

SOAPSTONE RESEARCH IN MEMORY OF J. D. LOVE, GRAND TETON NATIONAL PARK, WYOMING

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♦ ABSTRACT

Operating under a grant from the University of Wyoming-National Park Service Research Station, personnel from the Office of the Wyoming State Archaeologist and volunteers located and re-recorded two soapstone sources in Grand Teton National Park: 48TE1255 B Slim Lawrence's Asbestos Mine B and 48TE529. Over on the west side of the Tetons, in the Caribou-Targhee National Forest, we located and recorded a historic mine, three new prehistoric sites, and a previously unrecorded soapstone source: 48TE1646 -- the Rammel Mountain talc mine. Among the six newly discovered sites is 48TE1647, which contains two broken soapstone bowl preforms and a broken vessel associated with other prehistoric artifacts. This is interpreted to be evidence of prehistoric manufacture of soapstone bowls in Wyoming. More work needs to be done at this site as well as other in the Tetons.

♦ INTRODUCTION

Thanks to a grant from the University of Wyoming-National Park Service Research Station, personnel from the Office of the Wyoming State Archaeologist and three volunteers re-recorded two soapstone sources in Grand Teton National Park and located and recorded six new prehistoric sites in the Caribou-Targhee National Forest including an aboriginally utilized soapstone source. This work honors the late geologist John David Love, who mapped the geology of the Tetons and maintained an active interest in

the prehistoric inhabitants of Wyoming.

Environment Setting

The project took place on both sides of the Teton Range (Figure 1). On the east side, we surveyed the Owl and Berry creek drainages in the northern backcountry of Grand Teton National Park. Terrain in this area is steep and rugged (Turner 2000). It is so steep that we had trouble surveying in the vicinity of 48TE529, where the talus moved underfoot with every step.

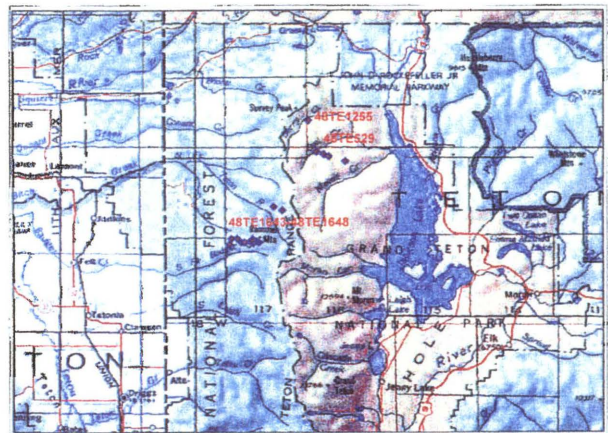


Figure 1. Map of northwestern Wyoming showing general location of project area.

In Grand Teton National Park we started on the western shore of Jackson Lake near the base of Harem Hill and followed the Berry Creek trail to the Upper Berry Creek Patrol Cabin, where we ascended a pass

west of Forellen Peak and then dropped into the Owl Creek drainage. We followed the Owl Creek trail down to Jackson Lake and then north back to Harem Hill.

Owl and Berry Creek Canyons have relatively flat valley floors, but there is an abrupt transition from the valley floor to steep slopes that continue up to the summits of Forellen and Owl peaks. Soapstone sources occur on the heavily timbered north and northwest-facing slopes of these peaks. Springs and seeps are common in the numerous gullies and avalanche chutes that dissect the north-facing slopes. Vegetation in the valley floors consists of willows along the creek. Sage or mixed conifer-aspen forest grow on the terraces. The north facing slopes are covered with spruce and fir at lower elevations and limber-whitebark pines up to treeline. A band of scree and talus rings the base of nearly vertical rock outcrops that form the peaks at highest elevations.

On the west side of the Tetons, our survey took place in the Jedediah Smith Wilderness in the Caribou-Targhee National Forest, in Wyoming. We surveyed a western spur of Rammel Mountain that forms a prominent ridge which can be followed all the way to a pass just south of Rammel Peak. East of the pass there is easy access to Bitch Creek. South of the ridge, and 1300 feet below, is the Badger Creek valley. To the north are the numerous gullies and streams coming off Rammel Mountain. Steep slopes and timber obscure visibility on either side of the ridge line. Dominant species are whitebark pine and Douglas fir.

Commercial logging outside the wilderness boundary has created a mosaic of open ground and mature conifer forests. Both logging and mining preceded creation of the Jedediah Smith Wilderness. An historic mine and a ruined cabin are inside the wilderness area boundary. Also, numerous snowmobile parts were observed inside the wilderness boundary. It is likely that there was vehicular access to 48TE2646- the Rammel Talc Mine before the creation of the Jedediah Smith Wilderness. This is based on the presence of dozer cuts at the mine.

Two of the six sites recorded on the west side of the Tetons were in the lower reaches of a cirque-like area. This bouldery subalpine area is characterized by long-lasting snowpack in the spring that gives way to alpine flowers fringing numerous rocky rivulets running through wet meadows interspersed with ribbon forests.



METHODS

The locations of the project areas are shown in Table 1. These areas of inquiry were chosen because soapstone is a ultra-mafic metamorphic rock, a type of rock with limited distribution in the Tetons. Ultramafic bodies were mapped by the late geologist J. David Love (Love et al. 1992). While other Precambrian rocks may contain soapstone elsewhere in the Tetons, it is almost sure to be found in ultra-mafic rocks.

Table 1. Project Area Summary.

Place Name	Geology	Site Number	Previously Recorded Cultural Resources?
Owl Creek	Layered gneiss	48TE529	Aboriginal soapstone quarry
Upper Berry Creek	Ultramafic	48TE1255	Historic asbestos mine)
Rammel Mountain	Augen gneiss	No	
Bitch Creek Narrows	Ultramafic		
Bitch Creek	Ultramafic		
Columbine Cascade	Ultramafic		
Moran Canyon	Ultramafic		

Unofficial searches of the Cultural Records Office database in Laramie were performed for the project areas prior to beginning fieldwork. A search of the CRO database (conducted 11/22/02) searching Teton County for the keyword "quarry" revealed that only one soapstone quarry has been recorded. Site 48TE529 was recorded by C.M. Love in 1971, who called it the "most important steatite quarry in the northern Teton Range" (C.M. Love 1971). Unfortunately, neither site maps nor photographs accompany the site form, and narrative description is only two sentences long.

The CRO file search also revealed that, other than 48TE529, no prehistoric cultural sites have been recorded in the vicinity of other soapstone sources whose geology was mapped by J. D. Love (Love et al. 1992). Slim Lawrence's historic asbestos mine (48TE1255), is also a source of soapstone, but appears to lack a prehistoric component; it is discussed further in the **SURVEY RESULTS** section. The Rammel Mountain soapstone source is shown on Love's geologic map of the

Tetons, but was never recorded as a prehistoric or historic cultural resource.

A total of 139 acres, surveyed at or near Class III standards (SHPO 2002), consists of 99 acres of linear survey both in GTNP and the Caribou-Targhee National Forest and about 40 acres of block survey in the Rammel Mountain area. The linear survey total is derived from multiplying the total number of miles walked (27.25) by 5280 ft/mile by a 30 foot wide survey corridor. The survey crew consisted of two professional archaeologists and three volunteers.

