, contains Late Archaic and Plains Village components. Artifacts found at the site include a red porcellanite Late Plains Archaic Samantha point, a chalcedony Late Plains Archaic Samantha point, two obsidian Late Prehistoric Plains side-notched projectile points, and one ceramic sherd of the Heart River phase or the Scattered Village complex (Floodman 1989d). Obsidian hydration samples date to AD 1630±11 and AD 1657±38 (ibid.). The site marks the first recovery of obsidian in the Little Missouri National Grassland sourced to Camas-Dry Creek, Idaho (ibid.).

Plains Village groups are ethnohistorically and ethnographically known to have exploited the Little Missouri River Badlands for a variety of resources, including eagles (cf. Allen 1982; Bowers 1950:232-233; Wilson 1928). Conical timber lodges usually associated with eagle trapping forays have been identified at several locations within the

SU (Allen 1982; Kuehn 1988a; Sperry 1981). How far did Villagers travel to catch eagles in the Badlands?

The Black Widow site (32BI751), situated on an upland flat above Dantz Creek in Billings County, appears to have served as a short-term campsite with activities including bison hunting and processing (possibly grease manufacture) and procurement of grey porcellanite (Foster 1990). Three hearths, charcoal, bone and burnt bone, two flake concentrations, and debitage were present at the site prior to salvage. Here, radiocarbon samples date to 320±130 BP or AD 1500-1760, although the samples are suspect due to shallow deposition (ibid.). These dates suggest a Plains Village or Equestrian period occupation. Investigators suggest nearby Holocene deposits along the ridgetop for future work.

For decades researchers have studied a trio of Hidatsa village sites (32ML39, 32DU2, and 32DU1) known as Nightwalker's Buttes (Lippincott 2007). Most of the information about these sites has come from oral history, local interviews, and observations by archaeologists. Site 32DU2, or Midipadi Butte, likely dates to the Knife River phase (ibid.:262). Another of the sites, 32DU1 or Nightwalker's Butte in the Badlands, is atop a steep-sided, eroding butte along the north side of the Little Missouri River in the LMRSU. It remains unclear how or why the village was abandoned. Was the village burned because of Northern Plains hostilities? The village contains 25-30 depressions, most of which are remnants of earthlodges but several of which may be former water reservoirs. Artifacts noted at the site include pottery, projectile points, debitage, hammerstone, bone and burnt bone, fire-cracked rock, and ash (ibid.:263, 265). Over the years the site has been ravaged by looters and erosional processes. Residents report that collectors' artifacts include pottery and Euro-American trade goods (ibid.). Site 32DU1 has been recommended as eligible for the NRHP several times and nominated by the US Army Corps of Engineers but has not been listed. As Lippincott (ibid.) suggests, future testing may reconcile the oral history and archaeological investigations, thus answering the question of how and why occupation ceased at 32DU1.

Major portions of the Little Missouri valley were traditional Hidatsa territory (cf. Bowers 1965:12). Hunting camps like the Koehler site (32GT1), attributed to the Mandan and located along the Heart River (Cooper 1958), should be anticipated along stretches of the upper Little Missouri. Lewis and Clark reported bison herds at the Missouri-Little Missouri confluence during April 1805 (Thwaites 1904-1905, cited in Hanson 1983c:Table 74.3). Prehistoric Villagers were probably in and out of the valley throughout the annual cycle. What groups from distant regions might have had secondary and tertiary areas (cf. Syms 1977) overlapping in the LMRSU?

Historic Preservation Goals, Priorities, and Strategies

The LMRSU has witnessed booms of archaeological activity with the vastly increased tempo of energy production since the late 1970s. Many important new findings concerning the region's rich prehistory were made because of that work. To continue this

trend concerted efforts should be made to 1) formally excavate various site and feature types, 2) complete thorough lab analyses, and 3) publish the results.

Plains Equestrian Period

There are several written accounts of horse-mounted Indian groups using this area. The Crow traveled through here going between their Big Horn Mountain territory and their Missouri River village homeland (Larocque 1910). The Hidatsa came out here from their villages to hunt (Wilson 1924). After the plagues of European diseases decreased the numbers of Villagers and the equestrian peoples gained military supremacy, the Teton Dakota appear to have controlled the Little Missouri country until the late 19th century when they were harassed by the US military and their support base was destroyed by killing off the bison herds. The Fort Dilts State Historic Site (32BO6) near Marmarth in Slope County represents the remnants of a hostile encounter between the Hunkpapa and a wagon train headed for the Montana gold fields. These remains stand in silent testimony to the recency of the Sioux domination of the Little Missouri country (cf. Haury 1989; SHSND 2014).

Environmental Modeling

In this SU, landform changes of the 20th century considerably affected the archaeological contexts of protohistoric and historic sites. The "Dirty '30s" resulted in two meters of deposition in places on the floodplain of the Little Missouri River (Running 1988). Clayton et al. (1976) mention the discovery of a license plate buried by five meters of sediments in a draw in the Badlands. Some sites of the equestrian groups may be neatly preserved, deeply buried in the Little Missouri River bottomlands. Studies of recent climatic conditions and corresponding landscape changes can yield important information for environmental modeling.

