OBSIDIAN PROCUREMENT AT THE UMPQUA/ EDEN SITE (35 DO 83), CENTRAL OREGON COAST: PRELIMINARY RESEARCH RESULTS

Craig Skinner
University of Oregon
March, 1987

OBSIDIAN PROCUREMENT AT THE UMPQUA/EDEN SITE (35 DO 83), CENTRAL OREGON COAST: PRELIMINARY RESEARCH RESULTS

Craig Skinner
University of Oregon
March, 1987

Preface

The preparatory research that is reported here, while solely my responsibility, would not have been possible without the cooperation of others. My thanks and a tip of the trowel to Ann Bennett and Richard Ross of Oregon State University for the loan of the Umpqua/Eden collection and to the Oregon State University Radiation Center for funding the instrumental neutron activation analyses that were carried out as part of this project. The INAA analyses were, unfortunately, not quite finished at the writing of this preliminary project decription. Until they are complete, the existence of the postulated local source or sources of coastal obsidian will remain a distinct, but as yet unverified, possibility.

The artifact counts shown in the data tables of Appendix 2 should be considered as close approximations rather than exact counts - on close examination, some of the numbers simply do not add up correctly, though they are close. This problem, probably due to data entry errors, was not corrected for this early research report though it will be addressed in later analyses.

This report also serves to illustrate the intrusive role of microcomputers in research today. The text was produced on a Commodore 64 microcomputer using WRITENOW! word processing software and was printed on a Comrex CR-IIE letter-quality printer. The tables were assembled with Practicalc and Sideways, electronic spreadsheet software, and were printed with a Star SG-10 dot matrix printer. The attribute data collected from the Umpqua/Eden collection was handled using Nutshell, an electronic database, and a Leading Edge IBM-PC compatible microcomputer.

The admittedly very preliminary research results that are reported in the following pages will, I hope, raise some questions concerning the future archaeological study of procurement and exchange systems along the Oregon Coast. A fresh outlook is indicated.

Craig Skinner
April, 1987

CONTENTS

FIGURES

TABLES

OBSIDIAN PROCUREMENT AT THE UMPQUA/EDEN SITE (35 DO 83), CENTRAL OREGON COAST: PRELIMINARY RESEARCH RESULTS

Abstract

Traditionally, the presence of obsidian artifactual materials in archaeological sites along the Oregon Coast has been interpreted to reflect trade systems with the interior. The recent identification of a coastal obsidian source at the mouth of the Siuslaw River, though, has raised the possibility of local procurement of at least some obsidian. During a casual examination, the frequency of obsidian debitage from the Umpqua/Eden Site, located at the mouth of the Umpqua River on the central Oregon Coast, was noted to be anomalously high when compared to other coastal sites. It was hypothesized that a source of obsidian, probably originating from the Crater Lake region, was present in the gravels of the Umpqua River and that this source had been utilized by the prehistoric inhabitants of the Umpqua/Eden Site. Trace element studies to confirm this remain uncompleted, though petrographic analysis of ten artifacts suggests the use of multiple sources at the site. Attribute analysis of obsidian debitage and flaked stone tools from the site also indicates that obsidian from at least one source, and perhaps as many as three, were locally available in the Umpqua River gravels. The existence of a local source appears to be well mirrored by the obsidian debitage ratio (which, conversely, should act as an indicator of local procurement). The preliminary evidence from this study suggests, though, that while local obsidian sources were known, there was minimal interest in the manufacture of tools from these available raw materials.

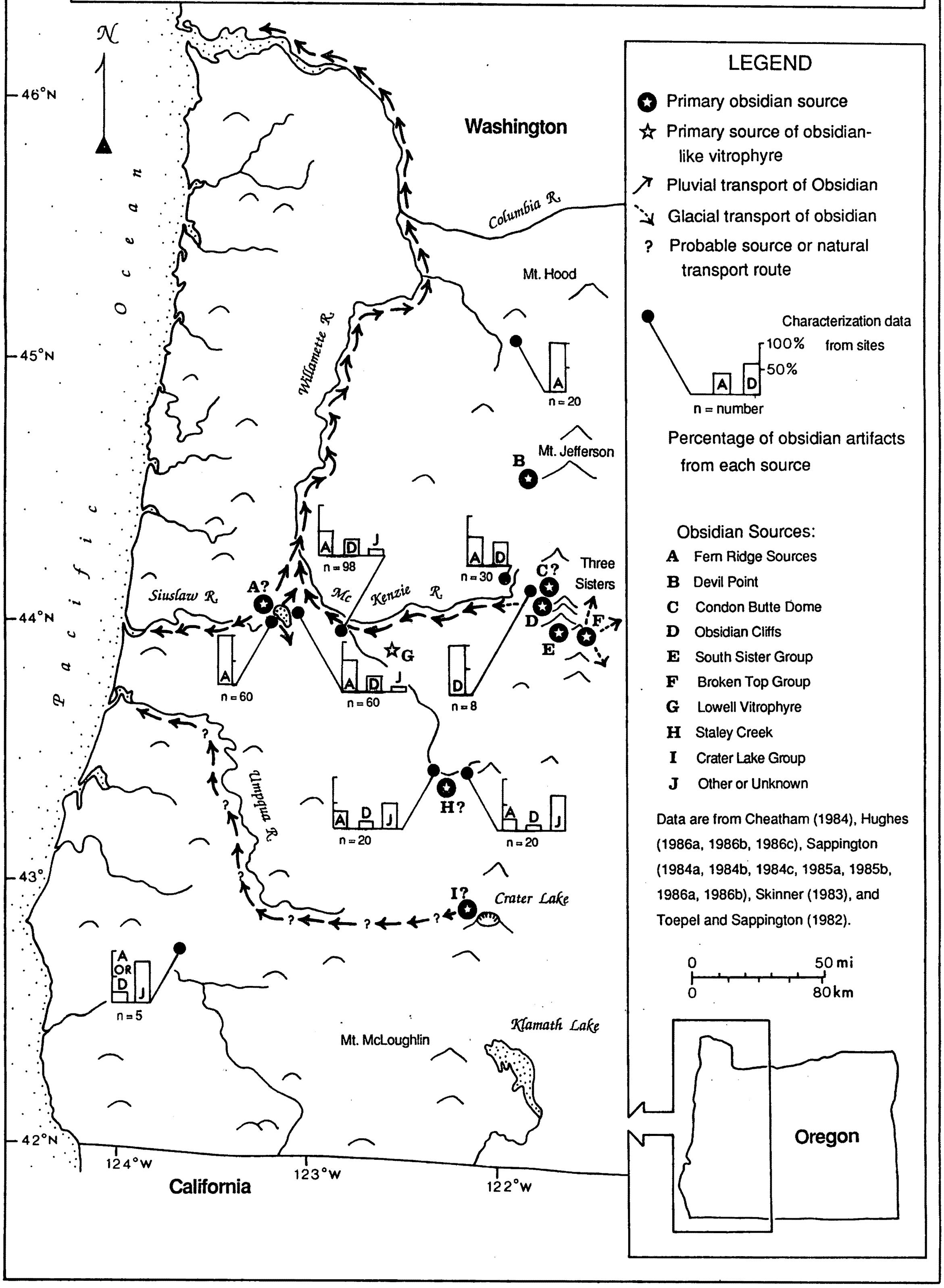
INTRODUCTION

For many years, it has been assumed by archaeologists studying artifactual remains from the Oregon Coast that objects made of obsidian have been imported through systems of contact and exchange from inland sources to the east or south. No indigenous sources of natural glass were known to exist along the coast and the geologic history of the adjacent Coast Range had yielded no clues that would lead anyone to believe otherwise. The presence of obsidian artifacts in archaeological collections was taken, then, as proof positive that the prehistoric inhabitants of the coast were obtaining their materials elsewhere, probably through systems of trade that connected segments of the coast with the interior valleys and with Northern California (Cressman, 1952; Draper, 1980:62 and 1982; Pullen, 1982:106). The scarcity of obsidian tools and debitage at most excavated coastal sites was seen as further proof of the exotic nature of artifactual obsidian on the Oregon Coast. Geochemical characterization studies of obsidian, though widely used in some other areas, had never been initiated for archaeological materials from the Oregon Coast, and the specific primary sources of artifactual obsidian had never been identified.

Recent research concerning Western Oregon obsidian sources, however, has demonstrated that several geologic sources of natural glass are indigenous to

PREHISTORIC UTILIZATION OF OBSIDIAN IN WESTERN OREGON

Craig Skinner March, 1987



the nearby Willamette Valley and, at least one location, to the Central Oregon Coast (figure 1)(Skinner, 1983 and 1986). Small obsidian pebbles, originating from an as yet unlocated primary source in the Central Coast Range, have been fluvially transported west to the mouth of the Siuslaw River as well as east and northeast throughout the Willamette Valley. With local procurement now recognized as a possibility, it became clear that obsidian artifacts recovered from coastal sites did not necessarily result from contact with the interior. Models regarding the operation of exchange networks and procurement dynamics along the coast would have be given some rethinking.

The coastal river gravel source yielded only small-size raw materials, though, and the presence of occasional large obsidian artifacts still pointed to the operation of trade or long-distance direct procurement systems. These may have not been as active as was once envisioned, but were still operative. The problem now has become to distinguish between locally-available obsidian glass and that which has been imported from other areas. Only when this has been done can characterized coastal obsidian be used as a marker for the prehistoric systems of exchange that once existed. Failure to abandon the outdated paradigm of "obsidian = trade" will only lead to a distorted and erroneous picture of prehistoric life along the Oregon Coast.

So, what is to be done? How many sources of natural glass are found along the Oregon Coast? Only one? More? How is local direct-access utilization of obsidian reflected in the archaeological record? Is obsidian from different sources used preferentially? Were all available sources known and exploited? How are different sources reflected in different artifact classes? These are all important questions that need to be asked if archaeologists are to understand and accurately interpret and reconstruct the behavioral systems that once existed along the western border of Oregon. The investigation carried out on a collection of lithic debitage and flaked stone tools that is described here, though of a very preliminary nature, attempts to set the stage for the exploration of these questions.

RESEARCH OBJECTIVES

The research that is reported here was initiated by a chance casual examination of lithic materials from an archaeological site on the southern margin of the Oregon Central Coast, the Umpqua/Eden Site (35DO83). It was noted that the lithic materials that had been recovered from the site during excavations in the 1970's were composed of an unusual number of obsidian artifacts, particularly obsidian debitage. The obsidian debitage also seemed to be composed of a high proportion of flakes and fragments exhibiting stream-rolled cortex. In addition, a few intact, unmodified pebbles of obsidian had also been recovered from the site. Could the inhabitants of the Umpqua/Eden site have been collecting obsidian from the mouth of the Siuslaw River located about 30 km (20 mi) to the north? While possible, this didn't seem like an adequate explanation considering that excavated sites located much closer to the Siuslaw River showed very little evidence that this local source was being utilized (Minor and Toepel, 1986; Minor et al., 1986; Skinner, 1986). An alternative explanation was that obsidian nodules were locally available in the gravels of the Umpqua River. The headwaters of the Umpqua River are located in Crater Lake area where a number of obsidian sources are known to exist and it is plausible that the Umpqua River is carrying glass from a High Cascades source to the coast (Williams, 1942; Skinner, 1983). This provided, at the very least, a testable hypothesis. If the source of glass proved to be local, how would it be reflected in the collection of debitage and tools recovered from the site? Knowledge of the characteristics of artifactual collections where local direct-access procurement systems were known to be in operation could be valuable to archaeologists interested in raw material procurement and utilization behavior. Data such as these could help to make it possible to predict the type of prehistoric procurement systems that existed, based on characteristics of associated artifactual collections, as well as to signal the existence of unidentified sources or raw materials.

It was decided, then, to use artifactual materials from the Umpqua/Eden Site to examine not only the possibility of a local obsidian source but to look at how the presence of a local source (if this was confirmed) would be reflected by the archaeological assemblage. To these ends, two general research objectives were formulated:

1. The characterization and geologic source determination of a sample of artifactual obsidian drawn from the site. This would need to be done to verify whether the obsidian at the Umpqua/Eden Site was being collected at the nearby Siuslaw River or whether it represented a distinct and formerly unrecognized (to modern archaeologists) source. It was determined that the trace element characterization of the glass would provide the most accurate means of "fingerprinting" the artifacts. In addition, petrographic analysis of the samples characterized with trace element abundances would also be carried out concurrently.

2. If the source of artifactual obsidian proved to be local, how would it be modeled in the archaeological assemblage? To this end the entire collection of cryptocrystalline and glassy flaked stone artifacts would need to be examined. Tool and debitage attribute data that might reflect local procurement and utilization would need to be collected and analyzed. The artifact class (tool, debitage, or raw material), the material (CCS or obsidian), the color and texture of the obsidian (crude indicators of source origin), the maximum dimension of the obsidian artifacts (a size parameter imposed on locally-available glass), and the presence or absence of cortex (the presence of which would suggest local procurement) were all considered to be attributes that might be important in reflecting local use. These attributes were all easily and rapidly determinable, a critical factor considering the size of the lithic collection (over 1100 artifacts) and the short time available for the initial analysis.

The research strategies employed in the research were essentially inductive in nature. So little is known about how procurement styles are reflected in archaeological lithic assemblages that the most appropriate method would involve a bit of "fishing" through the data. A few explicit predictions could be made, however. If the obsidian from the Umpqua/Eden Site was found not to originate from the Siuslaw River gravels, it almost certainly represented a local source. And, if the source was local, the proportion of obsidian debitage would be expected to be anomalously high in comparison to other coastal sites. Alternatively, if a source did exist in the Umpqua River gravels, the debitage could be predicted to be composed of a relatively large proportion of cortex flakes and fragments, evidence that local reduction of raw materials was taking place.

PREVIOUS ARCHAEOLOGICAL RESEARCH AT THE UMPQUA/EDEN SITE

The Umpqua/Eden Site is located on the south central coast of Oregon on a sheltered terrace overlooking the east bank of the Umpqua River (figure 2). The site, situated about 3.2 km upstream from the mouth of the river, is set in a estuarine environment rich in a variety of marine and terrestrial plant and animal resources.

Ethnographic accounts place several Umpqua villages in the general vicinity of the Umpqua/Eden site during early historic times, though specific locations were not recorded (Dorsey, 1890; Beckham, 1977; Hogg, 1979).

The site was first investigated by Peter Stenhouse (1974), who conducted limited test excavations in response to reports that an archaeological site was being destroyed by road building operations. Stenhouse recovered a variety of shellfish, fish, mammal, and bird remains along with bone, antler, and clay artifacts. A few lithic tools were also found as were two obsidian waste flakes (Stenhouse, 1974).

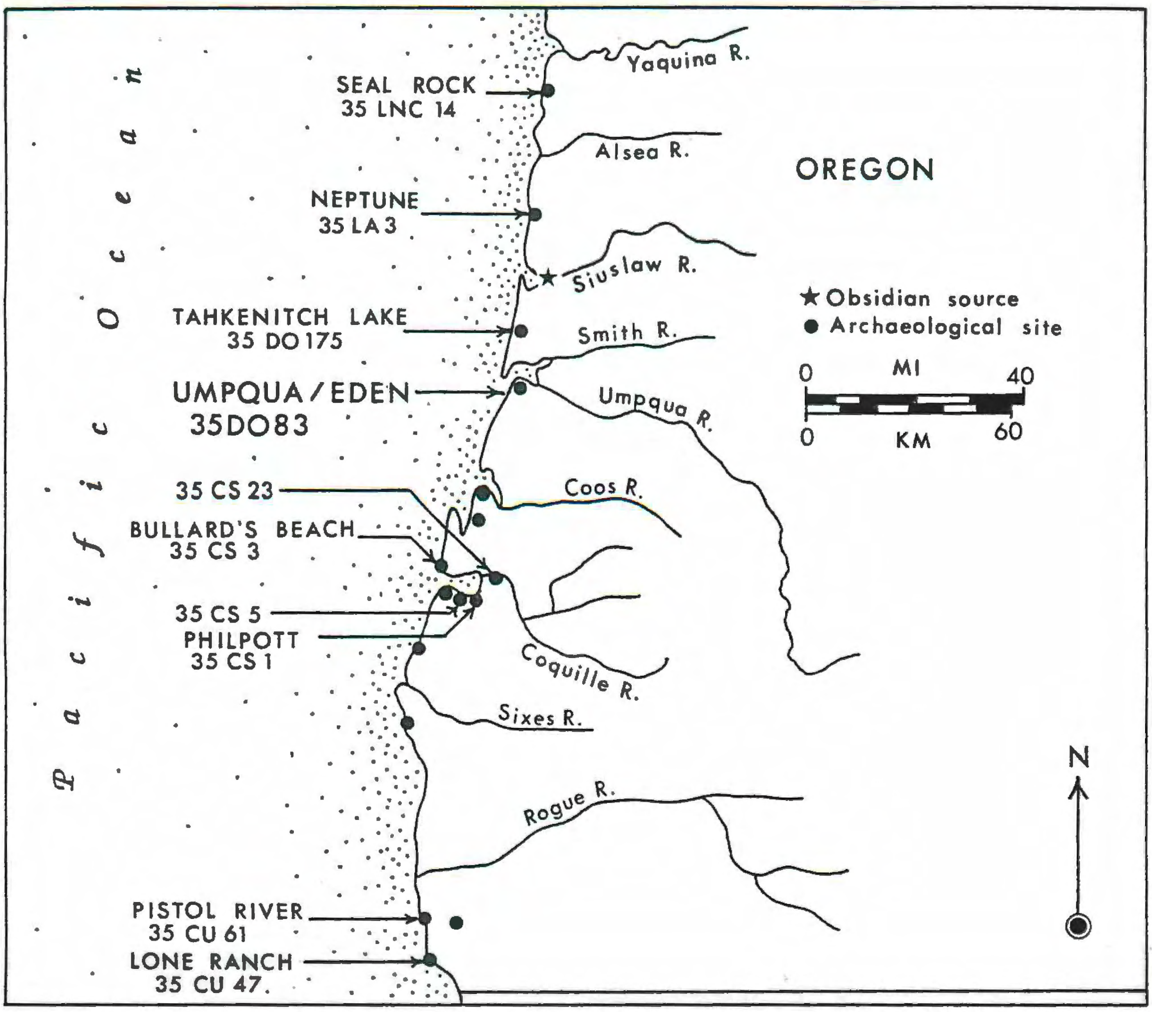


Figure 2: The location of the Umpqua/Eden Site (35DO83) on the Southern Oregon Coast.