Prehistoric cultural resources were recorded in compliance with current State Historic Preservation Office standards. Cultural resources encountered during pedestrian surveys were located with GPS receivers. Individual artifacts and features were located with GPS receivers, photographed, and described.

Isolated finds were located on a USGS 7.5' topographic map with a handheld GPS receiver, photographed, and the environmental context was recorded on Wyoming SHPO isolated find forms. The presence of two or more artifacts or features within 30 m of their nearest neighbor was considered a site. A thorough ground survey covered the site area; colored pin flags were placed to mark the location of each artifact and feature in a site. The locations of artifacts and sites were recorded with a GPS receiver and plotted on the appropriate USGS 7.5' topographic map using iGage (1999) **All Topo Maps: Wyoming** software. All pin flagged artifacts were recorded as to material type and general morphology (i.e., primary flake, core, biface, etc.) based on criteria outlined in Table 2. Time period definitions are in the same table.

A simplified Wyoming Cultural Properties Form was filled out for each site, and each site was plotted on the appropriate USGS 7.5' topographic map. The site setting, as well as tools, hafted bifaces, soapstone artifacts, and features were photographed. No subsurface testing was undertaken.

Sites were evaluated for National Register of Historic Places (NRHP) eligibility as either unevaluated or eligible. The rationale is that, given the brief nature of the field work, we were unable to spend enough time at sites to determine *ineligibility*. Also, most of these sites were in or near the trees, and past experience has shown that timber can easily conceal cultural resources.

Table 2. Definitions

CHIPPED CRYSTALLINE STONE	
PRIMARY FLAKE	A complete flake with a single ventral surface, a point of applied force, (i.e., striking platform), and intact flake margins. Flake margins are considered intact if the distal end exhibits a hinge or feather termination and if lateral breaks or snaps (if present) do not interfere with accurate width. It retains cortex on 100 to 75% of its dorsal surface.
SECONDARY FLAKE	Same as above, retaining between 75 and 1% cortex on the dorsal surface.
TERTIARY FLAKE	Same as above, but no cortex on the dorsal surface.
DEBRIS	Debitage lacking a ventral surface, point of applied force, or intact flake margins.
CORE	Any nucleus of raw material which exhibits the removal of two or more flakes of sufficient size (2-3 cm) to have been useful as flake tool blanks.
TESTED COBBLE	A piece of raw material having a minimum number of flakes removed. The flake scars are small (2 cm) and the flakes removed are not judgmentally believed to have been useful as tools (Ahler 1986:50).
CHOPPER	A cobble with at least one end exhibiting the removal of flakes. The modified edge usually has been dulled or blunted by battering and use (Sanders 1995:14).
HAFTED BIFACE	Bifacially flaked implement with a pointed distal end and basal modification (Chapman 1977:413). Most hafted bifaces are probably projectile points; larger ones may have had other uses.
BIFACE	Chipped stone objects with flattened cross-sections which exhibit bifacially directed flake removals (Ahler 1986:54).
DRILL	Flakes or bifaces with narrow, elongated, bifacially retouched projections. Projections are generally at least 1 cm long and have diamond-shaped cross-sections.
RETOUCHED FLAKE	A flake with a modified edge where a series of flakes were intentionally removed. The retouch may extend across the entire surface of one side of the flake. Includes items commonly known as graters, scrapers, and unifaces.
UTILIZED FLAKE	A flake showing a regular series of edge modifications typically due only to use. The edge modifications is generally limited to the removal of microflakes less than 2 mm in length.
GROUNDSTONE	
GROUNDSTONE	Stone artifacts manufactured by pecking and abrading. They are used for refining raw materials from the environment into digestible or utilitarian products; i.e., manos and metates (Shepherd 1992).
HAMMERSTONE	A cobble with evidence of non-random battering generally located on one or more ends.

Table 2. (cont) Artifact definitions

SOAPSTONE (from Adams 1992)	
WORKED PIECE	Any piece of soapstone with manufacturing marks such as pecks, grooves, hatchet marks.
PREFORM	Although recognizable in shape, a preform has not been carved out to the point of functionality.
BOWL	A completed piece that is generally flowerpot-shaped and holds between 1 and 2 liters
MANUFACTURING MARKS	Pecks: small pits made by hitting soapstone with pointy bone, antler or stone tools. Gouges: continuous application of pressure on a sharp tool results in long manufacturing marks. Metal Tools make regular, parallel and consistent marks. Percussion produces pecks, gouges, and hatchet marks. Abrasion produces striae and polish.
TIME PERIODS	
Historic	In Wyoming, generally after 1805. European trade goods begin to dominate aboriginal society.
Protohistoric	The short period between the arrival of the first trade goods and horses (ca 1650) and the arrival of Anglo explorers (ca 1805).
Prehistoric	The 12,000 or so years of human occupation of North America before ca 1492 A.D. The prehistoric is further divided into the Paleoindian period (ca 12000 to 7500 BP), the Archaic (7500 to 1500 BP) and the Late Prehistoric (1500 to ca 1650 AD).

All field notes, photographs, maps, etc., are housed at the Office of the Wyoming State Archaeologist in Laramie, Wyoming.

Copies of this report and completed site forms, maps and photographs were submitted to the SHPO Cultural Records Office, the National Park Service, and the Caribou-Targhee National Forest.

SOAPSTONE GEOLOGY

Soapstone is the common name for a rock composed chiefly of the mineral talc (Table 3). Talc is one of the softest of all the minerals; it defines the low end of the 10-step Mohs hardness scale. You can scratch a piece of talc with your fingernail. In the field it is bluish or greenish or greyish; finished artifacts are often black. The powdered rock feels soapy when you rub it between your fingers.

Table 3. Attributes of Soapstone.

Rock Type	Metamorphosed dolomite or ultramafic rock.
Age of Rock	Restricted to Precambrian rocks in Wyoming, >2.5 billion years old
Mineral	Talc
Hardness	Defines 1 on the Mohs scale. Can be scratched with a fingernail.
Texture	Powdered rock feels soapy.
Color	Bluish, greyish, or greenish.
Habitat	Saddles, passes, valleys; does not form ridges or prominent outcrops.
Chemistry	$Mg_3[Si_4O_{10}](OH)_2$ i.e., a magnesium silicate
Fall-off rate	Sharp, does not survive long in fluvial or glacial environments.
Also known as:	Steatite. Soapstone and steatite are not Catlinite.

Under the right temperature and pressure conditions, a magnesium silicate like dolomite metamorphoses into steatite or soapstone (Harris 1995b). It occurs in small deposits in Wyoming's mountains in metamorphic Precambrian rock that is older than 2.5 billion years.

Soapstone does not occur in predictable places like chert and quartzite. For example, the Paleozoic and Mesozoic-aged formations that contain cherts and quartzites are almost invariably ridge-forming rocks. If you see a ridge of Dakota sandstone, you know that if you walk below the outcrop you will eventually find the Morrison Formation and good cherts and quartzites. Eocene cherts are found in desert basins around the margins of the extinct Lake Gosiute. With experience, it is easy to predict where chert will occur, even without formal geological training.

