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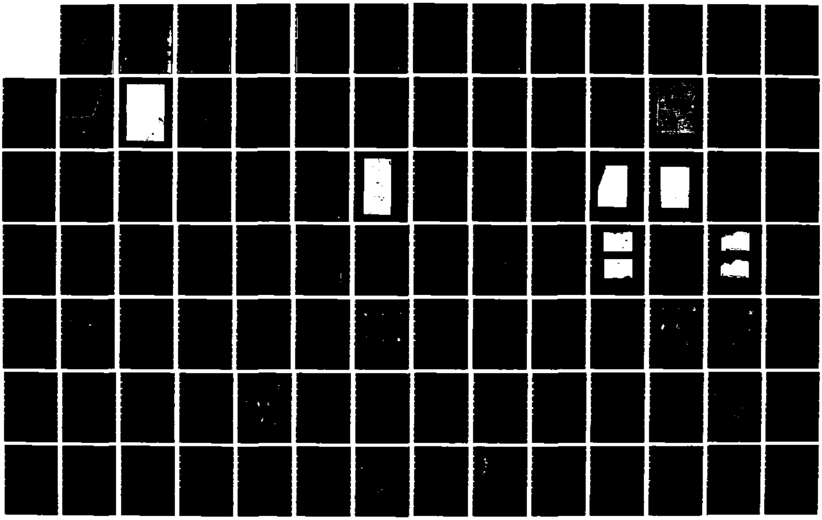

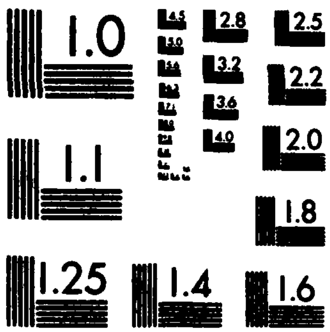
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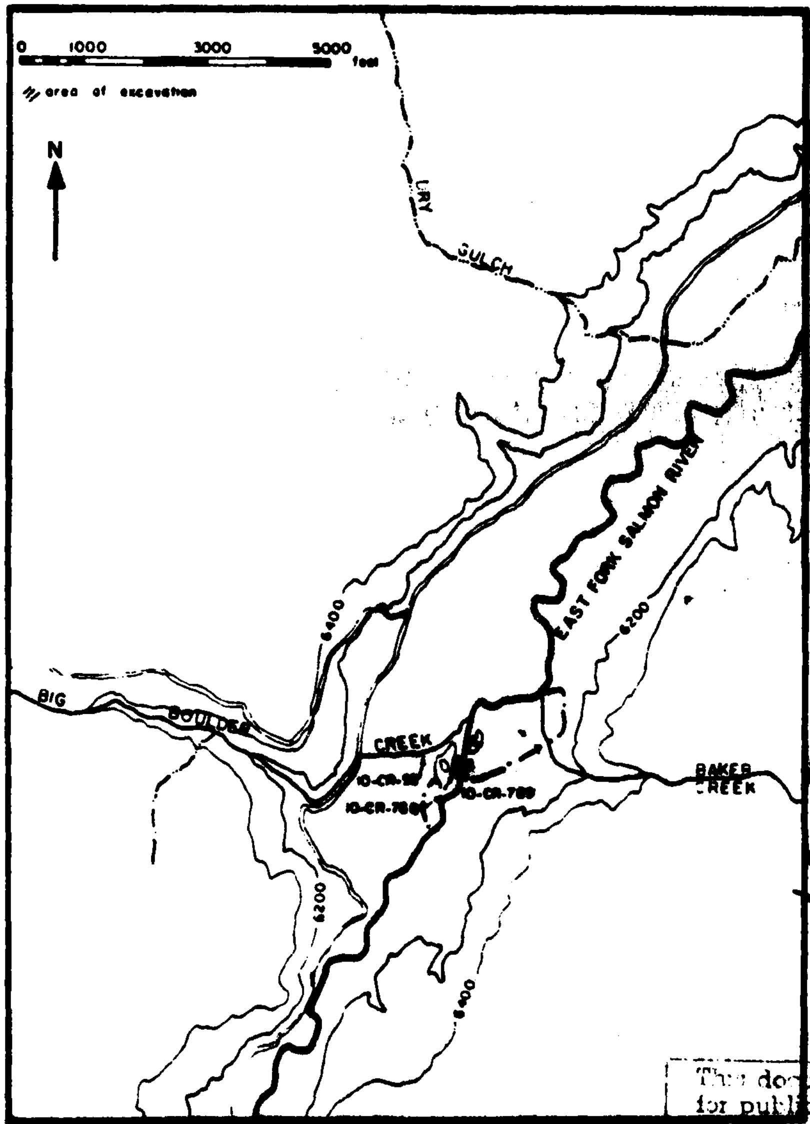
ARCHAEOLOGICAL INVESTIGATIONS ON THE EAST FORK OF THE SALMON RIVER, CUSTER COUNTY, IDAHO

by

Caroline D. Carley and Robert Lee Sappington



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Archaeological investigations in the area of a proposed satellite fish facility, located on the east fork of the Salmon River, identified three cultural sites of varying occupational intensity. Testing and data recovery indicated that the area was occupied for the past 4000 years. Overall, the sites are seen as all being similar to each other in many ways and might best be considered as a complex, rather than as individual sites.

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ABSTRACT

Archaeological investigations were conducted by the Laboratory of Anthropology, University of Idaho, along the East Fork of the Salmon River in conjunction with the proposed construction of the Hagerman Satellite Fish Hatchery by the U. S. Army Corps of Engineers, Walla Walla District. Excavation to mitigate the Big Boulder Creek site (10-CR-768) revealed several features radiocarbon dated at 165±75 BP and 1840±75 BP indicating at least two periods of occupation. Test excavation at another site (10-CR-93) indicated that there were no subsurface deposits while reconnaissance resulted in the recovery of projectile points typologically dated 4000-200 years BP. Test excavations across the East Fork at the Baker Creek site (10-CR-789) also failed to reveal significant subsurface deposits but the recovery of a single projectile point indicates an occupation comparable in age to that encountered at 10-CR-768 and 10-CR-93. Overall, it appears that the vicinity of the Hagerman Satellite Fish Hatchery was occupied for some 4000 years by aboriginal groups affiliated with those in southern Idaho and the Northern Great Basin in general.

ARCHAEOLOGICAL INVESTIGATIONS ON THE EAST FORK OF THE SALMON RIVER, CUSTER COUNTY, IDAHO

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Laboratory of Anthropology

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Moscow

1984

MANAGEMENT SUMMARY

Archaeological investigations conducted by the Laboratory of Anthropology, University of Idaho, in the vicinity of the proposed construction of the Hagerman Satellite Fish Hatchery by the U. S. Army Corps of Engineers, Walla Walla District resulted in the recovery of cultural material in virtually all areas examined. The heaviest concentration of material was in the naturally sheltered vicinity of the Big Boulder Creek site (10-CR-768) which was excavated to mitigate the impact of the hatchery itself. Test excavation and reconnaissance across the East Fork at the Baker Creek site (10-CR-789) in order to determine the impact of the proposed weir revealed a much more ephemeral occupation. However, future construction in another portion of this large site might impact a much more heavily occupied area. Testing in the vicinity of the access road to the hatchery at 10-CR-93 indicated that no significant subsurface deposits existed in that area. However, reconnaissance revealed a widespread distribution of surface material. The widespread distribution of cultural materials in the vicinity of the Hagerman Satellite Fish Hatchery indicates that any future ground disturbing activities should be examined prior to construction.

ACKNOWLEDGEMENTS

The completion of this report involved the efforts of a number of people. The authors and Keo Boreson served as the crew at all times. Special thanks go to Keo for her good spirits despite working in the snow and sharing a motel room with the authors. We were continually aided in the field by Leroy Allen and John Leier, Walla Walla District Archaeologists, Corps of Engineers, who also provided companionship, maps, and aerial photographs necessary for the completion of the report. Thomas J. Green, Idaho State Archaeologist, helped us locate his test units and provided strategic advice prior to our mitigation excavation at the Big Boulder Creek site. Richard R. Harrison, then State Office Archaeologist, and Nancy Vaughn Anderson, Salmon District Archaeologist, shared their extensive knowledge of local prehistory and the natural environment concerning central Idaho. Eddy Baker, long time area resident, provided useful information concerning numerous aspects of local history and the environment. Soil monoliths were taken using advice and supples provided by Anita Falen, Research Associate, Department of Plant, Soil, and Entomological Sciences and Maynard Fosberg, Professor of Soil Science volunteered his time to analyze and describe the monoliths.

Several people at Washington State University provided important services for the completion of this report. J. Jeffrey Flenniken, Assistant Professor in the Department of Anthropology, thermally treated and knapped a sample of the East Fork Lookout rhyolite. Christopher L. Brown, perennial student in the Department of Anthropology, identified and described the faunal remains. John Sheppard and Yvonne Welter, Department of Chemical Engineering, provided the radiocarbon assays.

Various personnel here at the Laboratory of Anthropology were responsible for completing this report. Roderick Sprague, Director, served as Principal Investigator and edited the final version of the report. Catherine Lubben, Secretary/Office Coordinator, managed the paperwork and supervised the typing and editing of all the different versions of this manuscript. Additional typing was done by Thomasene Blevins. Drafing was done by Ray Vefik, David Petersen, and Ken Kettener. Thanks to everyone for their support and help.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

The Sites

Archaeological investigations on the East Fork of the Salmon River in the vicinity of Big Boulder and Baker creeks occurred on four separate occasions between October 1981 and June 1982. The sequence included mitigation excavation of 10-CR-768, reconnaissance and recording of 10-CR-789, test excavation of 10-CR-789, and reconnaissance and test excavation of 10-CR-93. After each phase of the work the results and report were modified accordingly and, consequently, this report represents a diversity not normally found in similar projects. However, methods such as the use of 3 mm (1/8 in.) mesh wire for screening and the trinomial decimal system for cataloguing remained constant. Similarly, categories of lithic material are identical at all sites and the same criteria for the application of x-ray flourescence trace element analysis of the obsidian items (Appendix) were employed for all three sites. Each site is discussed separately since the situation and resulting data varied significantly according to the nature of the sites and the requirements for the various types of investigation.

Big Boulder Creek Site (10-CR-768)

The Big Boulder Creek site is located on the west bank of the East Fork of the Salmon River on an alluvial terrace of mixed sands, gravels, and silts (Figs. 1, 2, 3). At an elevation of 1850 m (6065 ft.), the site is situated at the base of three knolls which rise to an elevation of 1865 to 1870 m (6120 to 6140 ft.).

With the proposed construction of the Hagerman Satellite Fish Hatchery by the U. S. Army Corps of Engineers, Walla Walla District, the area was surveyed for evidence of cultural remains. Surface materials consisted of cryptocrystalline flakes, cut and burned bone, an end scraper, and a Desert side notched projectile point (Green 1981). Testing of the area to be impacted by construction was recommended.

