TRADE OR TRANSPORT
OCCURRENCE OF OBSIDIAN FROM THE MALAD, IDAHO, SOURCE IN THE GREAT PLAINS

By

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A thesis

Submitted in partial fulfillment

of the requirements for the degree of

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COMMITTEE APPROVAL

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of RANDY A. THOMPSON find it satisfactory and recommend that it be accepted.

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ABSTRACT

In an attempt to argue that materials were transported great distances by users and not necessarily acquired through trade involving multiple individuals or groups, this research traces the occurrence of obsidian from the Malad, Idaho source recovered in archaeological contexts throughout the Rocky Mountains and on to the southern Plains. This research uses the techniques of trace element analysis of obsidian (either by x-ray fluorescence or neutron activation), typological analysis of any formal artifacts by statistical or intuitive means, and locational analysis by plotting the various archaeological sites where Malad glass has been recovered.

The patterns evident from this analysis indicate a long-term transport of material from the Great Basin into the southern Plains. Although long distance trade is the most plausible explanation for the occurrences of Malad obsidian across the landscape, this research does not rule out the possibility of direct transport by the users of this material.

CHAPTER ONE

INTRODUCTION

Trace element analysis of obsidian artifacts from the Malad source in southern Idaho indicates that it is well-represented in the archaeological record from the Rocky Mountains to the southern Great Plains (Plager 2002; Hester et al. 1986; Hawley and Hughes 1999; Logan et al. 2001; Baugh and Nelson 1988; Hughes 1996a, 1996b; Baugh and Nelson 1987). In an attempt to argue that materials were transported great distances by users and not necessarily acquired through trade involving multiple individuals or groups, this research traces the occurrence of obsidian from the Malad, Idaho, source recovered in archaeological contexts throughout the Rocky Mountains and on to the southern Plains. The distribution of material from this source indicates that early Native Americans were selecting and using Malad obsidian by at least 11,000 years ago (Green 1983; Hughes 1994; Arkush and Pitblado 2000) and continued using it into historic times. Thus, the Malad obsidian source occupies a unique position in regional human prehistory as one of several important sources of lithic material utilized and widely traded by early Native Americans in the Intermountain West.

The occurrence of Malad obsidian in the southern Plains has been interpreted as the product of a north-south trade network. Baugh (1988:87) suggests that the presence of Malad obsidian throughout the southern Plains implies that "from the 12th through the 14th centuries, people located in central Texas and central Oklahoma were more deeply involved in a north-south exchange network than an east-west exchange system." Archaeological evidence indicates that prehistoric people moved throughout the Snake River region of the northern Great Basin and ethnographic accounts detail a highly mobile culture throughout the region. Wallace and Hoebel (1953:9) describe travel routes from the Great Basin into the Plains, which include the backbone formed by the Rocky Mountain chain as an apparently shielded route used by most of the Comanche in their movement toward the southern Plains. They further describe several accounts that mention Comanche and "Snakes" (Shoshone) using trails along the edge of the mountains on their frequent journeys from the Platte to the Arkansas rivers. Nelson (1982:13) stated "Shoshone Indians who migrated between Idaho and northern Utah probably picked up and brought obsidian with them as they traveled from Idaho to Utah. It may not have been a matter of trade but a matter of transporting what they had obtained and used while in Idaho." With this in mind, this research is designed to improve our understanding of the spatial and temporal distribution of obsidian from the Malad, Idaho, source.

Documented occurrences of obsidian artifacts and debitage from the Malad source have been reported in Idaho (Plager 2002), Utah (Arkush and Pitbaldo 2000; Hughes 1994), Colorado (Stiger 2001), Texas (Hester et al. 1986), Oklahoma (Baugh and Nelson 1988), Arkansas (Hughes et al. 2002), Kansas (Hawley and Hughes 1999), Nebraska (Baugh and Nelson 1988), North Dakota (Hughes 1996), and South Dakota (Hughes 1993). Although the majority of the obsidian that has been analyzed consists of debitage, various formed, or temporally diagnostic, artifacts have also been characterized. Further research into typology and comparison of Great Basin, specifically, Snake River Plain, artifact styles and those represented from Plains contexts is required to obtain a better understanding of the question of trade, transport, and temporal use of Malad obsidian.

The problem considered in this study is how to differentiate between indirect trade and individual, long distance transport of specific material from its source to its ultimate place of archaeological deposition. There are various modes of interaction that can be useful in understanding the movement or interaction of people based on material remains. It has been realized that the materials of which artifacts are made can be a far better guide than their style to the place of origin of such artifacts. Whole exchange systems can be reconstructed, or at least the movements of the goods can be investigated, if the materials in question are sufficiently distinctive for their sources to be identified (Renfrew and Bahn 2000:351).

The approach applied in this project is an exploratory research design, which is meant to extract as much information as possible about the distribution of material from a single, chemically identifiable, obsidian source. This research uses the techniques of trace element analysis of obsidian (either by x-ray fluorescence or neutron activation), typological analysis of any formal artifacts by statistical or intuitive means, and locational analysis by plotting the various archaeological sites where Malad glass has been recovered. This research is designed to evaluate the movement of tool-stone from this particular obsidian source. Obsidian is useful for this type of study because: 1) most individual geologic sources are geochemically homogeneous (the elemental composition usually does not vary significantly from one exposure of the source to another); 2) there are a limited number of sources; and 3) the chemical properties of obsidian are not changed during manufacture of the artifact (Nelson 1982).

Through the use of a quantitative distribution study, a dispersal pattern should give an indication of how this material was distributed across the landscape. Regional variations in artifact styles are known to exist, so it is assumed that variation in projectile point styles can generally be categorized into one of several regional groups with an examination of artifacts. The assumption being, that if artifact styles are more similar in style to a particular region, or geographic area, this would be an indication of individual or intra-group transport of a particular material. It has been argued that territories, which were occupied by certain groups can be effectively identified by lost or discarded artifacts. Through this analytical method, researchers have identified distinct groups by using unique styles of pottery, projectile points, basketry, and other material traits. As with exchanged objects, spatial patterning is also visible in the similarity between locally made items, or artifact styles. In general, increased distance may be found to correlate with decreasing similarity between non-exchanged items (Hodder 1978:170). Through stylistic analysis, artifact distributions can be mapped to show where a group of people lived during a certain time period (Reed 1985:7).

Spatial analysis has been used to solve many archaeological problems (Clarke 1977). The value of this technique lies primarily in identifying the direction of diffusion in the archaeological record, which can then be compared to observed patterns of human behavior. It is generally true that archaeological spatial data tell us something about past activities (Hodder 1978:3). The quantity of traded material usually declines as the distance from the source increases (Renfrew and Bahn 2000:370). By analyzing the way the decrease occurs, patterns may emerge which can inform us about the mechanism by which a material reached its destination. There are two difficulties in this kind of research. The first being that, the quality of data does not always allow one to decide reliably which fall-off curve is the appropriate one. A second, more serious, difficulty is that in some cases, different models for distribution produce the same curve (Hodder and Orton 1976:29). Knowing these difficulties within the models is a basis for understanding the limitations to making broad interpretations of the data, but also provides ample room to determine if patterns are observable in the archaeological record.

This research builds on Plager's (2001) research and incorporates the known occurrences of Malad obsidian from the source area in southeastern Idaho and the transport of this material onto the Plains. Examining a broader distribution of source material across the landscape provides information on probable transport patterns. This information can then be correlated with ethnographic data to formulate interpretations regarding past behaviors such as consumer preferences, the movement of people, or possible interactions and networks of trade (Plager 2001:5).

Environmental Information

In an effort to understand the use of tool-stone from this source area, environmental information may be an important consideration. Obsidian from the Malad, Idaho source has been referred to as Oneida (Frison and others 1968), Hawkins-Malad-Oneida (Green 1982, Moore 1995), Malad (Nelson and Holmes 1979; Hughes 1996) and Oneida County, Idaho (Sappington n.d.). This source is located in the greater Wright Creek and Dairy Creek areas of the central Bannock Range, in extreme southeast Idaho. The main source area has been reported at T.11S., R35E., Sec 26 on the 1968 USGS 7.5' Wakley Peak, Idaho Quadrangle (Moore 1995). Malad obsidian occurs in relatively large nodules and is usually a transparent black, although occasionally, it may also be mixed with a red or mahogany color.

Pedestrian survey indicates that the Malad obsidian source extends over a very broad expanse within this area. In general, this material can be found approximately 15 air miles north of Malad City, Idaho, in the northern Malad River watershed which is

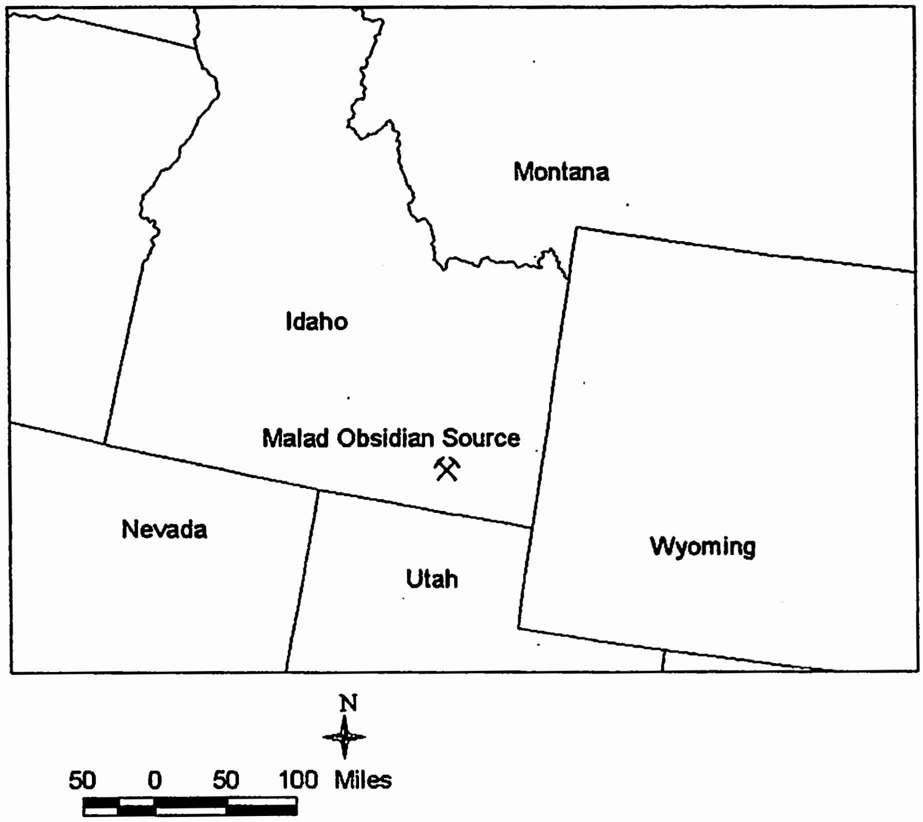

Figure 1. General location of Malad obsidian source area.

comprised of several perennial, spring fed, and intermittent streams. Precipitation averages about 15 inches per year, mostly in the form of rain. Winter snow packs are usually minor throughout the watershed, except in the higher elevations where snow depths can reach several feet.

The landscape is characterized by moderately sloping to moderately steep fluvially-worked foothills. Evidence of past volcanic activity is noticeable throughout the area in the form of basalt outcrops and pockets of volcanic ash. The geology consists of volcanically derived materials from the Starlight Formation, a 6.6 million year old upper Miocene rhyolite dome complex (Pope 2002). These include ash-flow tuffs, perlite, and basalt. The overall surface soil color is grayish brown to white; other geologic materials are mostly water-lain tuffs, sandstone and pebbly conglomerates. The average annual air temperature is 47 degrees F., and the average freeze-free period is 95 days (United States Department of Agriculture 1990).

For the most part, slopes in the area range from 20 to 40 degrees. Elevation ranges from 5800 feet to 6300 feet above sea level. Vegetation includes big sagebrush/grass interspersed with trembling aspen (*Populus tremulides)*, Rocky Mountain juniper (*Juniperus scopulrum)*, mountain mahogany (*Cercocarpus montanus)*, and Douglas-fir (*Pseudotsuga meziesii)* community types. Shrubs include mountain snowberry (*Symphoricarpos oreohphilus)*, chokecherry (*Prunus virginiana)*, Rocky Mountain maple (*Acer glabrum douglasii)*, bitterbrush (*Purshia tridentata)*, and serviceberry (*Amelanchier alnifolia)*. Common forbs and grasses include buckwheat *(Eriogonum flavum*), smooth aster (*Aster laevis)*, arrow-leaved balsamroot (*Balsamorhiza sagittata*), wyethia, leafy arnica (*Arnica chamissonis)*, smooth wildrye (*Elymus glaucas)*, wheat grass (*Agropyron cristatum)*, needle-and-thread (*Stipa comata)* and brome (*Bromus inermis)* grass. Common big game animals include mule deer (*Odocoileus hemionus*), and elk (*Cervus Canadensis)*. Small mammals in the area include mountain cottontail (*Sylvilagus nuttallii),* pygmy rabbit (*Sylvilagus idahoensis),* desert cottontail (*Sylvilagus audubonii),* whitetail jackrabbit (*Lepus townsendi),* blacktail jackrabbit (*Lepus californicus),* and snowshoe hare (*Lepus americanus)*. Fish in the area include cutthroat trout (*Salmo clarki),* Utah cutthroat (*salmo clarki utah),* Yellowstone cutthroat *(Salmo clarki bouvieri)* (United States Department of Agriculture 2003).

Ethnographic Information

Although this research is not dependent on associating this material with the movement of any particular tribe, it does make sense that Malad obsidian was procured primarily by Shoshone and/or Northern Paiute-speaking (Bannock) people. This assumption is made because the geographic region in which the Malad source is located comprises the historically known home range of these groups. Although there is disagreement about the longevity of Shoshonean occupation of this region, with researchers either supporting a later arrival of Shoshone (Numic) speakers (Miller 1966; Fowler 1972; Bettinger and Baumoff 1982; Sutton 1984) or arguing for an in situ development of the Numic speakers (Goss 1977), this research was conducted with the belief that archaeological information provides enough evidence to suggest long-term, Archaic or older, Shoshonean occupation.

Because this research accepts the assumption of lengthy Shoshone occupation of the Malad and greater Snake River Plain area, it must also consider the Shoshone-Comanche connection. Wallace and Hoebel (1952:6) state, "The language and culture of the Comanche point directly to a Shoshonean origin for the tribe. History also substantiates an origin in Shoshone country." The Shoshone-Bannock Tribes of Fort Hall, Idaho, Eastern Shoshone Tribe of the Wind River Reservation, and Comanche Tribes of Oklahoma all have oral histories regarding the origin of the Comanche Tribe. One of the Shoshone oral histories regarding the beginnings of the Comanche tells of several bands returning to the upper Snake River country in Idaho after a community bison hunt with relatives in the Wind River area. One band decided to continue south rather than return to the Snake River; this band was the first to visit the area now known as the Southern Plains. Professor R.N. Richardson stated, "...It seems that they (Shoshone) visited the south, found it was well suited to their mode of existence, and proceeded to fight for it and take it (1933:19)".