On the other hand, knowing that soapstone occurs in Archean metamorphic rocks adds absolutely no predictability to its occurrence. Soapstone sources do not form ledges, do not form ridges, and do not occur above or below distinctive formations. However, many prehistorically utilized soapstone sources in Wyoming seem to be close to the contact between Precambrian and younger sedimentary rocks.

When you carve soapstone the result is talcum powder. Big tools like choppers, picks, hatchets, and chisels produce some macroscopic "debitage", but in

my experience it weathers so fast that it is almost impossible to see after a few years on the ground.

PREVIOUS RESEARCH

In the literature, the amount of consideration accorded to steatite artifacts by researchers is often overshadowed by chipped stone artifacts. Yet the distribution of prehistoric and historic steatite artifacts is nearly global. Steatite is found on all six inhabited continents and many of the continental islands. The following is condensed from Adams (1992).

A Few Early Accounts in Western North America

In their 1804-1806 journey, Lewis and Clark note that the Lemhi Shoshone's cookware "consist of pots in the form of a jar made either out of earth or a soft white stone which becomes black and very hard by burning" (Thwaites 1904:19). They write that the soft rock was found near the Three Forks of the Missouri at the confluence of the Madison and Gallatin rivers (Thwaites 1904:19). They were most likely referring to soapstone, which is commercially mined in this area today (Wells 1974).

In 1805, the trader Laroque noted a carved stone cooking vessel:

I traded eight beavers with the Snake Indians in whose possessions I saw a Kettle or Pot hewn out of solid stone. It was about 1 1/2" thick and contained 6 or 8 quarts; it had been made with no other instrument but a piece of iron (Laroque in Wedel 1954:407).

This earliest reference contains the germs of three topics that continue to be of interest. First, a chronological marker: the object was in use at the time of contact. Second, the probable method of manufacture: the vessel was carved with an iron tool. Third, the cultural identity of the users was noted.

In an 1881 report, P.W. Norris, the superintendent of Yellowstone National Park, mentions high country steatite bowls found in the Park. Given that there are prehistorically utilized soapstone sources on the north, east, and south sides of the park, it is not surprising that prehistoric steatite artifacts have been found in this area.

◆ RECENT RESEARCH

J. David Love (Love and Christiansen 1985; Love et al. 1992) mapped the location of ultramafic rocks across Wyoming and in the Tetons. When Love (et al. 1992) mapped the geology of the Teton Range, he located five areas of ultramafic rock (Table 1). At least two of these sources have signs of aboriginal utilization (J.D. Love, personal communication 2002). Dave Love's son Charlie visited one of the aboriginally utilized steatite source in 1971. The locale was given a Smithsonian site number (48TE529; Table 1).

Frison (1982) details the distribution of aboriginally-utilized quarries and the manufacture of artifacts and examines some of the finished vessels. The aboriginal quarrying and manufacturing that Frison (1982:279) describes involved both pecking and gouging out vessel preforms while the blank was part of the outcrop. After the preform was roughed out, it was sometimes transported to another area for more shaping. In one case, a preform weighing 52 kilograms was transported two kilometers away from the quarry (Frison 1982:279).

Vessels do not appear to be randomly distributed across Wyoming (Marceau 1982 n.d.:22-25). However, it is not clear whether the vessel distribution is determined by the distribution of the quarries (Love 1972), or by patterns of human movement and subsistence strategies, or both. The greatest concentration of steatite vessels at a single site occurs at the Lawrence site on the shores of Jackson Lake (Wright 1984:54).

Little is known about the age of steatite vessels. Some vessels (or fragments), such as those from the River Bend Site (McKee 1988) or the Natural Corrals site (Larson 1965), were found in Protohistoric sites associated with Shoshone. The organic residue from the interior of a steatite bowl was dated to AD 1848 by accelerator mass spectroscopy (Adams 1992, Adams and Daniels 1995). The age of vessel manufacture is tied to questions about the ethnic affiliation of the vessel manufacturers. Wedel (1954) first raised the question of ethnic affiliation of steatite vessels and Shoshonean pottery, and concluded that the "ethnohistorical data indicate the steatite-working, like pottery making, was probably carried on by Shoshonean groups into the 19th century" (Wedel 1954: 407). Marceau (1982 n.d.: 81), citing numerous ethnographic and archaeological references to steatite artifacts and ceramics, disagreed: "neither ethnographic, ethnohistoric, nor archaeological data support an association between steatite and the

Shoshone." Frison (1982) concluded that steatite vessels are probably Late Prehistoric to Historic in age, and probably used by Shoshonean groups.

The most recent research on steatite emphasizes the range of artifact variation and attempts to explain how these were made and distributed (Frison 1982; Marceau 1982; Adams 2003b). Tools such as accelerator mass spectrometry dating, X-ray fluorescence (Adams 1992), X-ray diffraction (Adams 2002a), and gas chromatography mass spectroscopy (Malaney 2003) now permit research on questions of the use, transport, and dating of steatite artifacts.

◆ SURVEY RESULTS

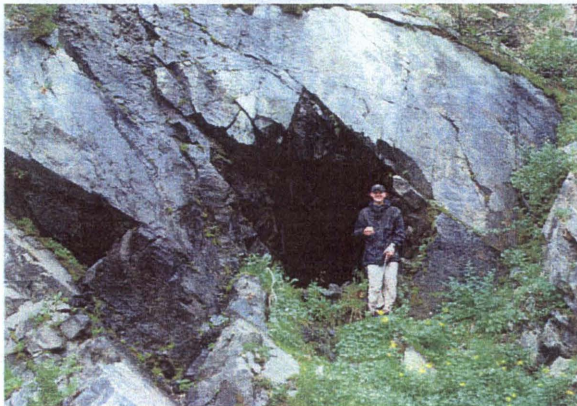
The first two site descriptions are updates of previously recorded sites in Grand Teton National Park. The remaining six sites occur in the Caribou-Targhee National Forest and are described here for the first time. Three of these new sites are exclusively prehistoric and three have both historic and prehistoric artifacts.

Grand Teton National Park Sites

The two sites recorded in Grand Teton National Park are described below.

SITE: 48TE1255 (Figure 2).

DESCRIPTION: 48TE1255 is an asbestos mine on the northern flank of Forellen Peak, above Berry Creek in Grand Teton National Park. Site size is 90 m NBS by 40 m E-W, for an area of about 2830 m². The mine adit opening is at an altitude of 7940 feet above sea level.



Mine opening at Slim Lawrence's asbestos mine

Figure 2. Photographs of 48TE1255.

This is what remains of Slim Lawrence's asbestos mine. Green chrysotile asbestos (Harris 1995a) was observed in small quantities in the talus below the mine opening, and there is an outcrop of long-fiber (> 5cm) white asbestos, about 15 cm thick by 2 m tall in the exposed wall near the opening.