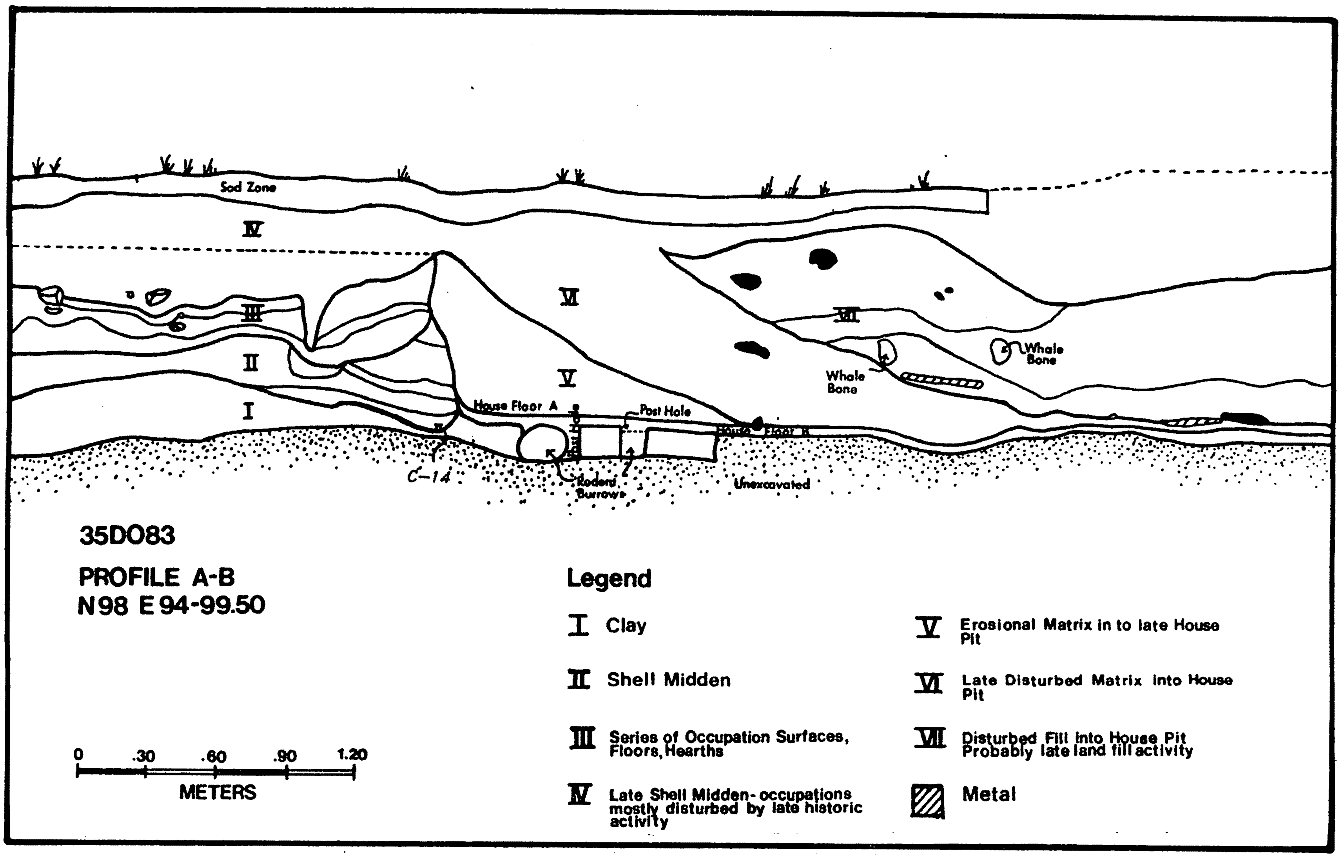


Figure 3: Profile of the Umpqua/Eden Site along an east-west axis, looking north (from Ross and Snyder, 1986).

Subsequently, the site was extensively excavated during the summer field seasons of 1978, 1979, 1980 by Oregon State University archaeologists. Though a thorough analysis of the excavated materials has not yet been completed, preliminary descriptions of the site can be found in Hogg (1979), Lyman (1985), and Ross and Snyder (1986). The most complete description of the artifactual materials can be found in Hogg (1979:126-161). The following brief description of the site is largely drawn from these sources.

The cultural deposits at the Umpqua/Eden Site consist of four distinctive strata (see figure 3). Stratum I, the oldest, is a clay zone underlying a thin midden deposit (Stratum II) averaging less than 15 cm in depth. Charcoal from the base of Stratum II (see figure 3) yielded a radiocarbon age of 2960 +- 45 years B.P. (DIC-1174), one of the oldest known radiocarbon dates from any Oregon Coastal site. Stratum III, averaging 40 cm in depth, was associated with charcoal, fire-cracked rock, shallow depressions, and living surfaces, all of which apparently accumulated over a long period of nearly continual use. Stratum IV, which included shell midden deposits, was found to be extensively disturbed, perhaps from aboriginal house building activity. Other disturbed strata identified at the site (Strata V, VI, and VII) are probably associated with historical European use of the area. Cultural activity at the site appears to have spanned at least 3,000 years, terminating sometime in the historical period.

Artifacts and faunal remains from the Umpqua/Eden Site indicate, not surprisingly, an orientation toward the exploitation of marine and river resources. Unique among Northwest sites was the presence of sun-baked clay artifacts. The lithic items recovered included a large collection of projectile points (by far the best-represented tool category found at the site) and an unusually high proportion of obsidian debitage. About one-third of the debitage found was composed of obsidian glass, an unexpectedly high percentage in light of the very small quantities (or complete absence) of this material found at other coastal sites in Oregon. Interestingly, the anomalously high percentage of obsidian debitage had not been mentioned in reports by previous researchers, though it has not completely escaped their notice (Ann Bennett, personal communication, 1987).

METHODS AND PROCEDURES

The research techniques and procedures involved in this investigation fell into three different distinct categories:

1. Instrumental neutron activation analysis (INAA) methods used in the geochemical characterization of the obsidian.
2. Petrographic methods for the petrographic analysis of the obsidian artifacts.
3. Lithic analysis methods for the interpretation of the lithic artifactual collection from the Umpqua/ Eden Site.

The first two methods were concerned with the characterization of the glass and the identification (as the evidence suggests) of a local source. The latter technique was used to monitor how the presence (or absence, if the characterization results proved negative) of locally available obsidian would be reflected in the flaked stone lithic artifacts from the site. The sequence of how these techniques were employed in the overall research strategy is illustrated in figure 4.

Instrumental Neutron Activation Analysis

Ten obsidian artifacts from six stratigraphic levels were selected from the Umpqua/Eden lithic collection for neutron activation analysis. Artifact types included several glassy and slighly porphyritic pieces of debitage with cortex, three biface fragments (no cortex), and a single unmodified obsidian pebble (see Appendix 3 for a more detailed description of each artifact). Emphasis was placed on the characterization of obsidian debitage, the presence of cortex acting as an indicator of probable local river gravel procurement. Obsidian tools, largely fragments of artifacts larger than the available local raw materials, were also characterized so as to give some indication of glass from non-local sources that was being used for the production of tools. Work by Hughes (1983) and Hughes and Bettinger (1984) has shown that significant differences exist in the sources of obsidian used in the manufacture different tool classes and it was hypothesized that this phenomenon might also be observed at the Umpqua/Eden Site.

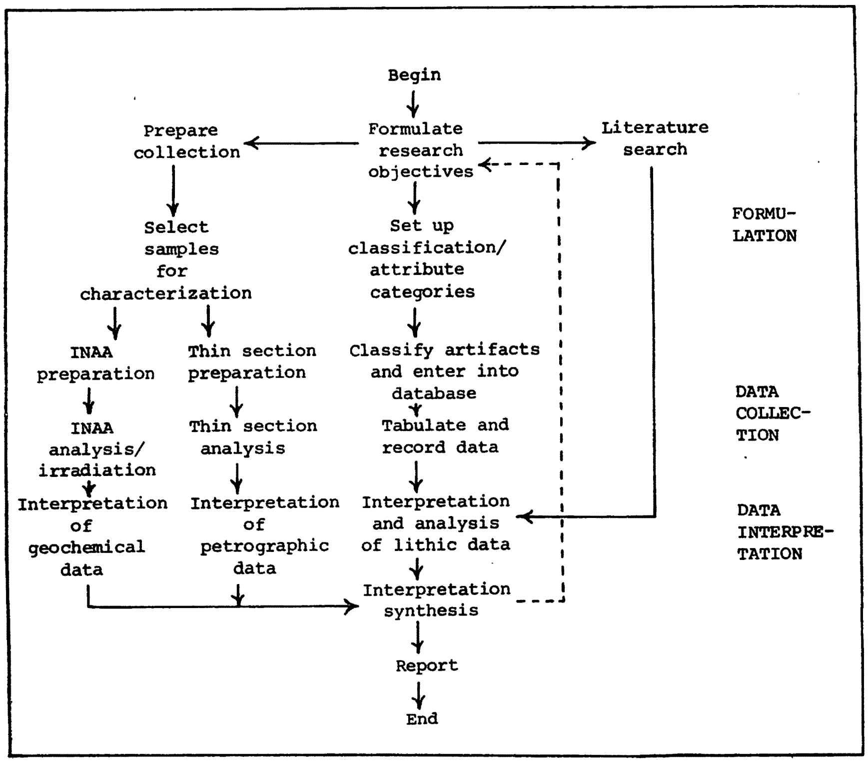


Figure 4: Flowchart of research project event sequence.

Trace element abundances of obsidian have proven to be a reliable and accurate attribute for characterizing obsidian artifacts and for determining their geologic sources. Different obsidian sources almost always prove to be remarkably homogeneous in composition while displaying enough intersource heterogeneity to be distinguishable from one other (see Skinner, 1983, for a review of the subject). Neutron activation analysis (INAA)is only one of the numerous instrumental analytical procedures that has been used to characterize artifactual and geologic sources of obsidian. I refer the reader to Goles (1978) for a detailed account of INAA methods and applications.

Each obsidian artifact was initially prepared for INNA determination of trace element abundances by removing approximately .5 gm of obsidian from each sample with a 4 in diameter rock saw. Cutting surfaces were sanded with carborundum sandpaper to remove any metal sawblade residues and then thoroughly washed. The glass fragments were then crushed with a mullite mortar and pestle, reduced to a coarse powder, and packaged in sterile plastic sample containers. At this point, the samples were delivered to the Oregon State University Radiation Center (Corvallis, Oregon) for irradiation by the reactor and for subsequent counting and data reduction. Sample counting is currently underway with final results expected about June, 1987.

Trace element abundances from the Umpqua/Eden artifacts will then be compared with those of most of the geologic sources currently known from Western Oregon (figure 1). Only the Devil Point (and, of course, the Umpqua River gravel) source has not yet been included in the geochemical comparison database.

Petrographic Analysis

Though trace element characterization methods have proven to be effective, they are both expensive and time-consuming, requiring access to sophisticated and expensive analytical equipment. With this in mind, an alternative characterization method, the petrographic characterization of the obsidian, was also explored as part of this project. The presence and/or relative abundances of microscopic structures in volcanic glass known as microlites and crystallites have shown some potential as characterization attributes (Skinner, 1983 and 1986). Though it is unlikely that this method would be useful for distinguishing a single source from a crowded source universe, it might prove useful when the number of potential obsidian sources is rather small as may well be the case along the Oregon Coast. When the source of petrographically-characterized artifacts can be independently ascertained by more reliable methods such as trace element analysis, it can be determined whether the petrographic technique can be regionally useful. Methods for the petrographic characterization of obsidian are described by Skinner (1986).

A small fragment from each of the ten samples submitted for INAA analysis was prepared as a standard petrographic thin section. Photomicrographs were then made of representative areas from each slide so as to determine the range of variation displayed in microlite and crystallite types (see figure 7). Because INAA results were not yet available, no attempt was made to analyze the slides in detail at this stage of research. The samples were simply sorted into petrographically distinguihable groups for later comparison with trace element characterization results.

Lithic Analysis

Description of Collection

The entire archaeological collection from the Umpqua/Eden Site is currently curated at the Department of Anthropology, Oregon State University. Included in this are the materials from Stenhouse's 1974 excavations as well as from the main 1978-1980 excavations. Many of the lithic materials, particularly the flaked stone tools, had previously been culled from the main body of the collection. The provenience of these artifacts was generally well recorded by square, level, and occasionally, elevation. A sizeable fraction of the lithic debitage (along with occasional tools), however, had not yet been separated from the original level bags. These latter artifacts were typically labeled by square, elevation, and rarely, by level.

Artifacts Selected for Analysis

Only two raw material classes were selected for analysis, cryptocrystalline silicates (CCS) and obsidian. These two classes of material share many similar physical qualities (similar hardness and texture) and were, for this analysis, considered to be functionally and technologically equivalent. Lithic artifacts of coarser-grained or relatively soft lithic materials such as basalt, sandstone, or serpentine were not considered in the analysis. This also made it easy to deal with the problem of sandstone and basalt fragments which may have found their way to the site through natural, and not human, means. In general, artifacts composed of these coarse-grained materials were larger, less modified, and apparently used for different purposes than artifacts made of CCS and obsidian. It should be noted, however, that this assumption did not prove to be entirely correct. During the analysis, a number of very fine-grained basalt projectile points were encountered. These were often identical in form to the CCS and obsidian points.

The materials from the Stenhouse excavations were also not included in the analysis. These artifacts were somewhat cryptically labeled and had been recovered using only vaguely described excavation methods. To reduce the bias introduced by sampling differences between the 1974 and 1978-1980 collections, it was thought best to not include the earlier materials.

Attributes for Analysis

What types of attributes or classification categories would best provide data that could be useful in answering the initial research questions? What attributes would reflect local or non-local procurement of raw materials? What attributes would indicate how the raw materials were used at this site? What categories could show changes though time? In the absence of geochemical data, what attributes would provide an indicator of the original primary geologic sources? To these ends, nine attributes were considered:

1. Artifact category: Tool, debitage, or raw material (figure 5). This category would reflect how the raw materials were being used by the inhabitants of the site.

2. Material: Obsidian or CCS. Any material that was considered technologically equivalent fell into one of these two classes. Obsidian was easily identified by its glassy texture. Any other lithic material in which individual grains could not be distinguished with the naked eye was relegated to the CCS category. This included a wide variety of siliceous materials commonly known as agate, chalcedony, jasper, chert, and quartzite.

3. Level: This temporally-related category was included to hopefully add some diachronic dimensions to the analysis through the control of the vertical provenance of the artifacts. Because of the difficulty of deciphering the equivalency of levels in different horizontal units (squares), it was decided not to use this data in the initial analysis.

4. Elevation: As with level, this was recorded as an indicator of vertical provenience (but only if the level was not known). Like the level provenience, this data was also not used in this initial analysis.

5. Type, if tool: A simple classification scheme was employed, with all tools being categorized as either unifacial, bifacial, cores, or utilized flakes. In addition, bifacial tools were further classified, when indicated, as blades or projectile points. These last two categories were added not to denote functional types but to provide further descriptive information through conventional descriptive categories. Fragmental probable projectile points and blades were conservatively classified as bifacial tools. Each of these tool types was clearly defined so that there would be little ambiguity during the analysis (see Appendix 1 for definitions). Tools were generally defined as any artifact which exhibited either purposeful shaping through the removal of flakes or the presence of use-wear evidence (such as edge crushing, nibbling,

stepping, snap fractures, or striations)(Greiser and Sheets, 1979). This category provided a picture of how the raw materials were actually being utilized at the site. The artifact classification scheme employed is illustrated in figure 5.

