1. NAME OF PROPERTY

Historic Name: OBSIDIAN CLIFF

Other Name/Site Number: 48YE433

2. LOCATION

Street & Number: Approximately 13 road miles south of Mammoth, Yellowstone National Park, Wyoming, on the east side of U.S. 89, just south of the Obsidian Cliff Kiosk

Not for publication: N/A

City/Town: Mammoth

Vicinity: X

State: WY County: Park Code: 029 Zip Code:____

3. CLASSIFICATION

Ownership of Property
Private:___
Public-Local:___
Public-State:___
Public-Federal: X

Category of Property
Building(s):___
District:___
Site: X
Structure:___
Object:___

Number of Resources within Property

Contributing	Noncontributing	
_____	_____	buildings
1	_____	sites
_____	_____	structures
_____	_____	objects
1	0	Total

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

Name of Related Multiple Property Listing: N/A

4. STATE/FEDERAL AGENCY CERTIFICATION

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

Signature of Certifying Official Date

State or Federal Agency and Bureau

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

Signature of Commenting or Other Official Date

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

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

Signature of Keeper Date of Action

6. FUNCTION OR USE

Historic:	INDUSTRY/PROCESSING/EXTRACTION COMMERCE/TRADE	Sub:	Processing Site Trade (Archeological)
Current:	LANDSCAPE RECREATION & CULTURE	Sub:	Natural Feature Outdoor Recreation

7. DESCRIPTION

ARCHITECTURAL CLASSIFICATION: N/A

MATERIALS:
Foundation:
Walls:
Roof:
Other:

Describe Present and Historic Physical Appearance.

Obsidian Cliff (48YE433) is located in northwestern Yellowstone National Park within the Middle Rocky Mountains of northwestern Wyoming. Obsidian Cliff (Photographs 1, 2 and 3) is a scenically attractive, geologically distinctive, natural feature that dominates this elevated and heavily forested landscape. For at least 11,000 years, it has been used as a raw material source for high quality obsidian tools and archeological sites in Yellowstone National Park contain a preponderance of this material. A recent archeological reconnaissance (Davis *et al.* 1994) on the Obsidian Cliff plateau has dramatized the high research potential of this unique culturally modified landscape.

NATURAL FEATURES

The topographic feature known as Obsidian Cliff is one of four rhyolite flows located north of the Yellowstone caldera and is (specifically) included within the Roaring Mountain Member of the Rhyolite Plateau (Boyd 1961; Christiansen and Blank 1972) (Map 1). The Obsidian Cliff volcanic flow is about 180,000 years old (Christiansen 1989), covers 14.5 square kilometers, and has an exposed vertical thickness, most of which is obsidian, of about 30 meters. The Obsidian Cliff flow erupted from a vent about 1 km to the east and filled a pre-existing valley. The flow rapidly chilled against the old valley wall. Erosion during glacial times exposed the cooled lava and is now visible as the west-facing Obsidian Cliff. most of the top of the Obsidian Cliff flow is covered by a thin mantle of rubble in a loose, fine-grained matrix (Pierce 1973) derived from the frost weathering of local bedrock. However, the presence of Paleozoic quartzite, Quaternary basalt, and igneous erratics within the mantle suggests glacial transport and deposition, probably during the Pinedale glaciation (70,000 to 12,000 years ago = years Before Present = B.P.) . While prehistoric peoples did select and modify obsidian cobbles contained in that loose mantle, they also actively mined substantial quantities of bedrock, or matrix, obsidian to resupply depleted stocks of raw obsidian for tool production for their own use and for trade materials.

The Obsidian Cliff lithic source area has been regarded as a prominent prehistoric quarry since its recognition late in the 19th century (Norris 1879; Holmes 1879, 1903, 1910, 1918; Chittenden 1895). The first published description, by geologist W. H. Holmes, conveys his impression of Obsidian Cliff as a natural feature and resource attraction to early native peoples:

> Considerable deposits of obsidian and obsidian porphyries had been observed in the national park previous to our visit in the summer of 1878, but no satisfactory exposures of the glassy varieties had been found. In October I had occasion to make examinations of a locality particularly rich in them, situated in the north-western part of the park, near the head of obsidian or Alum creek, a tributary of the middle fork of Gardiner's river. The crumbling trachytes of this part of the park give, in general, a rounded and monotonous character to the topography. The slopes of the valleys are gentle excepting at points where the glassy rocks predominate.

> In ascending obsidian creek, by way of the newly-cut wagon road which connects Mammoth Hot Springs with the Geyser Basins, we pass first through broad meadows and parked forest. Farther on the valley narrows up and the timber becomes extremely dense. At a point about twelve miles above the junction of the creek with the main stream, there is a narrow gateway known as obsidian cañon, through which the road and creek pass. From the east side of the valley a low promontory extends forward to the creek and breaks off in an abrupt nearly vertical wall, in which the obsidian rocks are exposed. The road approaches the cañon along the west side of the valley, and crosses to the east side at the lower end of the cañon; in order to avoid the swampy ground that borders the stream it has been carried across the steep debris slopes of the obsidian cliffs. For half a mile it is paved with glassy fragments and lined by huge angular masses of black and banded obsidian rock. From the upper border of the debris slope the vertical cliffs rise to the height of nearly two hundred feet. The lower half is composed of a heavy bed of black obsidian which exhibits some very fine pentagonal columns, somewhat irregularly arranged and frequently distorted, but with perfectly cut faces that glisten in the sunlight. The upper portion of the wall is composed of a much more obscurely columnar mass of impure spherulitic obsidian, the rude faces of the columns being often as much as ten or twelve feet across. To the right and left the columnar character becomes less marked, both in the upper and lower part of the cliff, and farther out seems to be entirely lost, the glassy rocks grading into the gray sanidine trachytes and obsidian porphyries of the surrounding hills.
>
> Extending upward from the edge of the promontory in a moderately gentle slope are four or five hundred feet of obsidian strata that exhibit some most interesting characters. There is no heavy mass of pure glassy rock, but a succession of irregular layers of a dozen or more varieties of spherulitic obsidian, obsidian porphyries and breccias. The colors of these rocks are exceedingly varied, the prevailing blacks giving way to reds, browns, greens and the richest possible marblings and mottlings (Holmes 1879:247-8).