A Comanche oral history recorded by the Santa Fe Laboratory of Anthropology group, and shared by Post Oak Jim, a 64-year-old Comanche who was interviewed in 1933 stated:

> "Two bands were living together in a large camp. One band was on the east side; the other on the west. Each had its own chief.
> Every night the young boys were out playing games-racing, and so forth. They were having a kicking game; they kicked each other. One boy kicked another over the stomach so hard that he died from it. That boy who was killed was from the West camp. He was the son of a chief. When this thing happened, the west camp cried all night. In the east camp It was silent. Next day, they buried that boy.
>
> The boy's father, the chief, had his crier go around announcing that there would be a big fight to see which camp was best so as to settle the question of his son's death. There was big excitement. Both sides had good warriors. The east camp ran to its horses. "If they really mean what they say, they will kill us," they cried.
>
> The two sides lined up, and the chiefs met in the center. Then an old man from the east camp came up into the center. He wept and told them it wasn't right for them to fight among themselves like that. They took pity on him. Then other old men came out and gathered with him. "You have plenty of enemies to fight,"

they cried. "These were just boys playing a game. Don't take this thing so seriously. You are setting a bad example for the children. What ever this chief wants to keep the peace we'll do it.

That chief called it off. He said he did not realize what he was doing. So the east camp brought them horses and other things.

After that the chief has his announcer tell the people it was time to move camp. "We have had bad luck here. There has been hard feeling." While they were still there, smallpox broke out.

Then they broke up. One group went north; those are the Shoshones. The other group went west (Wallace and Hoebel 1952:10).

Tribal stories also mention the people who became known as the Comanche returning to what is now southeastern Idaho and eastern Wyoming to visit, trade, arrange marriages, and generally keep in touch. One thing that must be kept in mind, when talking about the Shoshone bands: there were several different small bands that made up the Shoshone nation. The oral histories discuss only a few bands, and it is believed by many elders that groups of Shoshones had been visiting the Plains for a very long time before the horse arrived. The practice of continued relations between Shoshone and Comanche people continue today with an annual Shoshonean Reunion. The 2003 reunion, which was held in Fort Washakie, Wyoming, had an estimated 300 Shoshone- speaking participants from various tribes, including Comanche (Sho-Ban News 2003).

Obsidian In An Archaeological Context: A Theoretical Discussion

Some trace element concentrations for Malad obsidian overlap with other archaeologically significant obsidians in far western North America. However, barium concentration values (typically > 1500 PPM) clearly distinguish Malad from other sources (Table 1)(Hughes 2002).

Rb *Ppm*	Sr *ppm*	Y *ppm*	Zr *Ppm*	Nb *ppm*	*Ba* *Ppm*	Fe2O3 %	TiO2 %	MnO %	Na2O %
121.0	55.9	60.3	130.7	39.4	1571.2	1.08	.077	.031	3.60

Table 1. Average composition of obsidian from the Malad, Idaho, source area.

Artifact quality obsidian from a given source is usually chemically homogeneous, even for elements in minute concentrations. Because obsidian from different sources have distinctly different trace element concentration patterns it can be linked to specific geographic locations, much like fingerprints can be linked to specific individuals. The ability to determine the source location of obsidian and a resistance to environmental deterioration make this material a useful indicator of distribution networks and migratory activities of prehistoric people.

The Malad obsidian artifacts recovered in Colorado, Oklahoma, and Texas appear throughout time and are represented by flakes, bifaces, and arrow points. It is believed that the Late Prehistoric era represents the height of Native trade/transport of Malad obsidian onto the southern Plains, there is one occurrence in Texas and one in Oklahoma in which a flake of Malad obsidian is associated to Early Archaic/late Paleoindian times (Thomas R. Hester, personal communication; 2002). Once site locations and artifact assemblages are collected and analyzed, a more complete story should start to emerge.

Information regarding the use and transport of obsidian from several sources on the Snake River Plain, including the Malad source, has been analyzed and show a very long time-frame for use of this material. Evolutionary models have long linked economic developments to social evolution (Ericson and Baugh 1994:iv). The central tenet of Adam Smith (1976[1776]) was that wealth of nations, and ultimately their social progress, rested on the development of efficient, highly specialized economies and extensive trade. Marx's (1904[1857-58]) grand scheme of socio-political evolution focused on the role of burgeoning technology and economic specialization. These influential social philosophers, and many others of their time, believed that expanding systems of exchange were inevitable for techno-economic (and ultimately cultural) progress. The emergence of cultural ecology within American anthropology linked environmental adaptation, exchange, and the creation of new levels of political integration (Steward 1955). For example, Elman Service (1962) emphasized that chiefdoms were redistributional societies: when people settled down in ecologically diverse regions, local groups lost direct access to needed resources for which they then had to exchange. To guarantee the exchange among locally specialized groups, systems of redistribution managed centrally by regional chiefdoms were created, and these economic relationships formed the basis for the emergent social complexity.

Many archaeologists assume that the spatial patterning of material remains reflect the spatial patterning of past activities. Much effort was, and still is, directed towards defining areas of similarity between material culture assemblages. These areas of cultural similarity are then interpreted as ethnic, tribal, and language groupings (Hodder 1978:3). Archaeological and ethnographic information of Great Basin societies detail several small non-centralized bands moving seasonally throughout the region. Within these types of groups there is often a network of relationships joining group to group. The links in these networks vary in length according to occasion and place, but they are often relatively short. That is, one person's links are spatially limited, although goods and ties may move via these links for great distances (Hodder 1978:229). If we can understand and identify aspects of social and exchange organization in the material record, we can then construct a picture of society and its development.

Within the subsistence economy, exchange of finished tools and raw materials appear to have been more important than exchange of food. The exchange of utilitarian tools and related raw material, especially high-quality cherts and obsidian, is clearly evidenced. Perhaps best documented are the multiple and overlapping exchange systems for obsidian that developed from California and the Great Basin north into Alaska (Hughes 1994). The approach used for this research focuses on Steward's cultural materialist model. The "Steward model" (Steward 1936, 1938 Thomas 1972, 1974; Madsen 1982; Reed 1985) of very mobile communities composed of variable memberships and dependent on the seasonal availability of rather unpredictable and un-storable food supplies would result in a very dispersed settlement system and hence a fairly dispersed distribution for materials used by those groups. If style was found to vary independently of material and two or more material types were represented, the "Steward model" could be tested for this study area. The result would test the theory that Shoshonean groups traveled from one lithic source area to another, using the locally available material whenever a lithic component required replacement and did not rely on formal exchange or regional chiefdoms, but rather, was a complex hunter/gatherer society. Allowing some lag time in the system between manufacture and loss of projectile points, and for the high levels of mobility in this model, material from different sources should occur in association and at the opposite ends of a seasonal subsistence cycle (Binford 1979). The basic assumption being that bands traveling to areas outside of their usual region would transport lithic material and implements for future use. Since first introduced by Binford (1973, 1977, 1979), researchers have extensively explored the concept of curation in discussions of tool use efficiency, planning, and tool utility, among other issues (Smith 1999).

This research is limited to discussions of obsidian recovered in archaeological contexts and identified, either through X-Ray fluorescence or other chemical analysis, to have originated from the Malad, Idaho, source area. Although some factors may bias this sample (e.g., survey coverage, location of surveys, amount of material sourced), it is believed that an adequate amount of data exists to make some general interpretations as to the basic geographic distribution of material from this specific source area.

CHAPTER TWO

PREVIOUS RESEARCH

This research is an attempt to identify the prehistoric movement of people by tracing the occurrences of obsidian from a discrete, chemically identified source. For a good overview of obsidian characterization and spatial analysis studies throughout southern Idaho, see Plager (2001). A brief, but very complete history of Great Basin obsidian sourcing studies is outlined in Holmer (1997).

Thomas Hester et al. (1986) reported that obsidian artifacts recovered in Texas could be conclusively linked to the Malad source: "Though the chemical link between these Texas specimens and the distant Malad source could be demonstrated, these analyses could not tell us how the obsidian got from southern Idaho to areas as far away as southern Texas." The study of exchange begins with the identification of the parent sources of obsidian materials and specifying the distribution of these materials spatially within a particular period of time. It is one thing to determine the geographic source area for a commodity, but it is quite another matter to infer the social mechanism for the occurrence of that material at an archaeological site. The presence of non-local material at a site does not, by itself, provide irrefutable evidence for long-distance trade (Hughes 1994:238). Richard Hughes and James Bennyhoff (1986:255) researched various aspects of early trade in the Great Basin and concluded that "this generalized summary of evidence for prehistoric trade has made it apparent that, although general patterns can be outlined for certain subareas, serious gaps in available knowledge still exist. However, the evidence from the western subarea is complete enough to allow some fairly specific inferences about trade relationships during certain periods of time, particularly in the early Middle Archaic. During this period, it appears likely that obsidian artifacts were transferred through the same trans-Sierran network, probably along the same trails."

On the other hand, Vehic and Baugh (1994) concluded: "Trade does not appear to have been a prominent aspect of early Plains Archaic adaptations. So little is known about mobility and the size of exploitive areas, that the role of trade versus direct procurement cannot be defined.

Prior to the Late Archaic, reliance on local resources appears to be a major feature of Plains adaptations. The exception to this may be an essentially east-west trade that links the northern Plains with the Rockies/Pacific coast and the Great Lakes/Atlantic coast. However, the sizes of exploitive regions are likely large and trade may have been less important than direct access. The east-west trade system linking the northern Plains with the Rockies/Pacific coast to the west and the Great Lakes/Atlantic coast to the east continues. In contrast, the inhabitants of the Central and Southern Plains appear to have occupied a key position in the movement of obsidian along a north-south route (Baugh and Nelson 1988:88).

Numerous scholars have commented on the difficulty, if not impossibility of distinguishing direct access from indirect access (exchange/trade) archaeologically, but many specialists make the assumption that the more distant an artifact, or group of artifacts from the source of origin, the more likely it was obtained through trade (Hughes 1994:367). Hughes concluded that prehistoric exchange of obsidian was a multivariate phenomenon. At certain times obsidian appears to have moved through the same network, while at other times the mutually exclusive distributions of these materials suggest that different transmission routes were employed, potentially reflecting the operations of different conveyance systems and sociocultural units. The changing patterns of exchange of these materials can be considered a mosaic; varying by time period, site function, and artifact class (Hughes 1994). In regard to obsidian on the Great Plains, Baugh and Nelson (1988:87) stated, "While it is possible that acquisition was made directly by parties from each of the areas in which obsidian has been recovered, it is assumed that trade was a more efficient means by which to obtain such commodities." Hanes and Sappington (1983:21) conclude "the qualitative and quantitative distribution of obsidians gathered from a broad territory conform to Renfrew's 'Law of Monotonic Decrement' which states that relative quantities of imported commodities are inversely proportional to the distance from the source." They further state that while obsidian was usually obtained from the nearest geological source, it was sufficiently important to warrant importation from distant sources as well. Another important conclusion from this study was the belief that obsidian, predominantly procured in the form of small cobbles, was normally transported to distant camps as biface blanks, though the transport of raw cobbles was not uncommon (1983:1).

Craig Smith (1999:272) stated that studying the various aspects of curation of a non-local material at varying distances from its known source should provide useful insights into factors influencing the distribution of materials. Among the informative aspects of curation are: movement of materials between locations, including the type of implement transported (i.e., partially reduced blanks or finished tools); the production of tools for anticipated use; and the conservation of materials and implements through repair and maintenance. It is expected that prehistoric mobile hunter-gatherers handled various aspects of curation differently depending on the distance from the source. Smith's interpretation of 18 sites in Wyoming and Montana provided the data to make some important interpretations. One of those interpretations was based on the fact that many of the sites contained only small unusable fragments of obsidian, suggesting that the prehistoric inhabitants valued obsidian highly and removed most useable implements from the sites.

As argued by Kelly (1988:721), biface blanks are ideal for long use-life tools. Cores could also be carried from the quarries for producing more expedient tools as needed at the residential camp. In regard to distinguishing direct procurement or exchange Smith (1999:285) concluded that, "it is probably not possible to clearly distinguish direct and exchange zones of procurement". Smith (199:287) continues:

> "mobile hunter-gatherers treated various aspects of their technological organization differently depending on the distance of the site from the raw material source. Occupants of the sites closest to the obsidian sources manufactured more finished implements from blanks previously reduced somewhere else, probably at the quarry. In contrast, hunter-gatherers at sites further from the source transported, conserved, maintained, and repaired more complete tools that probably served as an individual's personal gear".

CHAPTER THREE

CULTURE HISTORY

Obsidian from the Malad source has been located throughout a broad section of North America. In order to investigate the relationship between the areas, a general overview of the culture histories of the Great Basin, the obsidian source area, the western Great Plains and on to the southern Plains, the furthest archaeological occurrences of Malad obsidian is noted. In an effort to make this research readable to more people, all dates have been converted to indicate Years Before Present (B.P.). Although the use of this time designation generally refers to information which has been subjected to absolute dating methods such as carbon dating, the dates presented are general dates and time frames.

Much of the Great Basin cultural sequence is based upon diagnostic projectile points. Jennings (1986) divided the sequence into four periods named the Pre-Archaic or Paleoindian (pre-10,000 B.P.), the Early Archaic (10,000-4,000 B.P.), the Middle Archaic (4,000-1,400 B.P.), and the Late Archaic (1,400 B.P. to present). Thomas (1981) further defined the Archaic sequence for the central Great Basin, based on seven diagnostic projectile point types/series designated Pinto, Humboldt, Large Side-notched, Elko, Gatecliff, Rosegate, and Desert Side-notched. Swanson (1972) also defined a series of local cultural phases for Idaho through the use of distinctive projectile point types, the association of faunal remains, and climatic changes. Butler (1986) has grouped these phases into three broad cultural periods labeled Early Big Game Hunting, Archaic, and Late.

The date of human arrival into the central Great Plains is open to debate. Conservatively, empirical evidence has shown that human groups existed throughout the New World, including the Plains, by at least 12,000 B.P. Although some archaeological evidence suggests that the first people arrived long before 12,000 B.P. and many archaeologists now argue that humans have been in the New World at least 20,000 years (Frison 1991; Haag 1962; Humphrey and Stanford; 1979 Willey and Sabloff 1980). In the central Plains, several sites deeply buried in Peorian Loess of the Republican River drainage of southern Nebraska suggest pre-17,000 B.P. occupations in this region of the Great Plains (Holen 1995).

Evidence of prehistoric human habitation in areas of the southern Plains can be traced to at least 11,000 years ago (Wedel 1961). The cultural chronology of this area is divided into three major prehistoric periods: Paleoindian, Archaic, and Late Prehistoric. The focus of this chronology is south-central Texas. This area of Texas is the one from which several examples of Malad obsidian have been recovered.