6. Color of obsidian glass: Black, mahogany (reddish-brown), greenish-black, brownish-black. These different colors of obsidian were all encountered during the analysis. The color of obsidian, when considered with other attributes, can be used to provide a gross indicator of geologic source. In the absence of a more reliable characterization method, it was thought that color might provide at least a clue as to the sources of obsidian that were being utilized.

7. Texture: Glassy or slightly porphyritic. The texture of the glass, too, was used as a possible indicator of the geologic source of the glass. Artifacts were classified either as glassy, if the surface of the obsidian showed no visible defects, or slightly porphyritic, if the surface showed flaws that were visible to the naked eye. These flaws, actually very small phenocrysts in the glass, are sometimes characteristic of specific sources. This method of characterizing a source needs to be used cautiously, however, as individual sources can sometimes exhibit considerable range in textural variation. In retrospect, a third textural category could have also been added - dull glassy. Gray obsidian was occasionally encountered and while classified as glassy, a more descriptively accurate term would have been dull glassy.

8. Cortex? Was cortex present or absent on the artifact? The presence of cortex on obsidian debitage was used as a indicator of probable local river gravel origin. Nodules of raw material are generally reduced or prepared as cores at or near their source to remove unusable portions i.e. cortex. The result of these activities are the production of cortex flakes (also known as primary or secondary flakes) near the sources of raw materials. The presence of cortex-free flakes (also known as tertiary or interior flakes) are associated with tool manufacturing or retouch activities.

9. Maximum dimension? The maximum dimension of the artifact (measured in millimeters) was taken as a possible sign of local or non-local procurement. Even though small nodules of obsidian might have been present in the Umpqua River gravels, it is likely that they were limited in size. The maximum dimension of obsidian flakes with cortex, then, would indicate what this size limit might be. When artifacts exceeded a certain locally available size, it could be assumed that they were probably non-local in origin. The maximum dimension would serve as an indicator of exchange or non-local procurement in this case.

These attributes and classification categories could also be combined to yield additional information. For instance, color and texture could be combined to provide a more sensitive geologic source indicator than either one alone. A cortex index (cortex flakes/total debitage) might be used as an indicator of the import of raw materials. The debitage index (debitage/total tools and debitage) could also be used as an index of general production (Ericson, 1984).

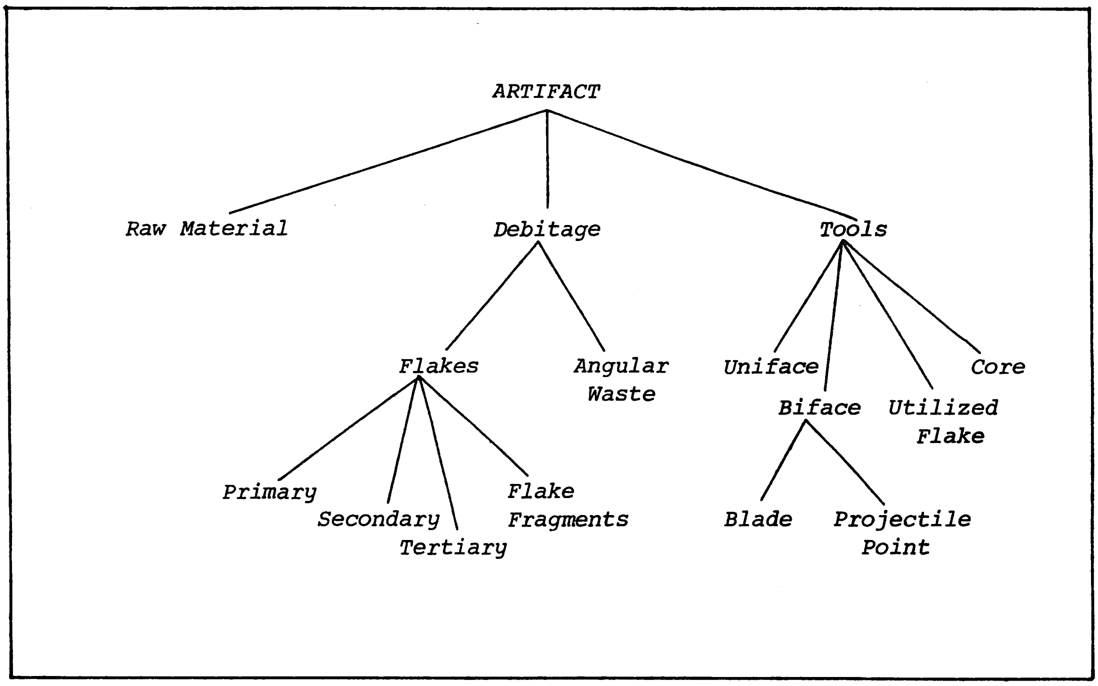


Figure 5: Artifact classification categories used to classify artifacts from the Umpqua/Eden Site.

```
***************************************************** 35DO83 *********
Category          < D
Material          < Obs
Level             < 2
Elevation         < -
Type, if tool     < -
--------------------------------------- Obsidian Source Attributes ---
Color(s)          < B
Texture           < SP
Cortex? (Y/N)     < Y
Max. Dimnsion (mm)< 15
----------------------------------------------------------------------
Comments          < Probable local river gravel source.

**********************************************************************
```

Figure 6: Example of the database record layout that was used in the recording of artifact attributes for later interpretation.

Data Management

Lithic attribute and classification data were recorded on an electronic database manager (Nutshell) with a Leading Edge (IBM PC-compatible) microcomputer. A separate database record was entered for each analyzed item (see figure 6 for an example of a database record). The use of a computerized database manager made for rapid data entry and the more convenient construction of the data tables of Appendix 2.

RESULTS

Instrumental Neutron Activation Analysis

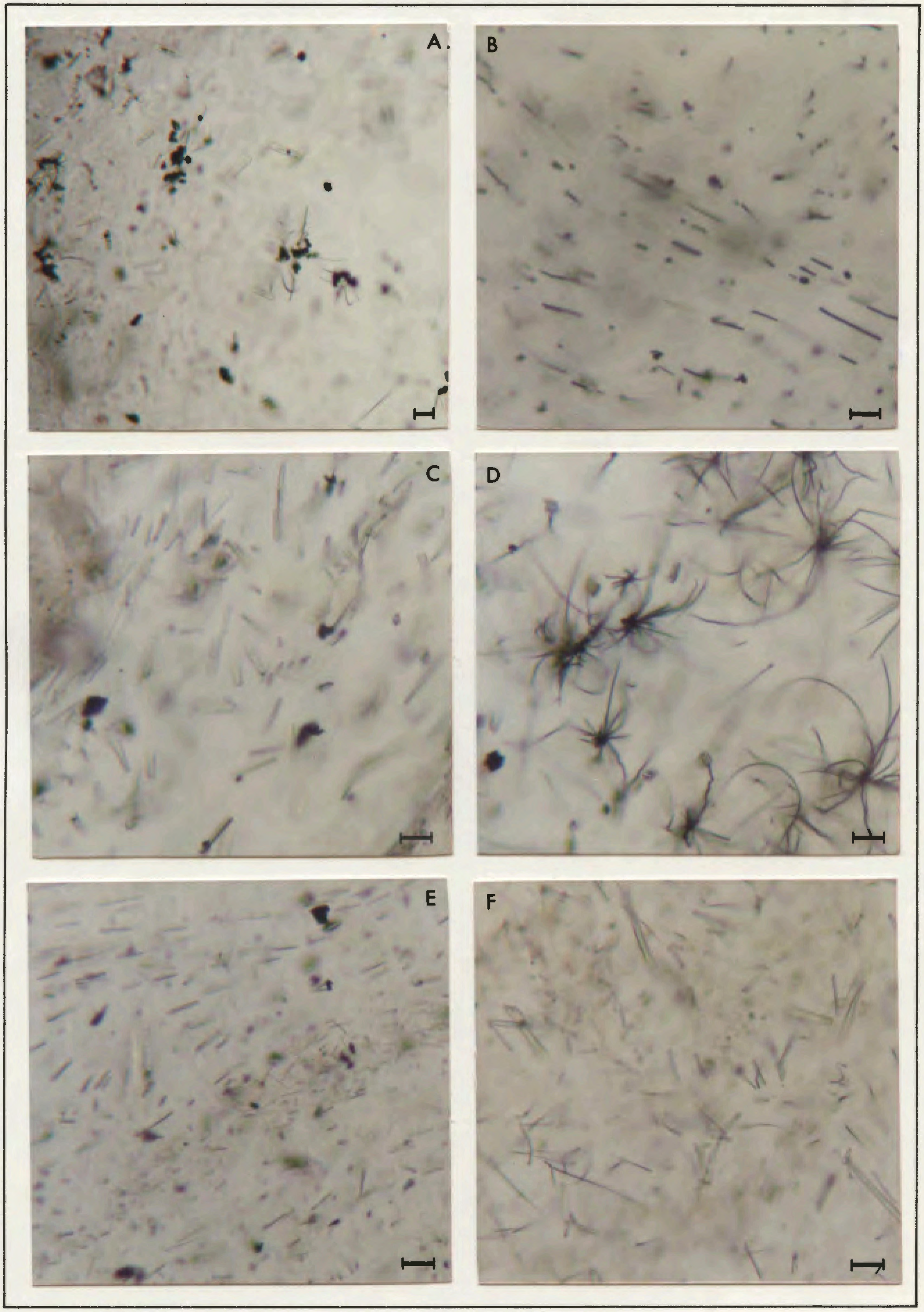
Neutron activation analysis of the ten obsidian artifacts is not yet complete and will be reported at a later date.

Petrographic Analysis

The detailed petrographic analysis of the obsidian artifacts will also be reported at a later date after trace element characterization data has been analyzed. Based on the preliminary thin section examination of the ten samples, however, a few observations can be advanced.

The samples were placed into six initial different groups on the basis of their microscopic petrographic characteristics (figure 7). Flakes of black glassy obsidian with cortex are pictured in figures 7A (UME-1) and 7F (UME-7) while flakes of black, slightly porphyritic obsidian with cortex are shown in figures 7B (UME-2), 7C (UME-3), and 7D (UME-4). There is no apparent relationship between the microscopic petrographic structures in the glass and the megascopic characteristics of the obsidian (the glass texture and presence of stream-rolled cortex). When these samples were compared to thin sections described by Skinner (1986), there appeared to be little difference between the obsidian from the Umpqua/Eden Site and the glass from some other known geologic sources in Western Oregon. While the results of the limited petrographic exam are inconclusive, they do suggest that the petrographic characterization of obsidian from the Umpqua/Eden Site may be of little value in determining the geologic sources of artifacts at this location. The detailed interpretation of the petrographic data, however, will have to wait until the INAA characterization information is complete.

Figure 7 (overleaf): Photomicrographs of artifactual obsidian from the Umpqua/Eden Site. Flakes with cortex were thought to have originated from the gravels of the Umpqua River. The scale bar in the lower right corner of the photomicrographs is 10 microns in length. Figure 7A: UME-1, a black glassy cortex flake, x 80. Figure 7B: UME-2, a slightly porphyritic cortex flake, x130. Figure 7C: UME-3, a slightly porphyritic cortex flake, x 130. Figure 7D: UME-4, a slightly porphyritic cortex flake, x130. Figure 7E: UME-5, a biface fragment, x 130. Figure 7F: UME-7, a glassy cortex flake, x130.


A.
B
C
D
E
F

Lithic Analysis

The chipped stone artifactual collection analyzed in this study consisted of 1009 individual pieces. Raw data for the collection, sorted by material type, are listed in Appendix 2.

Types of Artifacts Represented

The largest part of the total collection (80.6% by count) was made up of debitage. The remaining 19.4% consisted of tools. Projectile points constituted the largest percentage (59.7%) of the tool category, followed by general bifacial tools (25.0%), cores and blades (5.1% each), utilized flakes (4.1%), and unifacial tools (1.0%).

Raw Materials Represented

Cryptocrystalline artifacts comprised the largest part of the total assemblage with 67.2% of the tools and debitage (figure 8). Tools were represented by 24.6% of the cryptocrystalline materials with projectile points as the most common tool type (see figure 8 for percentages).

The total collection was also composed of 32.8% obsidian artifacts. The debitage category dominated the obsidian artifacts at 91.0% with tools making up the remaining 9.0% (see figure 8 for tool percentages). That almost one-third of the total collection (as well 37.1% of the total debitage) was composed of obsidian artifacts is without precedent for any reported archaeological site along the Oregon Coast. The significance of this anomalous and unexpected figure will be discussed in more detail later in this report.

Color categories of Obsidian Artifacts Represented

In the absence of more rigorous obsidian characterization data, four different visual classes of obsidian were recognized at the Umpqua/Eden Site (see figures 9 and 10 for percentages):

1. Black glassy obsidian - This was the most commonly represented color in the collection, making up 56.6% of the obsidian artifacts. Approximately one-third of the debitage in this category exhibited stream-rolled cortex, suggesting that at least some of the obsidian was being obtained locally.

2. Black slightly porphyritic obsidian - This was the second most common obsidian component in the collection, comprising 33.5% of the obsidian artifacts analyzed. Only 2.5% of this category of obsidian was categorized as tools. Cortex was found on about half of the debitage of this color and texture group, again suggesting that a sizeable percentage may be local in origin.

3. Gray obsidian - This group of artifacts, exhibiting a dull glassy luster, made up 8.8% of the obsidian artifacts. A little less than a third of the gray obsidian debitage were cortex flakes, indicating the high probability of local glass procurement.

4. Other colors - Three other distinct colors of obsidian artifacts (mahogany and black, brownish-black, and greenish-black) were also noted in the collection, though only four artifacts comprised this group. Three of the artifact were tools; the fourth was an interior flake showing no cortex.

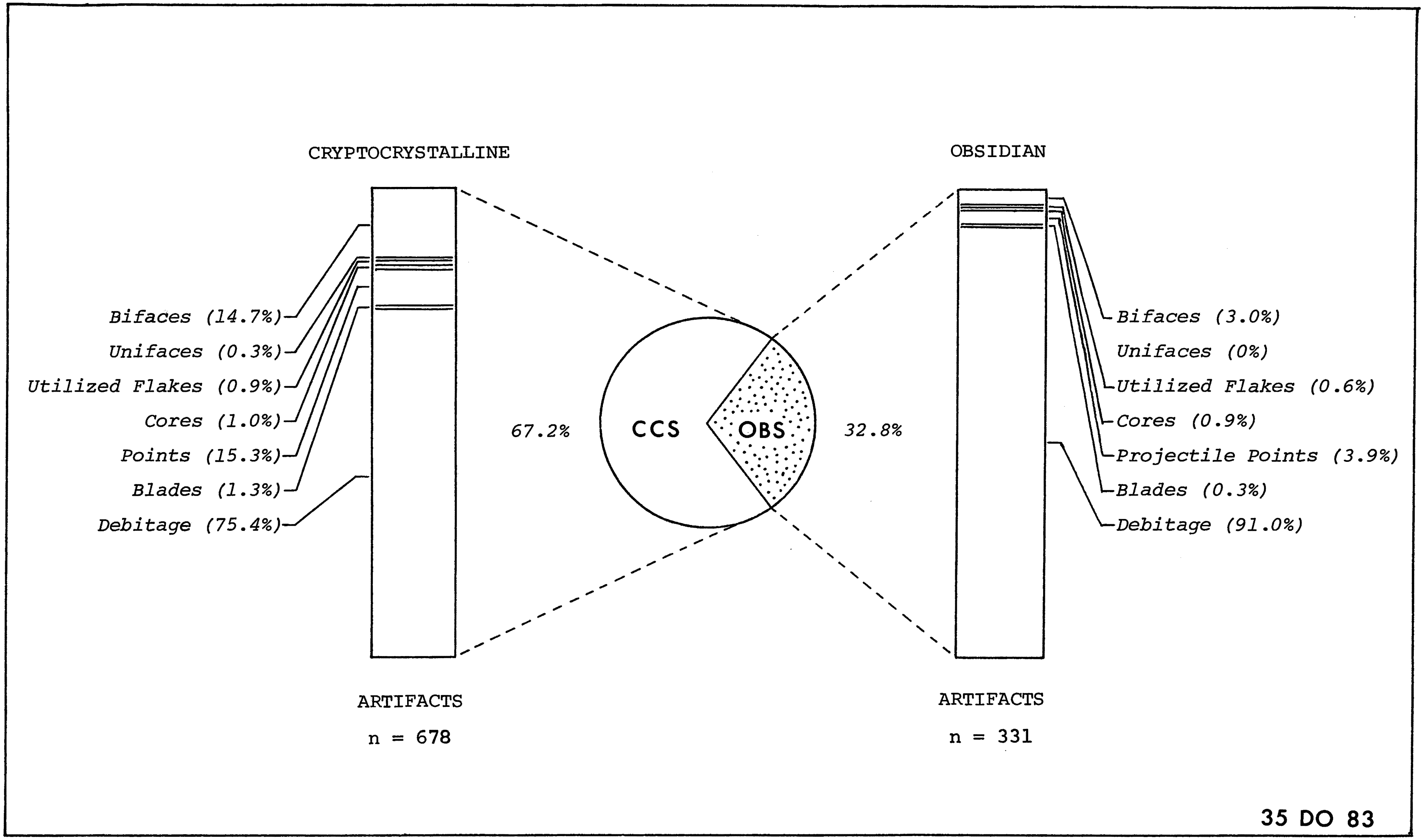


Figure 8: Frequency of cryptocrystalline and obsidian artifactual materials from 35DO83.