RESEARCH HISTORY

Antiquarians and early workers suspected that Obsidian Cliff was the primary prehistoric source for obsidian found as far away as the Ohio River valley (cf. Squier and Davis 1848; Shetrone 1926, 1930; Kramer 1951; and Griffin 1965 for a detailed historical appraisal), Idaho (Spinden 1908; Gruhn 1961), and at sites in the Southern Canadian Rockies and Plains (Wormington and Forbis 1965). These presumptions and conjectures were, until recently, untestable.

The application of instrumental trace- and bulk-element geochemistry techniques enabled the objective tracing of archeological specimens to known geological sources. It is now known, for instance, that obsidian from Obsidian Cliff was imported and utilized for ceremonial purposes by peoples of the Hopewell Interaction Sphere, during the Middle Woodland Period, ca. 1850-1750 B.P. (Frison *et al.* 1968; Griffin *et al.* 1969; Hatch *et al.* 1990). This

is notable because the Hopewell Culture was centered in the Ohio River valley, far from the Obsidian Cliff obsidian source. Thus, Yellowstone obsidian was a valued commodity imported by Hopewell for specialized ritual disposal at mortuary sites.

In addition, obsidian from Obsidian Cliff was also used for utilitarian purposes in the Upper Mississippi valley. Seventy-five percent of the obsidian analyzed from Middle Woodland and Late Prehistoric Period non-ritual sites in central Iowa (Anderson *et al.* 1986; Hughes and Nelson 1987) came from Obsidian Cliff, as did two-thirds of the obsidian analyzed from Late Plains Archaic, Middle Woodland, and Early Plains Village Period peoples sites in the Northeastern Plains of North Dakota (Baugh and Nelson 1988). Obsidian Cliff obsidian occurs in Middle Woodland mortuary and non-mortuary sites in Ohio, Illinois, Wisconsin, Michigan, and Ontario (Griffin *et al.* 1969). To the north, a significant fraction of Southern Canadian Plains and Canadian Rockies archeological obsidian originated at Obsidian Cliff and other Yellowstone sources (Davis 1972a, 1972b; Godfrey-Smith and Magne 1988), as did many obsidian artifacts analyzed from sites in the Montana Plains and Rockies and in the Wyoming Basin (Davis 1972a, 1972b; cf. Frison *et al.* 1968; Grif fin *et al.* 1969) . Limited amounts of Yellowstone obsidian were also transported west for use at sites in Idaho where reliance on obsidian from multiple local sources predominated (Sappington 1984) ; obsidian from Idaho sources also occurs as artifacts within Yellowstone National Park (Cannon 1990). To the south, Obsidian Cliff obsidian is found in southwestern Wyoming (Connor 1986) and into northwestern Colorado (Truesdale 1990; Davis *et al.* 1994).

The mechanisms by which obsidian was moved from the Obsidian Cliff source to geographically distant destinations are not known. Overland transport along trails or over water have been proposed. That the Upper Yellowstone River would have been the gateway or passageway is likely, with continuation to a downstream corridor leading to the Mississippi. Obsidian was probably traded "utilizing a generalized regional exchange system involving trading partners" (Baugh and Nelson 1988; Wood 1972) . To date, materials exchanged or traded for the obsidian which are diagnostic for Hopewell, i.e., Snyder points and Havana Ware, have not been found in the Yellowstone drainage, at Obsidian Cliff, or in the vicinity. That void may reflect the transfer of obsidian from the source eastward by indigenous peoples who quarried it and transferred it to middlemen. In any case, the considerable cost incurred and energy expended in a process that involved interaction on both intraregional and interregional scales were probably inspired by ideological rather than basic utilitarian motives (cf. Brose 1990). The 300 kg (660 lbs) of obsidian (weight calculated by Richard Hughes) found cached at the Hopewell site in Ohio (Greber and Ruhl 1989), for example, attests to the importance, value, and energy required to move this high-density raw material.

The first fieldwork-based archeological reports to mention Obsidian Cliff are a master's thesis (Hoffman 1961) and an inventory report (Taylor *et al.* 1964), although there was no fieldwork on the Obsidian Cliff plateau at that time. While professional and amateur archeologists visited this famed quarry site and some made the difficult climb up the talus slope to the Cliff edge, onsite technical studies were not initiated prior to 1986.

Beginning in 1986, several onsite inspections were made by National Park Service and Montana State University archeologists and a geologist into the maze of forest and complex terrain of the Obsidian Cliff plateau (see Photograph 8 for a view of the area before part of it burned in the Yellowstone fires of 1988) The inspections provided firsthand familiarity with the extent and scope of expected archeological features and associated prehistoric manifestations (Johnson 1986). Discoveries made during those visitations led to a second surface investigation by Montana State University in 1989 (Davis *et al.* 1992). The Yellowstone Wolf Creek fire in 1988 burned about 90 percent of the Obsidian Cliff plateau, consuming much of the accumulated surface duff and eliminating most of the lodgepole pine overstory. That substantial clearance of visual obstructions provided optimal conditions for

surface inspection.

Archeological reconnaissance identified 59 (Table 1, Map 2) prehistoric cultural loci (i.e., spatially discrete locations that present evidence of prehistoric activity associated with obsidian procurement) [see map 2 and Photographs 4 through 9], only a few of which were previously known to National Park Service personnel. Surface and subsurface procurement activity loci, along with workshop and occasional campsite debris, are the most prominent of visible archeological manifestations.

DESCRIPTION OF CULTURAL RESOURCES

The prehistoric activity loci are all associated, in one way or another, with obsidian extraction (loci are shown on Map 2 and cross-referenced in Table 1) . Quarry features consist of individual ovoid depressions or pits, multiple conjoining depressions varying from small to large in size, and linear trenches. Based on the extensive experience of Leslie B. Davis with aboriginal stone quarries, quarry activity was evaluated as being surface, i.e. procurement from an exposed outcrop or ledge, or subsurface where actual digging to gain access to the desired material occurred.