The site was originally recorded in 1990 by Melissa Connor, who did not visit the site, but relied on a backcountry ranger's description. The NPS/OWSA team visited the site on 8/4/03 and the following description is based on that visit. The site consists of mine adit (a horizontal shaft) and a talus cone at least 60 m long by >30 m wide at the base. The site is on a steep slope (45° at the mine opening). The talus originates at the mine opening and tumbles down 25 vertical meters, almost reaching the valley floor. The talus cone was created by mining the outcrop and discarding the least desirable rocks down slope. The talus slope consists of dark grey ultramafic rocks including bowl sized and bigger chunks of soapstone. Numerous large pieces of high quality soapstone were observed. The mine represents a considerable amount of work. Many hundreds of tons of rock were moved by Lawrence and dumped down the slope.

Above the talus slope is a flat spot about 20 m N-S by 40 m E-W chiseled out of the solid rock slope. The back wall of the flat spot has a mine adit. The adit's opening is about 2.5 m above the flat spot. The adit goes horizontally back (south) in to the hillside. The adit is about 20 m long and about 2 m in diameter. During the site visit on 8/4/03, there was a steady trickle of water pouring out of the mine. The flat spot is now a thriving riparian zone.

No historic features were observed below the mine, although experience suggests that there should be a camp/cabin in the valley below. There are faint traces of trails on either side of the mine opening, but neither could be followed to the valley floor. The only observed artifact was a twisted length of 2 inch pipe. Connor (1990:4), relying on a backcountry ranger's description, writes that "larger equipment associated with mining is scattered throughout the area."

The mine dates to no later than the 1920s. Harris (1995a:7) states that "small amounts of asbestos were produced prior to 1921" in his report on the economic geology of asbestos and serpentine deposits in Wyoming. In their section on asbestos in Wyoming, Ladoo and Myers (1951:47) note that asbestos is mined "near Berry Creek in Lincoln County [sic], on the north side of Forellen Peak, 35 miles from the nearest shipping point at Ashton, Idaho." Given that Teton County was

established by the Wyoming State Legislature in 1920 (Larson 1965:453), it seems that Ladoo and Myers were using old data.

We found no traces of aboriginal soapstone quarrying near the opening or on the talus slope below. We did not explore the steep terrain above the mine because rain had made the 45° slope too slippery for safe surveying. Traces of aboriginal quarrying are defined as peck marks or a series of axe/hatchet marks surrounding the place where bowl preforms were detached. Peck marks imply Prehistoric use of the soapstone source. Hatchet marks imply Protohistoric or Historic use by people seeking to detach large chunks for bowl manufacture (Table 2). I suspect that any trace of aboriginal use has been obliterated by mining.

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: In 1990 Connor wrote that there was insufficient data to evaluate the site's eligibility. Grand Teton National Park archeologist Jaquelin St Clair (personal communication 8/04/03), said that the site should be considered eligible for nomination to the National Register of Historic places during a site visit. The site is a reasonably intact example of 1920s mining practices. It can be associated with a person important to local history. It is also a rich source of soapstone that may have been used prehistorically. Because of its location in a national park, it is reasonably well preserved with excellent feeling of association. For these reasons the site is considered to be eligible under Criteria B and D.

IMPACTS: Other than the threat of mineral sample collection, impacts are unknown.

RECOMMENDATIONS: No further work is recommended.

SITE: 48TE529 (Figure 3).

DESCRIPTION: We confirmed that there is a large amount of soapstone on Owl Peak in Grand Teton National Park, but were unable to locate its bedrock source. The Owl Peak source occurs in a rugged canyon following the trace of the Forellen Fault (Love et al. 1992). The west side of the canyon is steeply inclined Paleozoic sedimentary limestone, while the east side of the canyon is Precambrian gneiss. This is a steep, dynamic environment, and rocks were shifting underfoot with every step across boulders, talus and scree.

Dave Love's son Charlie visited this aboriginal utilized steatite source in 1971 and filled out a site form and the locale was given a Smithsonian site number (48TE529), but no maps accompany the site form and the

written site description is one sentence long: "Narrow ridge of steatite", with the qualifier that this is the "most important steatite quarry in the northern Teton Range" (Love 1971).



Soapstone boulders in talus

Figure 3. Photograph of 48TE529

To further confound the matter, there are two contrasting legal locations for the site. One location is Charlie's, the other is from SHPO. We searched for the asbestos mine rather than the SHPO location because in my experience there is always soapstone at an asbestos outcrop, while the reverse is rarely true.

We did not reach the primary soapstone source described by Charlie Love. The "narrow ledge of soapstone" that Charlie Love (1972) describes was not visible and may have occurred a couple hundred meters east and above us.

Access to the asbestos mine on the upper spur of Owl Peak is best attained from some other approach than the one we took. Unstable talus slopes prevented us from climbing higher than 8800 feet, while the asbestos mine plots out a little below 9200 feet on Love's (et al. 1992) map. We did see tons of soapstone in the form of boulders up to 2 m on a side. The boulders occurred in a cirque-like area at the heads of two unnamed drainages that follow the trace of the Forellen Fault. We climbed up the cirque to about 9400 feet and saw soapstone, but no traces of aboriginal soapstone use.

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: Unevaluated until C.M. Love's site is relocated and visited. More work needs to be done to resolve the discrepancy between the Love asbestos mine location and the SHPO site location.

IMPACTS: Impacts are unknown.

RECOMMENDATIONS: More work is recommended.

Caribou-Targhee National Forest Sites

The following six sites are on the west side of the Teton Range on public land administered by the Caribou-Targhee National Forest. The sites occur in and near the Jedediah Smith Wilderness. They were located and recorded as a direct result of the UW-NPS grant.

SITE: 48TE1643 B Rammel 1 (Figure 4).

DESCRIPTION: Site size is 7 m in diameter for an area of 154 m². The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. The site occurs on both sides of a trail that climbs a flank of Rammel Mountain. This trail sees horse, pedestrian, and snowmobile use. The site is on an open ridge line, but there are scattered whitebark pines, sub-alpine fir, and Engelmann spruce within a few tens of meters on either side of the trail where the ground begins to drop steeply.



48TE1643 site photo

Figure 4.

The site consists of a small lithic scatter with a broken, Late Prehistoric, unnotched projectile point made from obsidian. The tip of the 14 by 13 by 2.5 mm thick projectile point broke off before it could be finished by notching the sides. The point was not collected, but left under a pile of four cobbles less than one meter from its findspot. A dark grey basalt primary flake and three pieces of ignimbrite debitage (one each: secondary, tertiary, and debris) were also recorded.

The only modern artifact was the ignition key to a Polaris snowmobile.

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: This small lithic scatter contains only one diagnostic artifact. The site occurs where there is negligible Holocene deposition. Recording has exhausted the site's information potential.

For these reasons, the site is considered to be ineligible for National Register nomination.

IMPACTS: Other than the threat of collection by looters, impacts are unknown.

RECOMMENDATIONS: No further work is recommended.

SITE: 48TE1644 B Rammel 2 (Figure 5).

DESCRIPTION: The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. Site size is 15 m N-S by 45 m E-W for an area of 565 m². The site occurs on both sides of a trail that climbs a flank of Rammel Mountain. This trail sees horse, pedestrian and snowmobile use. The site is on the open ridge line, but there are scattered whitebark pines, sub-alpine fir, and Engelmann spruce within a few tens of meters on either side of the trail where the ground begins to drop steeply. The site is roughly 500 m east of 48TE1643.