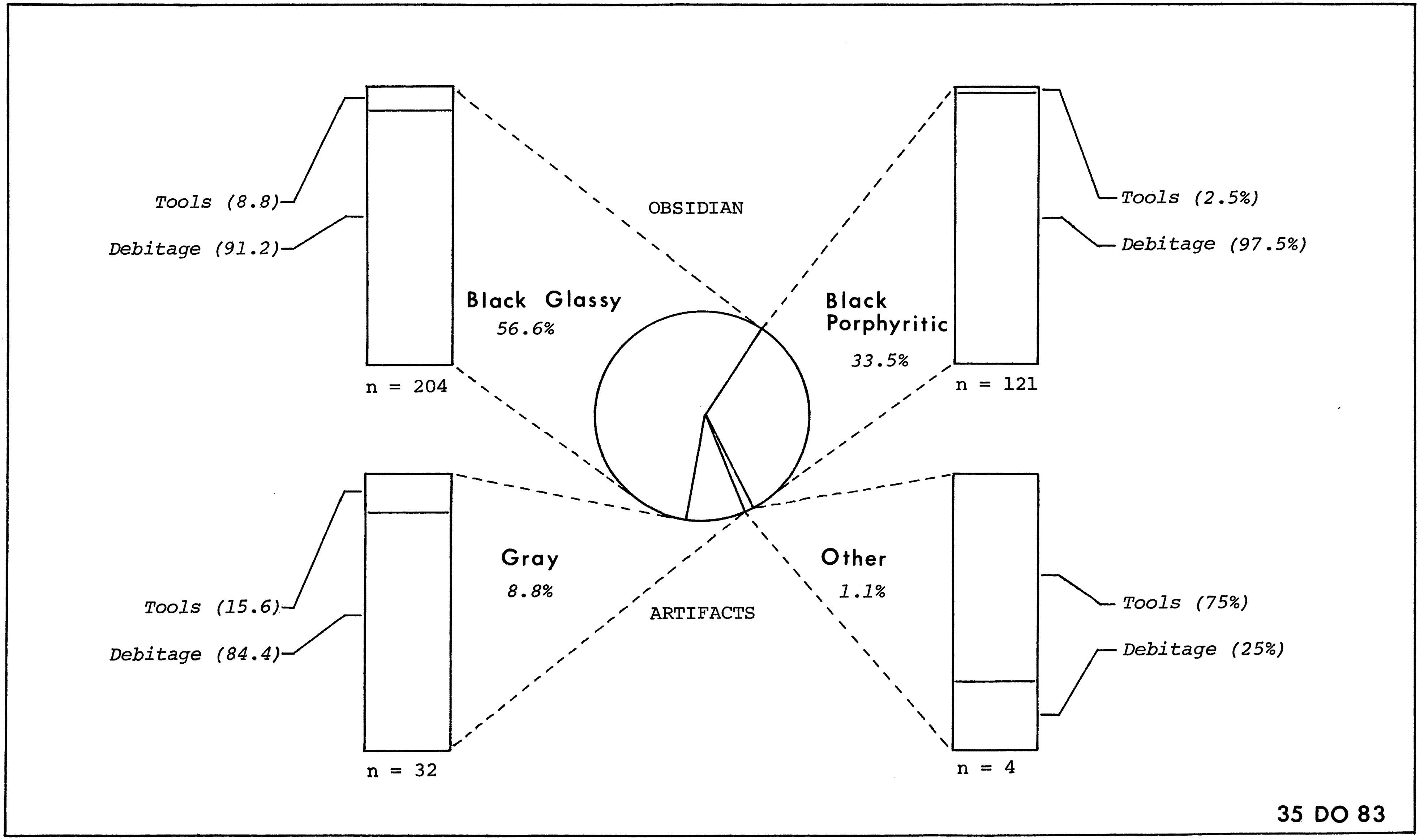
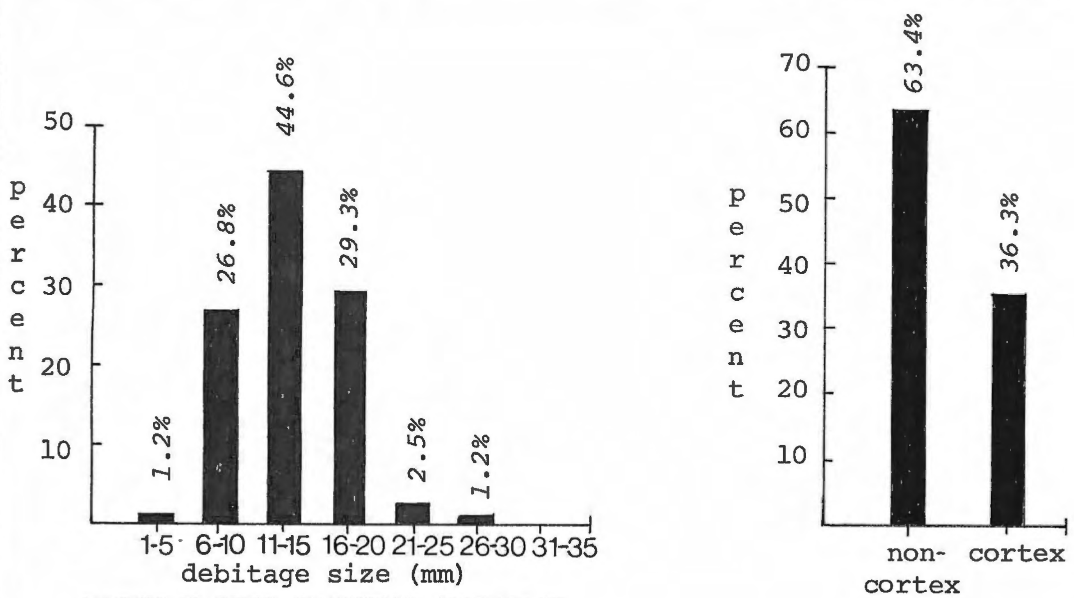
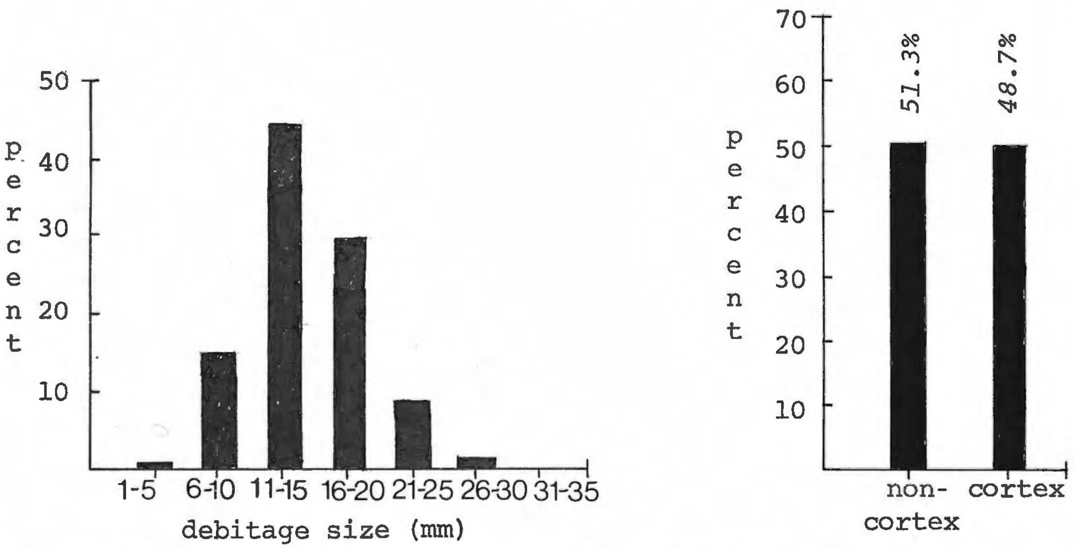


Figure 9: Frequency of obsidian artifacts sorted by color and texture.

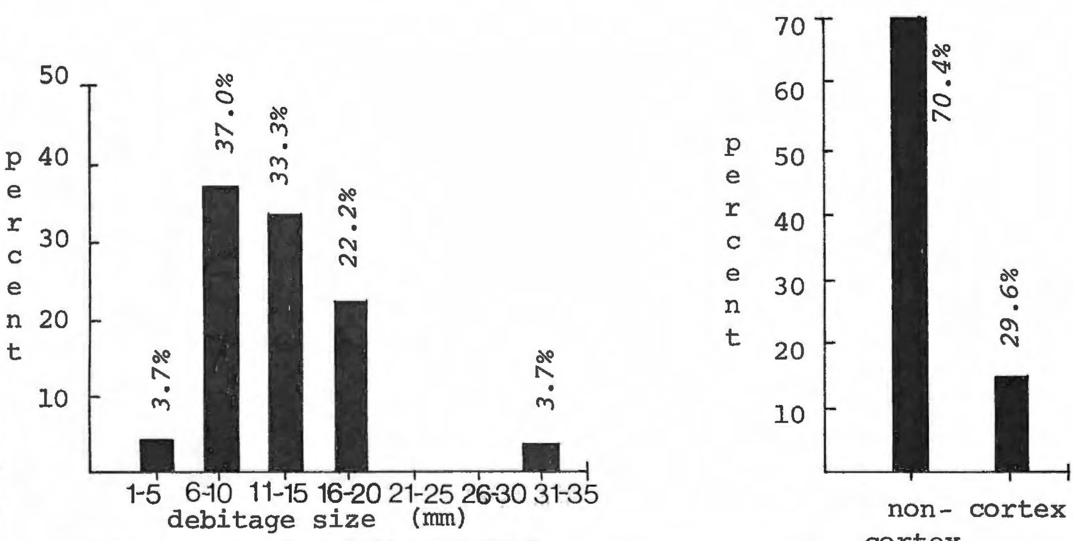
35 DO 83



BLACK GLASSY OBSIDIAN DEBITAGE



BLACK SLIGHTLY PORPHYRITIC OBSIDIAN DEBITAGE



GRAY GLASSY OBSIDIAN DEBITAGE

Figure 10 (previous page): Size and presence of cortex on obsidian debitage sorted by color.

Whether these four different visual categories of obsidian represent different primary sources of obsidian is impossible to say at this point in the investigation.

If the presence of cortex flakes does indicate probable local raw material procurement, it is likely that the first three color categories (black glassy, black prophyritic, and gray) were available in the gravels of the Umpqua River (or another nearby river). This is not to say that all black or gray artifacts originated locally, only that they may have. It seems probable, though, that artifacts made of glass other than black or gray did not originate locally - cortex flakes were only found of black and gray obsidian.

Size of Obsidian Debitage

The maximum dimension of each piece of obsidian debitage was measured and the size ranges plotted by glass color (figure 10). Though the size analysis of the debitage is not yet complete, examination of the histograms in figure 10 does suggest at least one important point.

The maximum size range of the debitage varies by color from 26-30 mm to 31-35 mm. By referring to table 7 in Appendix 2, it is apparent this same maximum range is composed of debitage with cortex . Assuming once again that cortex indicates local procurement, it is almost certain that any obsidian artifact with a maximum dimension greater than about 4 cm did not originate locally. The size of the artifact (coupled with an absence of cortex) can be considered as an important criterion of exotic obsidian origin.

Discussion

Obsidian in a Regional Context

Prior to this analysis of lithic materials from the Umpqua/Eden Site, obsidian has simply not been found (or, at least, reported) in significant archaeological quantities along the Oregon Coast. In the few sites where sufficient data exist, obsidian is typically found only in very small quantities or is not found at all. The obsidian debitage ratio (number of obsidian debitage items/total number of debitage items expressed as a percentage) has proven to be a reliable indicator of obsidian utilization and/or source proximity (Skinner, 1986). When the debitage ratio is visually plotted (figure 11) the anomalous nature of the Umpqua/Eden Site becomes graphically apparent. Farther inland in the Willamette Valley and Cascade Range, the obsidian debitage ratio appears to vary as a function of the distance of a site from the nearest obsidian source - the closer the source, the larger the ratio. Of all the coastal sites, only at Umpqua/ Eden does the debitage ratio rise above a few percent.

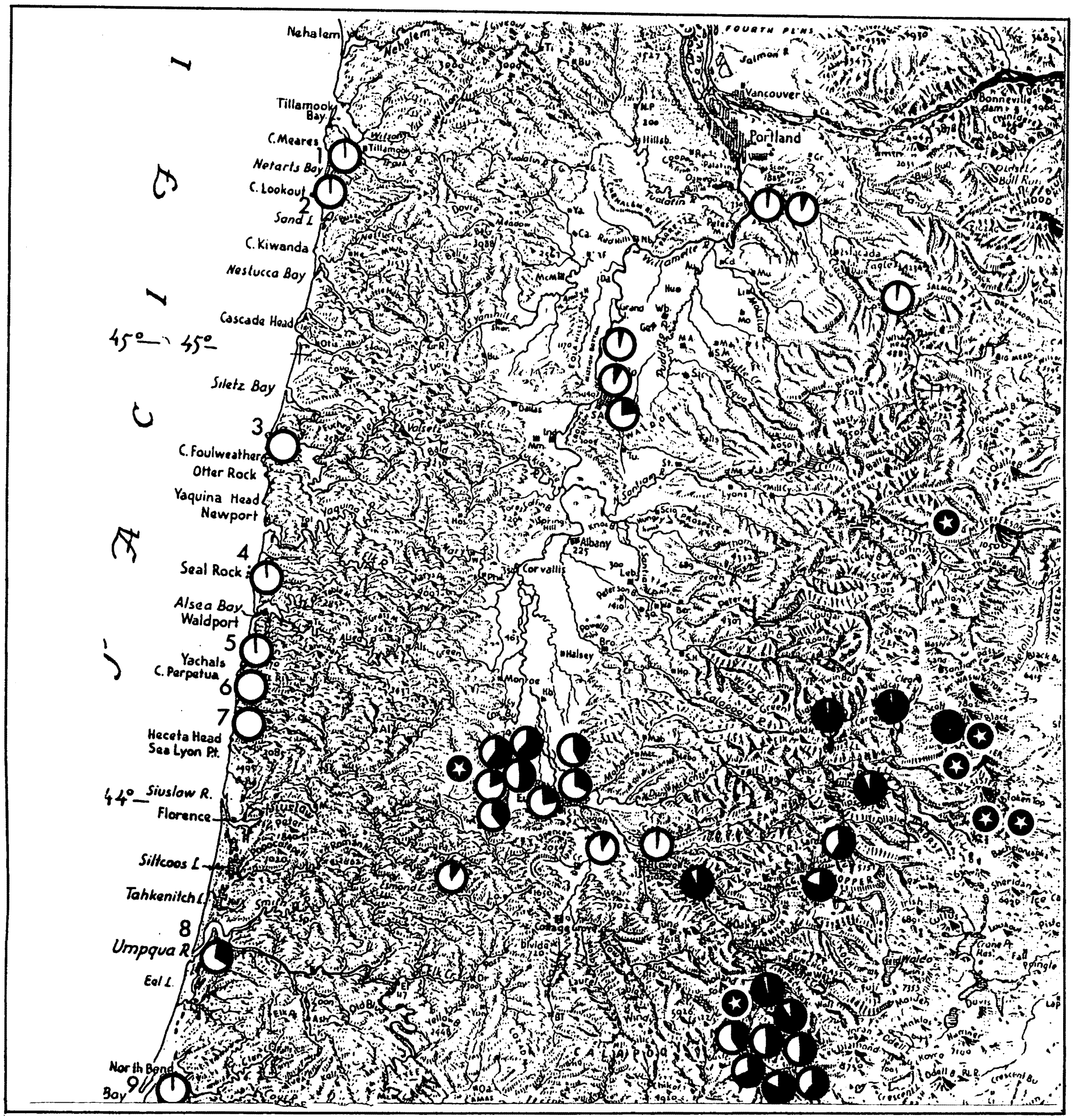


Figure 11: Obsidian debitage ratio for sites along the Central Oregon Coast. Empty circle = 0%; full circle = 100%. 1 - Netart Spit; 2 - Oceanside; 3 - Whale Cove; 4 - Seal Rock; 5 - Neptune; 6 - Good Fortune Point; 7 - Good Fortune Cove; 8 - Umpqua/Eden; 9 - Philpott. Data are from Newman (1959), Zontek (1978), Barner (1982), Minor et al. (1985), Draper (1980 and 1982), and Bennett (personal communication, 1987).