Thirty-six loci (60%) involve subsurface procurement exclusively and present one or more quarry features. Seven loci (11.7%) include both surface and subsurface procurement areas marked by quarry features. Six loci (10%) are characterized by subsurface quarry features with associated workshops. Five loci (8.3%) involve combinations of subsurface quarry features and surface procurement and workshop areas. Three loci (5%) involve only surface procurement. Two loci (3.3%) consist of surface procurement areas with associated workshops. Most workshop loci present some evidence of campsite activity such as fire-cracked rocks, initial-stage or finished tools of obsidian, and artifacts made from other raw material such as quartzite. The spatial coverage of the respective subsurface quarry features, workshops, and surface collection loci varies considerably across the plateau, as do the number of depressions, pits, and trenches evident at each locus. The depth and lateral extent of ground and bedrock disturbance and the quantities of obsidian removed from these largely buried subsurface features are quite variable surficially. This variation may be a function of selection for material quality, number of miners, degree of need, duration of extraction activity, and the ability to provide sustenance while utilizing this site. Only excavation can reveal the actual extent of underground obsidian procurement activity.

Table 1. Summary Data For Obsidian Cliff Quarry Loci, Yellowstone National Park.

Locus	Archeological Features	Obsidian Artifacts/Materials Observed
1	Trench-like depression 9.5 m long and 4.5 m wide, 0.5 to 1 m deep with 125 m diameter oval depression 40 m 20 m in all directions south of trench.	Cores, blocks, and nodules. Debris forms berm around margins and extends 20 m in all directions reduction debris.
2	Three 1-1.5 m diameter oval depressions; Primary and secondary reduction debris and three smaller oval depressions and large trench-like depression 2.5 m X 1.5 m; and cluster of 6 pits including a 2 m X 1 m trench.	Primary and secondary reduction debris and blocky cores.
3	Large depression formed by small intercoruiected pits 5 m x 7 m and 1 to 1.5 m deep.	Cores and raw material and primary and secondary reduction debris.
4	Irregularly shaped pits and trenches 20 m X 10 m, about 1.5 m deep.	Blocky cores, raw material, and quantities of primary and secondary reduction debris. Two hammerstones formed on round cobbles.
5	Two to three 1 X 1.5 m oval pits 1 to 1.5 m in diameter and 25 to 50 cm deep.	Quarry debris in the form of blocky cores and pieces of raw material along with primary and secondary reduction debris.
6	Single ovoid pit I X 1.5 m in diameter and 50 cm deep.	Cores and raw material and primary and secondary reduction debris.
7	Four clustered small diameter pits and one small pit nearby.	Blocky cores and raw material and primary and secondary reduction flakes.
8	Single ovoid pit l.S X 2 m and 50 cm deep.	Blocky cores and raw material and reduction debris.
9	Single ovoid pit 0.5 m in diameter and 30 cm deep.	Raw material and blocky cores and reduction debris.
10	Numerous overlapping pits and/or trenches along both sides of a 250 m long draw; depth up to 1.75 m and 5 to 25 m in diameter; deepest and most extensive quarry site on plateau.	Primary and secondary reduction debris and raw materials.
11	Two linear adjoining trenches 9 m and 6 m long and 1.5 to 1.7S m wide, with one pit 1.75 m diameter at end of trench.	Raw material and blocky cores and reduction debris.
12	Unknown number of pits with subtle surface evidence across an area 25 to 30 m X 12 to 15 m, filled with slopewash.	Prepared and unprepared cores, raw material, and secondary reduction flakes.
13	Maze of long trenches and shallow and deep pits 400 m X 125 m.	Cores, raw material, and reduction debris.

14	Two trenches 8 to 9 m long and 2 to 2.5 m wide with one 25 m diameter pit; 30 to 4 small 1.5 m diameter pits.	Quarry and reduction debris.
15	One 10 m X 6.5 m trench with five irregularly shaped pits.	Quarry and reduction debris.
16	One linear weaving trench 35 m long X 1.75 m wide and 1 to 1.5 m deep.	Quarry and reduction debris.
17	Unknown number of small shallow pits.	Quarry debris, flakes, blocky cores, and raw material.
18	One ovoid pit 4 m in diameter and 2025 cm deep.	Blocky cores, raw material, and reduction debris.
19	Maze of ovoid pits and a trench.	Blocky cores, raw material, and quantities of reduction debris.
20	Stepped or terraced pits over a 75 m X 3S m area.	Reduction flakes, blocky cores, and chunks.
21	Workshop.	Primary and secondary reduction flakes and interior reduction flakes.
22	Subtle small ovoid depressions over a 30 m X 15 m area.	Primary and secondary reduction flakes.
23	Single ovoid pit 2 m in diameter.	Primary and secondary reduction flakes.
24	At least 12 and probably more pits and linear trenches occur within a 175 m X 40 m wide area, with depth of I to 1.75 m.	Blocky cores and raw material.
25	Maze of pits and trenches in 115 X 90 m area.	Blocky cores, raw material, and reduction debris.
26	Two pits, one 8 X 4 m, and one 1.15 m in diameter along steep slope.	Quantities of natural and cultural obsidian blocks and cores.
27	Numerous pits cover a 700 X 100 m area.	Reduction debris, and finished tools in drainage.
28	At least 9 pits and trenches and one hearth and fire-broken rocks.	Quarry and reduction debris, workshop debris, finished tools, and thinning and sharpening flakes.
29	One linear trench 8 X 2 m and one 1.5 m diameter pit, with fire-broken rocks nearby.	Workshop debris, including thinning and finishing flakes, and fire-broken rocks.
30	Six to eight small pits 0.5 m deep, covering a 35 m X 10 m wide area.	Blocky cores, reduction.
31	Some pits 15 m in diameter and 2.5 m deep; others are shallow and subtle, within a 350 m X 75 m area.	Blocky cores, raw material, and quarry and reduction debris.
32	Four to five linear, trench-like depressions; One 2.5 m X 2 m pit on slope.	Blocky cores, raw material, and primary and secondary-reduction debris.