Excavation of eleven test pits by the Idaho State Historical Society in June 1981 determined the site boundaries and located significant archaeological deposits in the upper 30 cm of soil. Flakes, burned and cut bone, and fire-cracked rock were found; although no features were located at that time, cultural remains suggested their possible presence. As no other excavations had been conducted on the East Fork of the Salmon River it was determined that further excavations of 10-CR-768 could potentially produce information on the age of the site, activities at the site, and seasons when these activities took place. Since fish hatchery construction would adversely impact the site, mitigation was recommended (Green 1981).

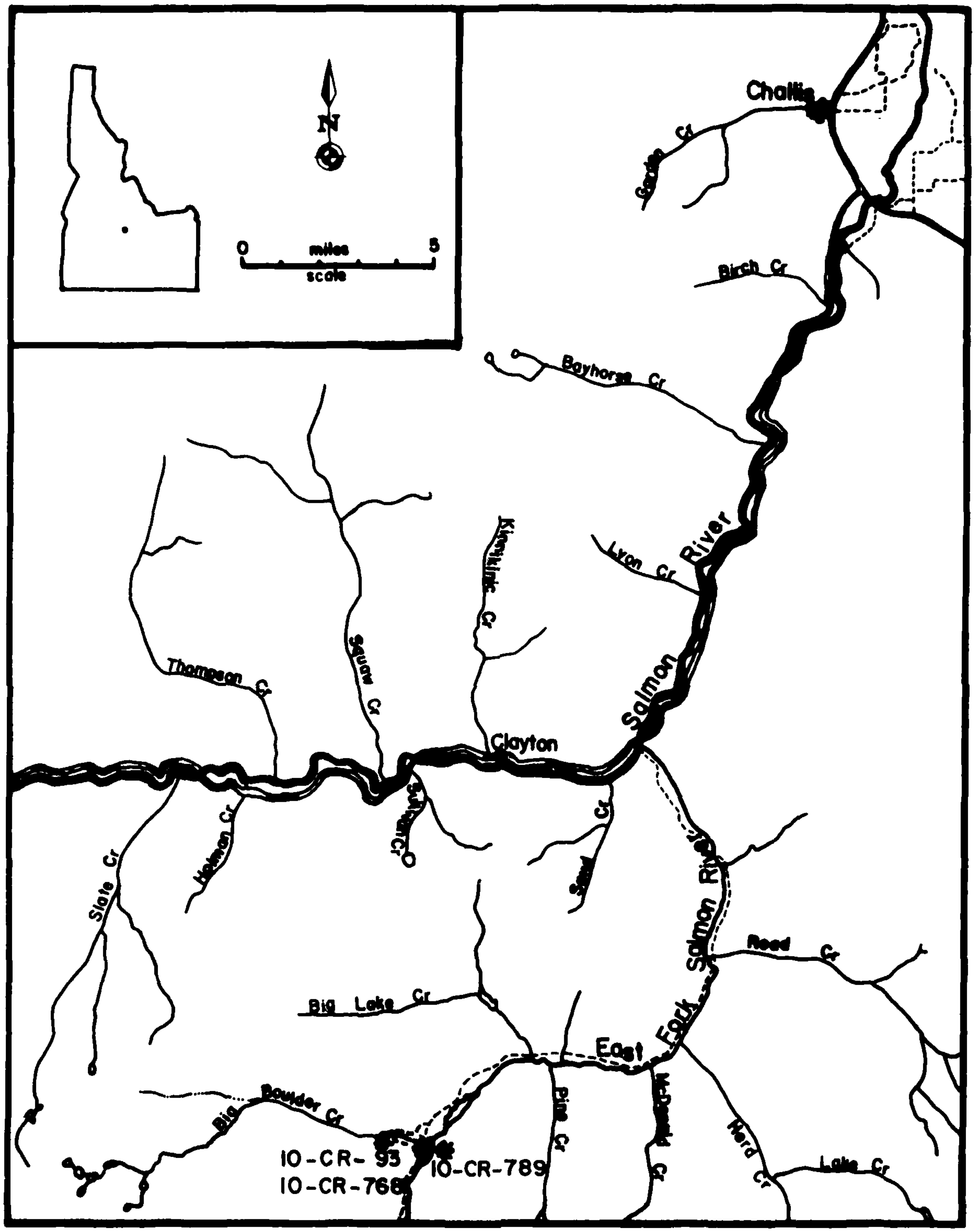


Fig. 1. Location of Big Boulder Creek site (10-CR-768), Baker Creek site (10-CR-789), and Hatchery Road site (10-CR-93). Base map is USGS 1:250,000 Challis, Idaho (1957).

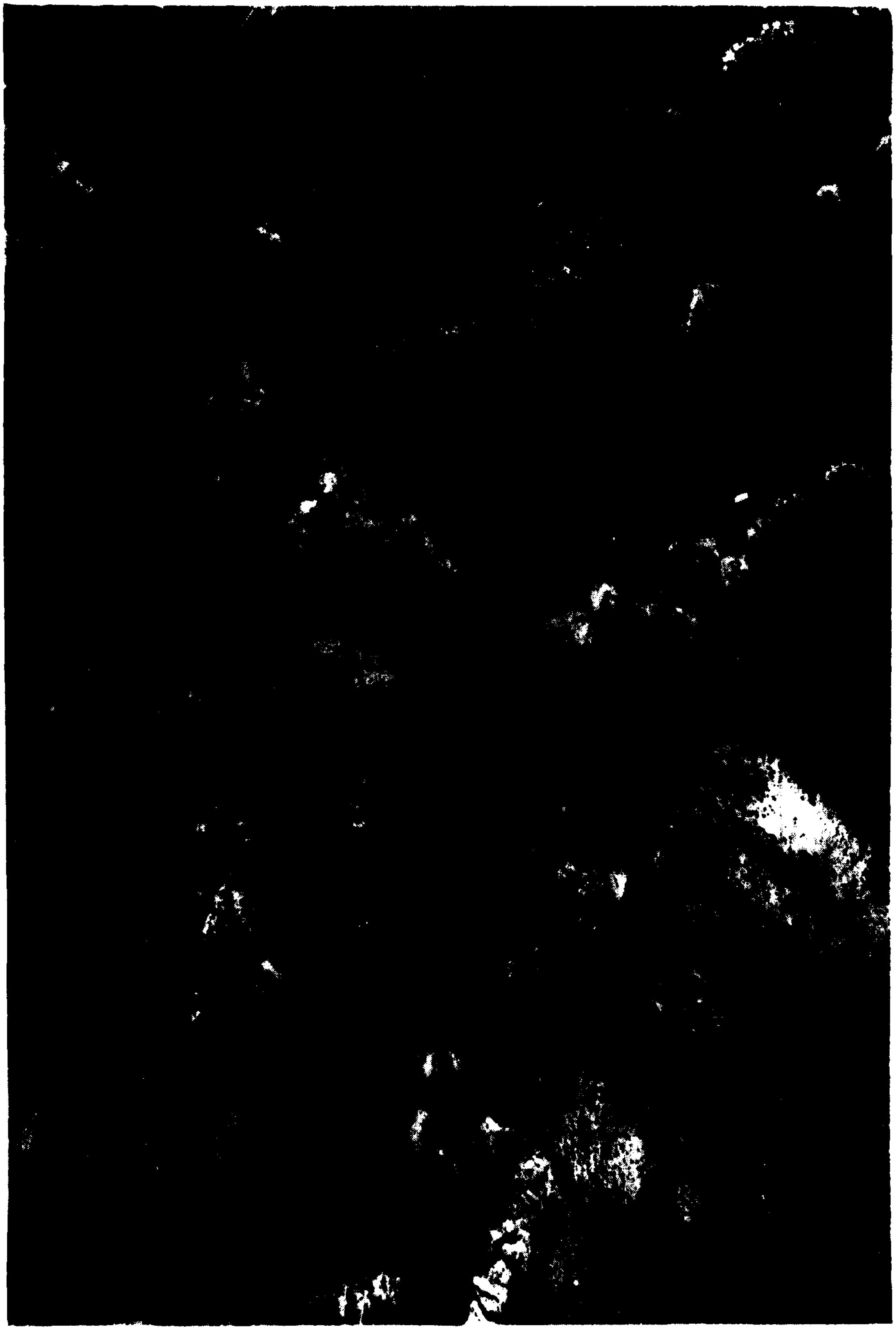


Fig. 2. Aerial view of sites.

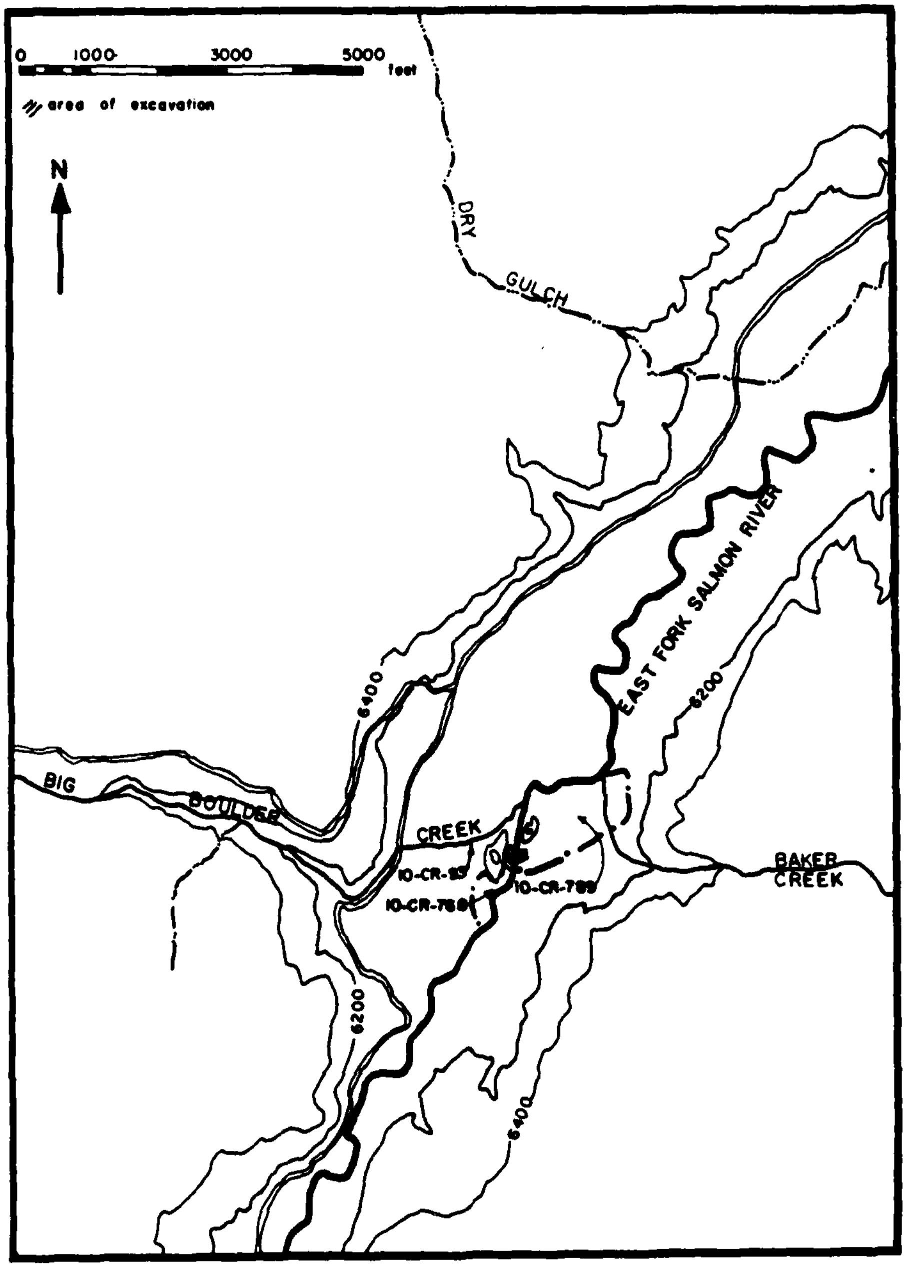


Fig. 3. Location, boundaries, and excavated areas of 10-CR-768 and 10-CR-789; location of 10-CR-93. Base map is USGS 1:24,000 Bowery Creek, Idaho (1963).

