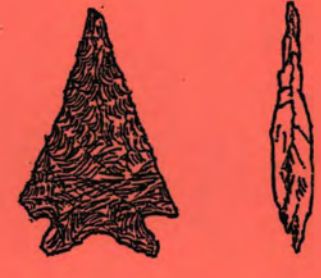
Obsidian Artifact-to-Source Results on and Adjacent to the Payette National Forest, Idaho

By

Lawrence A. Kingsbury



Elko Eared Dart Point Of Black Obsidian Sourced From Timber Butte, Idaho
PY-399.11 / 10AM141

Heritage Program
U.S. Department of Agriculture
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Intermountain Region
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Obsidian is the ancient name for volcanic "natural" glass. Most obsidian is black, but varies in color to mahogany, brown, green, and gray. Some obsidian has more than one color, some is opaque and some is translucent with bands of coloration varying from opaque to clear. All obsidian has a glassy luster and conchoidal fracture pattern that can be controlled during percussion and pressure knapping (Anonymous 1974:350).

Because obsidian can be shaped, ancient people found this natural glass useful in the manufacture of sharp edged tools. In ancient Europe and the Near East, obsidian was widely traded from the exploited sources in Hungary, Sardinia, central and eastern Turkey, the island of Lipari, adjacent to Sicily, and on the island of Melos in the Aegean Sea (Bray & Trump 1975).

In 1996, the author examined an obsidian artifact at a neolithic site on the southern coast of Crete. Obsidian does not naturally occur on the island of Crete. This obsidian likely originated from the island of Melos. In Mesoamerica, obsidian has been found in Mexico and Guatemala (Stross et. al. 1977:115-116). In 1994, the author examined obsidian microblades at the classic Mayan ruins of Tulum, State of Quintana Roo, Mexico. The geology in the entire state of Quintana Roo is limestone, not volcanic. The obsidian at Tulum probably originated from the Valley of Mexico,

Obsidian was a prized and desired material for American Indians in North America. The American Indian Hopewellian complex also referred to as the "Hopewell Burial Cult," of the Midwest United Stated dated from about 2,300 years before present (BP) and lasted until about 1,750 years BP (Jennings 1974:229). Hopewellian people were expert flint knappers and made flawless ceremonial knives from obsidian. Some knives, 32.5 cm in length, were unearthed at a Hopewell burial site in southeastern Ohio. The obsidian for these ceremonial knives may have originated from the

Yellowstone Plateau (Prufer 1964:233), a distance of about 3,218 km to the west. American Indians in Idaho lived much closer to the obsidian sources of the Intermountain West.

In the western United States, obsidian has been found in northwestern Utah and western Nevada (Condie & Blaxland 1970:275), southwestern Montana, eastern Idaho (Willingham 1995:4), western Idaho (Wells 1980:1), northwestern Wyoming (Hughes & Nelson 1987:313), southern and eastern Oregon and northern California, Washington and British Columbia (Sappington 1981c).

Obsidian does not naturally occur in the geology on the Payette National Forest (PNF) in west-central Idaho. See Map 1. All of the obsidian found on the PNF was carried there by American Indians. All of the obsidian is black, opaque to semi-translucent, or banded opaque and semi-translucent. There are approximately 571 identified prehistoric & protohistoric American Indian archaeological sites on the PNF. Many of these sites contain obsidian artifacts.

A sample of 267 obsidian artifacts from 55 archaeological sites and 15 isolated finds from the PNF, along with 11 obsidian artifacts from 11 sites in the area of the Middle Fork of the Salmon River, were analyzed by a nondestructive energy dispersive x-ray fluorescence analysis (XRF) (Sappington 1981b:7), (Hughes 1994 thru 2004). XRF has been demonstrated to be an effective method for correlating obsidian artifacts with their geologic sources, (Davis 1972), (Sappington 1980), (Ames & Green 1980), (Wright & Chaya 1985), (Hughes & Nelson 1987).

Robert Lee Sappington Ph.D., and Richard E. Hughes Ph.D., have analyzed all of the selected obsidian artifacts from and adjacent to the PNF. Tables 1, 2 and 3 provide lists of sites where artifact-to-source analysis have taken place and the results. Sappington is a professor of anthropology at the University of Idaho, Moscow. Sappington pioneered the first artifact-to-source analysis on the PNF (Sappington 1981a). Richard E. Hughes is director of Geochemical Research Laboratory, Portola Valley, California. Hughes continues to conduct obsidian artifact-to-source analysis for the PNF. Each scientist, at different times, performed independent laboratory investigations using XRF spectrometers equipped with an x-ray tube, accompanied by a variety of necessary equipment to complete the analysis.