33	Ten clusters of trenches, pits, and depressions in 200 m X 100 m area.	Blocky cores, raw material, and primary and secondary reduction debris.
34	6 to 10 linear trenches in 59 m X 35 m area.	Quarry and reduction debris, and interior reduction, thinning and sharpening flakes.
35	15 linear trenches in a maze on opposing ridges.	Blocky cores, raw material, and reduction debris.
36	Two deep trench-like depressions and single shallow pit.	Blocky cores, raw material, and reduction debris.
37	Three shallow depressions 1 to 2 m in diameter and 25 to 35 cm deep.	Blocky cores and raw material and reduction debris.
38	Eight deep to shallow linear and ovoid depressions.	Quarry and reduction debris.
39	Two linear, trench-like depressions 6 to 7 m long X 2.5 m wide; 15 pits and trenches 40 m south, 6.5 m to 2.5 m in diameter and 25 to 75 cm deep.	Quarry and reduction debris, including interior reduction, thinning, and sharpening flakes.
40	Five linear depressions and pits.	Prepared and unprepared cores, bifaces, hammerstone, and interior reduction flakes.
41	One pit 2.5 m long X 1.5 m wide and 25 cm deep.	Unprepared cores, raw material, primary and secondary reduction debris.
42	Three irregularly shaped pits at 15 m intervals along steep draw.	Unprepared cores and raw material, reduction debris.
43	A single trench 2 m long by 1 m wide and 25 to 30 cm deep.	Unprepared cores and raw material, primary and secondary reduction debris.
44	A long, deep trench (22 m X 7 m) accompanied by subtle depressions.	Unprepared cores, hammerstone, abrading stones, interior reduction flakes, thinning flakes, and sharpening flakes.
45	Subtle and shallow infilled depressions.	Unprepared cores, raw material, primary and secondary reduction debris.
46	Three large pits 8.5 m long and 2.5 m wide.	Unprepared cores, raw material, primary and secondary reduction flakes.
47	No quarry features.	Unprepared cores, raw material, and reduction debris.
48	Maze of shallow trenches and pits in 80 m X 70 m area.	Reduction flakes, thinning and sharpening flakes, quarry blanks and bifaces, hammerstone, and exotic lithics.

49	No quarry features.	Reduction flakes, interior reduction flakes, thinning flakes, sharpening flakes, quarry blanks and bifaces, hammerstone, and exotic lithics.
50	Twenty five pits in 200 m X 100 m area; trenches, pits, and depressions.	Extraction and reduction debris; workshop has many interior reduction flakes, quarry blanks, and bifaces.
51	Subtle, infilled depressions.	Unprepared cores and raw material and primary and secondary reduction flakes.
52	Fifteen to twenty trenches and pits in 400 m X 75 m area.	Unprepared cores and primary and secondary reduction flakes.
53	Two pits.	Unprepared cores and raw material and primary and secondary reduction flakes.
54	Two small pits 75 m apart: 2 m X 1 m in diameter.	Unprepared cores and raw material and primary and secondary reduction flakes.
55	Subtle infilled depressions on slope.	Unprepared cores and raw material and primary and secondary reduction flakes.
56	Three to five pits 25 cm to 75 cm in diameter and 20-30 cm deep.	Unprepared cores and raw material, primary and secondary reduction flakes, and thinning flakes.
57	A single pit 10 m long by 3 m wide.	Unprepared cores and raw material, primary and secondary reduction flakes and thinning flakes.
58	Three to four I m diameter depressions in a 12 m X 4 m area.	Unprepared cores, raw material, and primary and secondary reduction flakes.
59	Two clusters: two trench-like depressions, one 12 m long X 2.5 m wide and the other 8 m X 2 m, both 75 cm deep. The second is a cluster of pits 30 m x 15 m, with maze of small pits nearby.	Unprepared cores, raw material, and primary and secondary reduction flakes.

PRESENT CONDITION AND INTRUSIONS

A narrow road was constructed across the toe of the slope below the Cliff in 1878 under the direction of Superintendent P. W. Norris. Because of the difficulty of applying picks, axes, shovels, and iron bars to the task, Norris had fires built atop the obsidian rock. Cold water was then dashed onto the heated rock to fracture it and enable its removal so that passage could be gained across the base of the talus slope (Norris 1879). Obsidian Cliff, as observed from the modern, paved version of Superintendent Norris' road, retains its early appearance, as can be seen through a comparison with late 19th-century photographs (Photographs 1-3). Erosional processes over the past century have had little destructive effect. The fire of 1988 did not affect the appearance or condition of the cliff face.

The lithic procurement/workshop loci that collectively comprise the archeological assemblage on the western edge of the cliff margin have been subject to attrition by obsidian collectors for decades. The talus slope and workshop debris below the Cliff have also been pilfered unrelentingly. However, the forbidding nature of steep, densely forested, dissected slopes, and abrupt precipices of the plateau itself have combined to limit artifact scavenging to the roadside (on Map 2, this is identified by map designation "Obsidian Cliff"). The most remote loci (i.e., those farthest removed from the easily accessed northwestern edge) display the a range of artifacts, preforms, and other detritus typical of workshops adjacent to quarry pits, which is an indication of their pristine nature. Obsidian Cliff remains substantially intact.

Most of the collections are curated by the National Park Service at Yellowstone National Park, Mammoth Hot Springs Park Headquarters. They are maintained according to National Park Service standards. Although many pieces of Obsidian Cliff obsidian are held by many other institutions, there are no other significant collections. The National Park Service retains administrative responsibility for the collection's integrity.

Periodic forest fires have razed surficial, geological and artifactual obsidian, and associated quarry and workshop features with little destructive effect on the features. The loss of the opportunity to date heat-crazed, surface archeological obsidian by the hydration technique is mitigated by the fact that unknown, but obviously substantial amounts of obsidian debris exist *in situ* within numerous unaffected subsurface contexts on the plateau. The high degree of contextual integrity thus contributes to Landmark significance and ensures a high potential to yield information important to an in-depth and broader understanding of the roles that this key prehistoric quarry site played in North American prehistory.