In October 1981, three archaeologists from the Laboratory of Anthropology, University of Idaho were requested to mitigate the site with a 2% excavation consisting of a total of 48 1m^2 units. Areas selected for excavation were based on previous testing results. Due to the cultural remains encountered during mitigation only 31 m^2 units were completed within the time allowed. Five features were excavated and included fire pits and rock concentrations. Radiocarbon dates from two features dated the site to 165±75 BP (WSU 2663) and 1840±75 BP (WSU 2664). Debitage and flaked tools of chert, rhyolite, obsidian, and vitrophyre were recovered as well as cobble tools. Faunal analysis also revealed the presence of bighorn mountain sheep (*Ovis canadensis*) at the site.

Baker Creek Site (10-CR-789)

An inspection of the area of weir construction associated with the fish hatchery resulted in the recording of 10-CR-789, the Baker Creek site, across the river from the Big Boulder Creek site (Figs. 1, 2, 3).

During reconnaissance in November 1982, flaked lithic material was found extending 610 m (2000 ft.) north-south and 305 m (1000 ft.) east-west at an elevation of 1848 to 1853 m (6060 to 6080 ft.). The cultural remains were located on the second terrace above the East Fork of the Salmon River and south of Baker Creek. Because the newly recorded site was located directly across from the recently excavated Big Boulder Creek site, the lithic materials of the two sites were similar and with the depth of irrigation ditches suggesting potentially deep, stratified deposits; subsurface testing for determining site significance was recommended (Sappington 1982a).

In April 1982, three archaeologists from the Laboratory of Anthropology returned to the East Fork and tested the proposed weir construction area by excavating eight 1m^2 test pits on the first terrace above the floodplain. Although some cultural material was found, it was not extensive and the significant portion of the site appeared to be located on the next, or second, terrace above the area to be impacted; no further archaeological work was deemed necessary.

Hatchery Road (10-CR-93)

Archaeological investigation of an additional area of the Hagerman Satellite Fish Hatchery took place in June 1982, again by three archaeologists from the Laboratory of Anthropology, University of Idaho. The proposed road had been staked by surveyors, beginning at the present East Fork Road and continuing across a flat terrace to the construction site of the Hagerman Satellite Fish Hatchery on the East Fork of the Salmon River at the confluence of Big Boulder Creek (Figs. 1, 2, 3). This staked road right-of-way was examined and areas of concentrated lithic materials were designated as areas A, B, C, D, and E. From site files it appeared that Area A had been recorded as 10-CR-93 in the 1960s. The additional areas documented during this work are also considered as 10-CR-93 because of their close proximity to area A and to each other. Diagnostic artifacts and debitage were collected for further analysis and two pits were excavated.

Environmental and Biotic Settings

The study area falls within the boundaries of the Bureau of Land Management's Challis Planning Unit for which an extensive Environmental Impact Statement was prepared in 1977. Most of the following environmental and biotic data have been taken from this document (Department of the Interior 1977).

Climate

Air flow controlling weather in the Challis area is predominately westerly. Lower elevations tend to be sheltered from winds and precipitation by the high Salmon River Range to the west and the White Cloud Peaks, Pioneer, and Sawtooth ranges to the southwest. Clear conditions prevail during summer days with cumulus clouds in the late afternoon and early evenings. Severe thunderstorms are infrequent and relative humidity is low. During winter months stormy conditions are infrequent and of short duration and days are usually clear or partly cloudy. The average annual temperature at Challis is 44.1°F (6.5°C) (Department of Interior 1977:2-1). Big Boulder Creek and Baker Creek areas average 25 cm (10 in.) of rain per year (Department of the Interior 1977:Map 2-1).

Geology and Topography

The entire Challis Unit is underlain by a thick sequence of predominately marine sedimentary rocks of Paleozoic age including limestone, dolomites, quartzites, and argillites. Ash-beds and lava flows of the Challis volcanics of Tertiary age overlie older rocks. These rocks consist of an interbedded sequence of andesite and basalt flows, welded tuffs, and air-fall and water-laid ash of latitic to rhyolite composition. Quaternary sediments are represented by alluvial gravels, landslide debris, talus cones, and glacial deposits (Department of the Interior 1977:2-3). The sites are located on an alluvium terrace deposit. At Big Boulder Creek, volcanic basalt formations rise above and to the west of the alluvium terrace (Department of the Interior 1977:Map 2-2).

Soils and Water Resources

Alluvial soils are generally 15-25 cm (6-10 in.) deep over gravels and cobbles in the area and are developed from material washed from the uplands and high landscapes and redeposited along stream courses. A problem of overland flow and sediment transportation into streams is pronounced during periods of intense thunderstorms in the vicinity (Department of the Interior 1977:2-16,2-17).

Formations and soils associated with the Challis volcanics, such as those near the two sites, are rock outcroppings, talus, or soils less than 25 cm (10 in.) deep over bedrock. Long periods of weathering have produced extensive talus rockslides (Department of the Interior 1977:2-20).

Within the Challis Planning Unit are 47 perennial streams and 12 major intermittent streams.

Vegetation

The six major vegetative types in the Challis Unit include sagebrush-grass, grass, shadscale, wet meadow, conifer, and mountain mahogany.

All sites in the study area fall within the sagebrush-grass zone; this zone changes to the conifer zone a short distance up Big Boulder Creek (Department of the Interior 1977:Table 2-10). Major vegetative species of the Sagebrush-grass Type are Big Sagebrush (*Artemesia tridentata*), Bluebunch wheat grass (*Agropyron spicatum*), and Idaho fescue (*Festuca idahoensis*) (Department of the Interior 1977:2-41).

Farther up Big Boulder Creek the conifer vegetative species consist of Douglas fir (*Pseudotsuga taxifolia*) and Lodgepole pine (*Pinus contorta*) (Department of the Interior 1977:2-12) with mixing of Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), aspen (*Populus tremuloides*), and cottonwood (*Populus spp.*) (Department of the Interior 1977:2-52).

Fauna

Large mammals typically found in the sagebrush-grass environment include mule deer (*Odocoileus hemionus*), antelope (*Antelocapra americana*), and bobcat (*Lynx rufus*) year round, and elk (*Cervus canadensis*), bighorn sheep (*Ovis canadensis*), and mountain lion (*Felis concolor*) in winter months. Small animals, birds, and reptiles found in the sagebrush-grass vegetative type include: chipmunk (*Eutamias* spp.), weasel (*Mustela* spp.), sagebrush vole (*Lagurus curtatus*), Richardson's ground squirrel (*Citellus richardsonii*), shrew (*Sorex* spp.), mountain cottontail (*Sylvilagus nuttallii*), black-tailed jack rabbit (*Lepus californicus*), white-tailed jack rabbit (*Lepus townsendii*), coyote (*Canis latrans*), sage grouse (*Centrocercur urophasianus*), blue grouse (*Bonasa umbellus*), chukar (*Alectoris graeca*), mourning dove (*Zenaidura macroura*), meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), western rattlesnake (*Crotalus viridis*), and sagebrush lizard (*Sceloporus graciocus*).

Large mammals of the conifer environment include year round occupation by mule deer, elk, black bear (*Ursus americanus*), mountain lion, lynx (*Lynx canadensis*) and bobcat. The chipmunk, weasel, mountain cottontail, coyote, blue grouse, and western rattlesnake can also be found in the coniferous environment in addition to pine marten (*Martes americana*), red squirrel (*Tamiasciurus hudsonicus*), porcupine (*Erithizon dorsatum*), mountain vole (*Microtus montanus*), black-capped chickadee (*Parus atricapillus*) and downy woodpecker (*Dendrocopos pubecens*) (Department of the Interior 1977:Table 2-18).

Today, an estimated 25-50 mule deer use the area along the East Fork during the summer season, increasing to 200-300 during winter months (Department of the Interior 1977:Table 2-19). The deer inhabit south facing slopes up to 2600 m (8500 ft.) in elevation during open winter months and in more severe winters the animals are concentrated below 1980 m (6500 ft.) (Department of the Interior 1977:2-59). From late fall to early spring, mule deer can be seen in small herds throughout the East Fork valley from the Salmon River to Big Boulder Creek.

Two bands of Rocky Mountain bighorn sheep utilize the Challis Planning Unit, one on the East Fork and the other in the Birch Creek area. The East Fork herd is comprised of approximately 50-70 animals arriving in the area during late October or November at the beginning of breeding season. Winter and early spring are spent between Big Boulder Creek and Joe Jump Basin on the north side of the East Fork. By May, enroute to higher summer ranges, most ram and dry ewe groups have moved up to Railroad Ridge on the Challis National Forest. By mid-June the pregnant ewes have lambed and together they travel to summer areas in the White Cloud Peaks. The distance between winter and summer ranges is about 16 mi. (26 km) (Department of the Interior 1977:2-62). The Big Boulder Creek site is located within the bighorn sheep winter habitat; the Baker Creek site is not, as the bighorn sheep do not cross over the East Fork of the Salmon River (Department of the Interior 1977:Table 2-19).

Few elk inhabit the East Fork drainage; they may pass through the area enroute to other places or, occasionally, winter in very small numbers (Department of the Interior 1977:Table 2-19).