Each piece of obsidian contains trace signature elements unique to the geological source. Trace elements include zinc (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), barium (Ba), titanium (Ti), manganese (Mn), and iron (Fe). These trace elements are expressed in quantitative units i.e. parts per million [ppm] by weight. Matches between unknowns and known obsidian chemical groups were made on the basis of correspondences in diagnostic trace element concentration values. Artifact-to-obsidian source (geochemical type) correspondence was considered reliable if diagnostic mean measures for artifacts fell within two standard deviations of mean values for source standards. The trace element configuration match geologic obsidian sources (Hughes 1996:96-75).

Because obsidian does not occur naturally on the PNF, obsidian can be useful for determining the movements of prehistoric American Indians. The obsidian that has been carried to the PNF was procured from sources in eastern Oregon, southern and eastern Idaho, and the Yellowstone Plateau. Most of the obsidian artifacts analyzed came from the Timber Butte source in the lower Payette River Basin in Gem County, Idaho. In a letter from Lee Sappington addressed to Ms. Lee Bennett, Forest Archaeologist on the PNF dated April 6, 1981 he states..."Nearly all items (91%) came from Timber Butte, which is about what we expected, but the secondary source area was in the Wallowas (7%) and the remaining three items (2%) came from the Yellowstone area, (Sappington 1981a)."

Arnold, who conducted an archaeological survey of Long Valley in the early 1980's, stated that 95% of 241 obsidian artifacts from Long Valley, Idaho were derived from the Timber Butte source (1984:136). The Timber Butte source is about 63 km south of Long Valley. At archaeological site 10VY492, located on the South Fork of the Salmon River, four obsidian artifacts were analyzed by XRF. Three of the specimens originated from Timber Butte. The distance from the site to Timber Butte is about 120.7 km. The fourth obsidian artifact analyzed by XRF originated from the, Dooley Mountain source in eastern Oregon. Dooley Mountain is located 21 km south of Baker City, Oregon. From Dooley Mountain to the site is a distance of 170 km. Making an adjustment for meandering through the mountainous terrain, the distance that this obsidian was carried is estimated to be as much as 241 km.

Obsidian artifacts analyzed by Hughes in the area of the Middle Fork of the Salmon River on the eastern boundary of the PNF, revealed that obsidian was being procured from the Timber Butte source in southwest Idaho and from the Bear Gulch source in the Centennial Mountains to the northeast in eastern Idaho. An obsidian artifact analyzed from 10LH28 was from the Timber Butte source, a distance of 168 km to the southwest. An obsidian artifact analyzed from 10VY69 originated from the Bear Gulch source, a distance of 233 km to the northeast.

In west-central Idaho, at site 10AM266, with a view into eastern Oregon, one obsidian artifact was sourced from Big Southern Butte on the Snake River Plain in eastern Idaho (Crisson 2002:23). The distance from Big Southern Butte to the site is approximately 321 km (200 linear miles).

In the South Fork of the Salmon River at site 10VY222 one artifact was sourced to Teton Pass, Wyoming, a distance of 450 km (280 linear miles). Another observation made by the author while doing an archaeological excavation at 10VY492 on the South Fork of the Salmon River is that the greater the distance from the obsidian source to the archaeological site, the smaller the tools and chipping debitage. Sappington (1982) made the same observation in his study of obsidian sourcing in the area of the Middle Fork of the Salmon River. Sappington stated,... "there exists a direct correlation between distance -to-source area and mean artifact weight (Sappington 1982:422)." Obsidian was used to exhaustion at 10VY492. As obsidian was exhausted, other lithic materials closer at hand were used. At 10VY492, basalt and cryptocrystaline silicate are found in a higher frequency as compared to obsidian.

How long ago were American Indians using obsidian on the PNF? Based upon projectile points styles and comparative relative dating, the oldest obsidian artifacts have been associated with the Paleoindian Period dating from 8,000 to 11,000 years Before Present (BP). Petersen (1987) reported finding a black obsidian Clovis point on the edge of Cascade Reservoir, Long Valley, Idaho. Also, a Haskett Point base of black obsidian was found adjacent to Warren Creek near Warren, Idaho. An Eden Point (Cody Complex) of black semi-translucent obsidian was found adjacent to Lake Fork Creek in Long Valley (Stoddard 1996:5). American Indians have been using obsidian and transporting it to the PNF for 11,000 years.