8. STATEMENT OF SIGNIFICANCE

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

Applicable National Register Criteria: A___ B___ C_ D X

Criteria Considerations (Exceptions): A___ B___ C___ D___ E___ F___ G___

NHL Criteria: 6

NHL Theme(s):
[1987] I. Cultural Developments: Indigenous American Populations
- A. The Earliest Inhabitants
  - 1. The Early Peopling of North America
  - 11. Archaic Adaptations of the Plains
  - 21. The Big Game Hunters
- B. Post-Archaic & Pre-Contact Developments
  - 10. Plains Hunters & Gatherers
- C. Prehistoric Archeology: Topical Facets
  - 2. Prehistoric Technology
  - 8. Prehistoric Economics/Trade

[1994] V. Developing the American Economy
- 1. Extraction & Production
- 6. Exchange & Trade

VI. Expanding Science & Technology
- 2. Technological Applications

VII. Transforming the Environment
- 1. Manipulating the Environment & its Resources

Areas of Significance: Archeology/Prehistoric
Commerce
Industry
Period(s) of Significance: 11,500-200 B.P. (9,500 B.C.-A.D. 1800)
Significant Dates: N/A
Significant Person(s): N/A
Cultural Affiliation: Early (Paleoindian), Middle (Archaic), and Late Prehistoric Period
Architect/Builder: N/A

State Significance of Property, and Justify Criteria, Criteria Considerations, and Areas and Periods of Significance Noted Above.

Obsidian Cliff occupies a unique position in national prehistory as a singularly important source of lithic materials for prehistoric peoples of interior western North America. Significant on a national level in the area of indigenous American populations, Obsidian Cliff is recognized as an exceptionally well-preserved, heavily utilized lithic source that served the utilitarian needs and ceremonial requirements of early indigenous peoples over a large area of North America for 12,000 years. Under the National Historic Landmark thematic framework, Obsidian Cliff is important for its association with Theme I. Cultural Developments: Indigenous American Populations; subtheme I.A. The Earliest Inhabitants, and the following facets:

The Early Peopling of North America (Facet l.a.1) is pertinent to Obsidian Cliff because the earliest acknowledged technocomplex in western North America (Early Prehistoric Period [Mulloy 1958] or Paleoindian Period [Frison 19781), Clovis (11,500-11,000 B.P.), utilized local obsidian (Arthur 1966:9495), as did other later Paleoindian groups (Davis 1986; Davis and Greiser 1991). The Yellowstone Rhyolite Plateau was freed from Cordilleran ice by the end of the Pinedale glaciation, ca. 13,000 B.P. (Pierce 1979; Whitlock 1990), thus enabling exploitation by Early Prehistoric Period peoples who reached that area south of the ice sheets via Rocky Mountain trench or eastern foothills routes. Any possible Clovis precursors who could have frequented the plateau prior to 11,500 B.P. would also have found Obsidian Cliff accessible.

Archaic Adaptations of the Plains (Facet I.A.11) is pertinent to Obsidian Cliff because all of the Middle Prehistoric Period, or Plains Archaic Period, cultures known in the Northwestern Plains and Middle and Northern Rockies acquired obsidian from Obsidian Cliff during the 7500-1700 B.P. time period.

The Big Game Hunters (Facet I.A.21) of subtheme I.A. (Post-Archaic and Pre-Contact Developments) is pertinent to Obsidian Cliff because some of the technocomplexes distinguished within the Late Prehistoric Period of the Northwestern Plains and Rocky Mountains used obsidian from Obsidian Cliff from 1700 to 200 B.P. This use was particularly heavy during the Old Women's Phase (900 and 200 B.P.).

Plains Hunters and Gatherers (Facet 10) of subtheme I.B., Post-Archaic and Pre-Contact Developments, subsumes all of the prehistoric cultures that utilized Obsidian Cliff, as enumerated under I.A.1., I.A.11., and I.A.21. above, since hunting and gathering was the stable subsistence type characteristic of adaptations throughout Northwestern Plains and Rocky Mountain prehistory. Topical Facets I.C.2. (Prehistoric Technology) and I.C.8. (Prehistoric Economics/Trade) of subtheme I.C. (Prehistoric Archeology) are applicable to Obsidian Cliff since the procurement of lithic raw material, stone tool production, and associated industrial activities predominated at that location and because surplus obsidian became a valued economic and ceremonial commodity that figured in prehistoric trade networks.

The systematic excavation of archeological loci within Obsidian Cliff has the potential to yield important information (National Historic Landmark Criterion #6) regarding the use history of this key lithic resource throughout interior western North American prehistory and the broader problem of intercultural transactions or diffusion involved in the exportation of obsidian to distant users.

Finally, as elaborated below, Obsidian Cliff played an important role in application and development of the geochemical fingerprinting of obsidians, which is now applied to obsidians worldwide. These techniques have subsequently been used to study other culturally modified and traded types of stone such as catlinite, galena, turquoise, and steatite.

HISTORIC CONTEXT

Obsidian Cliff is nationally significant in several areas. Archeologists recognize the site as an outstanding example of a prehistoric quarry, with associated processing stations and possible occupation sites. (Many occupation sites demonstrating lithic reduction activities are known from around the Obsidian Cliff plateau but are outside the boundary presented here.) Within the obsidian-bearing volcanic flow are numerous quarries documenting the suitability and utility of the obsidian for artifact production. Obsidian from this source was highly prized and extensively traded. The Obsidian Cliff site also possesses exceptional qualities that illustrate and are useful for interpreting the cultural heritage of the United States. It offers superlative opportunities for scientific study and it retains a high degree of integrity of location, setting, feeling, and association.

Beginning nearly 12,000 years ago, this obsidian was deposited in archeological sites from the Middle Rockies across the Great Plains into the Midwest, the Columbia Plateau, and possibly the Great Basin. Obsidian mined from bedrock deposits at Obsidian Cliff and the Obsidian Cliff plateau and collected as redeposited cobbles from the overlying glacial till was utilized differentially by hunter-gatherer groups throughout regional prehistory, from the initial Early Prehistoric Period Clovis complex (11,500-11,000 B.P.) to the end of the Late Prehistoric Period (ca. 200 B. P.) [Davis 1972a, 1972b]. Only excavation can address the question of which culturally specific groups actually mined rather than surface collected obsidian from this source area. This is an area for future research. The degree of reliance on Obsidian Cliff obsidian varied with cultural affiliation, both temporally and spatially, in response to diverse natural and cultural factors operating at different times in different places. These data provide an objective, qualitative, and nominally quantitative basis for describing and comparing the differential obsidian utilization patterns characteristic for each regional prehistoric culture (Table 2).