Approximately 30-50 pronghorn antelope inhabit parts of the East Fork drainage year round (Department of the Interior 1977:Table 2-19). They are found primarily in the lower valleys near the mouth of the East Fork. Some bands may travel upward in summer months to mountain slopes and ridgetops rising over 275 m (900 ft.) in elevation (Department of the Interior 1977:2-65). The Big Boulder Creek and Baker Creek sites exist about 21 km (13 mi.) outside of the lower valley range of the antelope (Department of the Interior 1977:Map 2-14).

Many blue grouse, sage grouse, and chukars exist along the East Fork drainage (Department of the Interior 1977:Table 2-19).

The East Fork of the Salmon River, Big Boulder Creek, and Little Boulder Creek produce both anadromous and resident fish. Upstream from the mouths of the two creeks, only resident fish are produced (Department of the Interior 1977:Map 2-5). Species of fish found in these waters are: chinook salmon (*Oncorhynchus tshawtyscha*), steelhead trout (*Salmo gairdneri*), rainbow trout (*Salmo gairdneri*), cutthroat trout (*Salmo clarki*), dolly varden (*Salvelinus malma*), and Mountain white fish (*Prosopium williamsoni*) (Department of the Interior 1977: Table 2-24). The East Fork is one of the most important stream for salmon production in the entire upper Salmon River watershed, is an important steelhead producing stream, and is an important streams for the production of species of resident fish (Department of the Interior 1977:2-77, 2-80).

Historically, adult chinook salmon (*Oncorhynchus tshawtyscha*) and steelhead trout (*Salmo gairdneri*) abounded in the Salmon River during seasons of spawning runs. In the late nineteenth century the head waters of the Salmon River at Alturas, Pettit, Redfish, and Stanley Lakes were important spawning grounds for the chinook salmon, the redfish, or blueback salmon (*Oncorhynchus nerka*), and the salmon trout or steelhead trout. The chinook salmon arrived to spawn from mid-August to the first of September, and the steelhead salmon arrived in the spring to spawn between early May and mid-June (Everman 1896:260-277).

Migrating about 1374 km (848 mi.) from the Pacific Ocean, salmon enter the East Fork to spawn. Over 84 km (52 mi.) of the main Salmon River and the East Fork are utilized by summer chinook for spawning and rearing. Although adult anadromous fish might not spawn in the smaller tributary streams of the Salmon River and East Fork, the young fish enter them during summer months and migrate upstream to take advantage of preferred cooler water. Some juvenile chinook, hatched in the East Fork, enter tributary streams such as Big Boulder and Little Boulder creeks during summer months primarily because of cooler water temperatures. Spring chinook spawn within 20 km (12 mi.) of the upper East Fork and Herd Creek (Department of the Interior 1977:2-76, 2-77). A nearby resident and owner of land in the Big Boulder Creek vicinity, reports salmon spawning in large numbers along this portion of the East Fork (Eddie Baker 1982:personal communication).

The East Fork is also an important steelheadproducing stream, with lesser populations in the lower parts of Big Boulder and Little Boulder creeks (Department of the Inter.or 1977:2-80). Steelhead trout spawn in the area from December through March (Epperson 1977:56).

Cultural Background

History

The first Euroamericans to explore the Challis area were part of a Hudson's Bay Company fur trapping brigade led by Michael Bourdon in 1822. Others of the fur trade to travel through the area included Alexander Ross, Thomas McKay, John Work, and Captain B. L. E. Bonneville. By 1833 beaver were depleted and between the mid-1830s and mid-1860s few Euroamericans passed through this part of the country (Department of the Interior 1977:2-118-2-121, A-41).

The accounts of Warren A. Ferris of the American Fur Company of his 1831 expeditions in the Salmon River country in search of beaver include the first reported references to the East Fork of the Salmon River. Following his travels closely, however, it becomes evident that he was not referring to the present day East Fork, but rather an East Fork of the Salmon River in the vicinity of today's Lemhi River, possibly Eighteenmile Creek. Editor's footnotes provide the information that Market Lake is Mud Lake Gordiz River is Big Lost River, Little Salmon River is Lemhi, and Cotas Creek is Medicine Lodge Creek (Ferris 1940:86, 96, 97). Ferris returned from the Salmon country by way of Gordiz River and Little Salmon to Day's Defile crossing mountains to Cota's Defile and the headwaters of the *east fork of the Salmon river*. His description of this fork of the Salmon states that it flowed *northwestward* 50 mi. to the Salmon River (Ferris 1940:103). He also writes of descending into Horse Prairie 15 mi. north of the East Fork Valley (Ferris 1940:104) and of coming "into a large plain, where Cotas Creek, and the east fork of Salmon River, both take their rise (Ferris 1940:145-146). Furthermore, a return trip takes him "southward up Salmon River to the western extremity of little Salmon River valley, forty miles above the entrance of the east fork" (Ferris 1940:128).

As Ferris's references to the East Fork of the Salmon refer to an area outside our study area, it appears that there are no accounts of Euroamericans in the Big Boulder creek vicinity or the East Fork prior to the advent of mining in the late nineteenth century.

Thousands of miners poured into the region in the 1860s following the discovery of gold throughout the Salmon River mountains and along the river's tributaries. Towns such as Clayton on the Salmon River, Crystal City at the mouth of the East Fork, Bayhorse, and Challis were founded to supply mining regions. The population of the mining districts increased in the late 1880s and small farms and ranches appeared in nearby valleys to supply fresh produce and meat. Freight and stage roads were established to make products available to the mining districts (Department of the Interior 1977:2-121).

Near the headwaters of the East Fork, mining of lead ore was short-lived, beginning in the 1880s and ending by the 1890s (Umpleby 1914:224). Three concentrated areas of mining included the Galena, Warm Springs, and East Fork districts. Within the East Fork District mining of lead ore took place on the north side of Germania Creek (upriver from Big Boulder Creek) at Germania and Washington basins. Lead silver deposits were discovered in Germania Basin in 1880 and worked for seven years. After 1894 gold quartz ledges were worked here (Umpleby 1914:244). "This area is one of the most rugged regions in the State, some of the adjacent peaks having elevations reported to be more than 12,000 feet, and one peak over 13,000 feet" (Varley and others 1919:71).

During mining in the 1890s in the East Fork area, a good road formed the main thoroughfare from Hailey and Ketchum through the mining area and into Stanley Basin crossing along the valleys of Wood and Salmon rivers (Umpleby 1914:233). The Germania mining area could be reached from Clayton or Ketchum. A wagon road extended 50 mi. "from Ketchum to the head of Wood River, over the Galena summit into the valley of Salmon River [(East Fork?)] and thence up Pole Creek over a fairly easy summit into Germania Basin and onto Washington Basin. The area also may be reached by trail from Clayton, about 25 miles to the north" (Umpleby 1914:244).

An 1891 General Land Office map of Idaho (Fig. 4) shows a trail up the East Fork on to Galena. This and a more extensive network of trails and roads are illustrated in the U. S. G. S. study of the area in 1914. (Umpleby 1914:topographic map). Today, Galena can be reached, during high snow levels, by following the East Fork over the mountains to Big Wood River (Eddie Baker personal communication:1982).

Travel routes were established in this rugged area in the late nineteenth century and possibly before that time. Steward's aboriginal villages and subsistence areas of Idaho suggests a possible travel route from the mouth of the East Fork to Camas Prairie (Steward 1938:Fig. 10). Wintering near the mouth of the East Fork, the *Pasasigwana* "once ... went to Camas Prairie where they procured some horses ..." (Steward 1938:188). It is likely that a travel route, possibly a main one, existed prehistorically between the mouth of the East Fork, through the East Fork valley, over the mountains, to the Big Wood River and into Camas Prairie.

In 1881 Custer County was created and Challis elected as the county seat. Mining activity slowed in the late 1890s and early 1900s and miners soon left the area or acquired farms and ranches in the river valleys (Department of the Interior 1977:2-121).

Today the economy of Custer County and the town of Challis is based largely on ranching, agriculture, retail trade, tourism, and government activity. Of 44 Idaho counties, Custer ranks third in area, though only 37th in population. Population density is low and all of Custer County is considered rural (Department of the Interior 1977:2-124). The lands of the Big Boulder Creek area are used for livestock grazing and hay production (Department of the Interior 1977:2-121).

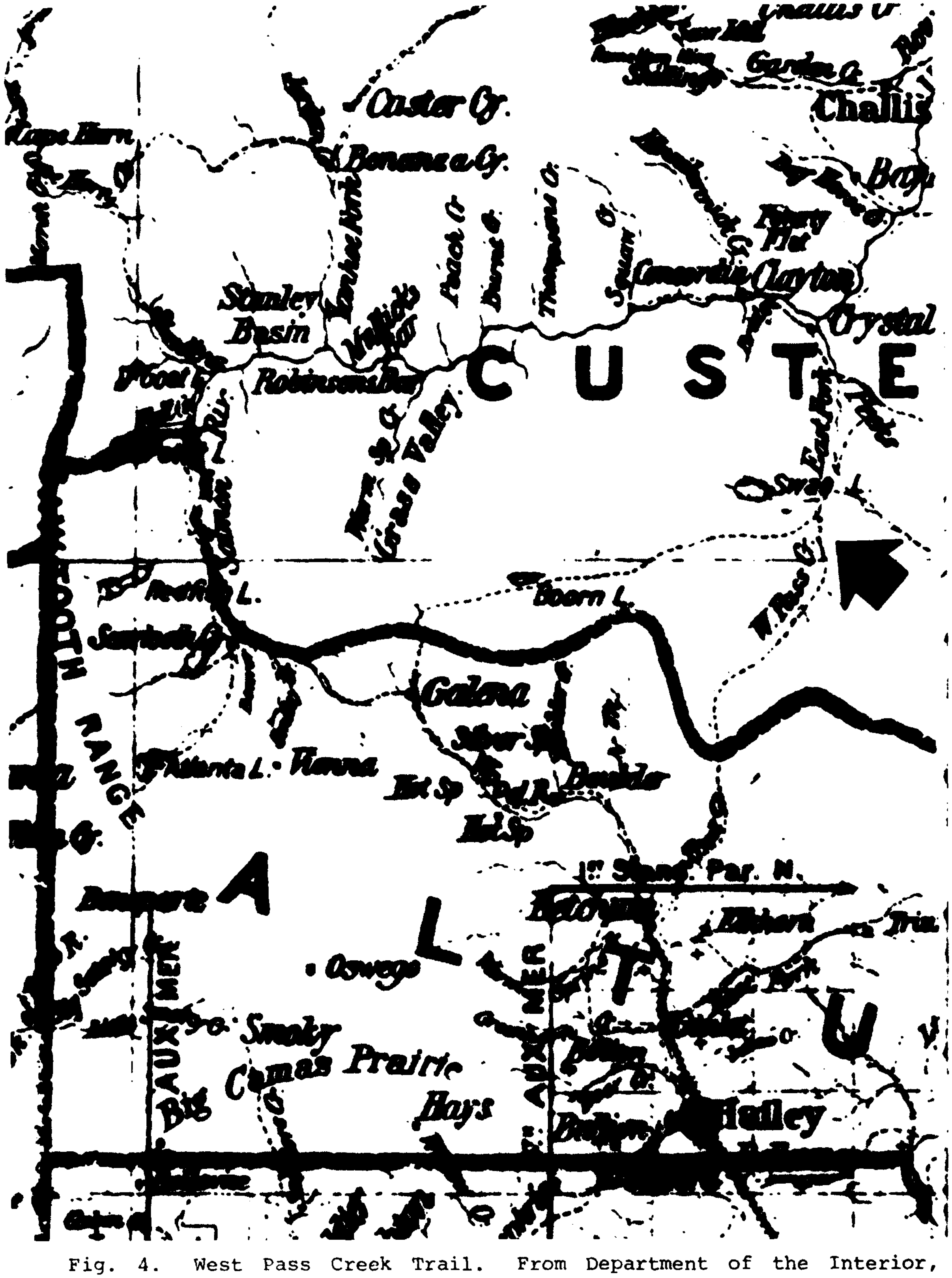


Fig. 4. West Pass Creek Trail. From Department of the Interior, General Land Office, 1891 in Madsen 1979:140 (enlarged). Swan Lake is now called Jimmy Smith Lake; Boorn Lake is now called Crater Lake. Arrow points to 1891 trail and approximate location of project area.