In summary, following Sappington's example and from similar observations he made in the Middle Fork of the Salmon River (1982:421-211), XRF analysis of obsidian artifacts at archaeological sites on the PNF appear to demonstrate five prehistoric behaviors that existed prior to Euroamerican contact:

First, despite the absence of locally available obsidian on the PNF, some prehistoric American Indians had a preference for obsidian and obtained it from 11 identified sources. Obsidian was derived from six sources located in eastern Oregon at Dooley Mountain (N 18), Gregory Creek (N 3), Sourdough Mountain (N 1), Coyote Wells (N 1), and Ebell-Rogers (N 2) and Sugarloaf Butte (N 1). In Idaho, obsidian was obtained from Timber Butte (N 214) in western Idaho, and Bear Gulch (N 4), and Big Southern Butte (N 1) in eastern Idaho. From northwestern Wyoming, obsidian was derived from Teton Pass (N 1), and Kepler-Yellowstone (N-2). Also, six obsidian samples are from unknown sources.

The majority of the obsidian on the PNF 80.3% came from the south procured from the Timber Butte, Idaho. The second highest frequency 6.7% came from the west from the Dooley Mountain source in eastern Oregon. From the east, 2.6% of the obsidian came from the Yellowstone Plateau. The greatest distance 434 km an artifact was transported from its source is from the Yellowstone Plateau.

Second, the Northern Rocky Mountains of central Idaho appear not to have been a physical barrier to American Indians. Within the Frank Church – River Of No Return Wilderness of central Idaho numerous archaeological sites with obsidian have been found from in the valley floors as well as in the higher elevations of the subalpine lakes and mountain ridges.

Third, American Indians had about 11,000 years to scatter obsidian artifacts throughout the PNF, up until the time of Euroamerican contact and the introduction of iron tools.

Finally, while the means by which obsidian was obtained and exchanged cannot be demonstrated, it is assumed that a combination of both direct procurement and exchange was undertaken (Sappington 1982:422). Obsidian was carried long distances and used until it was exhausted. At that point, other lithic materials with similar conchoidal fracturing properties were used. American Indians in prehistoric and historic times were mobile,

foraged over large landscapes searching for seasonally abundant food and other resources. They made periodic trips to congregate with other people, and when they got together, an item like obsidian was likely exchanged. From a scientific perspective in studying past cultures, XRF and obsidian is a useful measure in determining artifact-to source.

TABLE 1

Payette National Forest archaeological sites where obsidian artifacts have been sourced through x-ray fluorescence. Data was generated at the University of Idaho, Moscow by Robert Lee Sappington Ph.D. (1981) and at Geochemical Research Laboratory by Richard E. Hughes, Ph.D.

PNF Site #	Smithsonian Trinomials	# of specimens XRF analyzed	Originating Obsidian Source	Report
PY-10	10AM23	1	Timber Butte, ID	94-20
PY-18	10-VY-522	2	Timber Butte, ID	97-89
PY-21	10GM34	1	Timber Butte, ID	1981
PY-25	10WN167	1	Timber Butte, ID	1981
PY-60	10IH1580	8	Timber Butte, ID	94-20
PY-109	10AM69	4	Timber Butte, ID	1981
PY-113	10VY143	1	Timber Butte, ID	98-87
PY-114	10VY31	1	Timber Butte, ID	1981
PY-124	10VY41	3	Timber Butte, ID	1981
PY-127	10VY44	1	Timber Butte, ID	1981
PY-135	10VY54	2	Timber Butte, ID	1981
PY-147	10VY67	1	Bear Gulch, ID	98-87
PY-148	10VY68	4	Timber Butte, ID	2004-47
PY-154	10IH198	2	Timber Butte, ID	2004-47
		1	Dooley Mountain, OR	2004-47
PY-240	10VY246	9	Timber Butte, ID	1981
PY-241	10VY112	15	Timber Butte, ID	1981
PY-242	10VY224	8	Timber Butte, ID	1981
		1	Kepler-Yellowstone	
PY-244	10VY226	2	Timber Butte, ID	1981
PY-246	10VY228	1	Timber Butte, ID	98-97
PY-330	10AM107	6	Timber Butte, ID	1981
				96-75
PY-331	10AM108	17	Timber Butte, ID	1981
		6	Ebell Source, OR	
		1	Kepler-Yellowstone	
		6	Dooley Mountain, OR	2000-109
PY-332	10VY222	1	Teton Pass, WY	1981
		10	Timber Butte, ID	
PY-333	10VY223	18	Timber Butte, ID	1981