Cultural affiliation of obsidian use is inferred from diagnostic artifacts (projectile points indicative of their respective archeological cultures) and by matching archeological obsidian hydration dates from 134 sites throughout the Northwestern Plains and Northern Rockies with the known temporal span for each cultural entity, as established by radiocarbon dating. The differential obsidian use preferences indicated by analysis reflect variations within the developed data base, which may or may not be representative of the underlying archeological reality. One study of archeological obsidian attributed 91 percent of the obsidian to sources

within the Yellowstone Rhyolite Plateau: 56 percent from Obsidian Cliff, 32 percent from the FMY/Willow Park/Canyon Junction source, and three percent from Teton Pass; nine percent could not be attributed to a source (Davis 1972a).

Table 2: Representative Cultural Usage of Obsidian Cliff Obsidian Through Time for the Northern Plains.

			Percentage of Obsidian Sample	
PERIOD	**TIME[1]**	**CULTURE[2]**	**CULTURE**	**TOTAL**
Early Prehistoric	13000-7500 BP	Pre-Clovis	2.07	
		Clovis	0.56	
		Folsom-Midland	0.21	
		Agate Basin-Hell	0.83	
		Gap	2.21	
		Alberta-Cody	2.84	8.7
		Lusk-Fredrick		
Middle Prehistoric	7500-1700 BP	Mummy Cave	8.08	
		Oxbow	4.42	
		McKean	8.07	
		Hanna	6.36	
		Pelican Lake	18.26	45.0
Late Prehistoric	1700-200 BP	Besant-Avonlea	7.80	
		Old Woman's	32.60	40.4
Historic	post-200 BP	Historic	5.90	5.9

[1] BP = Before Present
[2] After Reeves 1969; See Davis 1972a, 1972b

The most notable intervals of intensified obsidian use in the Northwestern Plains and Northern Rocky Mountains occurred within the Late Middle Period Pelican Lake (18.3%) and terminal Late Period Old Women's (32.6%) phases (Davis and Zeier 1978). Increased population, expanded mobility and territoriality, and the development and operation of wide-ranging obsidian trade networks may account for heightened obsidian utilization. (The small percentages of the artifacts attributed to the Early Prehistoric period reflects the small sample available for the Davis 1972a study.) It is significant that Obsidian Cliff obsidian reached Hopewellians late in the Pelican Lake phase, ca. A.D. 100-200, when obsidian use was so prominently widespread within the Rockies and the contiguous Northwestern Plains region (Davis 1972a).

The societies occupying the Obsidian Cliff source area were always hunters and gatherers, but the societies to which the material was traded varied substantially in subsistence, settlement, and sociopolitical and ceremonial organization over time and space. Obsidian Cliff, therefore, allows one element in a procurement/distribution system to be held relatively constant while the others vary. This is a unique situation.

The long-term reliance on and dispersal through space of obsidian from Obsidian Cliff exceeds that documented for any other of the widely distributed, sourced lithic materials utilized prehistorically in the Middle and Northern Rockies and Northwestern Plains. No other single lithic material, including the popular Knife River flint of western North Dakota (Loendorf *et al.* 1984; Ahler 1986) and alibates from New Mexico, can claim such popularity and utility among so many diverse prehistoric cultures over comparable time and in space. Other archeologically significant lithic materials recognized in the southern, central, and northern Great Plains region (e.g. Tecovas jasper, porcellanite, Spanish Diggings quartzite, and Avon chert) are more spatially circumscribed in natural occurrence and their periods of use(s) are more temporally limited.

Distinctive aspects of Obsidian Cliff obsidian are that (1) it has a restricted natural occurrence, (2) it can be definitively identified using nondestructive means, (3) it was used over a long period of time, and (4) unlike many lithics used for utilitarian purposes, Obsidian Cliff obsidian also had a ceremonial component. Each of these attributes taken singly can be replicated at other lithic source areas, but few, have all of them. This can be illustrated for alibates, Florence-A chert, Catlinite, and Knife River flint. The contributions of the Catlinite and alibates quarries to American prehistory are recognized with their inclusion as National Historic monuments within the National Park system.

Alibates has a 3-4 square mile original source area and Florence-A is restricted to bedrock ledges along the Arkansas River drainage in Oklahoma and Kansas. The Knife River flint quarries extend over more than 10,000 acres (Ahler 1986:6). However, each of these materials is also available in stream and glacial gravels (Ahler 1986; Gregg 1987; Vehik 1988; Swenson 1986) over extensive areas. While large artifacts can be tied directly to quarries because this is the only place where sufficiently large cobbles can be found, there is often no way to determine the source of smaller artifacts.

Knife River flint is closest to Obsidian Cliff in its temporal range and spatial distribution, but there are look-a-like lithics, and Knife River flint may be found in gravels throughout the Dakotas, southern Manitoba, and Minnesota (Gregg 1987). Use of Alibates is more circumscribed in time and space. Although Paleoindians utilized Alibates, this use is consistently low until the Antelope Creek settlement at the quarries in the Late Prehistoric period (Lintz 1984:324). Small pieces of Alibates may not be visually distinctive and no non-destructive scientific techniques to positively identify Alibates found away from the quarries are known. For Florence-A, the peak use was during the Late Prehistoric Period in the Southern Plains (Vehik 1986).

Similarly, most archeological Catlinite dates from the last 500 years (Sigstad 1972), and only recently has there been a reliable test to distinguish Catlinite from the other two major sources of red pipestone (Gunnersen 1991). Earlier work (cf. Brown 1989) has often assumed red pipestone was from the Catlinite source. Gunnerson (1993:560) makes the point that if you do not know the source of the material, then you cannot know where the material originated. Without this knowledge, "they cannot know who obtained the material nor how the artifact reached its archeological location."

Obsidian Cliff obsidian can be identified through non-destructive, relatively inexpensive analyses. The same is generally not true for cherts. A few cherts are visually distinctive but are not restricted in natural occurrence, do not share major chemical constituents (Luedtke and Meyers 1984:287), or do not have the long, intensive use histories. Because most cherts, Catlinite (Gundersen 1991; Gundersen and Tiffany 1986; Howell 1940) and Knife River flint (Ahler 1986:11) have "look-alikes," source identification can be problematical. For cherts, sourcing analysis often depends upon neutron activation, a destructive, expensive technique, and requires a large number of samples to characterize a source (Luedtke and Meyers 1984). Most other lithic materials have sourcing problems of one kind or another– they cannot be definitely identified visually or non-destructively.