Local Procurement of Obsidian at the Umpqua/Eden Site

Two lines of evidence, a large obsidian debitage ratio and a large percentage of debitage with stream-rolled cortex, strongly suggest that the prehistoric inhabitants of the Umpqua/Eden Site were aware of the existence of a locally available source of obsidian. The completion of the INAA studies on the obsidian will either further support or invalidate this proposition. Confirmation that this proposed local source can be actually found in the gravels of the Umpqua River will have to wait for later field work.

The cortex that is found on the obsidian cortex debitage is of a rather distinctive type. Cortex that develops during fluvial transport of obsidian is quite different than cortex that develops through simple weathering. Though this cortex has not been previously described, it does appear to present an easily-recognized signature.

The presence of three varieties of obsidian debitage with cortex (black glassy, black and slightly porphyritic, and gray) also suggests that more than one source of obsidian was locally available. The three varieties are easily distinguishable from each other on a visual basis - whether these differences in appearance are a result of different primary origins will have to wait for geochemical confirmation. Regretably, the gray obsidian was not recognized until after INAA analysis had begun. No samples of this variety were prepared for analysis. The textural variation found in the black obsidian (black and slightly porphyritic) is occasionally found in a single obsidian source but could also as easily represent two distinct sources. The gray variety of glass (the color is the result of more complete crystallization) is most likely from a different source than the other two varieties. From this evidence it can be ascertained that there are almost certainly two distinct sources of glass, and perhaps three, to be found in the gravels of the Umpqua River.

Where does the obsidian from the Umpqua River gravels (if it does prove to exist) originate? Presently, the original primary source of the glass is not known though it is hypothesized to lie in Cascades in the Crater Lake Region. The headwaters of the Umpqua River originate in this region and several sources of obsidian have been reported from the Crater Lake area (Williams, 1942; Skinner, 1983). Primary sources of obsidian are suspected to lie in the Coast Range near Eugene, though, and the existence of another source in the Coast Range is not out of the question. A Crater Lake area origin would likely be reflected in anomalously large obsidian debitage ratios at inland sites bordering the Umpqua River. This data does not appear to exist, however. Published information from the few Umpqua River sites that have been excavated are presented either descriptively (Snyder, 1981) or in units that do not reflect obsidian utilization (Lyman et al., 1985).

Non-Local Procurement of Obsidian

Even though the bulk of obsidian at the Umpqua/Eden Site probably originated from a local source or source(s), what about artifacts which were almost certainly exotic in origin? The larger artifacts and oddly-colored artifacts are included in this category. Unusually large obsidian blades are also occasionally recovered from coastal sites - Chase (1873), for instance, described a 14-1/2 inch long blade from a midden site on the Southern Oregon Coast. Traditional archaeological thought would explain the presence of these pieces as resulting from trade with distant groups who did have access to the sources. Unfortunately, even this must be seen as yet another suspect archaeological truism. Procurement of raw materials is thought to occur in two basic ways, through direct access to the source and through trade or exhange networks. The recognition that relatively long distances may separate an artifact from its geologic source does not automatically indicate that exchange systems were in operation, however. Gould (1966:61), for example, describes the direct procurement of obsidian in the Bend, Oregon, area by Indians of the Northern California Coast. Obsidian was also considered an item of in addition to distance will be needed if coastal exchange systems are to be validated.

Virtually all of the easily identifiable exotic obsidian artifacts at the Umpqua/Eden Site were classified as tools. Hughes (1983:270) and Hughes and Bettinger (1984) have also noted that different classes of contemporaneous characterized obsidian artifacts have been differentially represented by obsidian sources. There seems to exist, at least in some cases, preferences for different obsidian raw materials for the manufacture of different types of tools. Further obsidian characterization investigations of coastal obsidians must keep this distinction in mind during the sampling of artifactual collections. The stratified sampling of collections, based on tool types, is recommended for future research.

If trade was a means through which some obsidian made its way to the Oregon Coast, where did the glass originate? Cressman (1953) has suggested that the movement of coastal groups was easier up and down the rivers than up and down the coast. Collins (1951) also illustrates trails that led from the Umpqua River mouth to the Southern Willamette Valley and the Klameth Lake Basin. If this is true, the sources of non-local obsidian probably lie largely in the Willamette Valley, the Klamath Basin area, and perhaps Northern California. Draper (1980:75) suggests cultural ties between the Southern Oregon Coast and Southern Oregon and Northern California. Again, characterization studies of coastal obsidian will be needed to provide hard evidence.

Local Utilization of Obsidian at the Umpqua/Eden Site

It seems almost certain, based on the large obsidian debitage ratio, that the Umqua/Eden inhabitants knew of a local obsidian source. How, then, did they use it and how is this use reflected in the lithic assemblage?

It is interesting to note that, even with the availability of a local obsidian source, the number of obsidian tools is small (n=29). Only 10% of the obsidian artifacts recovered were classified as tools, while almost 25% of the cryptocrystalline materials were used as tools. It appears as though the local glass was not particularly popular as a tool-making material. The black porhyritic glass that was apparently locally available was almost underrepresented in the tool categories (figure 9). The other two varieties of glass were also utilized in a distinctly smaller proprtion than were cryptocrystalline materials. Perhaps the small size of the local obsidian was an overriding factor in the selection of raw materials for lithic materials.

CONCLUSIONS

1. Based on the high relative frequency of obsidian debitage found at the Umpqua/Eden Site, it is likely that a local source of obsidian glass was available to the prehistoric inhabitants of the Umpqua/Eden Site.

2. Two, and perhaps three, locally available sources of obsidian were probably present. These were represented in the lithic collection by artifacts of black glassy, black porphyritic, and gray obsidian. Though a textural range of variation in obsidian is common at many sources and the two varieties of black obsidian could originate from the same primary source, the gray obsidian probably originated from a distinct source.

3. The presence of stream-rolled cortex on many of the pieces of debitage strongly suggests that the obsidian was found in river or stream gravels. Though obsidian pebbles are known from the Siuslaw River gravels not far to the north, the high percentage of obsidian at the Umpqua/Eden Site argues for an even closer source. This is thought have been in the gravels of the Umpqua River.

4. The primary source of the glass, if it is to be found in the Umpqua River gravels, is most likely in the Crater Lake area of the Oregon Cascades. The Umpqua drains from this area, one in which several sources of obsidian are known to exist.

5. If the artifactual obsidian does prove to be of local origin (determinable through later field work and geochemical studies), then the presence of an anomalously large percentage of obsidian debitage at an archaeological site can be taken as a strong indicator for the availability of a local source (even though one may not be known).

6. The presence of a local source of obsidian is likely to be well reflected by the obsidian debitage ratio.

7. Different primary sources of obsidian glass at the Umpqua/Eden Site appear to be indistinguishable on the basis of microscopic features, though the petrographic analysis of the glass is not yet complete.

8. The small number of total obsidian tools (relative to CCS) suggests that local sources, while known (as reflected by the large amounts of debitage), were not being extensively employed for the manufacture of tools. The black, slightly porphyritic obsidian was particularly uncommon in the tool category, probably because of the slightly lower quality of the glass in comparison to other available varieties. This also points to the value of using debitage ratios (over tool categories) to identify local obsidian sources.

9. The maximum dimension of an obsidian artifact may be used to infer an exotic origin, provided the maximum dimensions of locally available glass are known.

10. The larger size of many of the obsidian tools, as well as their color, strongly argues for an exotic origin for a number of the tools from the Umpqua/Eden Site. Whether this was the result of exchange systems or of long-distance direct procurement must remain open to speculation.

11. The likelihood that some of the tools were made of obsidian that was not found locally raises an important sampling issue for later coastal obsidian characterization research. Representative samples of obsidian from any single archaeological must be based on the stratified sampling of collections by artifact category. The use of only debitage or only projectile points, for instance, may lead to an erroneous and biased overall picture of obsidian use at a site.

12. The presence of obsidian artifactual material from Oregon coastal sites, as should now be clear, does not automatically signal the existence of contact and exchange or long-distance direct access systems. Though these may well have been in existence, evidence of their presence will have to be inferred only after locally available sources of obsidian have been identified and eliminated for consideration.

Obsidian studies of archaeological sites clearly have something to offer in the interpretation and reconstruction of Oregon coastal prehistory. Particularly valuable in the study of lithic procurement and utilization systems is the careful recovery and recording of debitage, a sorely neglected area of study in most coastal excavations and reports. Also indicated are further geoarchaeological investigations of sources of obsidian that might have been locally available.

There is also another major problem standing in the way of a clearer understanding of coastal prehistory - as Lyman and Ross (1986:16) have noted: "Another difficulty faced by those who wish to synthesize the available data is the fact that much of it is unpublished and/or in a form not easily accessed." Archaeological work along the Oregon Coast has been far from extensive with a total of only 42 sites having been tested or excavated. Detailed reports describing excavations are rare. Research addressing specific research objectives is rarer still (Lyman and Ross, 1986). There is a need for archaeological studies to make their way into print and for future and current research to focus on specific questions of adaptation, subsistence, cultural contacts and affiliations, chronology, and origins. Works in progress, primarily by Oregon State University archaeologists and graduate students, will hopefully help fill the noticeable information void that exists in the archaeological literature today.

REFERENCES CITED

Barner, Debra C. 1982. Shell and Archaeology: An Analysis of Shellfish Procurement and Utilization on the Central Oregon Coast, unpubl. Master's Thesis, Interdisciplinary Studies, Oregon State Univ.: Corvallis, OR, 122p.

Beckham, Stephen D. 1977. The Indians of Western Oregon, Arago Books: Coos Bay, OR, 263p.

Chase, A.W. 1873. "Indian Mounds and Relics on the Coast of Oregon", American J. Science, Ser.3, 6(106), No.31, Art. VI:26-32.

Cheatham, Richard D. 1984. The Fern Ridge Archaeological Project, Lane County, Oregon, Dept. of Anthropology, Univ. of Oregon: Eugene, OR, 219p.

Collins, Lloyd R. 1951. The Cultural Position of the Kalapuya in the Pacific Northwest, unpubl. Master's Thesis, Univ. of Oregon: Eugene, OR, 219p.

Cressman, Luther S. 1952. "Oregon Coast Prehistory", American Philosophical Society Yearbook, p.156-160.

-----. 1953. "Oregon Coast Prehistory: Problems and Progress", Oregon Historical Quarterly, 54:291-300.

Dorsey, J. Owen. 1890. "The Gentile System of the Siletz Tribes", J. American Folklore, 3:227-237.

Draper, John A. 1980. An Analysis of Lithic Tools and Debitage from 35 CS 1: A Prehistoric Site on the Southern Oregon Coast, unpubl. Master's Thesis, Interdisciplinary Studies, Oregon State Univ.: Corvallis, OR, 128p.

-----. 1982. "An Analysis of Lithic Tools and Debitage from 35CS1: A Prehistoric Site on the Southern Oregon Coast", Tebiwa, 19:47-78.

Ericson, Jonathon E. 1984. "Toward the Analysis of Lithic Production Systems", in Prehistoric Quarries and Lithic Production, ed. by J.E. Ericson and B.A. Purdy, Cambridge Univ. Press: New York, NY, p.1-9.

Goles, Gordon G. 1978. "Instrumental Methods of Neutron Activation Analysis", in Physical Methods of Determinative Mineralogy, ed. by J. Zussman, Academic Press: London, England, p.343-369.

Gould, Richard A. 1966. Archaeology of the Point St. George Site, and Tolowa Prehistory, Univ. of California Press: Berkeley, CA, 141p.

Greiser, Sally T. and Payson D. Sheets. 1977. "Raw Materials as a Functional Variable in Use-Wear Studies", in Lithic Use-Wear Analysis, ed. by B. Hayden, Academic Press: New York, NY, p.289-296.

Hogg, Thomas C., ed. 1979. Umpqua River Basin Cultural History, Phase I Research, Report to the Douglas County Commissioners, Roseburg, Oregon, by the Dept. of Anthropology, Oregon State Univ.: Corvallis, OR, 164p.

Hughes, Richard E. 1983. Exploring Diachronic Variability in Obsidian Procurement Patterns in Northeast California and Southcentral Oregon: Geochemical Characterization of Obsidian Sources and Projectile Points by Energy Dispersive X-Ray Fluorescence, unpubl. Ph.D. Dissertation, Univ. of California: Davis, CA.

-----. 1986a. "Appendix 4: X-Ray Fluorescence Results from 35LA529 and 35LA599", in The Colt and Saddle Sites: Excavations on Dead Horse Creek, by P.W. Baxter, Dept. of Anthropology, Univ. of Oregon: Eugene, OR, p.137-144.

-----. 1986b. Unpublished letter dated November 25, 1986, to James Heid, Forest Archaeologist, Willamette National Forest, Eugene, Oregon.

-----. 1986c. Unpublished letter dated September 24, 1986, to Elena Nilsson, archaeologist.

Hughes, Richard E. and Robert L. Bettinger. 1984. "Obsidian and Prehistoric Sociocultural Systems in California", in Exploring the Limits: Frontiers and Boundaries in Prehistory, ed. by S.P. DeAtley and F.J. Findlow, BAR International Series 223: Oxford, UK, p.153-172.

Lyman, R. Lee. 1985. "Identification and Analysis of the Umpqua/Eden (35DO83) Mammalian Fauna: Zooarchaeological Studies on the Central Oregon Coast", in Oregon State University Sea Grant College Proposal for 1985-1987, ORESU-P-85-002: Corvallis, OR, p.272-284.

Lyman, R. Lee; Michael A. Gallagher; Stephan E. Matz, and Alexy Simmons. 1985. Archaeological and Geoarchaeological Investigations at the Sylmon Valley School Site (35DO275), Southwestern Oregon, Report to the Roseburg Sanitary Authority, Roseburg, Oregon, by the Dept. of Anthropology, Oregon State Univ.: Corvallis, OR.

Lyman, R. Lee and Richard E. Ross. 1986. Oregon Coast Archaeology: A Critical History and a Model, unpubl. manuscript, 81p.

Minor, Rick; Kathryn A. Toepel, and Ruth L. Greenspan. 1985. Archaeological Excavations in the Cape Perpetua Scenic Area, Central Oregon Coast, Heritage Research Associates Report No.40: Eugene, OR, 112p.

Newman, Thomas M. 1959. Tillamook Prehistory and Its Relationship to the Northwest Coast Culture Area, unpubl. Ph.D. Dissertation, Univ. of Oregon: Eugene, OR.

Pullen, Reginald J. 1982. The Identification of Early Prehistoric Settlement Patterns Along the Coast of Southwestern Oregon: A Survey Based Upon Amateur Artifact Collections, unpubl. Master's Thesis, Interdisciplinary Studies, Oregon State Univ.: Corvallis, OR.

Ross, Richard E. and Sandra L. Snyder. 1986. "The Umpqua/Eden Site (35DO83): Exploitation of Marine Resources on the Central Oregon Coast", in Contributions to the Archaeology of Oregon, ed. by K.M. Ames, Association of Oregon Archaeologists Occasional Papers No.3: Salem, OR, p.80-101.

Sappington, Robert L. 1984a. "Appendix D: X-Ray Fluorescence Trace Element Analysis of Obsidian Items from Sites Near Fern Ridge Reservoir, West Central Oregon", in The Fern Ridge Lake Archaeological Project, Lane County, Oregon, by R. Cheatham, Dept. of Anthropolpogy, Univ. of Oregon: Eugene, OR, p.A22-A27.

-----. 1984b. "Appendix: X-Ray Fluorescence Trace Element Analysis of Obsidian Items from the Blitz Site, Willamette National Forest, Oregon", in The Blitz Site: An Early-Middle Archaic Campsite in the Cascades of Western Oregon, by R. Minor and K. Toepel, Heritage Research Associates Report No.34: Eugene, OR, p.63-68.

-----. 1984c. "Appendix 4: X-Ray Fluorescence Trace Element Analysis of Obsidian Items from 35CL61, Mt. Hood National Forest, Northwestern Oregon", in Archaeological Data Recovery Program, Hugh Creek Site, 35CL61, Clackamas County, Oregon, by K.R. Winthrop and D.J. Gray, Report prepared for the Mt. Hood National Forest, Estacada, Oregon, p.37-41.

-----. 1985a. "Appendix 3: X-Ray Fluorescence Trace Element Analysis of Obsidian Items from 35CL55, Mt. Hood National Forest, Northwestern Oregon", in Archaeological Investigations at the Ripple Site (35CL55) in the Mt. Hood National Forest, Clackamas County, Oregon, by C.G. Lebow, Anthropology Northwest No.2, Dept. of Anthropology, Oregon State Univ.: Corvallis, OR, p.135-138.

-----. 1985b. "Appendix B: Trace Element Analysis of Obsidian from the Flanagan Site", in The Flanagan Site: 6,000 Years of Occupation in the Upper Willamette Valley, Oregon, by K.A. Toepel, unpubl. Ph.D. Dissertation, Univ. of Oregon: Eugene, OR, p.180-186.