Early Big Game Hunting Period ca. 14,000-7800 B.P.

The Great Basin Paleoindian period spans the time frame of 14,000-7,800 B.P. During this period, cultural adaptations are marked by a focus on hunting large game animals that became extinct during the terminal phase of Late Pleistocene or in the Early Holocene. It is assumed that these peoples' diet also included plants and small game. Malad obsidian has been identified from three separate collections which date to this time period: Owl Cave in Idaho (Green 1983), The Fenn Cache in Wyoming (Hughes 1994), and at various open air sites in Northern Utah (Arkush and Pitblado 2000).

Evidence of human occupation in the Great Basin during this time period are scarce, but there are well documented sites in the area. As an example the Simon site which consists of several chipped stone bifaces, including a series of finely made Clovis points was located near Fairfield, Idaho, at the foot of the Rocky Mountains (Butler 1996) Another early site in the eastern Great Basin, Owl Cave, has been dated to 12,850 +/-150 B.P. Three Folsom point fragments in direct association with numerous culturally modified mammoth bones were recovered from the "mammoth Layer" at Owl Cave (Yohe and Woods 2002).

In the central Great Plains, the earliest universally accepted New World cultural tradition is that of the "Clovis" people who lived approximately 12,000 years ago at the end of the Pleistocene "Ice Age," during what is known as the "New World Paleolithic" (Braidwood 1964; Harris 1993), or "Paleoindian" period. Cultural remains of Clovis people have been found across the eastern two-thirds of North America. The people of this period were thought to have lived in small groups of highly nomadic hunters. There is presently no evidence of structural remains, food storage, and no hearths to indicate sustained, continuous site use on the Plains; although there is evidence that Clovis peoples reoccupied certain campsites near rich resource bases for short periods of time (Gunnerson 1984, 1987; Stanford 1979).

Following the age of the Clovis complex, mammoth hunters were numerous "Big Game" hunting groups armed with a variety of worked points. The different point styles of Folsom, Hell Gap, Scottsbluff and other Late Paleoindian complexes, undoubtedly represent related, but separate regional traditions. Like earlier Clovis people, they are thought to have been highly nomadic groups, following and relying heavily on herds of extinct forms of bison (*Bison antiquus and B.occidentalis),* although other Pleistocene animals were also preyed upon. Faunal remains from archaeological sites in the Plains include the extinct american horse (*Equus sp.*), western camel (*Camelops hesternus*), woodland musk ox (*Symos Cavifrons*), giant beaver (*Castoroid ohionsis*), and giant sloth (*Northrotheriops shastensis*)(Agenbroad 1973, 1974; Roberts 1935, 1939).

On the southern Plains, archaeologists use the term Paleoindian to refer to the earliest human occupation, roughly 11,000-8000 B.P. The initial part of the period encompasses the late Pleistocene. Both occupation and kill sites, with associated human artifacts and Pleistocene fauna, have been identified along the Balcones Escarpment. While dating of the onset of the Holocene remains somewhat ambiguous in the evaluation of many of these sites, it is clear that stylistic and technological traits of the projectile points of the early phase of the Paleondian tradition continue into late Paleo indian times. It is assumed that population size, settlement patterns, and a highly mobile lifeway likewise characterizes the Paleoindian cultural pattern as late as 8000 B.P.

While Paleoindian sites with clear evidence of Pleistocene faunal associations are few, the projectile points that characterize the early part of this period (11,000-8,000 B.P.) are widespread; these include Clovis, Folsom, and Plainview points. Similarly, the later phase diagnostics are quite common, although they are rarely located *in situ* within stratified deposits. These diagnostic point types are Golondrina, Scottsbluff, Angostura, and some highly localized styles still under analysis such as Barber points (Turner and Hester 1985).

Archaic Period, 7,800-1,300 B.P.

As defined by Willey and Phillips (1958), the Archaic Period of North America is characterized by generalized hunting-and-gathering peoples, living in a physical environment basically similar to that of today. The modern forms of bison, mountain sheep, deer, and small game were hunted and plant resources played a dominant role in the diet. Shortly after about 8,000 B.P., lanceolate point types were replaced by stemmed-indented base points followed by Bitterroot and Northern Side-notched points. Smaller, more variable types of projectile points also enter the archaeological record during the Archaic Period.

The Archaic is characterized by an Altithermal climatic shift toward warmer and drier conditions, which Reed et al. (1986:110) suggest prompted bison hunting populations of the Plains to enter the upper Snake River Basin and begin hunting mountain sheep as well as bison. Certainly, as defined by Willey and Phillips (1958), the Archaic in this region is associated with highly diversified subsistence practices. Butler (1978) argues that as the Altithermal reached its maximum about 3,800 B.P., grasses essential to large bison herds began to fail, and bison hunting populations must have experienced some dietary stress that could be expected to prompt changes in subsistence strategy. After the demise of what is envisioned as the Big Game Hunting Culture, subsistence patterns show no fundamental change throughout the record of occupation in the northern Great Basin deserts (Cressman 1986:126). Climatic changes only seemed to result in culturally insignificant shifts in the distribution of flora and fauna. The recovery of numerous basket containers and trays as well as hand stones and milling slabs from these sites indicate that plant processing was a dominant activity. The presence of smaller mammal and bird remains show that these animals also constituted a portion of the diet. In addition, smaller points including side-notched and stemmed-indented base forms replaced lanceolate points. Gruhn (1961) speculates that these two styles were used with two versions of atlatl-the former from the Plains the latter from the Great Basin.

Reed et al. (1986) have divided the Archaic period into three subperiods: an Early Archaic (7,500-5,000 B.P.), marked by use of Northern Side-notched type projectile points and Large Bifurcate or Stemmed-indented Base projectile points; a Middle Archaic period (5,000-3,500 B.P.), marked by a proliferation of projectile points including McKean-like lanceolate, stemmed points, Elko series points and Humboldt series points; and Late Archaic (3,500-1,300 B.P.), marked by a number of projectile point types including Pelican Lake points, Besant points, and Elko series points. Work by Holmer (1986a:105) identified variants of the Large Side-notched points. Some are found across the Great Basin throughout the Archaic while others occur between 7,500 and 3,500 B.P. Within the Humboldt series, Thomas (1981:23) identifies the Humboldt point "unnotched, lanceolate, concave based projectile points" and has identified the series in sites across the Great Basin dated to the last 5,000 years. The Gatecliff series is "comprised of medium to large contracting stem projectile points" (Thomas 1981:23) and is identified in occupations ranging from 5,000 to 3,300 years old. The Elko series is evident in sites in the central Great Basin from 3,250 to 1,250 B.P. It is "defined only relative to smaller (and later) Rosegate series… [and] consists of large, corner-notched projectile points" (Thomas 1981:20). Bettinger and Eerkins (1999) note that the size difference relates to function where larger, wide-necked Elko points function as an atlatl dart tip while lighter, narrow-necked Rosegate series points function as true arrowheads. On the central Plains the age of 'Big-Game hunter" had passed by around 8000 years ago. Major climatic shifts were occurring across the entire central North American continent during the period between 8000 and 5000 years ago that resulted in substantial warming and drying of the Great Plains. Known as the "Altithermal Climatic Episode" these climate changes greatly altered the range and quantity of both plant and animal species (Antevs 1955). In turn, human groups on the Plains who were dependent on those resources were affected during the Early Archaic Period (Gunnerson 1987).

At one time, researchers thought the Plains became completely devoid of human occupation during the Early Archaic (e.g., Mulloy 1958). It has now been recognized, however, that while Plains populations were reduced and lifestyles altered, occupation of this region continued throughout the Altithermal Episode (Fagan 1991; Frison 1978). Evidence suggests that populations in the western Great Plains were reduced as people sought refuge in the more moist foothills and high plateaus of the Rocky Mountains. Excursions were made onto the Plains in search of animal resources (Benedict 1991; Benedict and Olson 1978; Frison 1991; Frison and Walker 1984; Greiser et al. 1983; Swanson et al. 1964). This change in resource availability forced a shift in subsistence technologies by the people living in this region and a new form of "broad spectrum" subsistence appeared as groups broadened their diet-breadth (e.g., Flannery 1965). As primary resources are restricted, hunters are eventually forced to include smaller prey and exploit a wider variety of animal species groups. Plant foods became a significant supplement to hunted food resources. Many Plains sites that date to the Early Archaic period reflect this broad spectrum subsistence adaptation and include remains from a much wider range of hunted food resources (Frison 1991; Greiser et al 1983; Swanson et al. 1964; Wedel 1940, 1961)

As the effect of the Altithermal lessened and the environment returned to a cooler and moister climate around 5,000 B.P., larger populations again returned to the Plains. As Great Plains cultural complexes grew and developed, they began to reflect distinct, regional, and localized subsistence strategies. Western Plains cultures returned to a form of nomadic big-game hunter-gatherer subsistence; largely dependent on the modern bison species (*Bison bison*) (Gunnerson 1987).

On the southern Plains, the "Archaic" is used to denote a long time span of hunting and gathering cultural patterns that began around 8000 B.P. and continued until 1100 B.P. The period is broken up into several subperiods, largely on the basis of changes in projectile point styles, along with shifts in settlement patterns, other lithic tool forms, and use of certain plant and animal resources.

On the southern Plains, the Early Archaic (8000-5000 B.P.) is typified by specific diagnostic dart point types and tool forms. It is suggested that population densities were low and groups were organized into small, highly mobile bands.

The Middle Archaic (5000-3000 B.P.) is clearly a period of population increase, with the Native peoples developing specialized adaptations to the hunting and gathering of abundant regional food resources, especially acorns and white-tailed deer. The Perdenales dart point type is diagnostic of the period, as are large accumulations of fire-cracked rock known as "burned rock middens." These apparently represent intensive utilization of acorns, with the burned rock deposits indicative of certain kinds of processing and food preparation.

The Late to Terminal Archaic on the southern Plains represents a continuation of the hunting and gathering patterns of the Archaic, with some researchers seeing less specialization but others noting evidence of bison hunting in certain areas and the presence of cemetery sites (Black n.d.). Clearly, in some areas of the southern Plains, there may have been a trend toward territoriality and the development of wide-ranging trade contacts (Hester 1985).

Late Prehistoric Period, ca. 1300-150 B.P.

In the eastern Great Basin, a range of small triangular projectile point types mark the Late Prehistoric Period. Extending throughout the period are corner-notched Rosegate series points, Desert Side-notched series, and Cottonwood Triangular points. A number of phases have been identified within the Late Period. The Ahvish Phase (Shoshone for "People from long ago" Jimenez 1996:227) has been defined for demonstrably Numic or Shoshonean occupation at the Wahmuza site at Cedar Butte on the Fort Hall Indian Reservation (Holmer 1986b). The phase is suggested to range from about 700 to 250 B.P. or to the arrival of European trade goods. Cultural diagnostics include Desert Side-notched and Rosegate series projectile points. Another site from this time period that contained Malad obsidian is Aviators Cave, a collapsed lave tube on the Snake River Plain with an artifact inventory typical of the Ahvish phase, and includes feathers, hair, fur, hide and seed and other plant parts absent from the surface with Desert

Side-notched Sierra subtype, general Desert Side-notched, and Cottonwood triangular projectile point types.

The Dietrich Phase, first defined at Wilson Butte Cave by Ruth Gruhn (1961), dates to about 500 B.P., includes Rosegate series, Desert Side-notched, and Cottonwood Triangular points. Although this site had Malad obsidian associated with it, this material obsidian was dated to a much earlier component of the site.

In the Birch Creek Valley of eastern Idaho, diagnostic Shoshonean materials were identified in the Lemhi Phase (Swanson et al. 1964). The phase is dated at about 750-150 B.P. with diagnostic projectile point types consisting of Desert Side-notched and Cottonwood Triangular. Again, only one example of Malad obsidian has been noted in this area.

Several groups within the Great Plains tradition moved towards a semi-sedentary, horticulturalist society during this period. The exception is in the more arid western shortgrass plains which were, for the most part, not suitable for horticultural-based subsistence strategies, but did provide ample grazing for immense herds of bison. As a result, pedestrian nomadic hunting and gathering cultural complexes developed and occupied the dry western Great Plains.

On the southern Plains between 200 B.P. and the advent of Europeans archaeologists see some distinctive changes in material culture and other facets of the long-lived archaic hunting and gathering lifeway, and have termed this part of the chronological framework the "Late Prehistoric" (Hester 1971, 1980).

An early phase of this period, the Austin Phase, which occurred from 800-200 B.P., is associated with the introduction of the bow and arrow in parts of the southern

Plains. Beginning around 800 B.P., and apparently lasting up to about the time of historic contact, the Toyah Phase emphasized bison hunting. It has been postulated that this was the period of peak bison populations in the southern Plains (Dellehay 1974) and distinctive archaeological assemblages are present in areas where bison hunting was the main economy. Thus far, no large kill sites are known from this period, but there is a lot of bison bone in the campsites. Diagnostic artifacts include Perdiz arrow points, diamond-shaped beveled knives, plainware pottery, scrapers and other tools thought to be related to the processing and preparation of bison hides (Turner and Hester 1985).

Protohistoric and Historic Shoshonean Period

The transition from Protohistoric to Historic Shoshonean groups, which hinges on finding European trade goods in association with aboriginal materials, has not been well-demonstrated in the archaeological record of this Great Basin. Sometime after about 300 B.P. or during the Ahvish Phase, horses came to the Shoshone and other Plateau tribes. On the Plains, like the Great Basin, the Protohistoric period is typically characterized by that brief period when there was an infusion of European trade goods into Native American cultures. It was during this time, about 300 years B.P., that the horse was first utilized on the Plains. This was also the time when Native Americans acquired firearms. Although the horse and gun were the most important and culturally influential of the European trade goods, other items also came to be in high demand. Utilitarian goods such as axes, steel knives, firesteels, pots, pans, and other household utensils were highly desired by Plains people, as were cloth, buttons, beads, and other items of adornment.

CHAPTER FOUR

DATA AND METHODS

The "Stewart Model," indicates that very mobile communities composed of variable members and depending for their sustenance on the seasonal availability of rather unpredictable and un-storable food supplies would result in a very dispersed distribution of material remains (Reed 1985). In the research reported here, the distribution of Malad obsidian is used to investigate the movement of people across the landscape. The use of indicator material (i.e., obsidian from the Malad, Idaho, source area) provides insight into the area which most likely reflects a dialect group's subsistence territory. Within a confined geographic area, interpretations of group movement may be made based on an indicator material, stylistic interpretation, and spatial analysis. Addressing the question of group subsistence territory over a very broad geographic area provides an interesting problem, to say the least.