Ethnographic Background

Population

The Northern Shoshoni inhabited this part of Idaho, establishing large villages along the Lemhi River and fewer, smaller villages in the mountains; a marked cultural difference existed between the Shoshoni of the Lemhi River and those of the mountain ranges. The East Fork of the Salmon and Big Boulder Creek fall within the area occupied by the *tűkudeka* or Sheepeaters. Little is known historically or ethnographically about these mountain Shoshoni.

Steward estimated the total *tűkudeka* and Lemhi population as "about 200 families or 1200 persons in a subsistence area of some 27,000 square miles, or 1 person to 22.5 square miles", with the total *tűkudeka* people as "perhaps 100 families" (Steward 1938:189). He located one *tűkudeka* group of families near the mouth of the East Fork; during summer months groups of 2-3 families gathered vegetables and hunted small game "around the headwaters of Salmon River, East Fork of the Salmon River, the Lost River Range and the Salmon Range" (Steward 1938:187). The Yankee Fork of the Salmon Rivers was "the principal spawning ground of the Columbia River salmon and a center of *tűkudeka* winter camps" (Liljeblad 1957:100).

Subsistence

The *tűkudeka* subsisted on seasonal procurement of seeds, roots, mountain sheep, deer, and salmon (Steward 1938:189). "Practically all the food plants which are reported to have been utilized by Idaho Indians and a few more besides, are found within the territory once inhabited by the *tűkudeka*" (Liljeblad 1957:96). Families came together during fishing season and "people who fished together also wintered together in villages of considerable size near the salmon streams" (Liljeblad 1957:96). Fish were taken in the Salmon River and its tributaries. *Tahmaagai*, spring salmon, could be taken all winter long, and in March they went into small streams to spawn; redfish in August, Chinook Salmon in August. During early spring and summer, salmon could be taken from the river while game was hunted nearby (Steward 1938:192).

Although essentially an isolated people, avoiding outside contacts (Steward 1938:186-187), there are accounts of extensive travel by the *tűkudeka*. Their closest contacts were with the Lemhi, but they were known to have visited the valleys of the Boise and Weiser rivers (Murphy and Murphy 1960:323) and Camas Prairie for roots (Steward 1938:188).

> "They participated in trade on a small scale and sought contact with other people. Old people among them remembered having heard about journeys on foot to the country where the Salmon and Snake Rivers meet" [Liljeblad 1957:98].

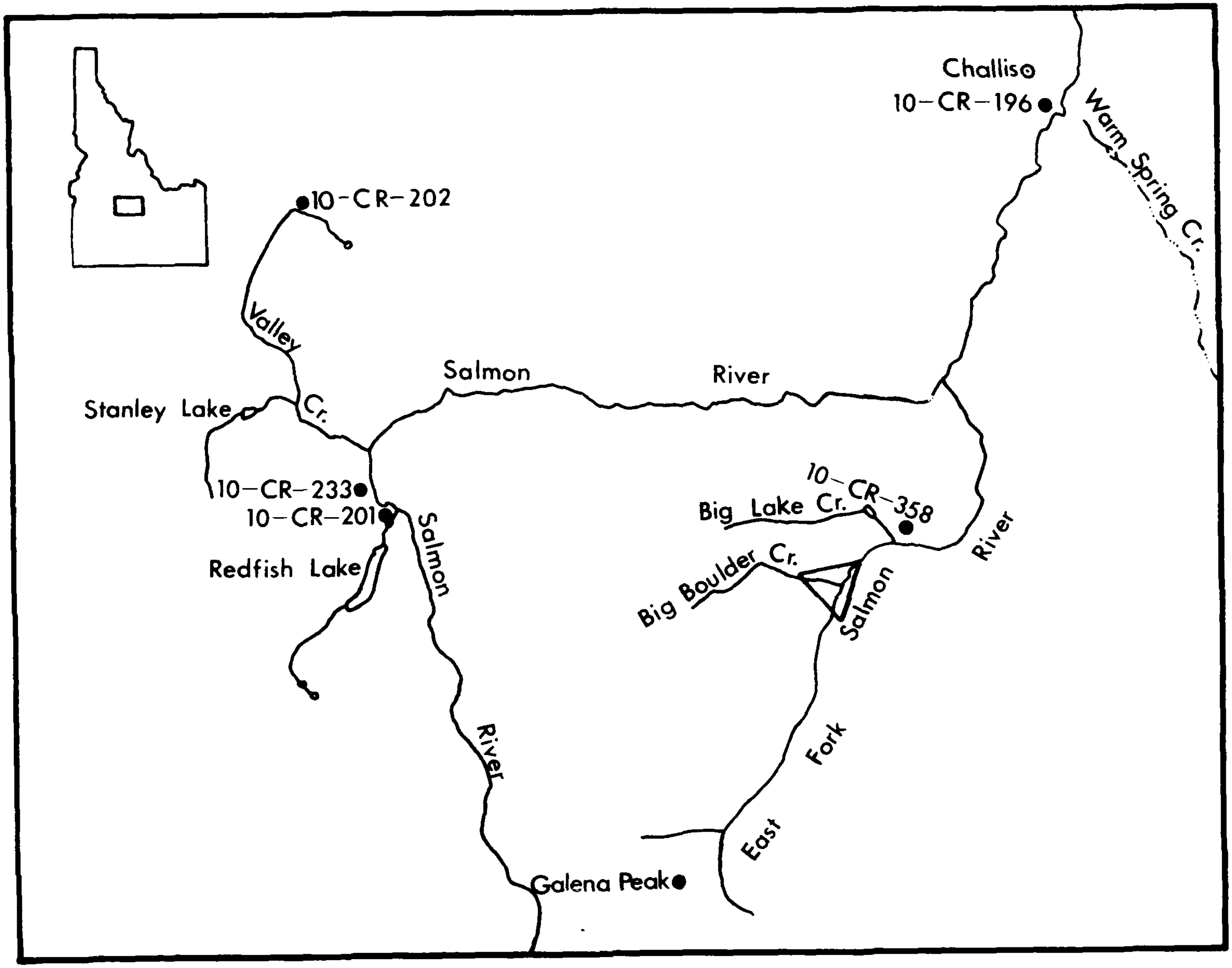


Fig. 5. Location of excavated or dated sites on the Salmon River in the vicinity of the study area (indicated by the triangle).

TABLE 1

Excavated or dated sites on the Salmon River in the vicinity of the Study Area

Site Number	Site Name	Description	Elevation (ft.)	Radiocarbon Dates	References
10-CR-196	Challis Bison Jump	Bison kill site	5080	1030±159 BP (SM 1354)	Butler 1971:4-32
10-CR-201	Red Fish Overhang	Small encampment Hunting and vegetal resource exploitation	6500	670±130 BP (WSU 1410, 1410b) 10,00±300 BP (WSU 1396)	Gallagher 1975 Sargeant 1973
10-CR-233	Dancing Cat site	Possibly seasonal winter encampment. Late prehistoric one component occupation area. Hunting economy	6400	None	O'Conner 1974
10-CR-358	East Fork Lookout	Rhyolite quarry. House structures. Hunting blinds	6840-7240	610±70 BP (WSU 1587)	Butler 1978 Epperson 1977

Groups of Shoshoni south of the Sawtooths, between American Falls and Bruneau, the Middle Snake, were known to hunt in the mountain country north of Hailey and "bighorn sheep were also pursued in the mountainous crags of this area" (Murphy and Murphy 1960:322).

After the introduction of the horse, during summer some families went east to hunt buffalo while others went west to Camas Prairie to trade buffalo hides for horses. Trips made to Camas Prairie were by small independent groups of related families, staying until October when they returned to the Lemhi River in the fall for winter (Steward 1938:191).

The Sheepeaters appear to have remained isolated into the historic period, being among the last to move to the reservations (Steward 1938:18; Liljeblad 1972:39-40; Wells 1980).

Previous Archaeology

Excavated sites in the study area are few (Fig. 5, Table 1), but they exhibit a wide variety of subsistence patterns, with varying numbers and kinds of artifacts and features encountered.

Excavation of Redfish Overhang (10-CR-201) in Stanley Basin indicates occupation in the area as early as 10,000 years ago (Sargeant 1973:63). Investigations of Shoup rock shelters in the Salmon River Canyon suggest occupation by 8000 years ago (Swanson and Sneed 1966:44); similarly, based on projectile point styles, occupation of the Sheepeater Battleground (10-CR-202) spanned 7000 years (Gallagher 1975).

While early prehistoric occupations reflect subsistence based on hunting, later occupations tend to represent both hunting such as the Challis Bison Jump (10-CR-196) (Butler 1971) and Sheepeater Battleground (Gallagher 1975) and a combination of hunting, gathering, and fishing as inferred from the archaeological records of Redfish Overhang (Gallagher 1975) and the Dancing Cat Site (10-CR-233) (O'Connor 1974).

Surveys of the Salmon River have shown extensive occupation along portions of the river. A survey of 200 km (125 mi.) of the Salmon River north of Challis added 241 new sites to the previously documented 58 sites, and demonstrated that this area had been intensively and extensively used prehistorically (Harrison 1971:9, 19). Similarly, a survey of the Middle Fork suggested human use of the area for at least 5000-6000 years with artifacts representing generalized hunting and gathering (Knudson and others 1982:133).

Prior to the Big Boulder Creek site excavations, no archaeological sites had been excavated along the East Fork of the Salmon River. Previous archaeological research on the East Fork of the Salmon River has been limited to two surveys.