48TE1644 site photo looking west

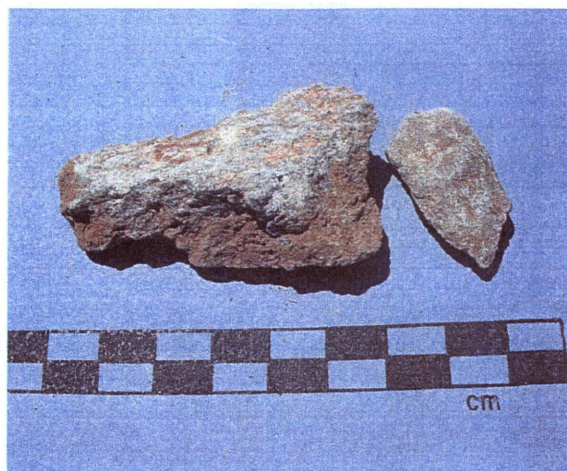
Figure 5.

The site consists of a light lithic scatter of obsidian, ignimbrite, chert, chalcedony, and two small pieces of soapstone debitage. Surface artifacts are summarized in Table 4.

Table 4. Surface Artifact Inventory, 48TE1644.

Material Type	Primary	Secondary	Tertiary	Debris	Other
Ignimbrite	1		1	5	
Obsidian		1	4		
Grey Chert			2		
Chalcedony			1		
Soapstone					2 small pieces

The two small pieces of soapstone are less than 10 cm long and do not exhibit any manufacturing marks (Figure 6), yet experience suggests that they are not naturally occurring. They may be soapstone "debitage" left over from bowl manufacture. One piece was found within 20 cm of a chert flake. Soapstone weathers rapidly, and on a windy ridge frequented by snowmobiles in the winter, horses and pedestrians in the summer, the combination of natural erosion and human impact may have removed the faint traces of manufacture on this softest of rocks.



Soapstone artifacts from 48TE1644

Figure 6. Photograph of 48TE1644

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: This site is unevaluated. Lithic scatters with soapstone "debitage" are extremely rare. I would like to re-examine this site and the surrounding country before considering it to be ineligible.

IMPACTS: Other than the threat of collection by looters, impacts are unknown.

RECOMMENDATIONS: Further work is recommended.

SITE: 48TE1645 B Rammel 3 (Figure 7).

DESCRIPTION: The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. The site is 17 m in diameter for an area of 227 m². The site consists of lithicdebitage, soapstone (probably related to the historic mine) and historic artifacts and features (Table 5). This site is about 75 m west of the Rammel Mountain soapstone quarry.

The soapstone debris found at this site differs from that at the previous site (48TE1644). Soapstone debris at this site consists of fist-size and larger rocks

with sharp edges, indicating recent mining, while the soapstone at 48TE1644 is much smaller, much thinner, and more likely to have resulted from bowl manufacture.



Dozer track heading toward talc mine

Figure 7. Photograph of 48TE1645

Table 5. Surface Artifact Inventory, 48TE1645.				
Material Type	Secondary	Tertiary	Debris	Other
Ignimbrite	2	3	3	
Obsidian		1	1	
Soapstone				debris from historic mining

The two historic features are linear scars left by a bulldozer that lead toward 49TE1646 - the Rammel Mountain Soapstone Quarry. Both are over 30 m long and up to 1 m deep. Two explanations for the dozer tracks are possible: First, miners were using the dozer to look for more soapstone; second, they were blading access to the soapstone body to facilitate its removal. Historic artifacts consist of post-1950s steel and glass fragments.

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: This site is unevaluated. Lithic scatters with soapstone "debitage" are extremely rare. I would like to re-visit this before I say that it is ineligible.

IMPACTS: Other than the threat of collection by looters, no impacts are known.

RECOMMENDATIONS: More work is recommended.

SITE: 48TE1646 B Rammel Mountain Indian Soapstone Quarry (Figure 8).

DESCRIPTION: The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. The site is an aboriginal soapstone quarry that has been almost completely obliterated by historic talc mining. Site size is 40 m NBS by 8 m E-W for an area of 250 m².



48TE1646 site photo

Figure 8.

The site was visited by J.D. Love, C.M. Love, and G.C. Frison in 1970; however, they did not formally record the site. The only record I could track down is what J.D. Love wrote in a precise hand, on the back of a photographic slide: "Rammel Mountain Indian soapstone quarry on high ridge N. of Badger Creek, W. side of Teton Range, Teton Co., Wyo. Note lichen on pedestal. Rock is Precambrian talc. J.D. Love 9/70." On the other side, in a different hand, in blue ink is: "Pedestal is at the base of a carved stone bowl after the vessel itself was removed."

There are at least four modern mining pits that follow a 2-3 m wide soapstone vein at a 330-320 degree bearing. There is no asbestos at this mine, just talc and soapstone. Three of the mining pits have been dynamited and no traces of aboriginal quarrying were observed. At the lowest pit, a few traces of aboriginal use remain. Evidence of aboriginal quarrying is defined as peck marks (made by stone tools) or axe/hatchet marks. Peck marks imply Prehistoric use of the soapstone source. Hatchet marks imply Protohistoric or Historic use by people seeking to detach large chunks for bowl manufacture.

Pit 1 is the lowest of the pits. It measures 10 by 3 by 2 m deep. It contains traces of aboriginal use as well as historic mining. There are peck marks on a steatite outcrop near the original ground surface. There are hatchet scars where a bowl preform may have been detached (Figure 9). The historic mining traces consists of the pit itself, in addition to three 5 cm diameter by as

much as 60 cm deep bore holes drilled into the steatite for shooting dynamite, and a number of historic graffiti. The Nichols family seems to have visited the site often. Janet Nichols, RMN, and MN signed in three times on 7/7/73, KN and AMN signed in on 7/29/74, and Bud carved his name in 1984. If the number of times they signed in is any indication of their interest, the Nichols family might be good folks to contact about the presence of soapstone bowls in the area.



48TE1646 bowl detachment scar

Figure 9.

The other pits are devoid of graffiti, bore holes, or aboriginal quarrying marks. Pit 2 exposes a wall of iron-stained soapstone about 4 m long by 1.5 m high. The pit is oriented at a bearing of 320 degrees.

Pit 3 is the largest of the four pits. It is about 15 m long by 4 m wide by 1.5 m deep. No traces of aboriginal or modern mining practices remain. The pit is oriented at a bearing of 330 degrees.

Pit 4 is almost contiguous with Pit #3. The soapstone in this pit is a little more schisty than the other pits. There is an obvious contact with a non-steatitic rock on the west wall of the pit.

Below the mine, soapstone boulders, cobbles and detritus occur for a few hundred feet. No preforms, bowls, or other aboriginal artifacts were observed in a fairly intense survey. However, Frison states (personal communication 8/13/03) that a large block of soapstone with an attached bowl preform lies in the Badger Creek valley, many hundreds of vertical feet below the quarry. This is the same preform shown in Love's 1970 slide. It was not relocated in 2003.