As stated in Chapter One, the problem considered in this study is how to differentiate between indirect trade and individual, long distance transport of specific material from its source to its ultimate place of deposition in the archaeological record. The approach applied in this project is an attempt to extract as much information as possible about the distribution of obsidian which has been chemically identified to be from the Malad, Idaho, source. The majority of sites included in this research were located through published journal articles, direct contact with researchers, and visits to universities and state historic preservation offices. In order to examine how material from the Malad source was distributed from the eastern Great Basin onto the southern Plains, the locational data was entered into a GIS database and plotted on a map. Many plotted on a map. Many of the sites are represented by a single flake, while others are represented by several flakes and tools. A total of 97 sites located in 11 states within the Great Basin and Great Plains were included in the database for this project. Following is a brief discussion of the sites from each state in which material from the Malad source has been located.

Arkansas

The Brown Bluff Site (3WA10) contained a single flake of Malad obsidian that was recovered there in 1994. This obsidian flake is the first recovered from any professionally excavated site in Arkansas. The stratigraphic context of the Brown Bluff specimen has been reported as consistent with a time placement in either the Late Prehistoric or Protohistoric time period (Hughes et al. 2002). This occurrence of Malad obsidian is currently the most distant locale for this material in an archaeological context.

Colorado

Twenty-three sites (5GA277, 5GF1667, 5MF1915, 5MF1915A, 5MF2849, MF2942, 5MF2942A, 5MF3161, 5MF3164, 5MF3164A, 5MF3307, 5MF3307A 5MF3440, 5MF3440A, 5MF3618, 5MF3737, 5MF3737A, 5RB2828, 5RB2873, 5RB3448, 5RB314, 5RB3807 and 5RB3807A) throughout Colorado have reported obsidian from the Malad obsidian source. Seven of these sites have the same site number, but with an 'A' designation following. These sites, although recorded under a single site number, have different locational data and are separate components of the sites. Of the twenty-three sites seven were dated to the Late Archaic, six were dated to the Late Prehistoric time period and ten of the sites did not have dates associated with them.

Obsidian is rarely located in archaeological contexts in Colorado, and few have ventured to suggest that a well-organized obsidian trade network moved the tiny quantities across the landscape. The two common interpretations of how the obsidian was transported from its source to the sites are that someone carried a few pieces across the span or that an occasional down-the-line trade moved quantities over the stretch (Stiger 2001).

Idaho

Eighteen Sites (10BK26, 10BK39, 10BK74, 10BM479, 10BM480, 10BT1582, 10BV30, 10BV9999, 10CA397, 10CA33, 10CL40, 10CU208, 10CU212, 10FR4, 10JE6, 10OA1, 10OA210, and 10TF1) in Idaho are included in the database. The time periods reflected are three Paleoindian sites, with the earliest being 10,200-11,000 B.P. at Owl Cave (the Wasden site) one Early Archaic site, three Late Archaic sites, five Prehistoric sites and six sites with no associated dates. Malad obsidian was used throughout a very long time frame. The spatial distribution is very interesting as Plager (2002) clearly shows that the distribution of Malad material in Idaho is generally limited to the southern part of the state.

Kansas

Six sites (14MY306, 14JW2, 14JW24, 14JW8, 14SD305, and 14LV1079) in Kansas are included in the database. The time periods include four sites associated with the Prehistoric period and two sites with no associated dates. At least two possible trade routes for the arrival of obsidian in Kansas has been suggested. The obsidian, acquired from the west by groups in Texas and Oklahoma, may have been traded north, and eventually, ended up at the site. Another scenario is that the Malad obsidian in from the west by groups in Texas and Oklahoma, may have been traded north, and eventually, ended up at the site. Another scenario is that the Malad obsidian in Oklahoma and Texas must have moved, as Baugh suggests "eastward from its Plateau sources into the Northern Plains and then southward to inhabitants of the Washita River phase sites and on into...Texas." For that matter, Plateau obsidian could as easily have been carried directly into the central Plains, bypassing the northern Plains (Hawley and Hughes 1999).

Nebraska

One site in Nebraska (25DW17) is included in the database. This site, described as a Late Prehistoric to Protohistoric hunting camp, represents a single occupation, with Malad obsidian being the only source represented. Baugh and Nelson (1988: 87) stated "While it is possible that acquisition was made directly by parties from the areas in which obsidian has been recovered, it is assumed that trade was a more efficient means by which to obtain such commodities."

Oklahoma

Seven sites in Oklahoma (34NW6, 34RM72, 34BV93, 34BV104, 34BK2, 34WO43, and 34GV22) are included in the database. One site is dated to the Early Archaic, one site to the Late Archaic, four to the Prehistoric to Protohistoric time periods and one site does not have an associated date. In a recent study conducted by Scott Brosowske, two flakes of obsidian which were collected from sites separated by approximately 20 miles were very close in chemical composition (Scott Brosowski, Personal Communication 2003). This may be an indication that the two flakes came off of the same core or nodule of obsidian.

Texas

Twenty sites in Texas (41BL104, 41SS2, 41LL4, 41TV133, 41BQ46, 41BX300, 41LK51, 41HI24, 41BL24, 41NL10, 41HY188, 41UV213, 41MX9, 41TV1604, 41GR29, 41CV137, 41BX746, 41TG233, 41WM362, and 41WM689) are included in the database. These sites range in dates from one Early Archaic, two Late Archaic, eight Prehistoric and nine with no associated dates. Hester (1986) stated; "it is clear that, by whatever means, obsidian from a southeastern Idaho outcrop was being distributed as far away as southern Texas in prehistoric times. Indeed we have a pattern of these Texas occurrences, that trends north-south along the Balcones Escarpment. There are various implications of these data for the study of Late Prehistoric populations in the region, one clearly being the existence of trade or exchange systems that likely moved not only obsidian, but also other materials and perhaps more importantly, new ideas and technologies."

Utah

Fourteen sites in Utah (42SL98, 42BO36, 42WB326, 42TO925, 42DA545, 42DA791, 42DA364, 42DA678, 42DA798, 42DA824, 42TO13, 42UN2324, 42UN2318, and 42DC815) are included in the database. Of these fourteen sites, one has been reported to be associated with the Paleoindian time period, one associated with the Early Archaic, four are associated with the Prehistoric time frame and the others have no associated dates. Although there are fourteen sites listed for Utah, it is quite likely that the majority of sites with obsidian from the Malad source are not included in this study. It is very probable, because of the location of the source area, that many more sites in northern Utah contain obsidian from the Malad source. An exhaustive search of records, available published literature, and unpublished "gray" literature was conducted with very little success. The site ages range from Paleoarchaic to Protohistoric time periods.

Nevada

One site in Nevada is included in the database (26EK25). Although very little information was found for this site, locational data was located and plotted on the distribution map. No age has been reported with this site, but chemical analysis confirms that material from this site has been chemically identified to the Malad source (Green 1982).

North Dakota

One site in North Dakota (32ME799) is included in the database; this site is dated from the Late Archaic to the Late Prehistoric time period. Although as reported, this time period is very broad. This site was included in the database because it is chemically linked to the Malad source, the time period is questionable, but the fact that it is sourced to Malad is important to this study.

Wyoming

Six sites in Wyoming (48LN3117, 48LN2555, 48SW270, 48SW998, 48CK1403, and 48YE1364) are included in the database. Four of these sites have been associated with the Late Archaic, one to the Prehistoric and one has no associated date. One site (the Fenn Cache) has been reported as containing obsidian from the Malad source area and dates to the Paleoindian times (Hughes 1989). This site was not included in the database because adequate information could not be located.

STATE	NUMBER OF SITES	PALEO-INDIAN	EARLY ARCHAIC	MIDDLE/LATE ARCHAIC	PREHISTORIC/ PROTOHISTORIC	NO DATE
ARKANSAS	1				1	
COLORADO	23			7	6	10
IDAHO	18	3	1	3	5	6
KANSAS	6				4	2
NEBRASKA	1				1	
NORTH DAKOTA	1				1	
OKLAHOMA	7		1	1	4	1
TEXAS	20		1	2	8	9
UTAH	14	1	1		4	8
WYOMING	6			4	1	1
NEVADA						1
N=11	N=97	N=4	N=4	N=17	N=35	N=37

Table 2. Site distributions.

A database consisting of site number, site location, and temporal affiliation was compiled and GIS software was used to plot the information spatially. Although many of the sites do not have temporal data associated with them, the distribution of sites with temporal data should provide, at the least, a general understanding of the temporal use of Malad obsidian.

It was hoped that identifying artifact typology and a comparison of Great Basin (specifically Snake River Plain) artifact styles and those represented from Plains contexts would provide a better understanding of the question of trade, transport, and temporal use of Malad obsidian. Because most of the analyzed obsidian samples were flakes, typological analysis of any formal artifacts by statistical and intuitive means was determined to not be a feasible element of this research. Outside of Idaho, only three formal artifacts were associated with Malad material.

Figure 2. Distribution of sites containing Malad obsidian.

Sites with dated context were of particular interest and the sites were plotted through time to show this distribution. The Paleoindian period is represented by four sites, all within the supply zone of the Malad source (Figure 3). The supply zone has been defined as the area within 300 km of the source (Hodder 1978:157). The Early Archaic time period is represented at only three sites, but the distribution of sites occur over a very broad area (Figure 4). The Middle and Late Archaic time periods were combined with 16 sites being represented (Figure 5). Combining these time periods did not affect the overall patterns. The Late Prehistoric and Protohistoric time periods were also combined, and have the largest number of sites represented at thirty-four (Figure 6).

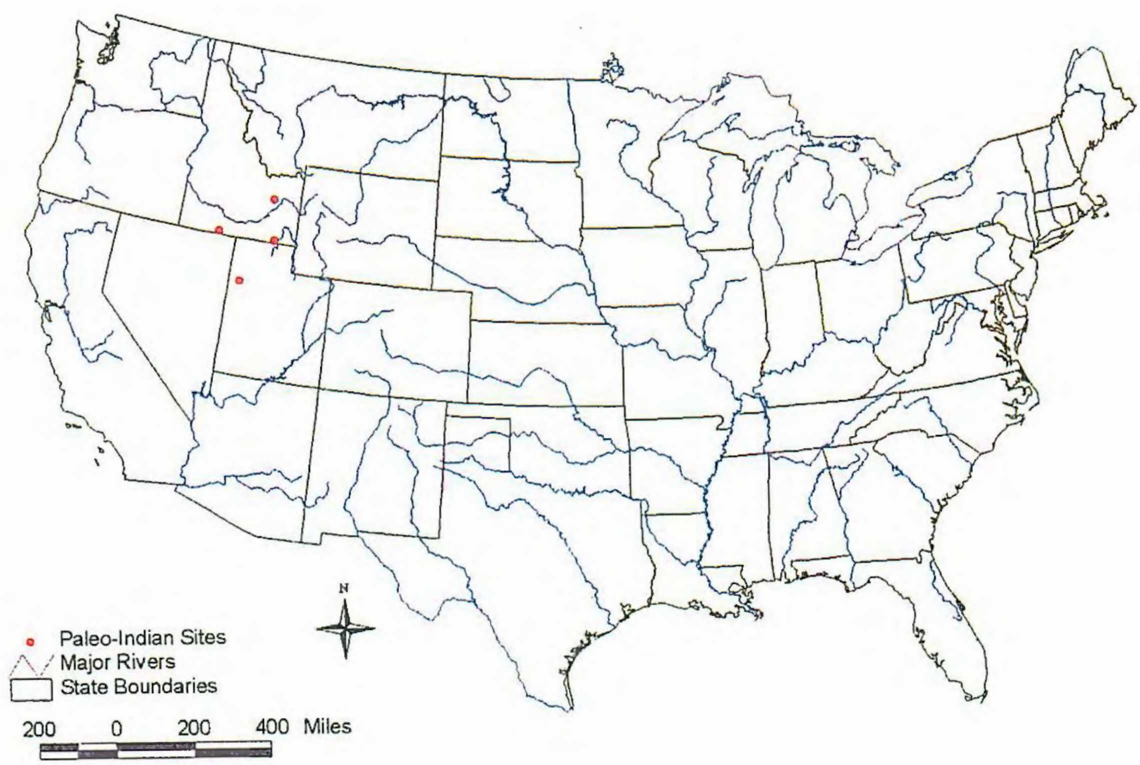

Figure 3. Malad material associated with the Paleoindian period.

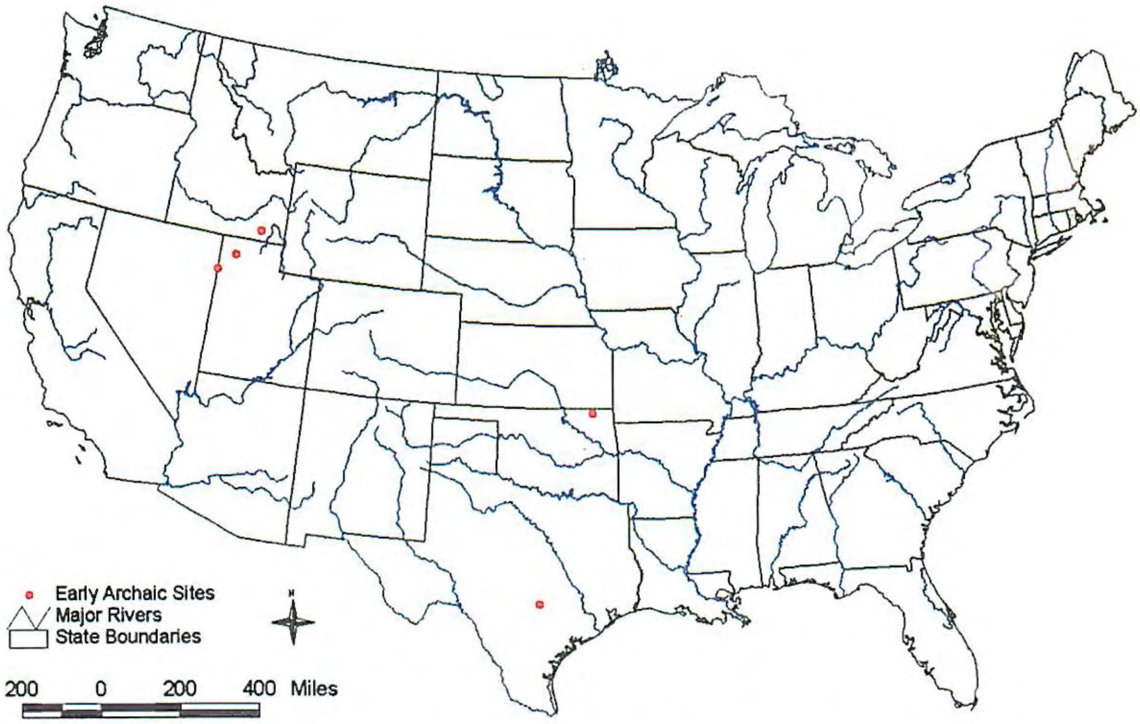

Figure 4. Malad material associated with the Early Archaic period.