During a 1966 reconnaissance for the Bureau of Land Management, lands were surveyed within the Salmon District by the Idaho State University Museum of Natural History at which time several sites were recorded along the East Fork (Swanson, King, and Chatters 1969:31). Among the inferences drawn from site density and ratios recorded during the survey was that areas outside of the upper Salmon and Big Lost River valleys "were used primarily for transient food collecting activities, especially hunting and fishing, rather than for semi-permanent winter village settlement..." (Swanson, King, and Chatters 1969:33).

In 1975 a cultural resource inventory of the Challis, Idaho, Bureau of Land Management Planning Unit was conducted by the Idaho State University Museum of Natural History; by the application of both random and non-random survey techniques, additional sites were recorded along the East Fork. Following locational analysis of archaeological sites it was concluded that "the factors governing site locations along the Salmon and East Fork rivers are not fully understood at this time" (Epperson 1977:58).

For the Challis Planning Unit as a whole, Epperson observed that intensive utilization of the area probably occurred during the fall, winter, and early spring seasons when bighorn sheep and anadromous fish were available for large-scale exploitation. Two important factors in site location were accessibility of the area to big game in the surrounding higher elevations and the availability of aquatic food resources. Sites tended to be located in regions where game animals came down to water, explaining the high occurrence of sites at areas where tributaries drain into the rivers, providing natural travel routes between the river valley bottoms and the surrounding upland regions. Thus, the Challis area was one of winter encampments of 20 or more families hunting and fishing.

> With the approach of warmer weather came the dispersion of the big game herds and the termination of the steelhead runs. The winter encampments broke up into smaller groups or 'kin cliques' as the people moved to higher elevations or different areas outside the planning unit to exploit a wide variety of resources, probably including several plant foods [Epperson 1977:58].

Of the 12 sites recorded in the immediate vicinity of Big Boulder Creek (Fig. 6), eight include hunting blinds (Table 2). In addition, the East Fork Lookout site (10-CR-358), a rhyolite quarry with hunting blinds and possible house structures, has been dated at 610±70 BP (WSU 1587) (Butler 1978:73).

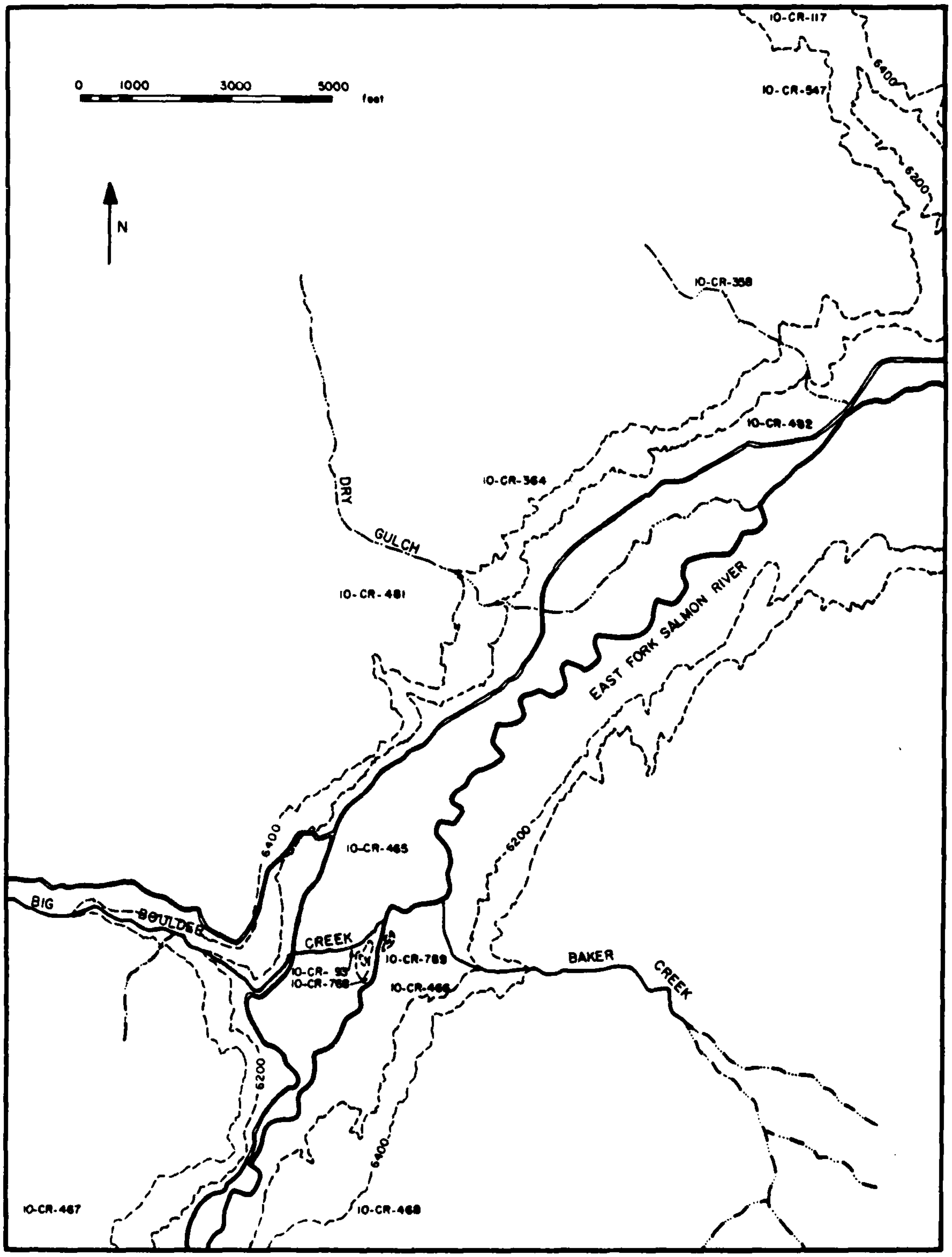


Fig. 6. Recorded sites on the East Fork of the Salmon River in the vicinity of the study area. Base maps are USGS 1:24,000 Bowery Creek, Idaho (1963) and Potaman Peak, Idaho (1963).

TABLE 2

Recorded sites on the East Fork of the Salmon River in the vicinity of the study area

Site Number[a]	Elevation (ft.)	Site Type	Artifacts	Features
10-CR-117	Not available	Open	Lithic scatter, Flaked tools	Hunting blinds/ House pits (2)
10-CR-547	6200-6260	Open	Lithic scatter	Hunting blinds/ House structures (6)
10-CR-358	6840-7240	Quarry	Lithic scatter, Flaked tools, Cobble tools	Hunting blinds (3)
10-CR-482	6200	Open	Lithic scatter	Hunting blinds (3)
10-CR-364	6200	Open	Lithic scatter	Hunting blind (1)
10-CR-481	6610	Open		Hunting blind (1)
10-CR-465	6080	Open		Hunting blind (1)
10-CR-789	6060	Open	Lithic scatter	
10-CR-768	6065	Open	Lithic scatter	
10-CR-466	6400	Open		Hunting blind (1)
10-CR-468	6360	Open		Hunting blinds (4)
10-CR-467	6800	Open	Lithic scatter	

[a] *from north to south*

2. ARCHAEOLOGY OF THE BIG BOULDER CREEK SITE (10-CR-768)

Excavations

The Big Boulder Creek site is located on the East Fork of the Salmon River near its confluence with Big Boulder Creek at an elevation of 1850 m (6065 ft.) and is bound by the river on the east and three rock outcrops rising to 1865-1870 m (6120-6140 ft.) on the west (Fig. 7). A hunting blind is located on the north side of the middle outcrop and lithic artifacts are scattered to the south beyond the immediate site boundaries on an open terrace above the river.

Although surface materials are evident over a large area, test excavations were carried out by Idaho State Historical Society archaeologists only in the area to be impacted by the U.S. Army Corps of Engineers' construction of a fish hatchery on the East Fork (Green 1981). This involved approximately 220 m north-south and 20 m east-west. Excavations were conducted on the river terrace and the flood plain and included seven 1 m^2 pits and four 1 x 2 m pits (Figs. 8 and 9) excavated to 20-100 cm in depth. All pits were excavated in 10 cm arbitrary levels using shovels and trowels and soil was screened through 6 mm (1/4 in.) mesh wire. Units were excavated on the flood plain until gravel was encountered and on the terrace until cultural materials were no longer located. During testing, the extent of the site was found to be primarily concentrated above the flood plain on a terrace near the base of the talus slope and within an area of ca. 75 m north-south and 40 m east-west. The depth of the site appeared to extend between 20 and 30 cm below the surface (Green 1981).

Excavations in October 1981 were carried out by Laboratory of Anthropology archaeologists to mitigate the site by recovering, through excavation, 2% of the site, or 48 1 m^2 pits, as recommended by the state archaeologist. The grid system established during test excavations was used and all cultural material from the testing has been incorporated within this later work (Table 3).

Mitigation efforts were concentrated within the terrace area to determine further the extent of the site and density of materials. Thirty-one 1 m^2 pits were excavated (Figs. 8 and 9), using traditional hand excavation methods, in arbitrary 10 cm levels until they were sterile of cultural material, between 20 and 40 cm below the surface (Table 3). All material was screened through 1/8 in. (3 mm) mesh wire.

Excavation units placed near the river bank and talus slope (Figs. 10 and 11) indicated that the area of concentrated cultural material narrowed to ca. 30 m north-south and 10 m east-west. Units 1, 7, and 10 yielded the greatest artifact densities, and units 2, 4, 5, and 6 exposed a large concentration of cobbles (Feature 1). As this later area was excavated to determine the boundaries of this feature, other features were encountered

Fig. 7. Aerial view of Big Boulder Creek site (10-CR-768). North is to the right.