Table 1 continued

PY-334	10VY238	1	Ebell Source, OR	1981
		4	Timber Butte, ID	98-87
PY-357	10AM93	2	Timber Butte, ID	1981
PY-381	10VY250	1	Timber Butte, ID	1981
PY-399	10AM141	13	Timber Butte, OR	95-18
		1	unknown	2000-13
		1	Dooley Mtn., OR	
PY-520	10AM176	4	Timber Butte, ID	1981
		1	Dooley Mountain,ID	99-21
		1	unknown	99-34
PY-536	10WN318	11	Timber Butte, ID	99-73
		3	Dooley Mtn., OR	99-77
		1	Gregory Creek,OR	
		1	unknown[1]	
PY-584	10VY492	1	Dooley Mtn., OR	94-26
		3	Timber Butte, ID	
PY-604	10IH1583	2	Timber Butte, ID	95-18
PY-752	10AM211	3	Timber Butte, ID	95-18
		1	Sugarloaf Butte,	
PY-937	10WN415	5	Timber Butte, ID	99-73
		1	Gregory Creek, OR	
PY-981	10AM266	1	Timber Butte, ID	98-87
		8	Timber Butte, ID	2002-78
		1	Big Southern Butte, ID	
PY-983	10AM261	4	Timber Butte, ID	95-18
PY-989	10WN444	1	Timber Butte, ID	96-75
PY-1179	10AM375	1	Dooley Mtn., OR	98-97
PY-1198	10WN498	1	Timber Butte, ID	98-97
PY-1218	10AM503	5	Timber Butte, ID	94-60
PY-1294	10IH2423	1	Timber Butte, ID	97-89
PY-1316	10AM433	2	Timber Butte, ID	97-89
PY-1317	10AM434	3	Timber Butte, ID	97-89
		1	Goodrich area, ID (glassy basalt)	
PY-1331	10IH2561	2	Timber Butte, ID	97-37
		1	unknown[1]	
PY-1349	10IH	1	Timber Butte, ID	97-89
PY-1448	10AM473	1	Timber Butte, ID	98-87
PY-1451	10AM475	1	Timber Butte, ID	98-87
PY-1457	10AM477	3	Timber Butte, ID	98-87
PY-1470	10AM479	1	Timber Butte, ID	98-87
PY-1519	10AM	1	Timber Butte, ID	99-77
PY-1540	10WN562	1	Sourdough Mtn, OR	99-78
		1	Coyote Wells, OR	

Table 1 continued

PY-1542	10WN564	1	unknown[1]	99-77
		1	Dooley Mtn., OR	99-78
		1	Gregory Creek, OR	2000-109
PY-1571	10VY1168	3	Timber Butte, ID	2000-109
PY-1580	10WN709	3	Timber Butte, ID	2000-109
PY-1590	10WN717	1	Timber Butte, ID	2000-109
PY-1654	10WN749	1	Timber Butte, ID	2004-47
		1	Dooley Mountain, OR	

[1]Although the source is unknown, the same unknown has been found at PY-536, PY-1331, PY-1542, on the Wallowa-Whitman National Forest, at Pittsburg landing on the Snake River, and at a site in Baker County, Oregon. (Hughes 97-37, 99-73, 99-77).

TABLE 2

Isolated Finds

1981 East Fk./Lake Fk.	1	Timber Butte, ID
1981 Landore	2	Timber Butte, ID
1981 Steen Creek	3	Timber Butte, ID
94-20 IF #1	1	Timber Butte, ID
94-20 IF #2	1	Timber Butte, ID
94-20 IF #146	1	Timber Butte, ID
95-18 IF#1	1	Timber Butte, ID
96-75 Sample #12	1	Timber Butte, ID
96-75 Sample #13	1	Dooley Mtn., OR
98-87 XRF# 5	1	Timber Butte, ID
98-87 XRF# 14	1	Timber Butte, ID
98-87 XRF# 17	1	Timber Butte, ID
98-87 XRF# 18	1	Timber Butte, ID
99-77 Sample # 6	1	Dooley Mtn., OR
2000-109 / 14NR5WS15	1	Dooley Mtn, OR

As of 01/05/2005, 267 obsidian artifacts have been sourced from the PNF. Eighty percent (214 pieces) were from Timber Butte, Idaho. The second highest frequency was 6.7% from Dooley Mountain, Oregon.