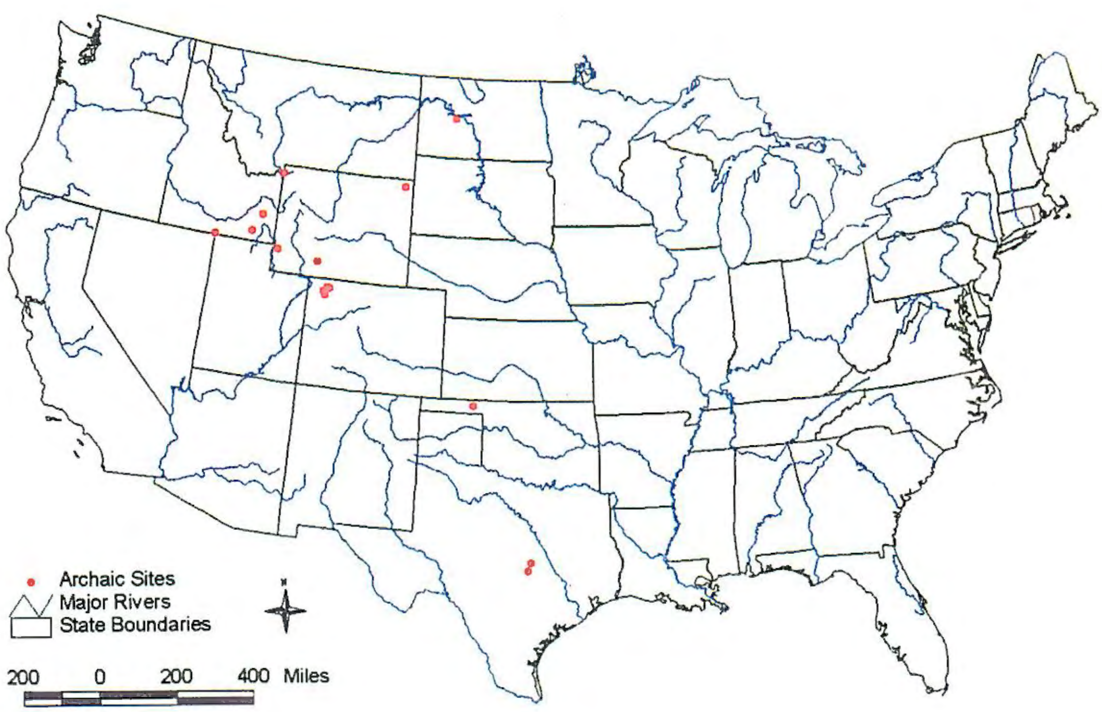

Figure 5. Malad material associated with the Middle and Late Archaic periods.

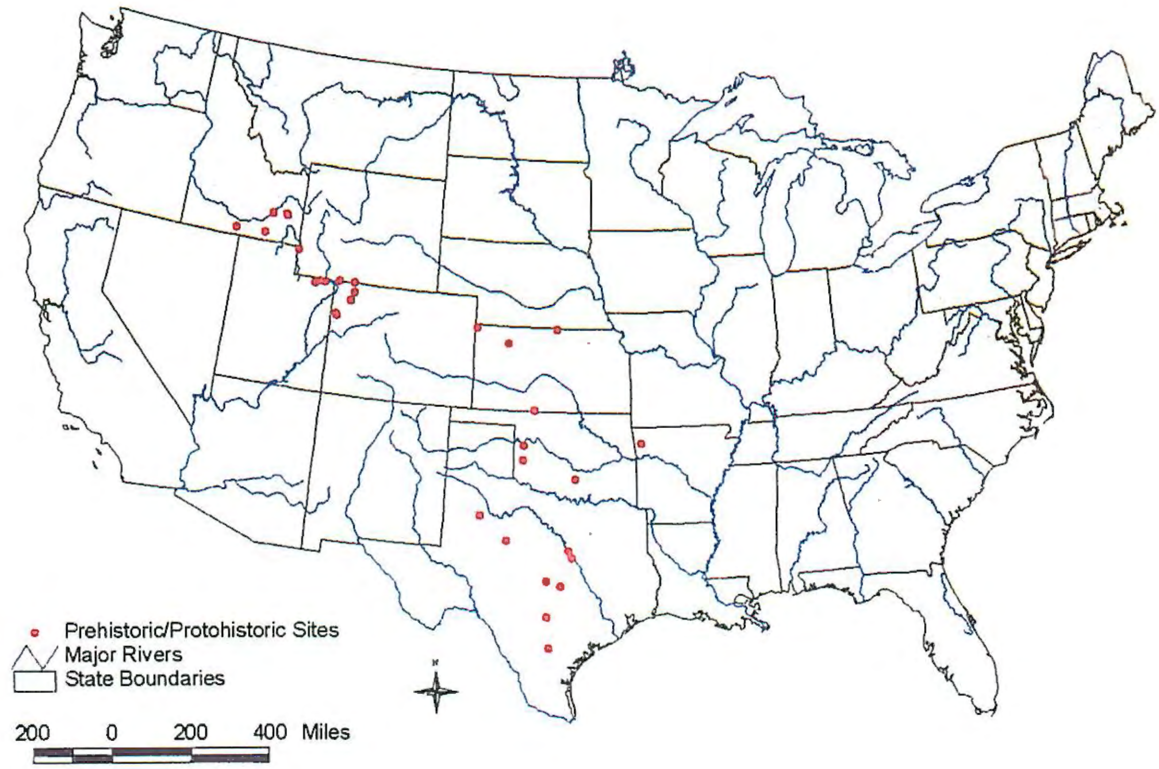

Figure 6. Malad material associated with the Late Prehistoric/Protohistoric periods.

Although there is a good sample of dated sites (N=60), numerous sites (N=37) have no associated dates but are still considered important in understanding the overall distribution of Malad material. Data from numerous survey and excavation reports as well as from the published literature was included in this research. The compiled data may not reflect all the analysis that has been conducted in which obsidian from this source area has been located.

The sites were plotted on a map and fall-off analysis was conducted. In an effort to include most of the sites, a fan-shaped area was created for the analysis. The area was divided into eight blocks, with block number one encompassing the source area and block number eight being the farthest away. The blocks were spaced at approximately two hundred mile increments from the source location. The area of each block was calculated to the nearest acre. All sites within each block was counted and divided by the area to give a rough estimate of site density. This information was then plotted on a graph to determine if the distance decay patterns would provide information as to the mechanism by which the material was transported.

It is assumed that the quantity of a traded material usually declines as the distance from the source increases. In some cases there are regularities in the way in which the decrease occurs, and this pattern can inform us about the mechanism by which a material reached its destination (Renfrew and Bahn 2000:370). Although a couple of sites fall outside of the counted blocks, the majority of sites were included in the fall-off analysis.

The purpose of this analysis is to determine if there were any patterns in the distribution across the landscape. There are several models which give indications as to how materials were moved across the landscape. Humans tend to move in non-random patterns. We know that human behavior is not random but is constrained and determined by factors such as kinship, economics, and environment (Hodder and Orten 1976). The inclusion of sites which were considered outliers was determined not to be beneficial to understanding the overall patterns.

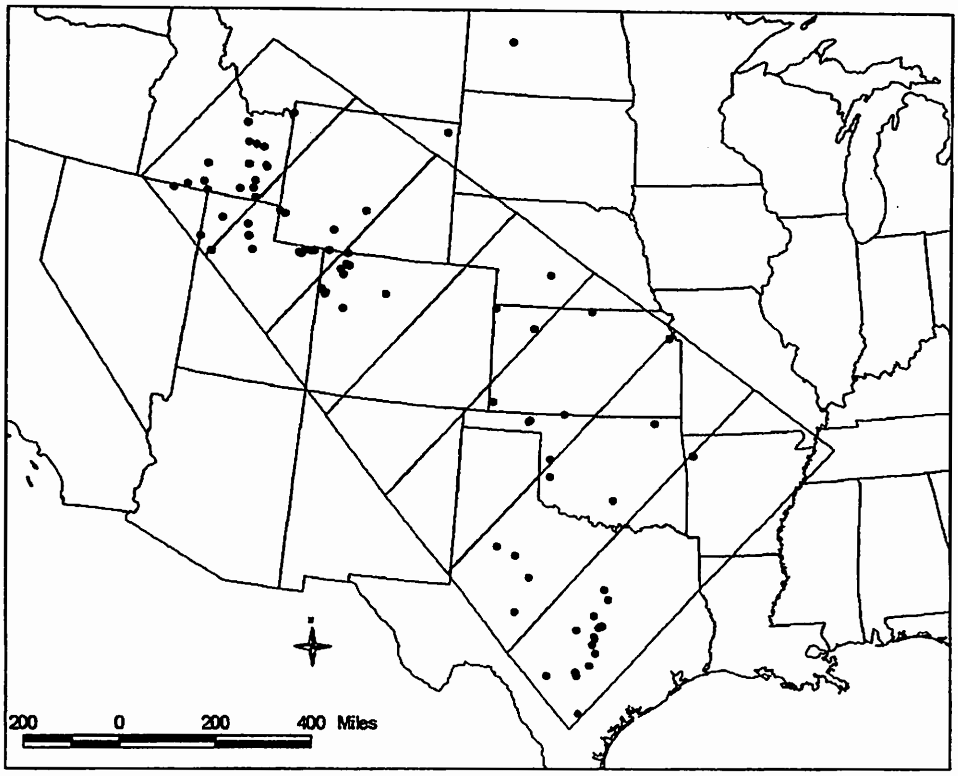

Figure 7. Fall-off analysis blocks.

BLOCK	MILES FROM SOURCE	TOTAL Area (Acres million)	SITES	DENSITY
1	200	24.039	22	.915
2	400	26.001	18	.692
3	600	28.855	21	.728
4	800	31.478	3	.095
5	1000	34.035	7	.206
6	1200	35.570	8	.225
7	1400	37.877	17	.449
8	1600	0	0	0

Table 3. Fall-off analysis data.

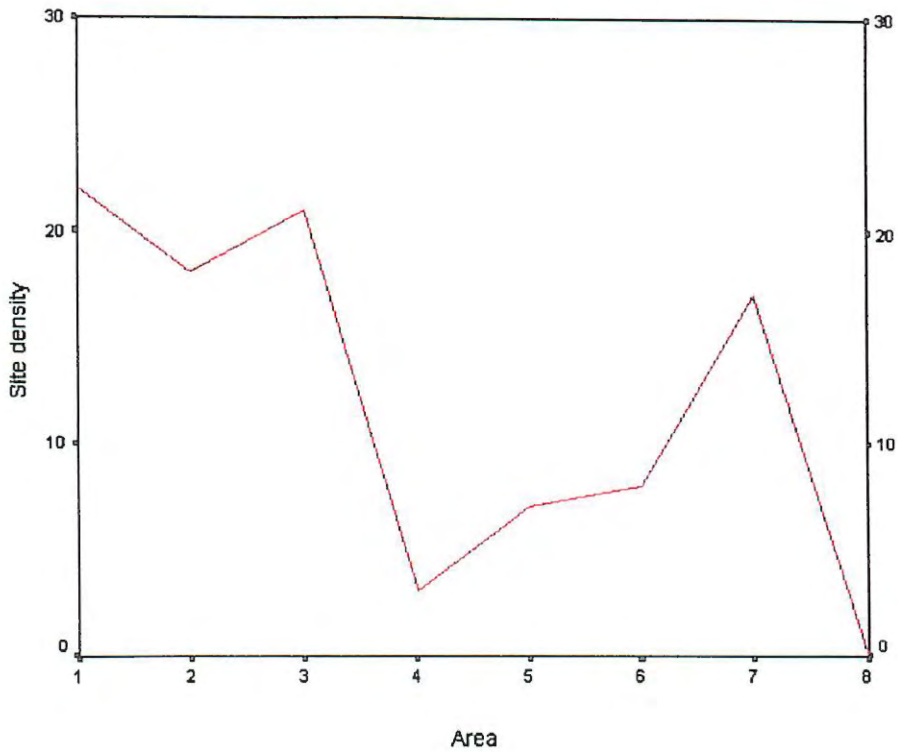

Figure 8. Line graph of fall-off analysis.

The line produced by this data (Figure 8) is basically the same multi-modal lines that Renfrew and Bahn produced for data that was determined to be central place redistribution.

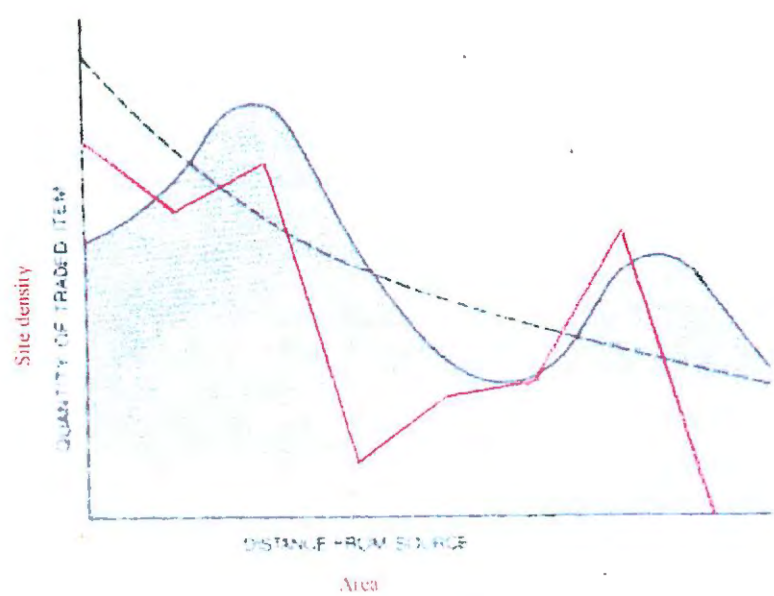

Figure 9. Malad line graph combined with Renfrew and Bahn graph.

Figure 9 combines the line graph which was produced by overlying the Malad obsidian data over the graph produced by Renfrew and Bahn and described as indicating a central place or market exchange redistribution model (2000:371).

To further understand the mechanics of the transport of this material, trend surface analysis was conducted. In order to accomplish this, the distribution map (Figure 10) was divided into uniform three-degree cells (longitude and latitude) and the number of sites within each cell was calculated. The patterning was then "smoothed" to reduce local irregularities by using an average calculated from sites for each individual cell plus all of the neighboring cells. This results in a very simplified moving average from which a contour map of the spatial distribution of this material can be produced. The result of this analysis is that important trends are isolated from the background "noise" more clearly (Renfrew and Bahn 2000:369). The resulting map further displays the bi-modal distribution of Malad obsidian.