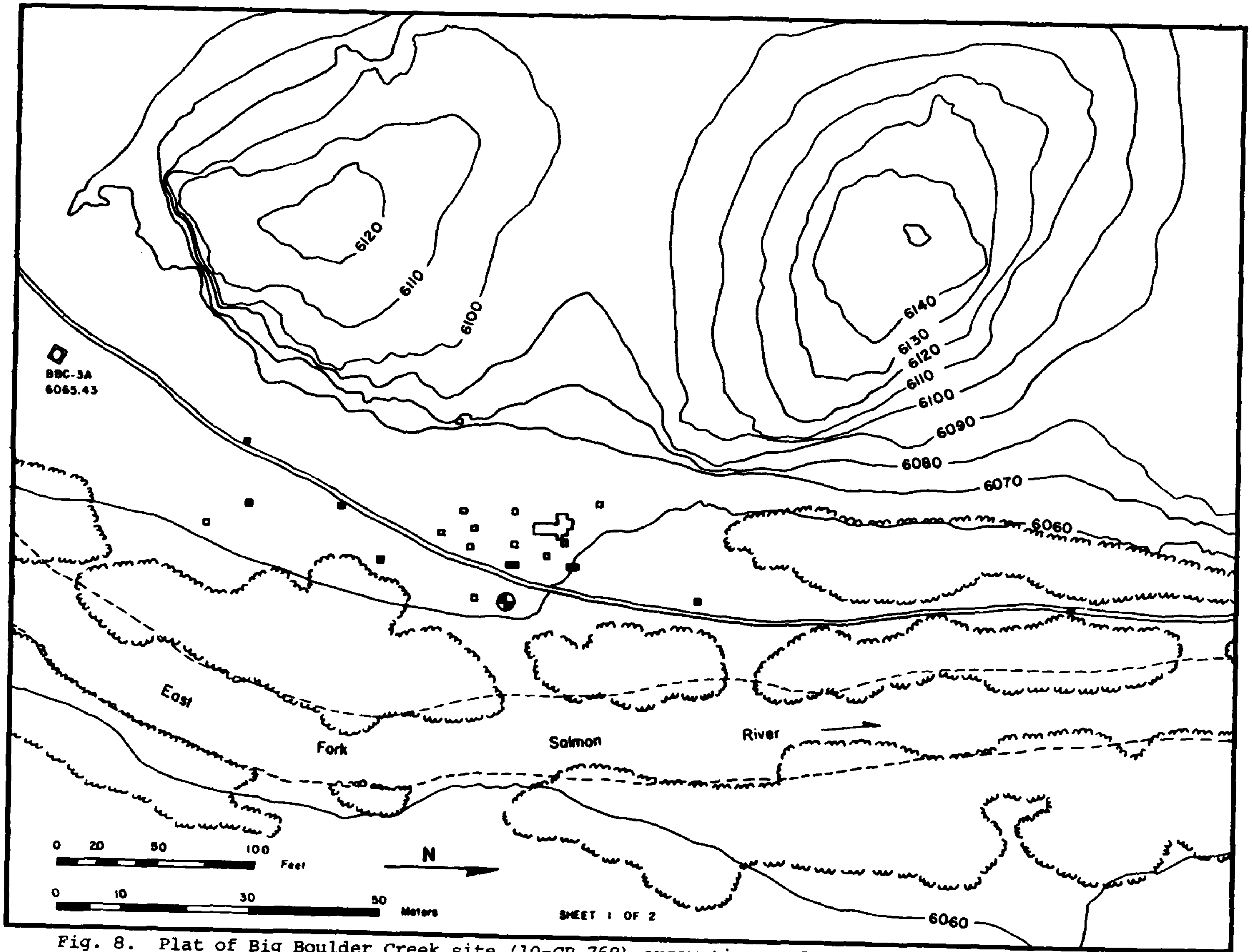


Fig. 8. Plat of Big Boulder Creek site (10-CR-768) excavations. Test excavations are shaded, mitigation excavations are open.

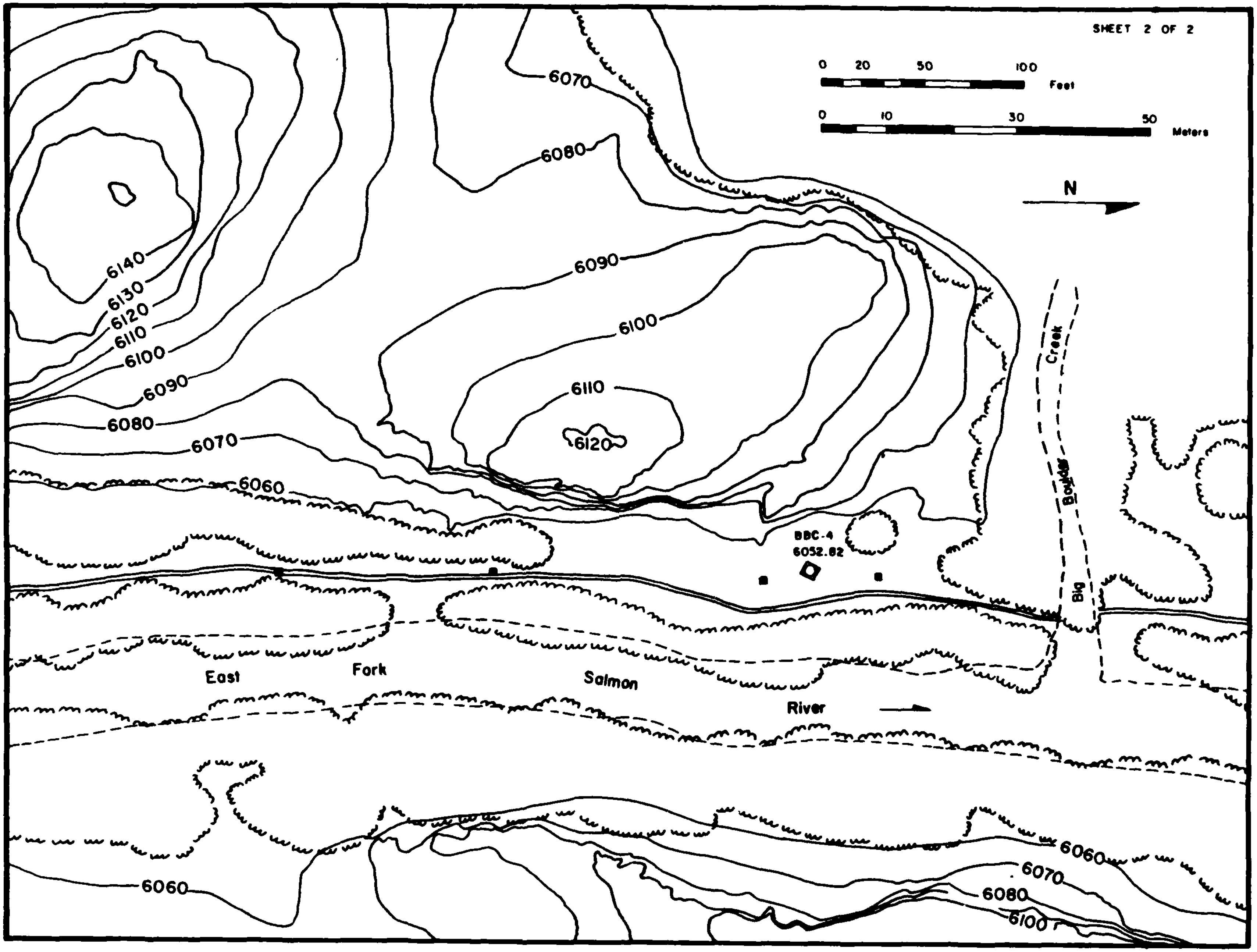


Fig. 9. Plat of Big Boulder Creek site (10-CR-768) excavations showing test excavations at far north end of project area.

TABLE 3

Big Boulder Creek site (10-CR-768) excavation units

*Mitigation excavation units**

Assigned Unit Number	Site Coordinates	Depth (cm)	Levels	Associated Features
1	492N 85E	40	4	
2	509N 88E	20	2	Feature 1
3	501N 90E	40	4	
4	508N 88E	30	2	Feature 1
5	508N 87E	20	2	Feature 1
6	509N 87E	20	2	Feature 1
7	494N 88E	30	3	
8	506N 93E	30	3	
9	486N 87E	30	3	
10	493N 91E	30	3	
11	487N 80E	30	3	
12	431N 85E	30	3	
13	510N 87E	30	3	
14	508N 86E	30	3	
15	509N 86E	30	3	
16	510N 86E	30	3	
17	509N 85E	20	2	Feature 2
18	508N 89E	20	2	
19	514N 84E	30	3	
20	509N 87E	20	2	Feature 3
21	507N 88E	20	2	Feature 3
22	506N 88E	30	3	
23	506N 87E	20	2	Feature 4
24	506N 85E	20	2	
25	494N 99E	20	2	
26	508N 85E	20	2	
27	509N 90E	20	2	
28	505N 88E	20	2	Feature 5
29	504N 88E	20	2	Feature 5
30	505N 87E	20	2	Feature 5
31	504N 87E	20	2	Feature 5

*All units 1 m^2

Test excavation units

Assigned Unit Number	Site Coordinates	Depth (cm)	Unit Size (m)
32a	500N 94E	100	1 x 2
32b	501N 94E	80	1 x 2
33	480N 94E	40	1 x 1
34	475N 84E	30	1 x 1
35	460N 84E	30	1 x 1
36	459N 75E	20	1 x 1
37a	678N 99E	66	1 x 2
37b	679N 99E	40	1 x 2
38a	660N 100E	60	1 x 2
38b	661N 100E	30	1 x 2
39	619N 99E	66	1 x 1
40	589N 99E	60	1 x 1
41	530N 100E	70	1 x 1
42a	508N 94E	window	1 x 2
42b	509N 94E	trench	1 x 2

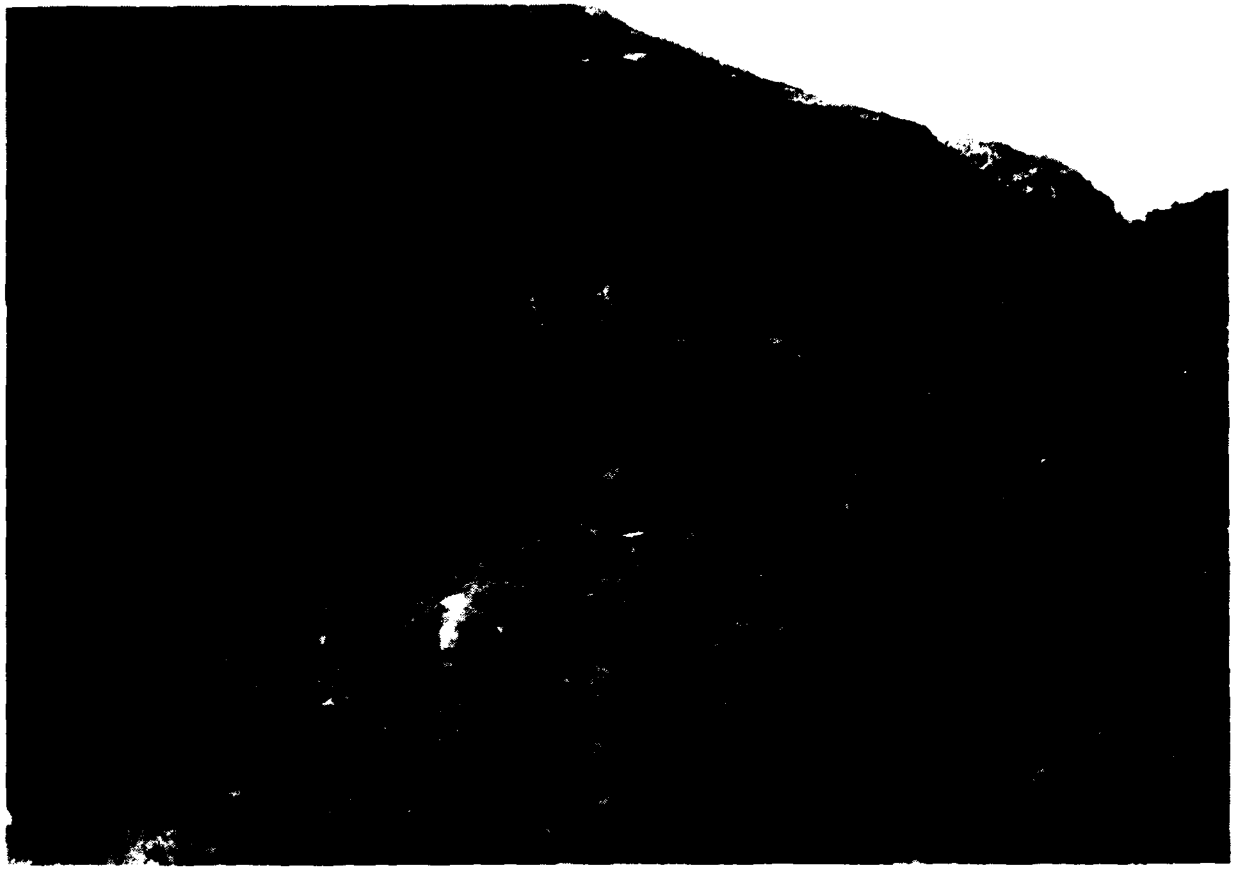


Fig. 10. Overview of the Big Boulder Creek site (10-CR-768) excavations, looking south.