-----. 1986a. Unpublished letter dated February 11, 1986, to Dick Cheatham, Department of Anthropology, University of Oregon, Eugene, Oregon.

-----. 1986b. "X-Ray Fluorescence Trace Element Analysis of Obsidian Items from Four Sites Near Oakridge, Oregon", in The Colt and Saddle Sites: Excavations on Dead Horse Creek, by P.W. Baxter, Dept. of Anthropology, Univ. of Oregon: Eugene, OR, p.110-133.

Skinner, Craig E. 1983. Obsidian Studies in Oregon: An Introduction to Obsidian and An Investigation of Selected Methods of Obsidian Characterization Utilizing Obsidian Collected at Prehistoric Quarry Sites in Oregon, unpubl. Master's Thesis, IS:IP, Univ. of Oregon: Eugene, OR, 406p.

-----. 1986. The Occurrence, Characterization, and Prehistoric Utilization of Geologic Sources of Obsidian in Central Western Oregon: Preliminary Research Results, unpubl. manuscript, 103p.

Snyder, Sandra L. 1983. Medicine Creek: Pre- and Post-Mazama Occupation in the Cascades, Tebiwa Papers No.23, 13p.

Stenhouse, Peter J. 1974. Progress Report on the Umpqua/Eden Archaeological Rescue Dig (1st Phase), Oregon Coastal Archaeological Society, 56p.

Toepel, Kathryn A. and Robert L. Sappington. 1982. "Obsidian Use in the Willamette Valley: Trace Element Analysis of Obsidian from the Halverson Site", Tebiwa, 19:27-40.

Williams, Howel. 1942. The Geology of Crater Lake National Park, Oregon, Carnegie Institute of Washington Publication 540: Washington, DC, 162p.

Zontek, Terry. 1978. Test Excavations and Cultural Resource Evaluation of the Oceanside Site (35-TI-47), Dept. of Anthropology, Oregon State Univ.: Corvallis, OR, 28p.

APPENDIX 1:
GLOSSARY

Angular Waste: Debitage class considered to be an accidental byproduct of flake removal activities; flake features that would identify it as a particular type of flake fragment are absent.

Artifactual: Referring to an object used, moved, modified, or manufactured by humans; includes debitage and raw materials recovered from an archaeological context.

Biface: A tool with an edge created by retouch along both sides of the same part of an edge; a minimum of 3 contiguous negative flake must be found on both tool surfaces.

Blade: Biface whose length is at least twice its width.

Characterization: The identification of a raw material through the determination of a distinguishing attribute or feature.

Core: An objective piece whose function is to produce flakes suitable for tool manufacture.

Cortex: Weathered exterior of a nodule of lithic material.

CCS: Crypto-crystalline silicate; a catch-all category for glassy or very fine-grained lithic materials in which the crystalline component is not visible to the naked eye.

Cortex Flake: Any flake with cortex on the dorsal surface.

Crystallite: A broad term applied to a minute crystal form or body of unknown mineralologic composition which does not polarize light.

Debitage: Non-tool artifactual materials considered as waste, i.e. flakes, flake fragments, and angular waste.

Direct-access: Procurement style in which the users of a lithic material obtain it directly from its primary or secondary geologic source.

Dorsal Surface: The flake surface that was originally the outer face of the core or objective piece; characterized by ridges and sometimes by cortex.

Elevation: Vertical location in relation to site datum; establishes horizontal provenience.

Exchange System: Procurement syle in which needed materials are obtained through trade.

Exotic: Material that is not indigenous to an area i.e. it has been introduced through human or natural means.

Flake Fragment: Any flake in which more than 1/2 of the distal end is missing.

INAA: Instrumental neutron activation analysis.

Maximum Dimension: The longest dimension that can be measured (on any axis) on an artifact.

Microlite: A microscopic crystal with determinable optical properties.

Micron: One-millionth of a meter.

Petrographic: Referring to the systematic description or classification of rocks.

Porphyritic: Textural term for igneous rocks in which larger crystals are set in a fine-grained or glassy groundmass.

Primary Flake: Flake removed from a core in order to prepare the core for the removal of usable flakes; characterized by greater than 90 percent cortex on the dorsal surface.

Procurement System: System through which prehistoric peoples obtained raw materials.

Projectile Point: Bifacial tool designed to be hafted to a shaft; often used more as a descriptive convention that functional category.

Provenience: Three-dimensional location of an artifact within an archaeological context.

Secondary Flake: Flakes removed from a core to be used as tool or to be retouched into a tool; characterized by less than 90 percent cortex on the dorsal surface.

Secondary Obsidian Source: A source of obsidian occurring in a context removed from its original, primary location.

Slightly Porphyritic Texture: Obsidian texture in which megascopic (though often very small) phenocrysts are visible in the glassy groundmass.

Tertiary Flake: Flake produced by retouch during the manufacture of a tool; characterized by the absence of cortex on the dorsal surface.

Tool: Any artifact that has been used for a task and that exhibits use-wear or that has been purposefully shaped and modified through the removal of flakes.

Trace Element: Element occurring in quantities of less than about 1000 parts per million.

Uniface: Tool that has a minimum of 3 contiguous retouch flake scars on one side of an edge.

Use-Wear: Physical characteristics produced during the use of an artifact as a tool; characterized by attributes such as stepping, nibbling, snap fractures, and striations.

Utilized Flake: Unmodified flake that exhibits evidence of use-wear.

Ventral Surface: The flake surface that was originally the interior of the core.

APPENDIX 2:
TABULATED LITHIC MATERIAL DATA
FROM 35 DO 83

ARTIFACT TYPE		LEVELS 1	2	3	4	5	6	7	8	9	10	OTHER	TOTAL
T	BIFACE	4	7	8	6	2	6	0	2	0	0	4	39
O	UNIFACE	0	0	1	1	0	0	0	0	0	0	0	2
O	UFLAKE	1	3	1	0	1	0	0	0	0	0	0	6
L	CORE	0	4	0	3	0	0	0	0	0	0	0	7
S	POINT	29	34	19	6	10	2	2	0	0	1	1	104
	BLADE	2	0	0	4	1	0	1	1	0	0	0	9
TOOL SUBTOTAL		36	48	29	20	14	8	3	3	0	1	5	167
DEB. SUBTOTAL		41	133	93	91	86	12	15	9	1	0	30	511
TOTAL		77	181	122	111	100	20	18	12	1	1	35	678

CRYPTOCRYSTALLINE (CCS) ARTIFACTS FROM 35D083.

ARTIFACT TYPE		LEVELS											TOTAL
		1	2	3	4	5	6	7	8	9	10	OTHER	
T	BIFACE	0	0	6	0	0	0	1	1	1	0	1	10
O	UNIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O	UFLAKE	0	0	0	0	0	0	0	0	0	0	2	2
L	CORE	1	1	0	0	1	0	0	0	0	0	0	3
S	POINT	4	3	2	1	1	0	1	0	0	0	1	13
	BLADE	0	0	0	0	0	0	0	1	0	0	0	1
TOOL SUBTOTAL		5	4	8	1	2	0	2	2	1	0	4	29
DEBI-	CORTEX	32	42	17	20	2	1	3	0	2	0	22	141
TAGE	NONE	35	53	24	26	11	4	0	1	0	1	6	161
DEB. SUBTOTAL		67	95	41	46	13	5	3	1	2	1	28	302
TOTAL		72	99	49	47	15	5	5	3	3	1	32	331

ALL OBSIDIAN ARTIFACTS FROM 35D083.

ARTIFACT TYPE		LEVELS 1	2	3	4	5	6	7	8	9	10	OTHER	TOTAL
T	BIFACE	0	0	3	0	0	0	1	0	1	0	1	6
O	UNIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O	UFLAKE	0	0	0	0	0	0	0	0	0	0	0	0
L	CORE	1	1	0	0	0	0	0	0	0	0	0	2
S	POINT	4	3	0	1	1	0	0	0	0	0	0	9
	BLADE	0	0	0	0	0	0	0	1	0	0	0	1
TOOL SUBTOTAL		5	4	3	1	1	0	1	1	1	0	1	18
DEBI-	CORTEX	23	17	5	8	1	0	2	0	0	0	11	67
TAGE	NONE	20	33	16	20	5	3	0	1	0	1	2	101
DEB. SUBTOTAL		43	50	21	28	6	3	2	1	0	1	13	168
TOTAL		48	54	24	29	7	3	3	2	1	1	14	186

BLACK GLASSY OBSIDIAN ARTIFACTS FROM 35D083.

ARTIFACT TYPE		LEVELS 1	2	3	4	5	6	7	8	9	10	OTHER	TOTAL
T	BIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O	UNIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O	UFLAKE	0	0	0	0	0	0	0	0	0	0	1	1
L	CORE	0	0	0	0	1	0	0	0	0	0	0	1
S	POINT	0	0	1	0	0	0	0	0	0	0	0	1
	BLADE	0	0	0	0	0	0	0	0	0	0	0	0
TOOL SUBTOTAL		0	0	1	0	1	0	0	0	0	0	1	3
DEBI-	CORTEX	16	23	8	11	0	1	1	0	2	0	10	72
TAGE	NONE	11	14	8	3	3	0	0	0	0	0	4	43
DEB. SUBTOTAL		27	37	16	14	3	1	1	0	2	0	14	115
TOTAL		27	37	17	14	4	1	1	0	2	0	14	118

BLACK OBSIDIAN, SLIGHTLY PORPHYRITIC OBSIDIAN ARTIFACTS FROM 35D083.

ARTIFACT TYPE		LEVELS 1	2	3	4	5	6	7	8	9	10	OTHER	TOTAL
T	BIFACE	0	0	2	0	0	0	0	0	0	0	0	2
O	UNIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O	UFLAKE	0	0	0	0	0	0	0	0	0	0	0	0
L	CORE	0	0	0	0	0	0	0	0	0	0	0	0
S	POINT	0	0	1	0	0	0	1	0	0	0	1	3
	BLADE	0	0	0	0	0	0	0	0	0	0	0	0
TOOL SUBTOTAL		0	0	3	0	0	0	1	0	0	0	1	5
DEBI-	CORTEX	3	1	0	1	1	0	0	0	0	0	1	7
TAGE	NONE	4	5	4	3	3	1	0	0	0	0	0	20
DEB. SUBTOTAL		7	6	4	4	4	1	0	0	0	0	1	27
TOTAL		7	6	7	4	4	1	1	0	0	0	2	32

GRAY OBSIDIAN ARTIFACTS FROM 35D083.

ARTIFACT TYPE	LEVELS 1	2	3	4	5	6	7	8	9	10	OTHER	TOTAL
T BIFACE	0	0	1*	0	0	0	0	1**	0	0	0	2
O UNIFACE	0	0	0	0	0	0	0	0	0	0	0	0
O UFLAKE	0	0	0	0	0	0	0	0	0	0	0	1
L CORE	0	0	0	0	0	0	0	0	0	0	1*	0
S POINT	0	0	0	0	0	0	0	0	0	0	0	0
BLADE	0	0	0	0	0	0	0	0	0	0	0	0
TOOL SUBTOTAL	0	0	1	0	0	0	0	1	0	0	1	3
DEBI- CORTEX	0	0	0	0	0	0	0	0	0	0	0	0
TAGE NONE	0	1***	0	0	0	0	0	0	0	0	0	1
DEB. SUBTOTAL	0	1	0	0	0	0	0	0	0	0	0	1
TOTAL	0	1	0	0	0	0	0	1	0	0	1	4

NON-BLACK OR GRAY OBSIDIAN ARTIFACTS FROM 35D083.
*   MAHOGANY AND BLACK
** BROWNISH-BLACK
*** GREENISH-BLACK

DEBITAGE SIZE	BLACK GLASSY		BLACK PORPHYRTC		GRAY GLASSY		OTHER		TOTAL	
	CORTEX	NONE	CORTEX	NONE	CORTEX	NONE	CORTEX	NONE	CORTEX	NONE
1-5 MM	0	2	0	1	0	1	0	0	0	4
6-10 MM	2	40	6	11	1	9	0	0	9	60
11-15 MM	26	44	30	22	2	7	0	1	58	72
16-20 MM	23	13	25	8	4	2	0	0	52	23
21-25 MM	4	0	9	1	0	0	0	0	13	1
26-30 MM	2	1	2	0	0	0	0	0	4	1
31-35 MM	0	0	0	0	1	0	0	0	1	0
TOTAL	57	100	72	43	8	19	0	1	137	161

DEBITAGE SIZE RANGES FOR ALL OBSIDIAN DEBITAGE AT 35D083.

APPENDIX 3:
ARTIFACT DATA FOR INAA SAMPLES
FROM 35 DO 83

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No. >UME-1
Material >Obsidian Category >Arch
Collection Date >78-80 Collected by >OSU
Country >USA
State >Oregon County >Douglas
Geoprovince >Coast
Landform >Umpqua River
USGS Map >Reedsport 15' (1956)
Section >32
Township >21S Range >12W
Primry or Secondry?>S Max. Dimension (cm) >1.9
Geosource if Scndry>? Weight (gm) >1.95
Arch. Site No. >35 DO 83 Artifact Quality? >-
Artifact Provenance>Level 1; stratum 4; 96N/98E

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

Si02	>-	Cr	>-	(-)	Ta	>-	(-)
Ti02	>-	Co	>-	(-)	Sm	>-	(-)
A1203	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe203	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na20	>-	Ba	>-	(-)			
K20	>-	La	>-	(-)			
P205	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses
Major Method >- Major abundances in wt.% oxide
Trace Method >- Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned by OSU 12-86; specimen # 1-366. Core preparation flake. Dorsal surface 60% cortex; originally a stream-rolled nodule with diameter of about 2.2 cm. Banded with a glassy texture. 1.9 x 1.2 x 0.8 cm.
Project >PHD, INAA-1

****

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-2		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>1.8
Geosource if Scndry	>?	Weight (gm)	>1.54
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 1; 94N/96.85E		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

SiO2	>-	Cr	>-	(-)	Ta	>-	(-)
TiO2	>-	Co	>-	(-)	Sm	>-	(-)
Al2O3	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe2O3	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na2O	>-	Ba	>-	(-)			
K2O	>-	La	>-	(-)			
P2O5	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method	>-	Major abundances in wt.% oxide
Trace Method	>-	Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned 12-86 by OSU; specimen # 1-21. Core preparation flake. Dorsal surface cortex; originally a stream rolled nodule with a diameter of about 2.2 cm. Slightly porphyritic texture. 1.8 x 1.1 x 0.7 cm.

Project >PHD, INAA-1

****

```
**************************************************** Sample Database ***
SAMPLE NAME          >UMPQUA-EDEN SITE
-------------------------------------------------------------------------
Sample No.           >UME-3
Material             >Obsidian          Category      >Arch
Collection Date      >78-80             Collected by  >OSU
Country              >USA
State                >Oregon                County    >Douglas
Geoprovince          >Coast
Landform             >Umpqua River
USGS Map             >Reedsport 15' (1956)
Section              >32
Township             >21S                           Range >12W
Primry or Secondry?>S          Max. Dimension (cm) >1.9
Geosource if Scndry>?                  Weight (gm) >1.21
Arch. Site No.       >35 DO  83        Artifact Quality?  >-
Artifact Provenance>Level 2; N108/E90
-------------------------------------------------------------------------
Hand Specimen?       >Y                 Powder?            >N
Thin Section?        >Y                 Microprobe?        >N
Hydration?           >N                 INNA?              >N
Photomicrograph?     >N                 XRF Major?         >N
Chip?                >N                 XRF Trace?         >N
-------------------------------------------------------------------------
SiO2     >-          Cr   >-    (-      )     Ta   >-     (-      )
TiO2     >-          Co   >-    (-      )     Sm   >-     (-      )
Al2O3    >-          Rb   >-    (-      )     Eu   >-     (-      )
MgO      >-          Sr   >-    (-      )     Tb   >-     (-      )
Fe2O3    >-          Y    >-    (-      )     Yb   >-     (-      )
FeO      >-          Zr   >-    (-      )     Lu   >-     (-      )
MnO      >-          Nb   >-    (-      )     Th   >-     (-      )
CaO      >-          Cs   >-    (-      )     U    >-     (-      )
Na2O     >-          Ba   >-    (-      )
K2O      >-          La   >-    (-      )
P2O5     >-          Hf   >-    (-      )
Total    >
                                 Analytical error in parentheses
Major Method         >-          Major abundances in wt.% oxide
Trace Method         >-          Trace abundances in ppm
-------------------------------------------------------------------------
Density              >-
-------------------------------------------------------------------------
References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments    >Loaned by OSU 12-86; specimen # 2-231. Core preparation
             flake. Dorsal surface 100% cortex; originally a stream
             rolled nodule with a diameter of 2-3 cm. Slightly
             porphyritic texture with banding. 1.9 x 1.7 x 0.4 cm.
Project     >PHD, INAA-1
*************************************************************************
```

*** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-4		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>1.6
Geosource if Scndry	>?	Weight (gm)	>1.06
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 2; N110/E92		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

SiO_2	>-	Cr	>-	(-)	Ta	>-	(-)
TiO_2	>-	Co	>-	(-)	Sm	>-	(-)
Al_2O_3	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe_2O_3	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na_2O	>-	Ba	>-	(-)			
K_2O	>-	La	>-	(-)			
P_2O_5	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method >- Major abundances in wt.% oxide

Trace Method >- Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned by OSU 12-86; specimen # 2-172. Core preparation flake. Dorsal surface about 50% cortex; originally a stream rolled nodule with a diameter of 2-3 cm. Slightly porphyritic texture (no banding). 1.6 x 1.3 x 0.6 cm.