Obsidian Cliff and its associated sites are also more free of disturbance than other lithic source areas because they have been in Federal protective ownership for over 120 years. This is not the case for other major quarries and their associated processing and camp sites. Many lithic source locations were utilized only long enough to obtain raw material. Material was then removed to camps in off-quarry areas for further processing (this varies in the extent to which processing was conducted). These camps are typically in nearby stream valleys whose floodplains and terraces have been extensively developed by intrusions of various kinds (roads, power lines, collecting, plowing.) As a result, while the quarries may have been protected, the surrounding associated campsites and processing areas have of ten been disturbed. The above situation with associated campsites in adjacent valleys is also true for Obsidian Cliff but these sites (for example, 48YE357 and 48YE11) have limited disturbance that is primarily surficial in nature.

Most other source areas have been farmed, ranched, and/or variously developed with the destruction of pits and displacement and breakage of debris. These kinds of disturbances have impacted most major quarries and their associated processing and camp sites because they are in private or mixed ownership or only recently gained protected status (for example, Alibates became a National Monument in 1965). Other examples are Flint Ridge and the Knife River flint quarries that extend over many landownerships. Much of the Knife River flint source has been cultivated (Ahler 1986), while the integrity of Flint Ridge has been severely impacted by historic quarrying and farming (Yerkes *et al.* 1988).

Although Obsidian Cliff is commonly identified in the archeological literature as a major obsidian source, the source area itself has not yet been studied in detail. Much information about Obsidian Cliff comes from the study of artifacts far distant from their source; for example, the Hopewell obsidians where 90 percent are sourced to Obsidian Cliff. Data-based reconstructions of quarrying intensity, quantity of obsidian extracted, technological attributes of discarded artifacts and detritus, and quarry feature morphology and preservation (in effect, site formation and deformation) have not been done.

Subsurface investigation of the quarry features and surrounding workshops would increase our knowledge of bedrock geology and prehistoric mining techniques. The unknown depth and scale of quarried features and debitage deposits in workshops prevents an estimate of labor commitment, temporal intervals, duration of mining, and other factors of importance in understanding lithic procurement behavior patterns among diverse prehistoric peoples. Such knowledge would enable construction of a mining event sequence, chronology, and

inferences regarding mining technology and orientation. The extraction. and production of surplus obsidian intended for long-distance use, transfer, and trade are major problems that can be addressed through further investigations at the Obsidian Cliff source.

SIGNIFICANCE FOR GEOCHEMICAL AND GEOPHYSICAL STUDIES

Obsidian Cliff is unique among obsidian sources in Wyoming, Montana, and Idaho in that it is a bedrock (in-place) deposit. The majority of these obsidian sources including Bear Gulch, American Falls, Camus Creek, Teton Pass, and Dry Creek are secondary lag deposits, far from their original bedrock locations. With chipped stone materials derived from lag deposits, there is always some degree of uncertainty about the original source.

Obsidian Cliff has played an important role in the development and application of geophysical and geochemical analyses to archeological materials for problem solving. In the late 1950s and the early 1960s, the obsidian hydration dating technique was introduced by geochemists to archeologists as a new chronometric method (Friedman and Smith 1959, 1960; Evans and Meggers 1960). In the mid-1960s, interest in learning the source of obsidian in Hopewell sites led to cooperative investigations among archeologists and physicists, chemists, and geologists (Frison *et al.* 1968; Griffin *et al.* 1969) and the development of a technique to date obsidian. This obsidian (hydration) dating is now widely applied among obsidian-providing geocultural areas of the world to geological (Friedman *et al.* 1973; Pierce *et al.* 1976; Adams 1990) as well as to archeological dating situations (Davis 196,6, 1972a, 1972b, 1986; Frison 1974; Davis and Zeier 1978; Nelson 1984; Wright and Chaya 1985; Wright *et al.* 1990; and numerous others.)

The desire to accurately tie archeological obsidian to geological sources, particularly Obsidian Cliff, and thereby to illuminate prehistoric trade and other intercultural connections (Anderson *et al.* 1986; Wright *et al.* 1969; Hughes and Nelson 1987; Baugh and Nelson 1988), has contributed to the evolution of applied geophysical analytical techniques, including neutron activation, atomic absorption spectroscopy, x-ray diffraction, and particle-induced x-ray emission analysis. Recent studies of the Ohio Hopewell obsidian problem have combined and integrated hydration and compositional analyses (Hatch *et al.* 1990; Hughes 1992). Following the successful application of these techniques to obsidian, this elemental analysis (fingerprinting) has been applied to other archeological stone materials such as galena, catlinite, turquoise, and cherts. Such instrumental analyses are now routine in American archeology.

The long-term temporal and multiculturally variable utilization of obsidian from Obsidian Cliff, as a basic industrial, economic, and exported commercial commodity throughout the 11,500-year-long regional prehistoric culture sequence, establishes Obsidian Cliff as nationally significant. It played a major role in our Nation' s heritage. Obsidian Cliff is of inordinate importance for understanding the dynamics of prehistoric hunter-gatherer lithic procurement, lithic production, lithic utilization, and lithic trade/exchange systems and patterns in western interior North America and beyond.

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Previous documentation on file (NPS):

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

Primary Location of Additional Data:
_X_ State Historic Preservation Office
___ Other State Agency
_X_ Federal Agency
___ Local Government
_X_ University: Montana State University
_X_ Other (Specify Repository): National Park Service, Midwest Archeological Center
Lincoln, Nebraska

10. GEOGRAPHICAL DATA

Acreage of Property: 3,580 acres (14.5 sq. km.)

UTM References:

	Zone	Easting	Northing
A	12	521580	4962880
B	12	521520	4963290
C	12	521680	4964000
D	12	522560	4964000
E	12	523000	4964700
F	12	525000	4964000
G	12	525730	4963000
H	12	524450	4961480
I	12	525610	4960760
J	12	525700	4960000
K	12	525420	4959380
L	12	524180	4958550
M	12	523560	4959180
N	12	523540	4959800
O	12	523980	4959930
P	12	522510	4961500
Q	12	521770	4961710

Verbal Boundary Description:

Segment A-B: Coordinate A is a benchmark (7383') near the east shoulder of the highway. From A, the segment trends north-northwesterly for 340 m to coordinate B. This segment roughly parallels the highway on its east side. It follows the base of the cliffs visible to the east of the Yellowstone National Park Obsidian Cliff Kiosk.