TABLE 3

Prehistoric Archaeological Sites on the Middle Fork District of the Salmon-Challis National Forest

10VY70	SL-62	1	Bear Gulch, ID	96-75
10VY69		1	Bear Gulch, ID	96-75
10LH491	Lemhi County	1	unknown[2]	96-75
10LH27	Middle Fork 24	1	Bear Gulch, ID	96-75
10LH28	Middle Fork 25	1	Timber Butte, ID	96-75
10VY125	Middle Fork 30	1	Timber Butte, ID	96-75
10VY376	BS-624	1	Timber Butte, ID	96-75
10CR576/876	CR-228	1	Timber Butte, ID	96-75
10VY83	Middle Fork 37	1	unknown[2]	96-75
10VY454	Middle Fork 43	1	Timber Butte, ID	96-75
10CR929	Middle Fork 58	1	unknown	96-75

[2]Although the source is unknown, these two artifacts are from the same source. (Hughes 96-75)

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97-89, October 8, 1997
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99-21, March 17, 1999
99-34, May 18, 1999
99-55, July 21, 1999
99-73, September 9, 1999
99-77, September 28, 1999
99-78, October 7, 1999
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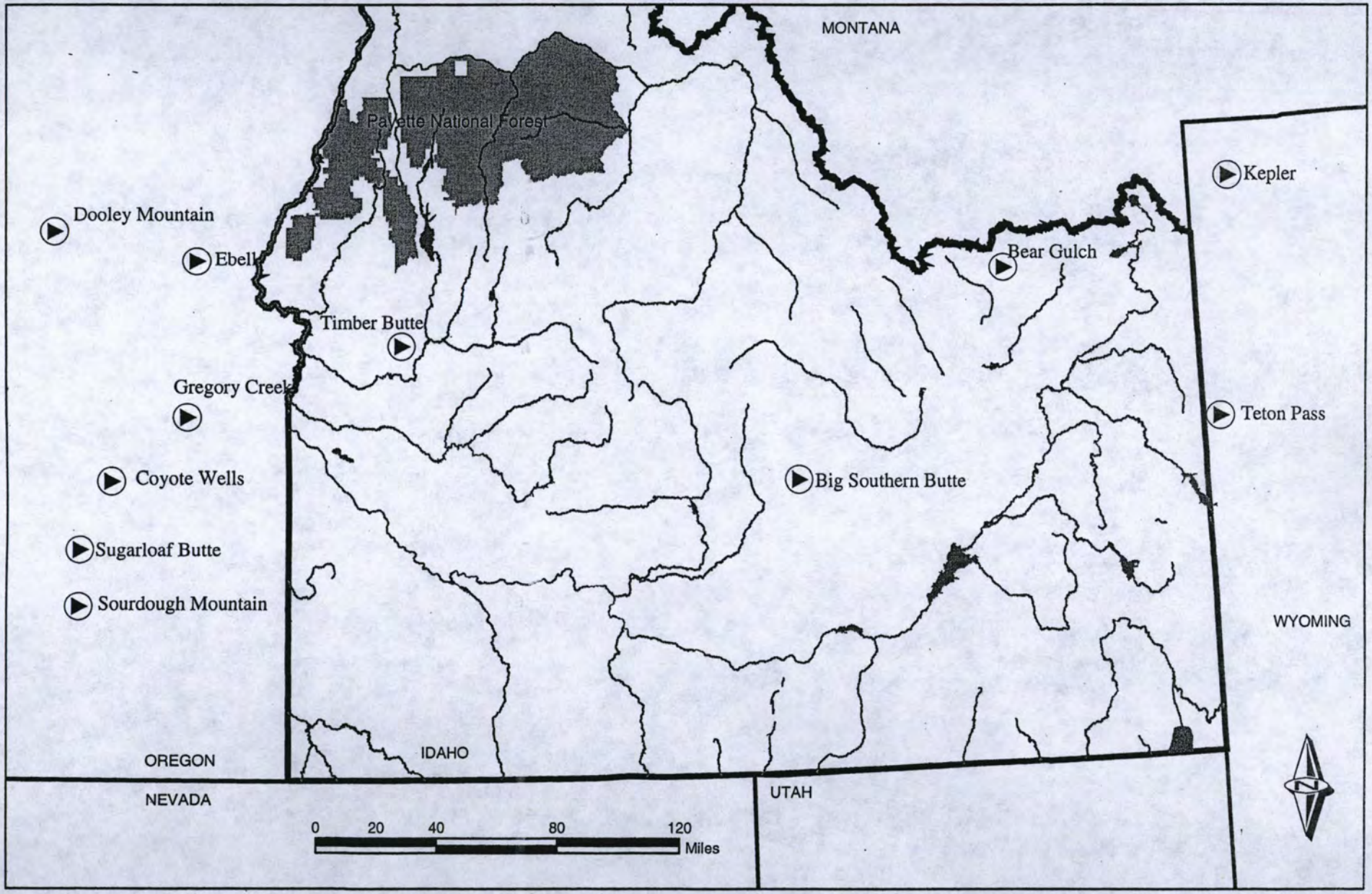

Map 1 Identified obsidian sources for XFR analyzed artifacts found on the Payette National Forest