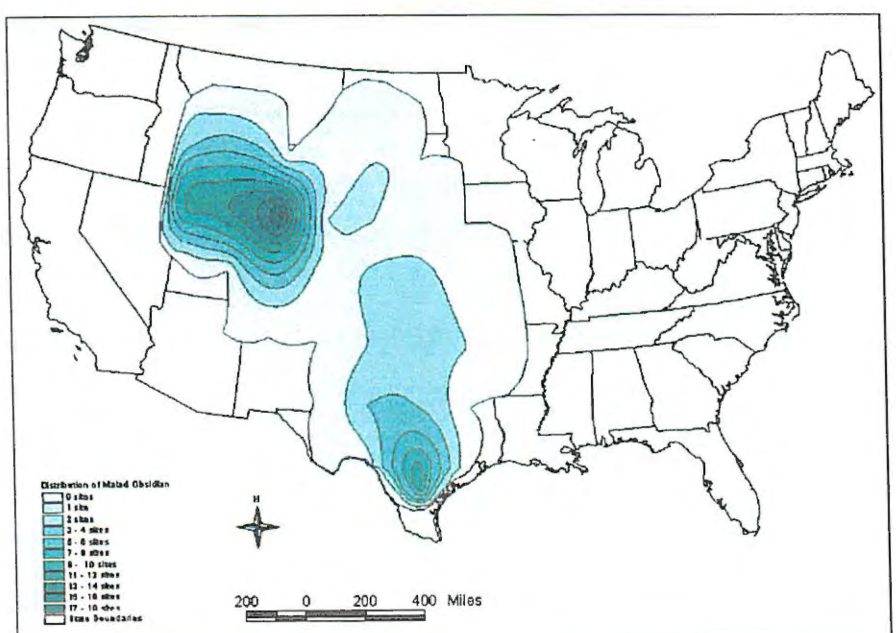

Figure 10. Trend surface analysis map.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

When looking at the distribution of material through time and space, it is pretty amazing to think that this material was transported over such long distances. The challenge is in attempting to interpret what, if any additional knowledge is gained through plotting distributions of particular artifacts. This research does provide some very interesting information concerning the transport of Malad obsidian across the landscape. That being said, this information is also very preliminary, and is based only on one very small segment of the total artifact assemblage that may be present in these sites. As this project progressed, there were a few aspects of the research which would provide a much greater understanding of the information.

There are a few very important factors that must be considered when discussing the data for this project and the interpretation of said data. The very first and, in my opinion, most important is the fact that this data is limited to sites which have had Malad obsidian collected and reported. Every attempt was made to collect as much data as possible, but there is no doubt that many sites containing material from the Malad source are not represented. It is obvious that when looking at distribution of artifacts, that we are also reporting on areas where archaeological research has occurred. In interpreting this data, it must be stated that the absence of material may in fact be an absence of archaeological investigations, absence of reporting, and not specifically an absence of the material. The distribution, both in time and on the landscape, of additional sites could dramatically change the distribution patterns of this material.

Another factor that needs to be understood is the fact that the presence of obsidian from the Malad source was the only factor for inclusion in the database. The interpretation of this data would have been much stronger if the Malad material could have been reported as a percentage of all artifacts within each site. Because this data was spread out over several states and among several researchers, that level of investigation was not possible. Again, looking at the percentage of Malad material within the total artifact assemblage at each site and across the landscape may provide a completely different picture of the distribution of this material. With these limitations in mind, the following discussion and conclusions are presented.

The distribution of material from the Malad source is very impressive considering the distance from the source where the material has been located. The farthest site is over seven hundred miles (in a straight line) from the source area. The study of distribution can be made clear by the production of a map, but a distribution map must be interpreted if we are to understand the processes that lay behind it (Renfrew and Bahn 2000:369). The distribution map (Figure 2) is a very good visual indicator of the distribution of material from the Malad source. It is clear that Malad obsidian was transported into the Great Basin, central Plains and southern Plains from Early Archaic through Late Prehistoric times. The presence of non-local material in a site does not, by itself, provide irrefutable evidence for long-distance trade (Hughes and Bennyhoff 1986:238). A problem with this area of research is the danger that researchers get trapped into "providing an indication of only the range, rather than the mobility, since the raw material could have been acquired through residential or logistical movement or trade"

(Jones et. al., 2003:6). These problems in research tactics are a result of trying to obtain fine-grained information from a coarse-grained data base.

In an effort to understand the movement of Malad material by time period, the sites were plotted on separate maps which were then broken into discreet time periods. What is interesting about the distribution when broken down into time-period is the fact that by the Early Archaic, Malad material is found on the southern Plains. This indicates that some sort of relationship between the southern Plains and the eastern Great Basin has been present since early archaic times. Although at this point, it is hard to define what that relationship is, this is a line of inquiry that would be very interesting to pursue further. Are there other indications of very early contact and if so, does this affect the way we believe populations moved and populated the landscape in these areas?

The Middle and Late Archaic time periods show an increase in the occurrence of material from the Malad source across the landscape. During these time periods, it appears that the movement of material begins to appear more frequently through Utah and Colorado, and ending up in southern Plains context in Texas and Oklahoma. The material is also present in the central and northern Plains during this time period. Again, this movement indicates economic and/or ethnic relationships between two distinct culture areas and the increased presence of material may be seen as an indication of larger populations, more mobility among populations, or both.

In the Late Prehistoric/Protohistoric time period, the same general pattern is present with material being transported from the eastern Great Basin on to the southern Plains. Something that is important to note is the absence of Malad obsidian to the north. This absence of this material may be an indication of a change in the cultural make-up of the populations in the northern Plains. As expected, the Late Prehistoric/Protohistoric time period is represented by more sites than any other time period. The temporal distribution of the sites are far earlier than the generally accepted entrance of the Comanche onto the southern Plains, and this may be an area in which further research could contribute to our understanding of regional interaction, travel and trade. It does appear that during the middle to late prehistoric periods, there was a general increase in the material out of the Great Basin and onto the Plains. Another interesting aspect of the site distribution through time is the fact that from the Early Archaic and all the way into the Protohistoric time period, the movement of material from the Malad source onto the southern Plains stays constant. This would indicate a very long-standing relationship, and stable cultural systems through time. If different cultural groups were moving in and out of either area, it would seem that this system would not have stayed so constant through such a long time period. Further investigations into this phenomenon would be very interesting.

As stated earlier in this chapter, many studies of this type end up providing an indication of only range, rather than mobility patterns, since the raw material could have been acquired through residential or logistical movement or trade (Jones et. al., 2003:6). In an effort to avoid being lumped into that type of study, fall-off analysis and trend surface analysis was conducted to try to understand the mechanism by which this material was transported.

As described in the preceding chapter, the fall-off analysis was conducted by dividing the area of distribution into grids and counting the sites per area within each grid. As described by Renfrew and Bahn (2000:370) "The quantity of traded material usually declines as the distance from the source increases." The analysis for this data produced a multi-modal fall-off curve, which is indicative of down-the-line trade, with a central place redistribution system (Renfrew and Bahn 2000:371). That is to say, that the material is abundant near the source area, as the material moved further from the source, it was redistributed at a general trading area and at that point an increase in the frequency of material is seen in the material record. The results of the trend surface analysis (Figure 9) further illustrated the results of the fall-off analysis. This further indicates the presence of a central distribution center for down-the-line trade materials.

As stated in the introduction, this research was designed to examine the transport of obsidian from the Great Basin onto the southern Plains. The problem considered in this study is how to differentiate between trade and individual, long distance transport of specific material from its source to its ultimate place of deposition in the archaeological record. The assumption is that the more distant a commodity is from its point of origin, the more likely it is that the commodity was obtained through trade. However, due to the limitations of available evidence, direct access cannot be ruled out.

Perhaps the most common approach to understanding trade patterns has been to infer patterns of movement using the geologic source provenance of stone tools in archaeological assemblages (Jones et. al. 2003:5). This project provides information at different levels concerning the aspects of material acquisition, distribution, and consumption patterns. It would be worthwhile to investigate the distribution of obsidian sourced to areas in New Mexico. If, in fact, the New Mexico materials can be traced back toward the Great Basin, this may imply that prehistoric people were re-supplying their tool kits once they reached the known sources in the southern Plains and Southwest.

Based on this research, it is also difficult not to consider trade as the major factor in the distribution of material from the Malad source. This research further supports Baugh's (1988:87) argument that the presence of Malad obsidian throughout the southern Plains implies that "from the 12th through the 14th centuries, people located in central Texas and central Oklahoma were more deeply involved in a north-south exchange network than an east-west exchange system".

Although a conclusion of trade based solely on the distribution of obsidian from this source is contrary to the argument that the material was transported great distances by the users, at this point, trade does seem to be the most defendable conclusion which can be made. Another plausible scenario which is consistent with ethnography, ethnographic record, and the distribution of materials is a long-standing connection between the eastern Great Basin and the southern Plains. People traveling from the Great Basin into the Plains would transport and use material from the Malad source as they traveled south. The distributions that are present in this research could very well be the two areas at opposite ends of the use area. Numerous scholars have commented on the difficulty, if not impossibility, of distinguishing direct access from indirect access archaeologically, but many specialists still make the assumption that the more distant an artifact, or group of artifacts from its parent source of origin, the more likely it was obtained through trade (Hughes 1994:366).

This research did lead to a much greater understanding of the distribution of material from this obsidian source. The temporal data is of great interest, and although not able to answer the question posed in this study should be valuable to future researchers. If this type of approach was considered for a variety of source areas, material types, and artifacts, a much greater understanding of the regional trade, transport and travel patterns may emerge.

Although typological analysis of formal artifacts by statistical and intuitive means was determined to not be a feasible element to this research. This would be an interesting aspect to the question of trade or transport of material from the Great Basin onto the southern Plains, but so few artifacts are available for study, that statistically valid conclusions are hard to make. Because this research was bound by material from the Malad source, the numbers of artifacts were reduced even further. An interesting and informative project would be to analyze the artifacts from various sites across the Great Basin, central Plains and southern Plains and see if the artifacts are statistically more or less similar across the landscape. An in-depth analysis of the artifacts from the sites in this research may provide more information as to trade and transport networks.

This research has made it clear that due to the advances in obsidian source identification studies, these studies should be a basic part of all archaeological research designs. This information should also be available to scholars in a searchable database. Although the results of this research were not able to definitely answer the question as to how the material from Malad made its way into the southern Plains, the information provided is important to the overall understanding of the movement of prehistoric people from the eastern Great Basin and onto the Plains. Although not clear in the data, I do believe that people were moving much greater distances than archaeological research has assumed. Many of the boundaries which limit archaeological research are self-imposed by the science as well as the cultural biases of those doing the research and if greater understanding is to occur, people must begin to move beyond these boundaries. This research has provided the foundation for pursuing further investigations into the movement of people and materials across many of these perceived regional, cultural, and geographic boundaries.

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APPENDIX A

SITE DISTRIBUTION DATABASE

Database Variables

A= State Number*
B=County Designation*
C=Site Number*
*These three variables make-up the Smithsonian trinomial site designation
D=UTM Zone
E=UTM Easting
F=UTM Northing
G=Associated Age of Site
1=Paleoindian
2=Early/Middle Archaic
3=Archaic
4=Prehistoric/Protohistoric
5=No Associated Date
H=Degree's Latitude
I=Degree's Longitude

SITE DISTRIBUTION
DATABASE

	A	B	C	D	E	F	G	H	I
1	STATE	COUNT	SITE	ZONE	UTME	UTMN	AGE	LAT	LONG
2	3	WA	10	15	393600	3968380	4.00	35.86	-94.18
3	5	GA	277	13	380440	4428860	5.00	40.00	-106.40
4	5	GF	1667	13	241840	4368850	5.00	39.43	-108.00
5	5	MF	1915	12	742220	4473820	3.00	40.38	-108.15
6	5	MF	1915	12	742010	4473220	4.00	40.38	-108.15
7	5	MF	2849	12	751520	4505440	4.00	40.66	-108.02
8	5	MF	2942	12	731520	4487170	3.00	40.50	-108.27
9	5	MF	2942A	12	731270	4486720	3.00	40.50	-108.27
10	5	MF	3161	12	747770	4504800	3.00	40.66	-108.07
11	5	MF	3164	12	748460	4505210	3.00	40.66	-108.06
12	5	MF	3164A	12	748380	4505140	3.00	40.66	-108.06
13	5	MF	3307	13	249440	4504040	3.00	40.65	-107.96
14	5	MF	3307A	13	250170	4503600	5.00	40.65	-107.95
15	5	MF	3440	12	683180	4538230	4.00	40.98	-108.82
16	5	MF	3440A	12	683050	4538230	5.00	40.98	-108.82
17	5	MF	3618	12	748110	4505080	5.00	40.66	-108.07
18	5	MF	3737	12	746880	4541100	4.00	40.99	-108.07
19	5	MF	3737A	12	746980	4540900	5.00	40.98	-108.06
20	5	RB	2828	12	691160	4410480	5.00	39.82	-108.77
21	5	RB	2873	12	686100	4410480	4.00	39.83	-108.83
22	5	RB	314	12	690580	4405130	4.00	39.78	-108.77
23	5	RB	3448	12	675750	4419320	5.00	39.91	-108.94
24	5	RB	3807	12	675870	4416180	5.00	39.88	-108.94
25	5	RB	3807A	13	380620	4428860	5.00	40.00	-106.40
26	10	BK	26	12	372950	4761200	4.00	42.99	-112.56
27	10	BK	39	12	402120	4712960	5.00	42.56	-112.19
28	10	BK	74	12	399350	4689400	2.00	42.35	-112.22
29	10	BM	479	12	431050	4765150	4.00	43.04	-111.85
30	10	BM	480	12	429900	4765550	5.00	43.04	-111.86
31	10	BT	1582	12	361780	4830500	5.00	43.62	-112.71
32	10	BV	30	12	387820	4828660	1.00	43.60	-112.39
33	10	BV	9999	12	415029	4823546	5.00	43.56	-112.05
34	10	CA	397	11	744510	4657160	3.00	42.03	-114.05
35	10	CA	33	11	727000	4681460	4.00	42.25	-114.25
36	10	CL	40	12	348340	4890180	5.00	44.15	-112.90
37	10	CU	208	12	432900	4763150	3.00	43.02	-111.82
38	10	CU	212	12	434334	4760947	4.00	43.00	-111.81
39	10	FR	4	12	410830	4660668	1.00	42.09	-112.08
40	10	JE	6	11	727400	4740680	5.00	42.79	-114.22
41	10	OA	1	12	399685	4689603	3.00	42.35	-112.22
42	10	OA	210	12	352159	4679840	4.00	42.26	-112.79
43	10	TF	1	11	673580	4663600	1.00	42.11	-114.90
44	14	MY	305	14	246460	4126310	5.00	37.25	-101.86
45	14	JW	2	14	246460	4417600	4.00	39.87	-101.96
46	14	JW	24	14	575460	4417930	4.00	39.91	-98.12
47	14	JW	8	14	575940	4417760	4.00	39.91	-98.11
48	14	SD	305A				4.00	39.36	-100.43