INTERPRETATION: Given that there are prehistoric sites with soapstone and chipped stone artifacts nearby, and that peck marks are still visible in Pit #1, I think it is safe to say that this source was used by Native Americans

in Prehistoric and Protohistoric times. EuroAmericans mined the talc vein in the Historic past. As is common elsewhere with outcrops of high quality stone, such as chert, obsidian, ocher, and soapstone, that are known to have been important to prehistoric people, procurement and utilization continues into the present.

Frison (personal communication 1991) said that soapstone was considered by old time miners to be an indicator of gold. In 1950, high grade steatite, already ground fine enough to pass through a #200 mesh screen, was selling for \$10 a ton (Ladoo and Myers 1951: 541). At that price, the Rammel Mountain soapstone source would have returned a few hundred dollars at most.

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: Although the aboriginal component of the soapstone quarry has been almost obliterated by more recent workings, there is still information potential in what remains. For this reason it is unevaluated.

IMPACTS: Other than the threat of collection by looters, no impacts are known.

RECOMMENDATIONS: More work is recommended. Apparently, we did not descend the slope far enough to find the bowl preform attached to a soapstone slab that Love and Frison photographed. This piece needs to be examined to see if the manufacturing marks are prehistoric (peck marks) or historic (hatchet cuts).

SITE: 48TE1647 B Rammel Amble Ding Dong Site (Figure 10).

DESCRIPTION: The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. It is located in an Engelmann spruce and sub-alpine fir forest immediately north of a small spring-fed creek. Monkeyflower, sedges, and sorrel hug both sides of the creek. Large granitic boulders dot the landscape. There is a large amount of barren ground in this drainage, suggesting a dynamic environment. The site is on ground that slopes west-southwest at 15°. It is a small site, only 9 m in diameter.



48TE1647 site photo, looking northeast

Figure 10.

The site consists of two broken soapstone bowl preforms, a broken soapstone bowl, and seven pieces of obsidian. Surface artifacts are summarized in Table 6.

Material Type	Primary	Secondary	Tertiary	Debris	Other
Obsidian	1	1	1	3	core
Soapstone					2 broken bowl preforms and one broken bowl in 5 pieces

Both preforms and the fragmentary bowl were found in a 7 meter diameter area. All five pieces of the broken bowl were found within a 0.75 m diameter area.

Preform #1 is a broken soapstone bowl preform (Figure 11). It is 20 cm tall. The outside diameter is 19 by roughly 16 cm. The inside diameter is 15.5 by roughly 11.5 cm. The maximum excavated depth is 8 cm. It is a classic (Frison 1982; Adams 1992) flowerpot-shaped vessel with a flanged base. The base diameter is 14 by 12 cm, the flange is about 2 cm high. All the manufacturing marks left on the bowl are consistent with manufacture by stone tools. The interior base has been pecked, while the interior walls were gouged and chopped by a tool with an irregular working edge. The exterior was chopped circumferentially rather than longitudinally. The manufacturing marks are about 1 cm across by 0.7 cm long.



Figure 11.

Preform #2 is a broken soapstone bowl preform (Figure 12). It split vertically, but not into even halves. The piece that we found represents about 2/3 of the preform's base. There are no obvious impurities where the bowl split. The preform once had side walls, but only a small amount of wall remains attached to the base. The preform has a classic flanged shape. The flange is about 1.5 cm high. The wall remnants are about 2 cm thick. Its height is 9.6 cm. The outside diameter is 16.5 by 10 cm at the top of the wall remnants, and 10 by 7 cm at the base. All the manufacturing marks left on the bowl are consistent with manufacture by stone tools. Both the interior and exterior exhibit peck marks, but both surfaces are more weathered and smoother than preform #1.



Preform #2, 48TE1647

Figure 12.

Five pieces of a nearly completed, but subsequently broken, soapstone bowl were found in a 75 cm diameter area that was in close proximity to the preforms. Three of the fragments fit together and the other two fit together, but assemblies of the three and two do not fit together in any combination. No part of the base is present, but part of an irregular lip is present. There is no evidence of a flange. All the manufacturing marks left on the bowl are consistent with manufacture by stone tools. The manufacturing marks on the interior surface suggest a tool with an irregular edge that was used by a right handed person, because the manufacturing marks go from top right to bottom left. The exterior is more weathered and was chopped with a different tool that had an irregular edge. The height is estimated to be 15 cm.

INTERPRETATION: I suspect that the site was a cache rather than a camp or manufacturing area. The ground slopes too much for comfortable camping and the site lacks soapstone "debitage" found at workshops in the Wind River Mountains (Adams 2003a).

This site and 48TE1644 (above) make a good argument for a prehistoric origin of the soapstone bowl industry. Sites with soapstone bowls anddebitage are rare (Adams 1992, 2003b). About one-third of the vessels I have examined have metal tool marks. Usually there are historic artifacts superimposed over the prehistoric sign. In this case, the nearest historic artifacts are over 150 m south of the site. With the notable exception of 48NA580, where Frison (1982) recorded chipped stone tools and soapstone, few single component prehistoric soapstone sites have been recorded (Adams 1992).

TESTING: No testing was performed.

COLLECTION: No artifacts were collected. The soapstone artifacts were hidden under brush and rocks; the obsidian was not disturbed.

NATIONAL REGISTER STATUS: Although small and lacking in diversity, this is an important site. It contains soapstone artifacts with manufacturing marks consistent with stone tools in an unequivocally prehistoric context. Further study can be expected to yield significant scientific information. For this reason, 49TE1647 is considered eligible for nomination to the National Register of Historic Places.

IMPACTS: Other than the threat of collection by looters, no impacts are known.

RECOMMENDATIONS: Never in my 15-plus years as a professional archaeologist have I recommended collecting all the artifacts at a site, but in this case I think that it is important to collect the bowl fragments and both preforms as well as the obsidiandebitage. Taken together, they are an important resource for further research.

SITE: 48TE1648 B Historic Mining area (Figures 13, and 14).

DESCRIPTION: This multi-component site consist of two mining test pits, one mine with a substantial adit and shaft, an old cabin, and prehistoric lithics. The site is in the Jedediah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. Site size is 50 m NBS by 310 m E-W for an area of 12,175 m². The mine is at an altitude of 9120 feet above sea level, the cabin and lithics are at 9080 feet, the cairn is at 9200 feet and the highest pit was at 9390 feet.

There is a mining test pit at the top of this site (Figure 13) in an iron-stained rock. Then there is another pit in gneiss (Figure 13). Neither pit exceeds 3 m in depth.

The mine represents a considerable amount of work. There is a horizontal adit, about 1.6 m in diameter, that goes back at least 10 m (Figure 14). A few meters

into the mine a similarly sized vertical shaft drops down at least 3 m from the adit. There are greenish copper minerals in the mine tailings. It is not clear what was being mined, but there is no talc in any of the test pits or the mine.



Test pit. Wypt 75.