Cultural Chronology

The period spans nearly the entire 19th century, ending with the impacts of US military expeditions against native peoples, including General Sully's Badlands Expedition of 1864 and the encounter at Fort Dilts (32B06) (Haury 1989; SHSND 2014). Various horse-mounted tribes such as the Crow, Dakota, Cheyenne, Assiniboine, and Hidatsa probably all utilized the Little Missouri basin (cf. Bamforth 1988:85-96; Curtis 1909:4). To date, there is no evidence from the archaeological record indicating any need for chronological subdivisions of the Equestrian period in the LMRSU to represent any phases or episodes of dominance of any native culture.

Kuehn (1988a) has suggested that two investigated sites in the Badlands may possibly date to the Equestrian period. These components include a stone circle site (32BI423) on Fantail Creek Ridge (Kuehn 1986). The temporal/cultural affiliation is open to some question. There clearly exists a need to develop better criteria to simply identify Equestrian period sites in the LMRSU. What are the diagnostic attributes of Equestrian period sites in the Little Missouri basin?

Settlement Behavior

Narratives concerning traditional native culture such as those penned by Gilbert Wilson (e.g., 1924:263-298, 299-311) describe a general sort of settlement employed by many Northern Plains groups such as the Hidatsa and Dakota. Temporary tipi camps were set up by hunting parties during different seasons of the year, and these settlements functioned as the field camps of pedestrian hunter-gatherers. Many of these locations, unless repeatedly reoccupied or marked by stone circles, probably contain little in the way of identifiable material traces in the archaeological record. Detailed ethnohistoric research coupled with field reconnaissance may help locate some of these campsites. In the Little Missouri Badlands, research conducted by Allen (1982) has shown the fruitfulness of this approach for identifying conical timber lodge structures and associated eagle trapping pit features based on background information collected by Bowers (1965:232-233) and Wilson (1928). A research program implemented for stone circle sites may generate new findings concerning Equestrian period settlement behavior. How many temporary campsites mentioned in the ethnohistoric literature can be documented by on-the-ground reconnaissance?

Native Subsistence Practices

Subsistence of the horse-mounted hunting and gathering peoples was founded on bison. But wild plant foods, other wild animal foods, and garden produce received in exchange with settled Village gardeners were significant components of the diet. A solitary stand of limber pine along Cannonball Creek just east of the Little Missouri River in Slope County is believed to have been started from seeds carried to the location in the early AD 1700s by a group which had recently traveled from the nearest natural stand of limber pine (Beckes et al. 1981). The nearest sources are in the Black Hills to the south, the Big Horn-Pryer Mountains area to the west, and the Missouri Breaks country of northern Montana. Both the cambium and pinion-like nuts of the limber pine are edible. There are archaeological sites in the location of this stand (ibid.). If some of these sites could be identified as protohistoric, they could certainly yield important information on the topic of material culture in the Equestrian period. How did subsistence practices of groups in the Badlands differ from groups using other parts of North Dakota during the Equestrian period?

Technologies

Equestrian groups were equipped with a variety of technologies in their post-contact lifeways. The horse and dog played key roles in transportation as beasts of burden (cf. Wilson 1924). The advent of the fur trade and increased Euro-American contact in the 19th century brought about many changes in the traditional culture of groups such as the Hidatsa (cf. Gilman and Schneider 1987). Metal tools and implements obtained via trade replaced traditional items of stone, bone, wood, shell, and clay. The gun ascended to a place alongside the bow and arrow in basic weaponry. Is there any way of measuring the effectiveness or efficiency of the mixed Euro-Native American technologies of the Equestrian period against the earlier prehistoric entirely Native American technologies?

Artifact Styles

The paucity of investigated Equestrian period sites in the SU renders statements concerning dimensions of artifact style rather tenuous. The means of identification of sites assignable to this period remains a priority. What is needed is a long-term research program directed at tackling this issue. What are the distinctive attributes of post-contact artifact style in the Little Missouri basin?

Regional Interaction

There may have been territorial continuity between the Crow and Hidatsa from the time of their fissioning in the 1500s until the Hidatsa were drastically weakened by the plagues in the late 1700s. Thereafter, their Teton Dakota and Assiniboine enemies forced a wedge between them in the country between the Little Missouri and Powder rivers (Hanson 1979:82). Should prehistoric Crow sites in the Little Missouri country have well-made late prehistoric ceramics and not the poor-quality post-plague ceramics found at Mandan and Hidatsa sites along the Missouri River in the Garrison and Southern Missouri River SU?

Historic Preservation Goals, Priorities, and Strategies

A high priority in the LMRSU is the continued documentation and preservation of traditionally important cultural resources including conical timbered lodges and associated features such as eagle trapping pits. Conical timbered lodges should be protected (cf. Floodman 2012:84-88; Loendorf 1978:42).