SITE DISTRIBUTION
DATABASE

	A	B	C	D	E	F	G	H	I
49	14	LV	1079				5.00	39.19	-95.03
50	25	DW	17	14			5.00	40.87	-99.82
51	32	ME	799	14	279802	5254017	3.00	47.40	-101.92
52	34	NW	6				3.00	36.80	-95.61
53	34	RM	72	14	447650	3953600	4.00	35.73	-99.58
54	34	BV	93				3.00	36.76	-100.47
55	34	BV	104				5.00	36.80	-100.40
56	34	BK	2	14	447650	3897500	4.00	35.22	-99.58
57	34	WO	43	14	490080	4094350	4.00	37.00	-99.11
58	34	GV	22	14	666360	3829340	4.00	34.59	-97.19
59	41	BL	104	14	628733	3429465	3.00	30.99	-97.65
60	41	BL	24	14	640085	3433408	5.00	31.03	-97.53
61	41	BQ	46	14	658441	3518331	4.00	31.79	-97.33
62	41	BX	300	14	558489	3275729	4.00	29.61	-98.40
63	41	BX	746	14	553795	3287544	5.00	29.72	-98.44
64	41	CV	137	14	612394	3465413	5.00	31.32	-97.82
65	41	GR	29	14	276533	3671989	4.00	33.17	-101.40
66	41	HI	24	14	643334	3545866	4.00	32.04	-97.48
67	41	HY	188	14	601494	3308911	2.00	29.91	-97.95
68	41	LK	51	14	566731	3153234	4.00	28.51	-98.32
69	41	LL	4	14	552775	3420736	5.00	30.92	-98.45
70	41	MX	9	14	337644	3643943	5.00	32.92	-100.74
71	41	NL	10	14	383827	3577411	4.00	32.33	-100.23
72	41	SS	2	14	552908	3420983	4.00	30.92	-98.45
73	41	TG	233	14	339614	3467854	5.00	31.34	-100.69
74	41	TV	133	14	607766	3377129	5.00	30.52	-97.88
75	41	TV	1604	14	620538	3349047	5.00	30.27	-97.75
76	41	UV	213	14	455839	3273785	5.00	29.59	-99.46
77	41	WM	362	14	615840	3394200	3.00	30.68	-97.79
78	41	WM	689	14	612878	3401001	4.00	30.74	-97.82
79	42	SL	98				5.00		
80	42	BO	36	12	310862	4582449	2.00	41.37	-113.26
81	42	WB	326	12	399560	4575820	5.00	41.33	-112.20
82	42	TO	925	12	289050	4476350	1.00	40.41	-113.49
83	42	DA	545	12	605080	4526760	4.00	40.89	-109.75
84	42	DA	791	12	627000	4527360	4.00	40.89	-109.49
85	42	DA	364				5.00		
86	42	DA	678	12	635800	4532480	5.00	40.93	-109.39
87	42	DA	798	12	626400	4528500	4.00	40.90	-109.50
88	42	DA	824	12	590800	4517860	5.00	40.81	-109.92
89	42	TO	13	11	751810	451490	3.00	40.75	-114.02
90	42	UN	2324	12	591770	4513080	5.00	40.77	-109.91
91	42	UN	2318	12	591900	4512400	5.00	40.76	-109.91
92	42	DC	815	12	584220	4516740	4.00	40.80	-110.00
93	48	LN	3117	12	499380	4634230	4.00	41.86	-111.01
94	48	LN	2555	12	517570	4630020	3.00	41.82	-110.79
96	48	SW	998	13	290367	4678549	5.00	42.23	-107.54
97	48	CK	1403	13	541210	4949660	3.00	44.70	-104.48

SITE DISTRIBUTION
DATABASE

	A	B	C	D	E	F	G	H	I
98	48	YE	1364	12	496855	4944610	3.00	44.66	-111.04
99	26	EK	25	11	63066	4643607	5.00	41.93	-115.42

APPENDIX B

SITE DISTRIBUTION MAPS

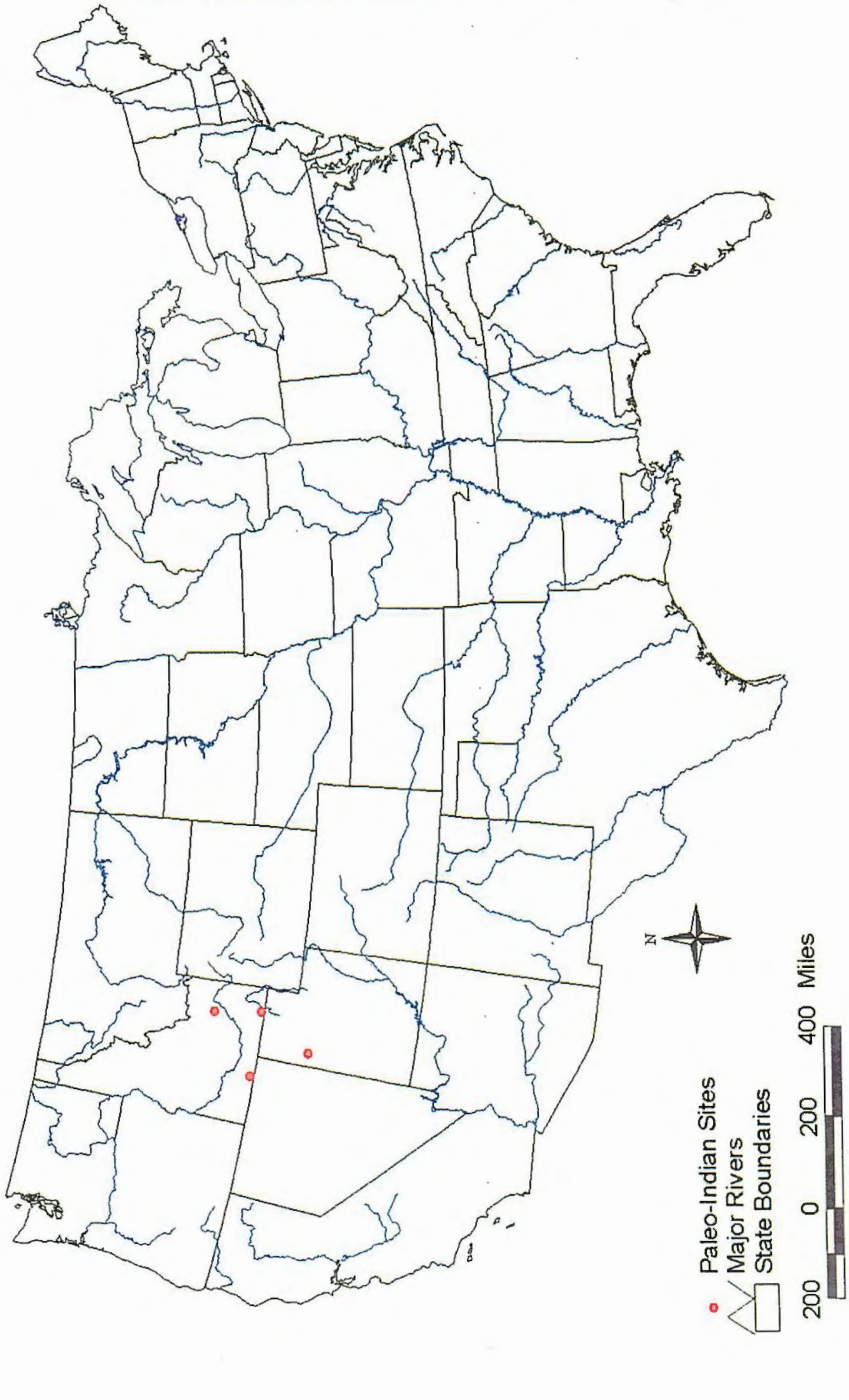
APPENDIX C

FALL-OFF ANALYSIS

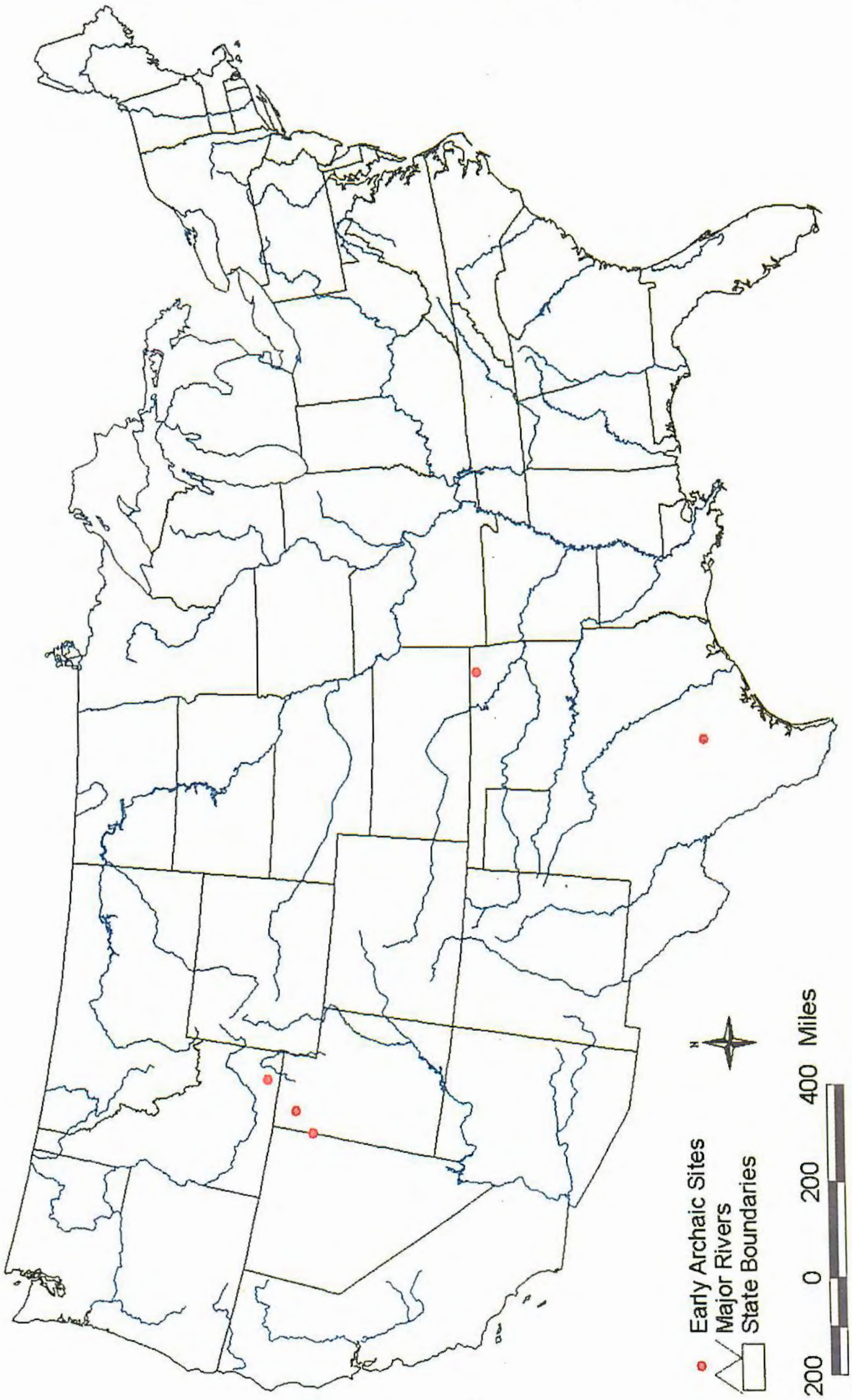
B1.

Distribution of sites with presence of Malad obsidian

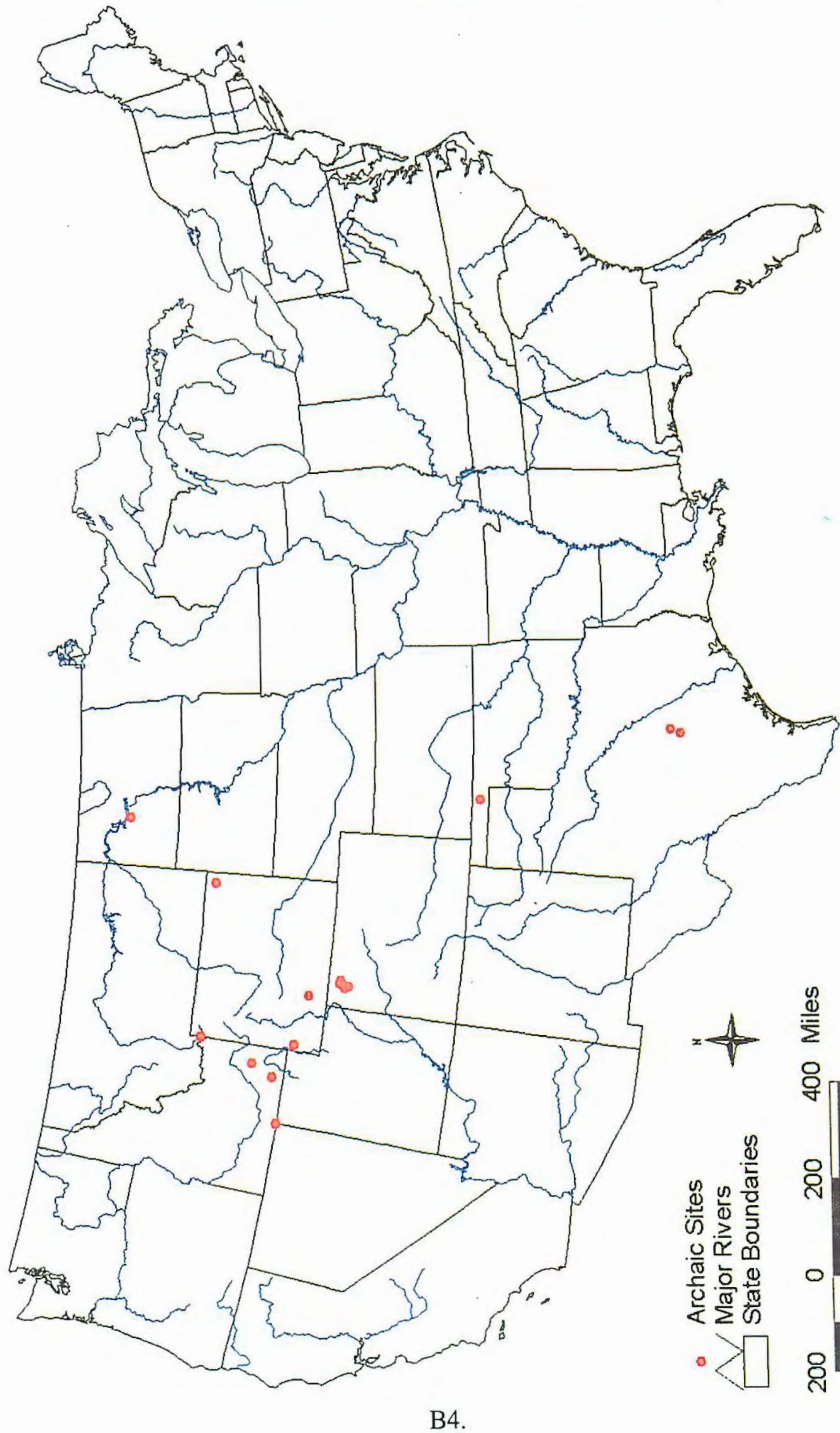
Malad material associated with the Paleoindian period