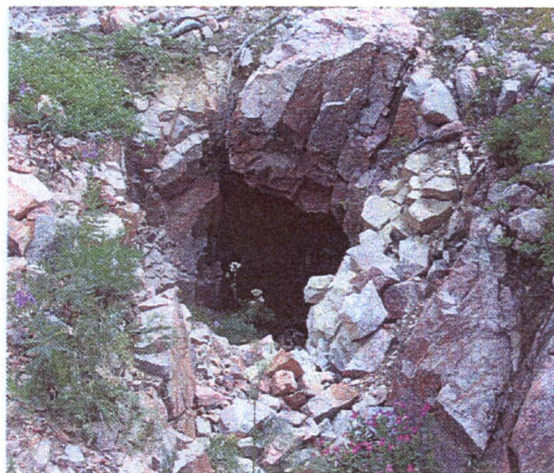
Test pit. Wypt 77.

Figure 13. Photographs of 48TE1648

By all indications the cabin is old. The timbers were cut with an axe, not a saw. The logs are V-notched and still fit tightly. Only five courses of logs remain and they are warped and sunken. Other than a solder-dot can fragment, no identifiable historic artifacts were recorded.

Scattered about the flat spot near the cabin is a background noise of rust fragments that may have been from cans, but they are rusted beyond all archaeological utility.

The cairn looks to be of Euro-American origin. The center is not filled in with rocks and it looks like a 4 by 4 inch post, used to mark mining claims, would fit in this space.



Mine opening.

Figure 14. Photograph of 48TE1648

In addition to the historic mining features, seven prehistoric artifacts were found within the mine site boundary. Four of the seven prehistoric artifacts were within 30 m of the cabin. FS-1 is a cobble quartzite utilized flake tool (Figure 15). It measures 75 by 50 by 25 mm thick and there is about 65 mm of use along one edge. It was found within 30 m of three other pieces of debitage (grey obsidian debris, orthoquartzite secondary flake, and an ignimbrite secondary flake). It is unclear if the prehistoric artifacts were collected by the miners or if they predated the miners. Another three pieces of ignimbrite (two tertiary flakes and a biface thinning flake) were found about 40 m uphill of the cairn.



FS-1

Figure15 Photograph of 48TE1648

TESTING: No testing was performed.

NATIONAL REGISTER STATUS: Unevaluated. Since we were doing aboriginal archaeology under the grant, very little time was spent recording the historic site.

IMPACTS: Other than the threat of collection by looters, no impacts are known.

RECOMMENDATIONS: A combination of historic research and more archaeology is recommended.

Isolated Finds

Four isolated prehistoric finds were located and recorded. They are described below.

IF-1 is the base of a Middle Archaic projectile point (Figure 16). It was found in the Caribou-Targhee National Forest on the west side of the Teton Range. It was found in the middle of the trail near Indian Meadows. The Indian Meadows trail passes through heavy whitebark pine timber. The point base was found about 50 m south of an unmodified soapstone boulder also found in the trail. The point base is made from high quality milky white chalcedony. It measures 17 by 20 by 5 mm thick. The base has not been ground. The base is most likely a Middle Archaic Hanna or Duncan projectile point (Frison 1991:91). The point base was collected and turned over to the Caribou-Targhee National Forest archaeologist.

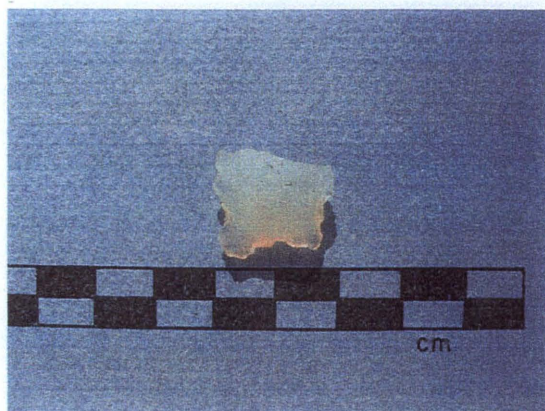


Figure 16. Photograph of IF-1.

IF-2 is a cairn on the edge of a gneiss outcrop overlooking the Badger Creek drainage. It is located about 100 m east of the Rammel Mountain soapstone quarry in the Jeddiah Smith Wilderness of the Caribou-Targhee National Forest on the west side of the Teton Range. The cairn is about 1 m high by 1.3 m in diameter and consists of at least two dozen rocks and is six courses high (Figure 17).



IF-2

Figure 17. Photograph of IF-2.

IF-3 (Figure 18) consists of two chunks of ignimbrite debris found on an unnamed pass on the flank of Rammel Mountain between the Indian Meadows and Bitch Creek drainages. The pass is grassy and surrounded by Krumholz. Both pieces are angular chunks of glassy ignimbrite a few centimeters on a side. They were not collected.



IF-3

Figure 18. Photograph IF-3

IF-4 is a quartzite secondary flake found in the valley below 48TE529 (Figure 19). It measures 7 by 5 by 2 cm. It was detached from a rounded quartzite stream cobble. The flake was found in a meadow on the south side of Owl Creek in a pocket gopher mound. It was not collected.



DISCUSSION

Other archaeologists have made a case for northwestern Wyoming being the epicenter of the Rocky Mountain soapstone bowl industry (Marceau 1982;

Wedel 1954), yet until this report, little fieldwork had been done to confirm this. Soapstone quarries and workshops in other Wyoming mountain ranges such as the Big Horns, the Winds, the Laramie Range are much better known and recorded (Adams 2003a; Frison 1982; Harris 1995b; Schoen and Vlcek 1991).



IF-4

Figure 19. Photograph of IF-4.

During the first year of fieldwork, OWSA archaeologists visited three of the six ultramafic rock outcrop locations mapped by Love (et al. 1992). Traces of aboriginal use were found at one source on the west side of the Tetons (48TE1646). Historic mining at 48TE1255 may have obliterated any possible traces of aboriginal use. 48TE529 is an important aboriginal quarry according to C.M. Love (1971); however, we were unable to relocate the primary source.

The time depth of soapstone artifacts in Wyoming is great: A disc bead, found at the Hell Gap Paleoindian site, came from a level older than 9000 years (Adams n.d.). Steatite beads were found at the Split Rock site in a feature dating to 5500 years ago (Eakin 1987). Soapstone pipes date to at least 4000 years ago (Frison and Walker 1984:38-39).

However, the antiquity of soapstone vessels is hard to prove. One bowl was AMS dated to AD 1848 (Adams 1992) and other bowl fragments were found at Protohistoric sites. At least one-third of the vessels I have examined have metal tool marks (Adams 1992). The discovery of soapstone bowls and chipped stone at 48TE1647 B where two bowl preforms and a broken bowl exhibit manufacturing marks consistent with stone, not metal, tools B is considered to be unambiguous evidence of prehistoric bowl manufacture. Soapstone debris was also found associated with prehistoric artifacts at 48TE1644.

◆ MANAGEMENT RECOMMENDATIONS

In the first year of an expected three year project, archaeologists and volunteers surveyed more than 130 acres and recorded eight sites in Grand Teton National Park and Caribou-Targhee National Forest. We visited and recorded sites in GTNP that lacked formal documentation and found six new sites in the Caribou-Targhee National Forest.