Project >PHD, INAA-1

****

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No. >UME-5
Material >Obsidian   Category >Arch
Collection Date >78-80   Collected by >OSU
Country >USA
State >Oregon   County >Douglas
Geoprovince >Coast
Landform >Umpqua River
USGS Map >Reedsport 15' (1956)
Section >32
Township >21S   Range >12W
Primry or Secondry?>S   Max. Dimension (cm) >2.4
Geosource if Scndry>?   Weight (gm) >2.52
Arch. Site No. >35 DO 83   Artifact Quality? >-
Artifact Provenance>Level 2; N98/E94

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

Si02	>-	Cr	>-	(-)	Ta	>-	(-)
Ti02	>-	Co	>-	(-)	Sm	>-	(-)
A1203	>-	Rb	>-	(-)	Eu	>-	(-)
Mg0	>-	Sr	>-	(-)	Tb	>-	(-)
Fe203	>-	Y	>-	(-)	Yb	>-	(-)
Fe0	>-	Zr	>-	(-)	Lu	>-	(-)
Mn0	>-	Nb	>-	(-)	Th	>-	(-)
Ca0	>-	Cs	>-	(-)	U	>-	(-)
Na20	>-	Ba	>-	(-)			
K20	>-	La	>-	(-)			
P205	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses
Major Method >-   Major abundances in wt.% oxide
Trace Method >-   Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned by OSU 12-86; specimen # 2-6. Distal biface fragment (tip of point). No banding. 2.2 x 1.8 x 0.8 cm.

Project >PHD, INAA-1
****

```
************************************************** Sample Database ***
SAMPLE NAME         >UMPQUA-EDEN SITE
----------------------------------------------------------------------
Sample No.          >UME-6
Material            >Obsidian          Category       >Arch
Collection Date     >78-80             Collected by   >OSU
Country             >USA
State               >Oregon                County     >Douglas
Geoprovince         >Coast
Landform            >Umpqua River
USGS Map            >Reedsport 15' (1956)
Section             >32
Township            >21S                           Range >12W
Primry or Secondry?>S          Max. Dimension (cm) >1.8
Geosource if Scndry>?                  Weight (gm) >1.0
Arch. Site No.      >35 DO  83         Artifact Quality?  >-
Artifact Provenance>Level 3; 100N/98E
----------------------------------------------------------------------
Hand Specimen?      >Y                 Powder?             >N
Thin Section?       >Y                 Microprobe?         >N
Hydration?          >N                 INNA?               >N
Photomicrograph?    >N                 XRF Major?          >N
Chip?               >N                 XRF Trace?          >N
----------------------------------------------------------------------
SiO2     >-          Cr    >-     (-      )     Ta    >-      (-      )
TiO2     >-          Co    >-     (-      )     Sm    >-      (-      )
Al2O3    >-          Rb    >-     (-      )     Eu    >-      (-      )
MgO      >-          Sr    >-     (-      )     Tb    >-      (-      )
Fe2O3    >-          Y     >-     (-      )     Yb    >-      (-      )
FeO      >-          Zr    >-     (-      )     Lu    >-      (-      )
MnO      >-          Nb    >-     (-      )     Th    >-      (-      )
CaO      >-          Cs    >-     (-      )     U     >-      (-      )
Na2O     >-          Ba    >-     (-      )
K2O      >-          La    >-     (-      )
P2O5     >-          Hf    >-     (-      )
Total    >
                                    Analytical error in parentheses
Major Method        >-              Major abundances in wt.% oxide
Trace Method        >-              Trace abundances in ppm
----------------------------------------------------------------------
Density             >-
----------------------------------------------------------------------
References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments    >Loaned by OSU 12-86; specimen # 3-89. Core preparation
             flake. Dorsal surface 80% cortex; originally a stream
             rolled nodule with about 2-4 cm diameter. Banded with
             glassy texture. 1.8 x 1.1 x 0.6 cm.
Project     >PHD, INAA-1
**********************************************************************
```

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-7		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>2.1
Geosource if Scndry	>?	Weight (gm)	>1.1
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 3; N110/E92		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

Si02	>-	Cr	>-	(-)	Ta	>-	(-)
Ti02	>-	Co	>-	(-)	Sm	>-	(-)
A1203	>-	Rb	>-	(-)	Eu	>-	(-)
Mg0	>-	Sr	>-	(-)	Tb	>-	(-)
Fe203	>-	Y	>-	(-)	Yb	>-	(-)
Fe0	>-	Zr	>-	(-)	Lu	>-	(-)
Mn0	>-	Nb	>-	(-)	Th	>-	(-)
Ca0	>-	Cs	>-	(-)	U	>-	(-)
Na20	>-	Ba	>-	(-)			
K20	>-	La	>-	(-)			
P205	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method	>-	Major abundances in wt.% oxide
Trace Method	>-	Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned by OSU 12-86; specimen # 3-308. Core reduction flake. 25% of dorsal surface is cortex; originally a stream rolled nodule with a diameter of about 2.5-5 cm.Banded with a glassy texture. 2.1 x 1.3 x 0.6 cm.

Project >PHD, INAA-1

****

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-8		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>2.6
Geosource if Scndry	>?	Weight (gm)	>3.23
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 6; 100N/92E		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

SiO2	>-	Cr	>-	(-)	Ta	>-	(-)
TiO2	>-	Co	>-	(-)	Sm	>-	(-)
Al2O3	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe2O3	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na2O	>-	Ba	>-	(-)			
K2O	>-	La	>-	(-)			
P2O5	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method >- Major abundances in wt.% oxide

Trace Method >- Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned by OSU 12-86; specimen #6-1. Medial biface fragment. Original length at least 2.6 cm and probably considerably larger. Glassy texture. 2.6 x 1.2 x 0.9 cm.

Project >PHD, INAA-1

****

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-9		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>1.7
Geosource if Scndry	>?	Weight (gm)	>4.08
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 7; 100N/98E		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

SiO2	>-	Cr	>-	(-)	Ta	>-	(-)
TiO2	>-	Co	>-	(-)	Sm	>-	(-)
Al2O3	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe2O3	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na2O	>-	Ba	>-	(-)			
K2O	>-	La	>-	(-)			
P2O5	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method >- Major abundances in wt.% oxide

Trace Method >- Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned from OSU 12-86; specimen #7-58. Unworked stream rolled obsidian nodule measuring 1.7 x 1.7 x 1.1 cm. Found in archaeological context. Slightly porphyritic texture.

Project >PHD, INAA-1

****

** Sample Database ***

SAMPLE NAME >UMPQUA-EDEN SITE

Sample No.	>UME-10		
Material	>Obsidian	Category	>Arch
Collection Date	>78-80	Collected by	>OSU
Country	>USA		
State	>Oregon	County	>Douglas
Geoprovince	>Coast		
Landform	>Umpqua River		
USGS Map	>Reedsport 15' (1956)		
Section	>32		
Township	>21S	Range	>12W
Primry or Secondry?	>S	Max. Dimension (cm)	>3.2
Geosource if Scndry	>?	Weight (gm)	>2.49
Arch. Site No.	>35 DO 83	Artifact Quality?	>-
Artifact Provenance	>Level 8; N106/E93.5		

Hand Specimen?	>Y	Powder?	>N
Thin Section?	>Y	Microprobe?	>N
Hydration?	>N	INNA?	>N
Photomicrograph?	>N	XRF Major?	>N
Chip?	>N	XRF Trace?	>N

SiO_2	>-	Cr	>-	(-)	Ta	>-	(-)
TiO_2	>-	Co	>-	(-)	Sm	>-	(-)
Al_2O_3	>-	Rb	>-	(-)	Eu	>-	(-)
MgO	>-	Sr	>-	(-)	Tb	>-	(-)
Fe_2O_3	>-	Y	>-	(-)	Yb	>-	(-)
FeO	>-	Zr	>-	(-)	Lu	>-	(-)
MnO	>-	Nb	>-	(-)	Th	>-	(-)
CaO	>-	Cs	>-	(-)	U	>-	(-)
Na_2O	>-	Ba	>-	(-)			
K_2O	>-	La	>-	(-)			
P_2O_5	>-	Hf	>-	(-)			
Total	>						

Analytical error in parentheses

Major Method >- Major abundances in wt.% oxide

Trace Method >- Trace abundances in ppm

Density >-

References >Stenhouse, 1974; Lyman, 1985; Ross and Snyder, 1986

Comments >Loaned from OSU 12-86; specimen #8-2. Biface fragment; original piece considerably larger. Unusually transparent clear glass with black banding (anomalous at site). 3.2 x 1.0 x 0.9 cm.

Project >PHD, INAA-1

****

UMPQUA/EDEN SITE (35D083) OBSIDIAN UTILIZATION REPORT UPDATE

This update (to Skinner, 1987) consists of artifact totals and percentages that were computed after database entry errors were identified and corrected along with the results of a very preliminary analysis of INAA data recently received.

Raw Material Utilization:

CCS (n=683) - 67.0%
Obsidian (n=336) - 33.0%

Artifact Totals:

ARTIFACT TYPE	CCS	OBSIDIAN
Raw Material (Raw)	6 (0.9%)	0
Bifaces (Bif)	38 (5.6%)	10 (3.0%)
Unifaces (Uni)	2 (0.2%)	0
Utilized Flakes (UFl)	5 (0.7%)	2 (0.6%)
Cores (Core)	7 (1.0%)	3 (0.9%)
Projectile Points (Pnt)	104 (15.2%)	13 (3.9%)
Blades (Bld)	9 (1.3%)	1 (0.3%)
Debitage (Deb)	512 (75.0%)	307 (91.4)
	-----	-----
Total	683 (99.9%)	336 (100.1%)

Frequency of Obsidian Artifacts Sorted by Color:

COLOR	TOOLS	DEBITAGE
Black Glassy (n=180)	19 (10.5%)	161 (89.5%)
Black Porphyritic (n=120)	3 (2.5%)	117 (97.5%)
Gray (n=32)	5 (15.6%)	27 (84.4%)
Other (n=4)	3 (75.0%)	1 (25.0%)

Instrumental Neutron Activation Analysis Results

Neutron activation analyses were received 5-87. Preliminary conclusions from initial analysis of the data include:

1. The glassy and slightly porphyritic varieties of black obsidian originated from the same geologic source. The textural variation (glassy or slightly porphyritic) is not diagnostic of two different sources at this site but is only the normal variation exhibited by a single geologic source (primary location still not known).

2. Of the ten Umpqua/Eden artifacts analyzed, eight proved to be from a single source (see attached scatterplot). The eight artifacts did not correlate with glass available at the mouth of the nearby Siuslaw River or from other characterized obsidian sources of obsidian in Western Oregon and almost undoubtedly originated from the gravels of the Umpqua River.

3. The two remaining Umpqua/Obsidian artifacts (UME-8 and UME-10) originated at two different geologic sources, neither of which were represented in the Western Oregon obsidian database. A single obsidian artifact from the Whale Cove Site (35LNC60) , analyzed in a related project, also appears to have originated from the same unknown geologic source as UME-8 (see attached scatterplot).

4. It looks as though two different obsidian sources were probably locally utilized at the Umpqua/Eden Site, a black variety and a gray variety (unfortunately not analyzed as part of this project).

Reference: Skinner, Craig. 1987. Obsidian Procurement at the Umpqua/Eden Site (35DO83), Central Oregon Coast: Preliminary Research Results, Unpubl. manuscript, 50p.

Frequency of CCS and obsidian artifactual materials from 35D083

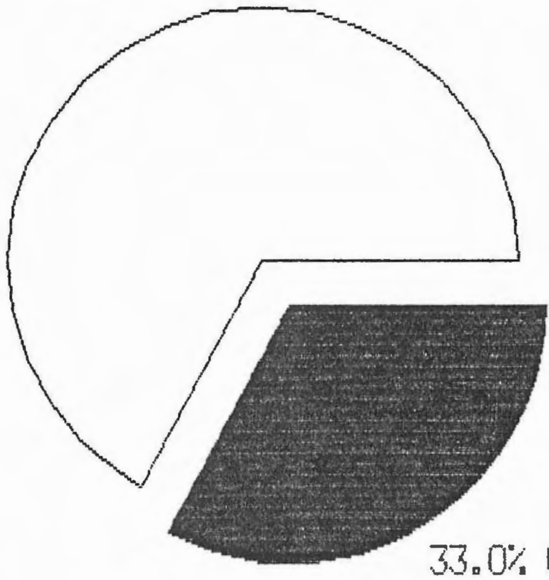


Figure 8 (Revised from Skinner, 1987)