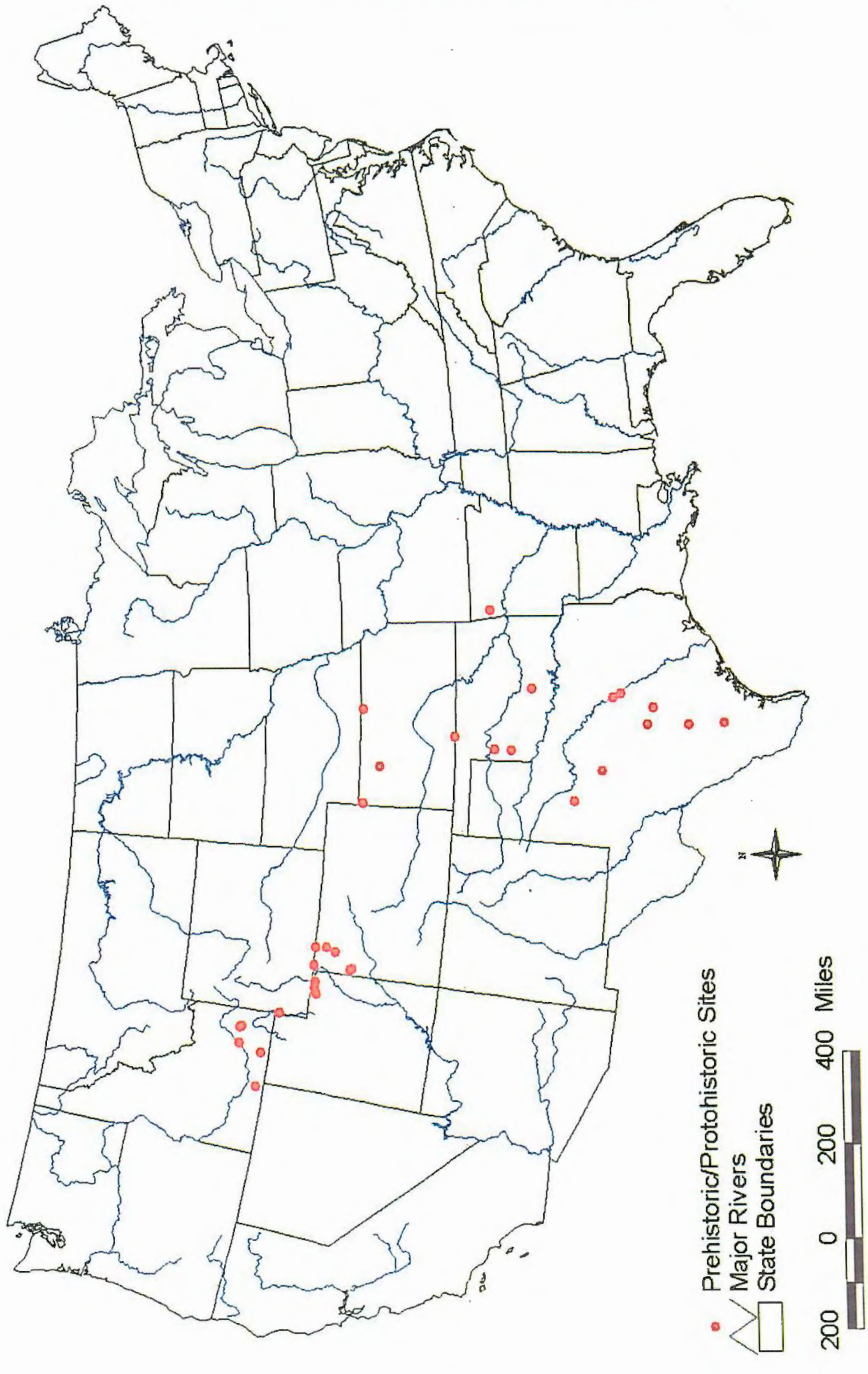
Malad material associated with the Early Archaic period.



Malad material associated with the Middle and Late Archaic period.



Malad material associated with the Late Prehistoric/Protohistoric period.



APPENDIX

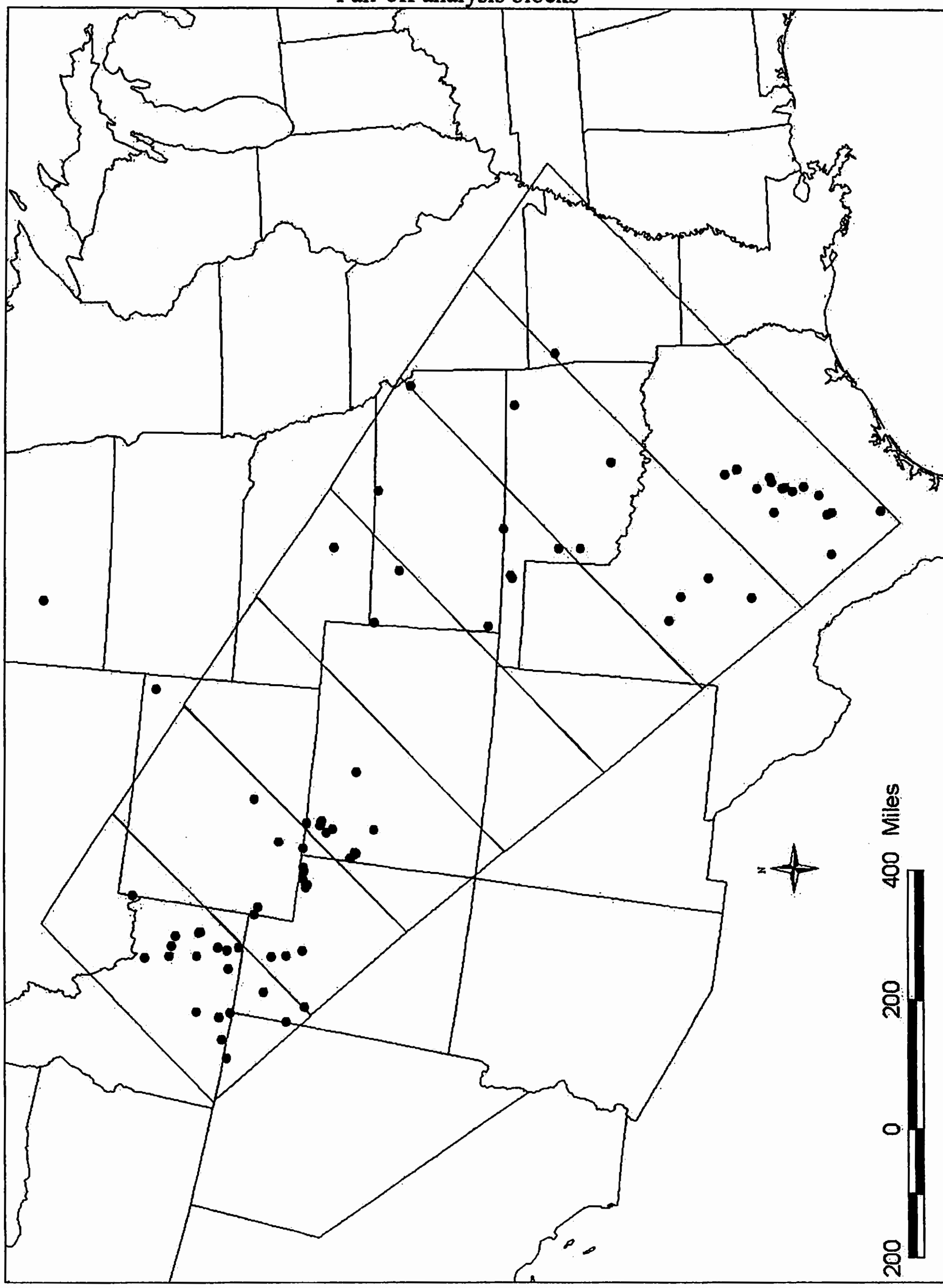
FALL-OFF ANALYSIS

C1...........Fall-off analysis blocks.

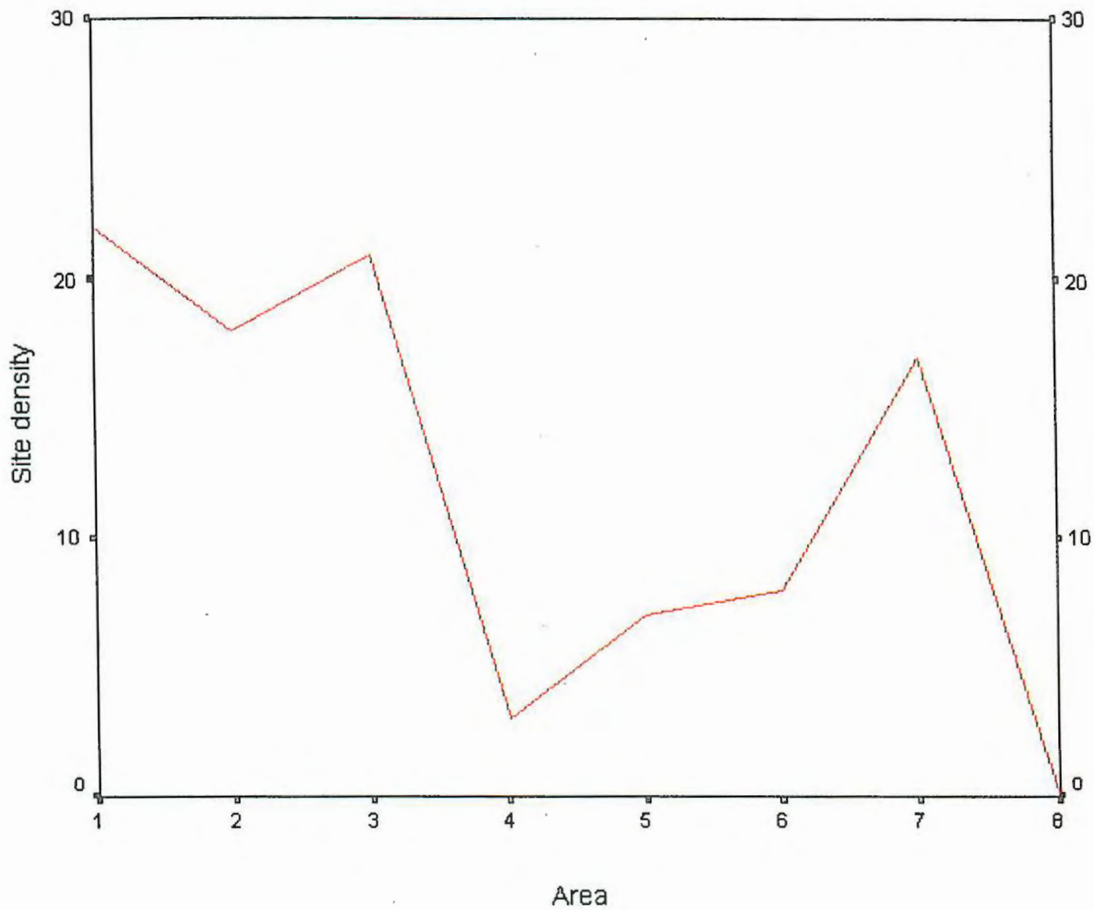
C2...........Line graph and data from fall-off analysis.

C3...........Malad fall-off analysis over Renfrew and Bahn analysis

Fall-off analysis blocks

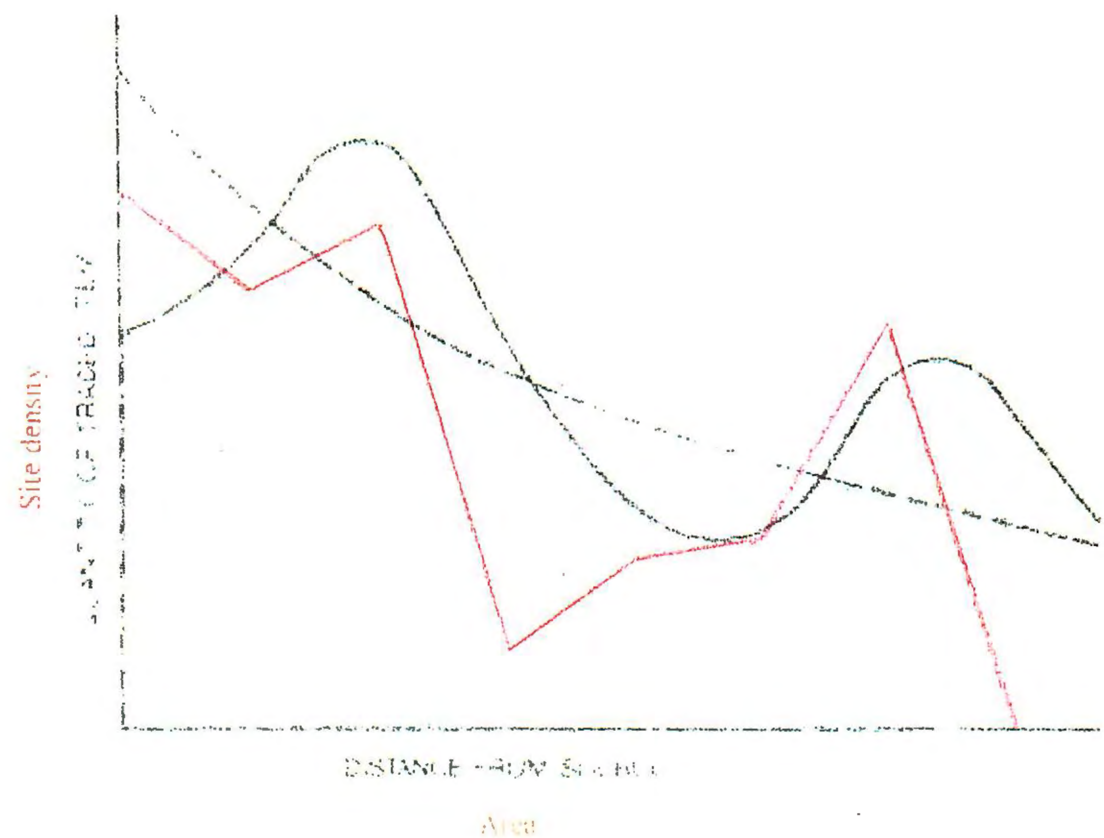


Line graph and data from fall-off analysis.



BLOCK	MILES FROM SOURCE	TOTAL Area (Acres million)	SITES	DENSITY
1	200	24.039	22	.915
2	400	26.001	18	.692
3	600	28.855	21	.728
4	800	31.478	3	.095
5	1000	34.035	7	.206
6	1200	35.570	8	.225
7	1400	37.877	17	.449
8	1600	0	0	0

Malad fall-off analysis over Renfrew and Bahn (2000:371) analysis.



APPENDIX D

TREND SURFACE ANALYSIS

Trend surface analysis.