Segment B-C: From coordinate B, this segment runs north-northeasterly for 800 m to C. This segment stays on the east side of Obsidian Creek and runs along the base of the cliffs that form Obsidian Canyon. Coordinate C is 125 m northeast of Crystal Spring.

Segment C-D: From C, this segment runs due east for 880 m. It goes up a rather steep slope and crosses a lobe of the obsidian flow at its northwest corner. This boundary transect also crosses the small stream that flows past the Crystal Springs Park Service Cabin. It then runs up a steep slope to a saddle that separates Obsidian Lake from the Obsidian Cliff flow. Coordinate D is at the east edge of this saddle.

Segment D-E: From D, this segment runs northeasterly for 840 m. This transect runs about midslope along the northeast face of the Obsidian Cliff flow, staying just below the 7900' contour.

Segment E-F: From E, this segment runs east-southeasterly for 2200 m. This leg runs about midslope and upslope along the north face of the Obsidian Cliff flow, staying near the 8000 and 8100 ft contours. Coordinate F is about 100 m southeast of a saddle that separates the Horseshoe Hill area from the Obsidian Cliff flow.

Segment F-G: From F, this segment runs southeasterly for 1230 m, taking in the toe of the Obsidian Cliff flow's northeast slope. This segment also includes part of the flats with a hydrothermal area south of Horseshoe Hill. Coordinate G is within the basin of this hydrothermal area.

Segment G-H: From G, this segment runs southwesterly for 2000 m, taking in the toe of the Obsidian Cliff flow's east slope. This segment runs through the south end of the hydrothermal basin mentioned in the preceding segment description. It passes through a low saddle with a Benchmark reading 7922 feet that separates the hydrothermal basin from the middle fork of three unnamed drainages at the head of Solfatara Creek. From this saddle, the transect continues southwesterly, going up the slope on the east side of the Obsidian Cliff flow before dropping down and crossing the west fork of the head of Solfatara Creek. Coordinate H is midslope on the west side of the aforementioned west fork drainage.

Segment H-I: From H, this segment runs southeasterly for 1340 m. It drops downward from H, taking in the lower portions of the Obsidian Cliff flow slope and staying west of Solfatara Creek. Coordinate I is at the base of the flow slope and 50 m west of Solfatara Creek.

Segment I-J: From I, this segment runs south-southeasterly for 760 m, staying at the base of the Obsidian Cliff flow. It parallels Solfatara Creek, which is 50 to 200 m to the east. Coordinate J occurs at the base of the flow slope.

Segment J-K: From J, this segment runs south-southwesterly for 700 m. The middle of this segment crosses midslope, but the transect ends at the base of the Obsidian Cliff flow slope at coordinate K.

Segment K-L: From K, this segment runs southwesterly for 1520 m. The first 750 m of this transect takes in the base of the obsidian flow and includes the very edge of the Solfatara Creek valley. The remainder of the transect cuts across a low bench that projects southeasterly into the Solfatara Valley (the segment does not incorporate this bench). Coordinate L is at the base of the obsidian flow slope.

Segment L-M: From L, this segment runs northwesterly for 900 m. This segment runs along the base of the obsidian flow south slope, paralleling, but staying east of, the stream flowing out of Lake of the Woods. Coordinate M is at the base of the obsidian flow slope.

Segment M-N: From M, this segment runs north and slightly west for 560 m. It stays east of the stream that flows out of Lake of the Woods and runs along the base of the Obsidian Cliff flow. Coordinate N is at the base of the flow and on the east edge of the stream that flows out of Lake of the Woods.

Segment N-0: From N, this segment runs east-northeasterly for 500 m, staying along the base of the obsidian flow.

Segment O-P: From 0, this segment runs in a straight northwesterly line for 2200 m. This transect begins by crossing two small draws that drain into the stream flowing out of Lake of the Woods. The straight line runs upslope to the upper portion of the obsidian flow and drops down again to the base of the slope before turning upslope as it crosses these draws. Thereafter, the segment stays about midslope until it crosses a small stream that drains the area around "The Landmark" and flows down toward the outlet of Lake of the Woods. After crossing this drainage, the transect rises up slightly to the crest of a low ridge and then drops to the base of the obsidian flow slope to coordinate P.

Segment P-0: From P, this segment runs west-northwesterly for 740 m. For the first 350 m, this transect stays along the base of the obsidian flow. Thereafter, it rises up to midslope before dropping down again to the slope base at the southwest corner of the Obsidian Cliff flow.

Segment O-A: From Q, this segment runs north-northwesterly for 1150 m. For the first 600 m, this segment follows the base of the obsidian flow, staying near the 7700 foot contour. Thereafter, it drops down very steep cliffs along the east side of the Obsidian Creek valley east of Beaver Lake. This transect ends at the benchmark (7383') that defines coordinate A.

Boundary Justification:

The boundary was determined by extensive reconnaissance level inventory. The locations of archeological features and debris are distributed extensively within the exploited Obsidian Cliff rhyolite flow. The defined boundary corresponds closely to the topographic limits of the plateau formed by that volcanic flow, and all significant archeological features are located within the defined boundary (see Table 1 and Map 2).

11. FORM PREPARED BY

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NATIONAL HISTORIC LANDMARKS SURVEY
October 27, 1995

OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
View of Cliff from Beaver Lake
Photo: F. Jay Haynes, 1899 (courtesy of the Haynes Foundation Collection, Montana Historical Society, Helena, Montana

OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
View of Cliff from road that passes beneath it
Photo: F. Jay Haynes, 1884 (courtesy of the Haynes Foundation Collection, Montana Historical Society, Helena, Montana

OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
Long trench-like quarry feature at Locus 27
Photo: Montana State University, 1989

#5

OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
Long trench-like quarry feature extending up north side of draw at Locus 33
Photo: Montana State University, 1989

#7

OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
Large ovoid quarry feature depression at Locus 33
Photo: Montana State University, 1989

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OBSIDIAN CLIFF
Yellowstone National Park, Wyoming
Fire damaged obsidian core and miscellaneous debris
Photo: Ann M. Johnson, NPS, 1989

#9

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#2 Obsidian Cliff National Landmark
Yellowstone National Park