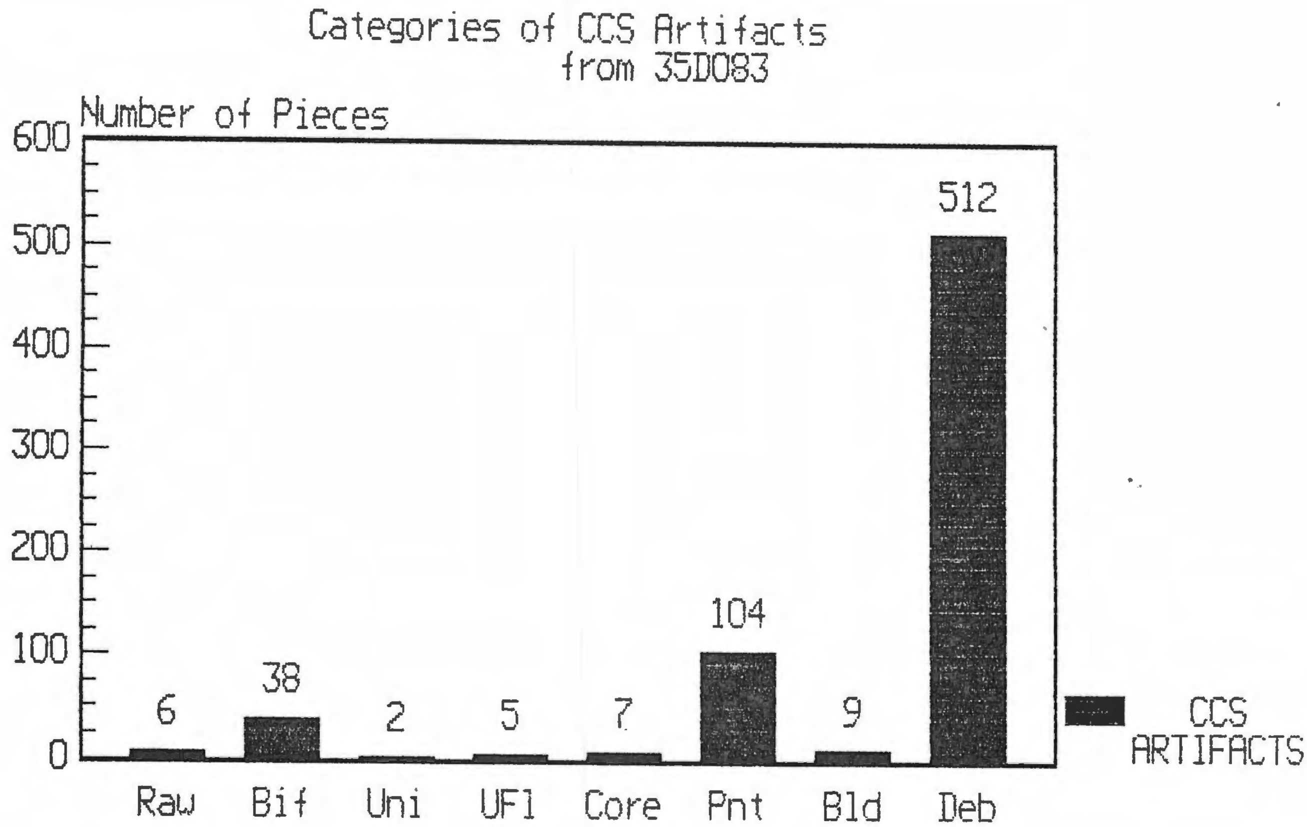
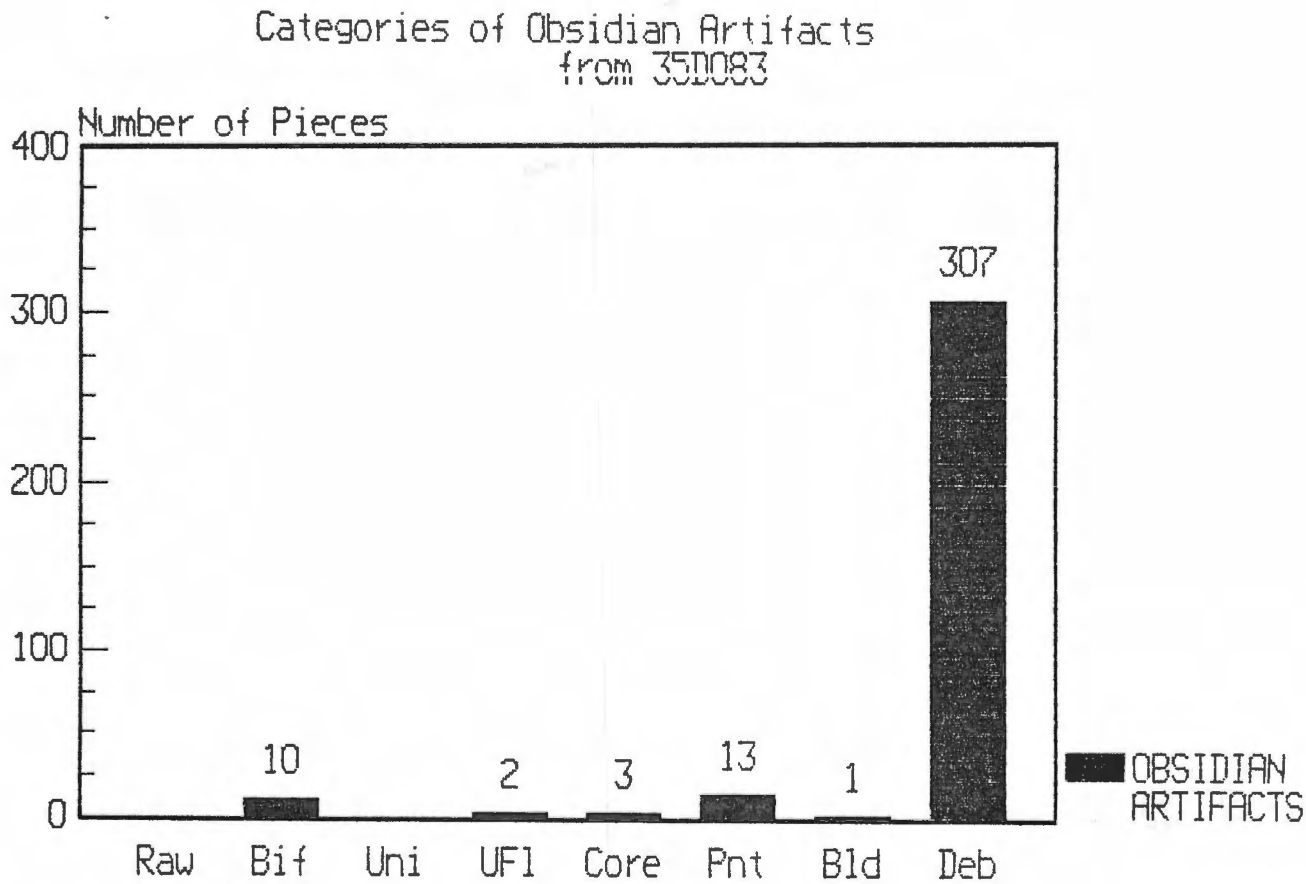
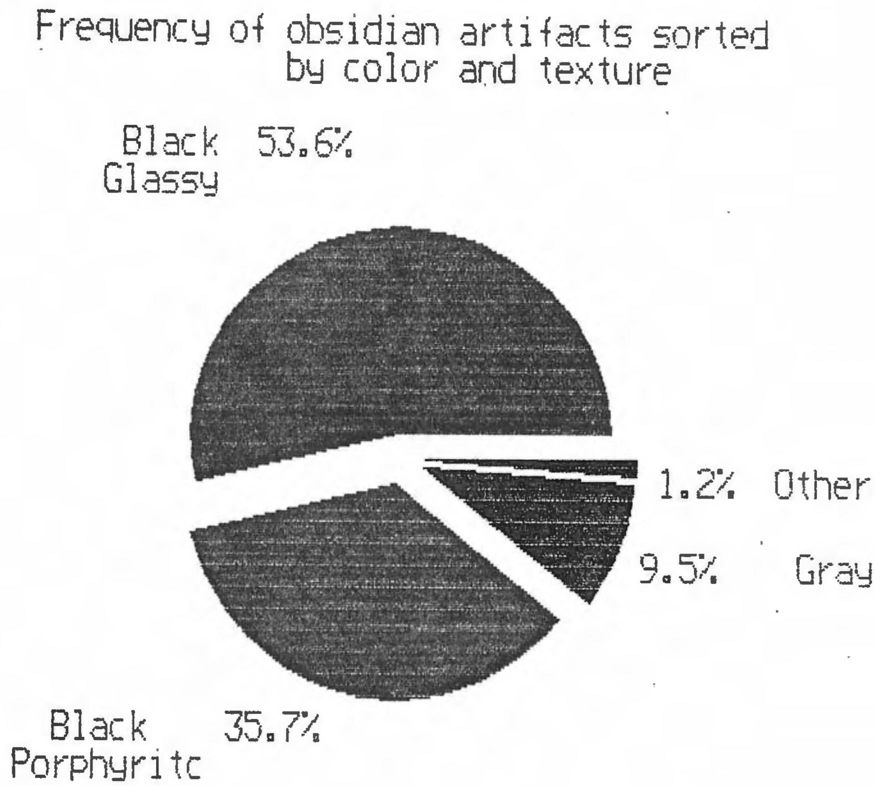


Figure 8 (Revised from Skinner, 1987)





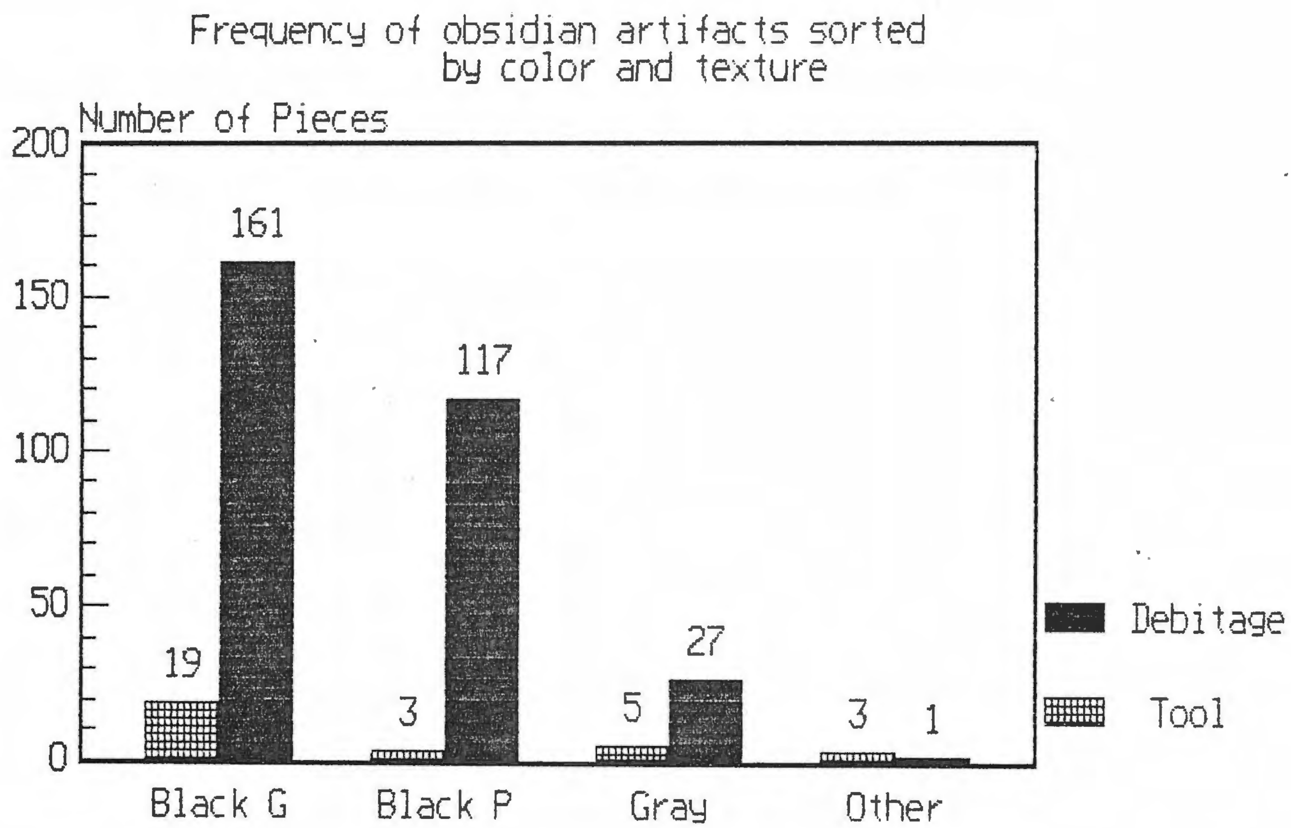
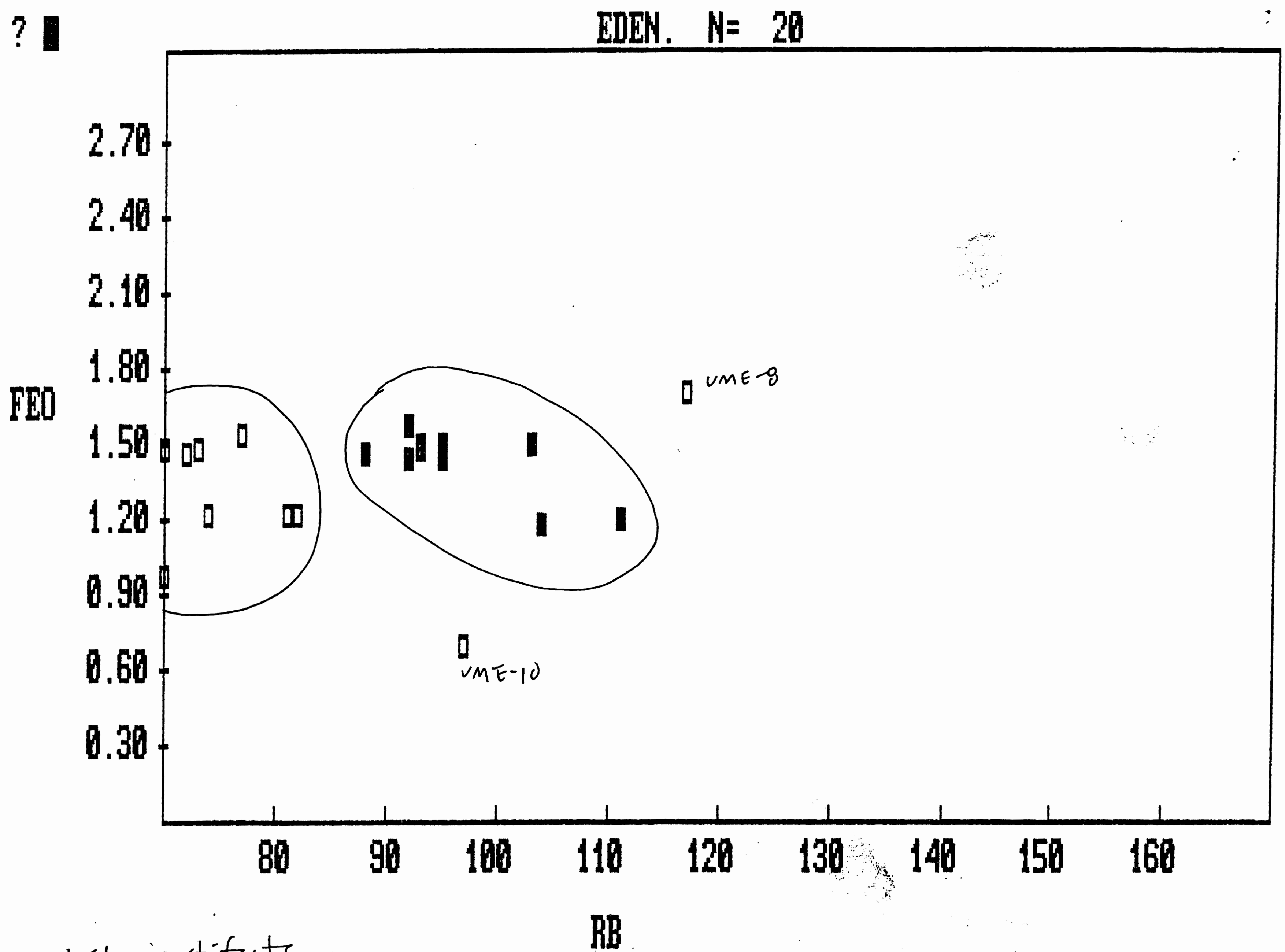
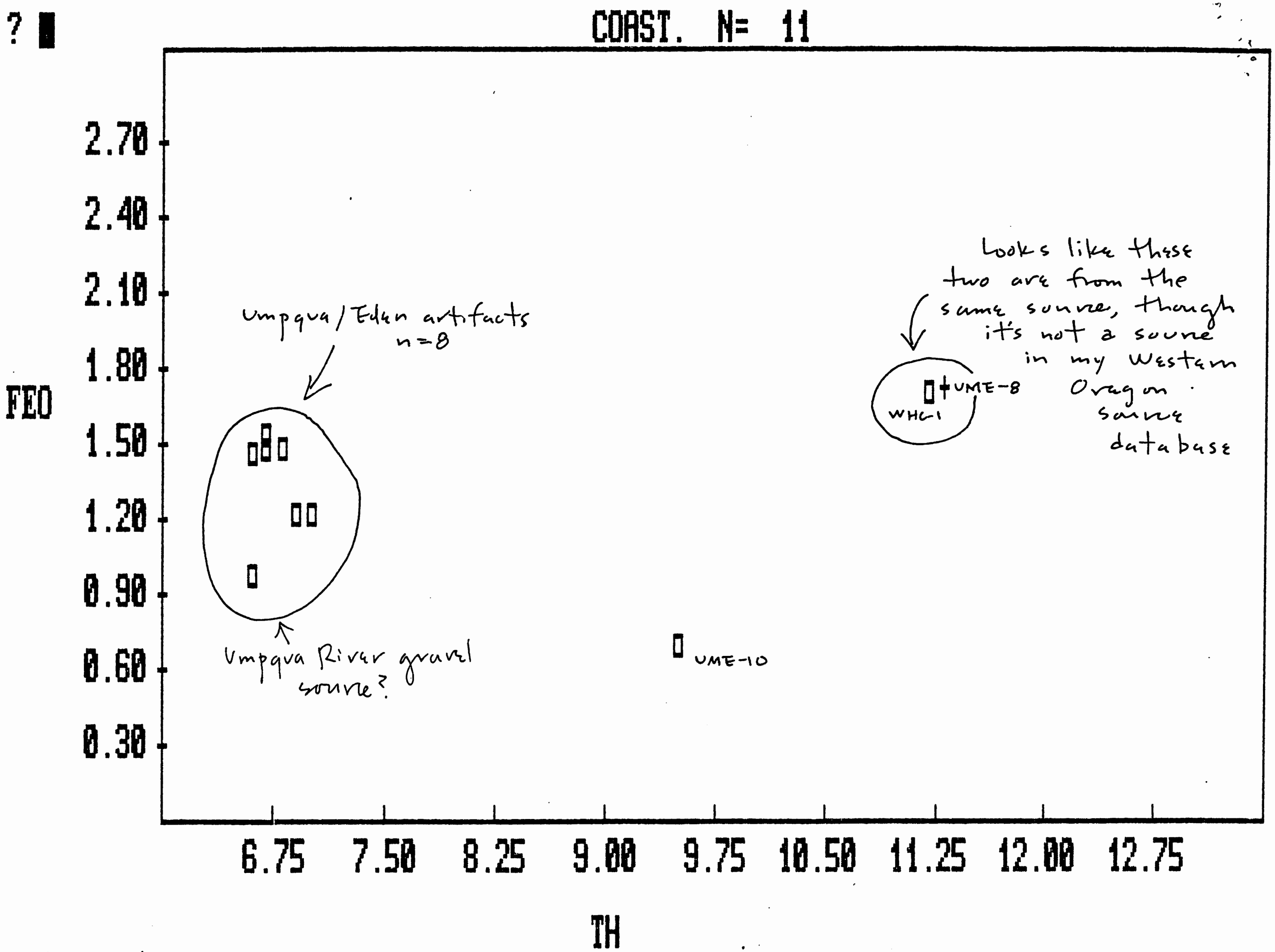


Figure 9 (Revised from Skinner, 1987)



□ Umpqua / Eden artifacts
▨ Inman Creek source / Siuslaw River source



+ Whale Cove Site n=1

□ Umpqua/Eden Site n=10

The WHC-1 and UME-8 samples are almost certainly from the same geologic source, though the location of the source is still unknown