More work is recommended at 48TE529 in Grand Teton National Park. While a secondary source of soapstone was located, the aboriginal quarry described by Charlie Love was not re-located. This is one of the closest sources to the Lawrence site, which had the highest concentration of soapstone artifacts of any known archaeological site in Wyoming.

Site 48TE1647 has evidence of prehistoric manufacture of soapstone bowls. Complete collection of this site is recommended. Based on findings on the west side of the Tetons in the Caribou-Targhee National Forest, I believe that there is good potential for the discovery of aboriginally-utilized soapstone sources in the Bitch Creek area. More work is recommended in this area.

If another year of funding is obtained by the author, the team is committed to locating and recording additional soapstone sources in both Grand Teton National Park and in the Caribou-Targhee NF.

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APPENDIX

OBSERVATIONS ON SOAPSTONE GEOLOGY IN THE TETON RANGE

By

Yvette A. Widman

The Tetons are the youngest mountains in the Rocky Mountain system. The Teton Range is a result of two major tectonic episodes. The first was during the Laramide Orogeny (80-65 million years ago). The second began nine million years ago, with most of the uplift taking place within the last five million years and the range has been rising since (Love et al 2003:1).

The Teton system is comprised of two structures: the Teton Range is "an up-faulted block tilted to the west. And Jackson Hole, [which is] a narrow, down dropped fault block" (Harris 1995:558). Looking north, the western flank of the range is comprised of downward dipping Paleozoic rocks. The peaks are of Precambrian granite with intrusive dikes. Some, like Mt. Moran, are capped with Cambrian Period sedimentary deposits (Flathead Sandstone). These are bounded to the east by the steeply dipping Teton normal fault (Gilmer 1986:42).

Based on strontium-rubidium dates, the Precambrian rocks are approximately 2.5 billion years old (Harris et al 1995:558). They include layered granitic gneisses (a metamorphic rock that has foliations), granites, migmatites, diabase dikes, and small ultramafic pods of dark green serpentine. These pods are associated with the steatite deposits.

Steatite or soapstone is a variant of talc. Talc ($\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$) is a phyllosilicate and when it is found in a compact and massive form it is referred to as steatite or soapstone (Hurlbut and Klein 1977). Soapstone has a dark grey or green color, is translucent, and characterized by its greasy feel and luster. The crystallography of talc is described as "...monoclinic; $2/m$ (one rotation axis with perpendicular mirror). Usually tabular with rhombic or hexagonal outline. Foliated and in radiating foliated groups" (Hurlbut and Klein 1977:403). It is a secondary mineral resulting from low-grade metamorphism of magnesium silicates such as olivine, pyroxenes, and amphiboles (Hurlbut and Klein 1977).

Three steatite outcrops in the Tetons were examined -- Slim's Asbestos Mine, Owl Peak, and the Rammel Mountain Quarry.

48TE1255 B Slim's Asbestos Mine

The mine is located in the Berry Creek drainage in the northern part of the range. It is in a 50 meter wide outcropping of Late Archean metamorphic rocks comprised of layered gneiss and ultramafic rocks. The outcrop is just east of the Forellen Peak Fault. These rocks were metamorphosed approximately 2,815 Ma (Love et al 1992). The gneiss is biotite rich B no feldspar crystals were observed. Veins of quartzite occur throughout the outcropping. The ultramafic rocks include lineations of long, brown asbestos fibers in the gneiss near the mine opening. Steatite cobbles can be found in the talus slope below the mine and there is a boulder near the mine opening which has a 15 cm rind of steatite.

48TE529 B Owl Peak

The quarry was not located, however we found steatite cobbles on our approach from Owl Creek. The area surveyed was in Precambrian deposits --primarily gneiss. Madison Limestone outcrops to the west on Elk Mountain. Love's map (Love et al 1992) shows the quarry in the Precambrian layered gneiss and is about the same distance east of the Forellen Peak Fault as Slim's Mine in the next drainage north. The map does not show an outcropping of the ultramafic rocks as is associated with Slim's Mine and the Rammel Mountain Quarry.

48TE1646 B Rammel Mountain Talc Quarry

The quarry is geologically mapped as a pod of Precambrian ultramafic rocks which is surrounded similar aged gneiss and is immediately north of a Proterozoic diabase dike which was emplaced before 1,450 Ma (Reed et al 1973, Love et al 1992). It is located on a small shelf below the Badger Creek Rim, near Rammel Mountain. The quarry consists of four pits excavated along a northerly trend.

Three lithologic units were described. These units are labeled from top to bottom as Strata I, II, and III.

The units consist of two bands of gneiss (Strata I and III) which are partitioned by a steatite vein (Stratum II).

Stratum I is approximately 1.25 meters thick in pit 3. A shelf of this gneiss is slightly exposed above the pit itself. The gneiss is characterized by a slightly darker color than the gneiss in Stratum III. The mineralized laminae are thicker (up to two cm), more convoluted than the lower gneiss, and are comprised of what looks like small crystals (0.1-0.2 mm) of quartzite, plagioclase, and an unidentified red crystal. The contact between this stratum and stratum II is not well defined.

Stratum II is the steatite vein. It is a relatively homogenous bed up to two meters thick in quarry pit 1, and tapers down to 1.25 meters thick in pit 3. There are subtle, gradational changes in the steatite vein near the contacts with Strata I and III. The upper part of the vein, near Stratum I, is harder and has a slight color change, possibly due to staining from the upper bed. The lower contact is also characterized by a change in hardness. In addition, there is a crystalline change. The lower portion of the bed is a laminated schist that grades into a hard, fibrous, steatite. This rind which is 20 cm thick, with laminae no larger than 5 cm thick, has a darker green hue to it and could be serpentine. The contact between Strata II and III was beautifully exposed in quarry pit 2.

Stratum III is a layered gneiss. There is a massive quartzite layer (15 cm thick) immediately below Stratum II. The main body is a biotite rich gneiss where the biotite is laminated and looks like crossbeds from a low velocity flow. There are veins of quartz and plagioclase crystals interspersed throughout the stratum. The average size of the crystals is slightly larger than quartz and plagioclase veins in Stratum I.

◆ DISCUSSION

All three mines are located in Precambrian gneiss. Both Slim Lawrence's Asbestos Mine and the Rammel Mountain Indian soapstone quarry are directly associated with small pods of ultramafic rocks (Love *et al* 1992 and Reed *et al* 1973). One other known talc outcropping, near Bitch Creek Narrows is also geologically mapped as pod of ultramafic rock surrounded by Precambrian gneiss. It would not be surprising to find the Owl Peak Mine directly associated with a small outcropping of ultramafic rocks.

The ultramafic rocks seem to be regional, suggesting a localized tectonic event. All outcrops are located in the northern half of the Teton Range (Love *et al* 1992). In addition to the ultramafic outcrops found at Berry Creek and Rammel Mountain, there is a smattering of mapped ultramafic rocks in Waterfalls Canyon, southeast of Ranger Peak. Interestingly, some of these pods are east of the Forellen Peak Fault, as in the case of the both Slim's Mine and the Owl Peak Mine. The southern most outcrop of ultramafic rocks is in Moran Canyon, east of the confluence of the North Fork and the South Fork of Moran Creek. All of these locales should be examined for possible sources for steatite.

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