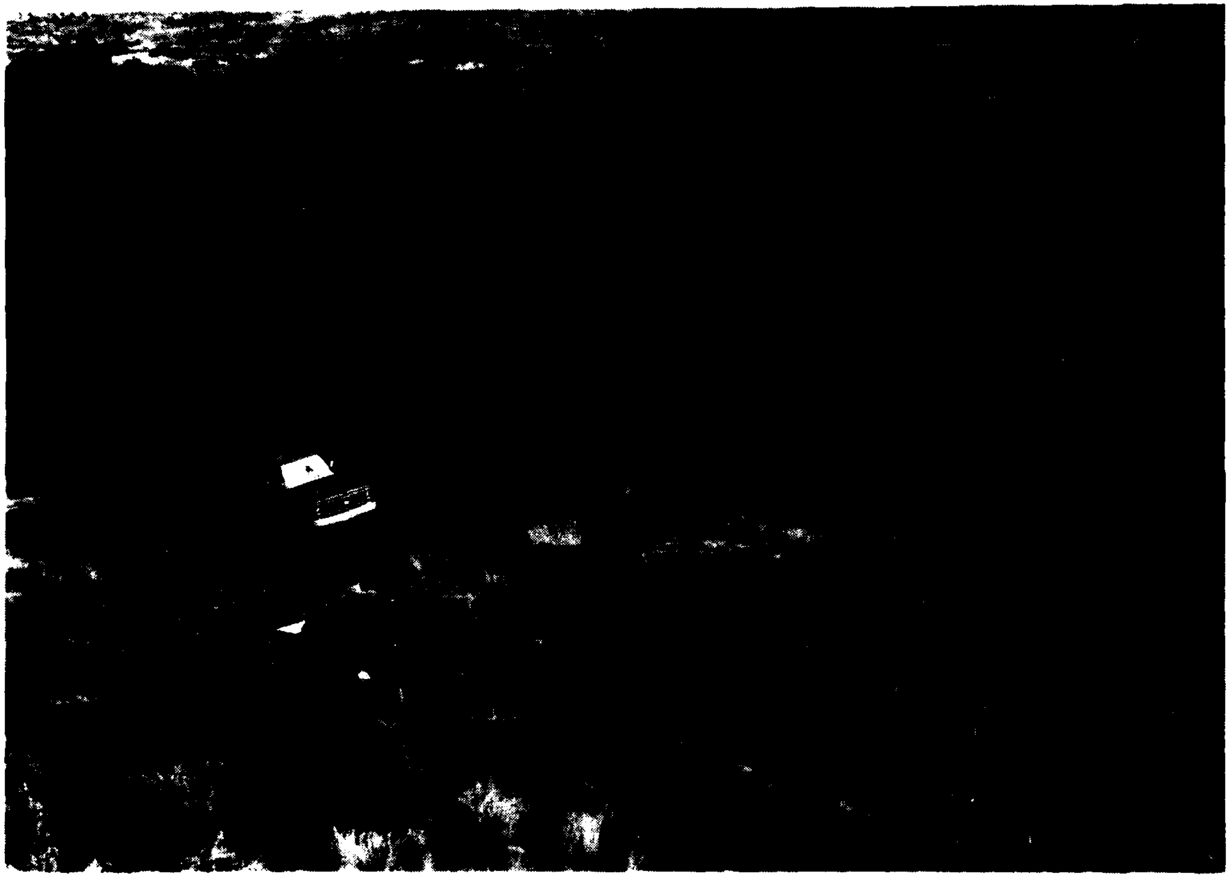


Fig. 11. Overview of the Big Boulder Creek site (10-CR-768) excavations, looking east.

and this became the focus of the excavations (Fig. 12). The five features uncovered involved detailed documentation and did not allow time to excavate additional units.

Laboratory Methods

All material recovered was returned to the Laboratory of Anthropology for cleaning, sorting, and labelling. A catalogue was established with an inventory and description of all items grouped by levels within units. A trinomial system was employed with the first number representing the unit (either surface or excavation), the second number representing the level or lot, and the third the unique number for that item within the unit and level. For example, 1.2.3 refers to the third item from the second level of excavation unit 1. All lithic items were measured to the nearest mm and weighed to the nearest 0.1 g. Some items considered potential artifacts in the field were reexamined and if no evidence of deliberate modification or use wear could be determined they were discarded to facilitate curation. Lithic material categories were identified by the authors based on samples of local and regional material including visits to most of the known quarry sites.

All faunal remains were separated and examined for evidence of modification as well as identification as to species by Christopher L. Brown of Washington State University. A sample of local rhyolite was thermally pretreated and knapped by J. Jeffrey Flenniken of Washington State University. The charcoal samples were also examined by the Radiocarbon Laboratory at Washington State University. The soil monoliths were transported to the Department of Soil Sciences at the University of Idaho for analysis by Maynard Fosberg.

Stratigraphy and Soils

Three soil monoliths were collected, two from the immediate feature area and one from outside of this area as follows: Monolith 1, north wall units 13/16 (511N/86-88E); Monolith 2, center of west wall Unit 23 (506-507N/87E); Monolith 3, center of north wall Unit 8 (507/93-94E). These were described by Maynard Fosberg, Professor of Soil Science, University of Idaho, and are summarized below.

Monolith 1 (Fig. 13)

A1 (Stratum 3) 0-5 cm bs. Dark gray (10YR 3.6/1) dry, very dark brown (10YR 2/2) moist, loam with weak, fine, granular structure. Noneffervescent. Boundary is abrupt, smooth, and parallel to the surface.

A2 (Stratum 3) 5-12 cm bs. Grayish brown (10YR 4.6/2) dry, very dark grayish brown (10YR 3/2) moist, loam with moderate fine granular structure. One burned rock in horizon. Noneffervescent. Boundary is abrupt, smooth, and parallel to the surface.

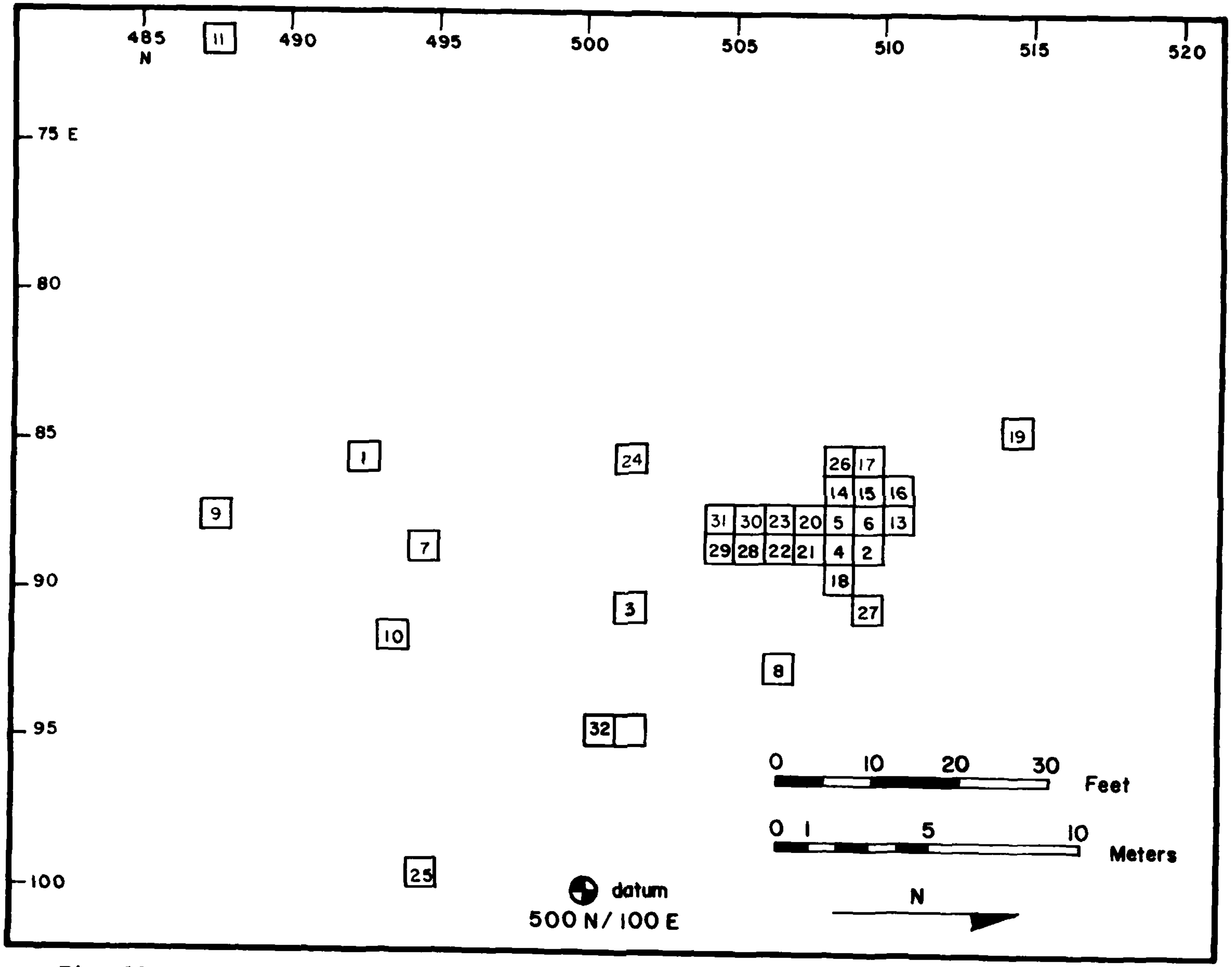


Fig. 12. Plat of core excavation area (10-CR-768) showing grid and unit numbers.

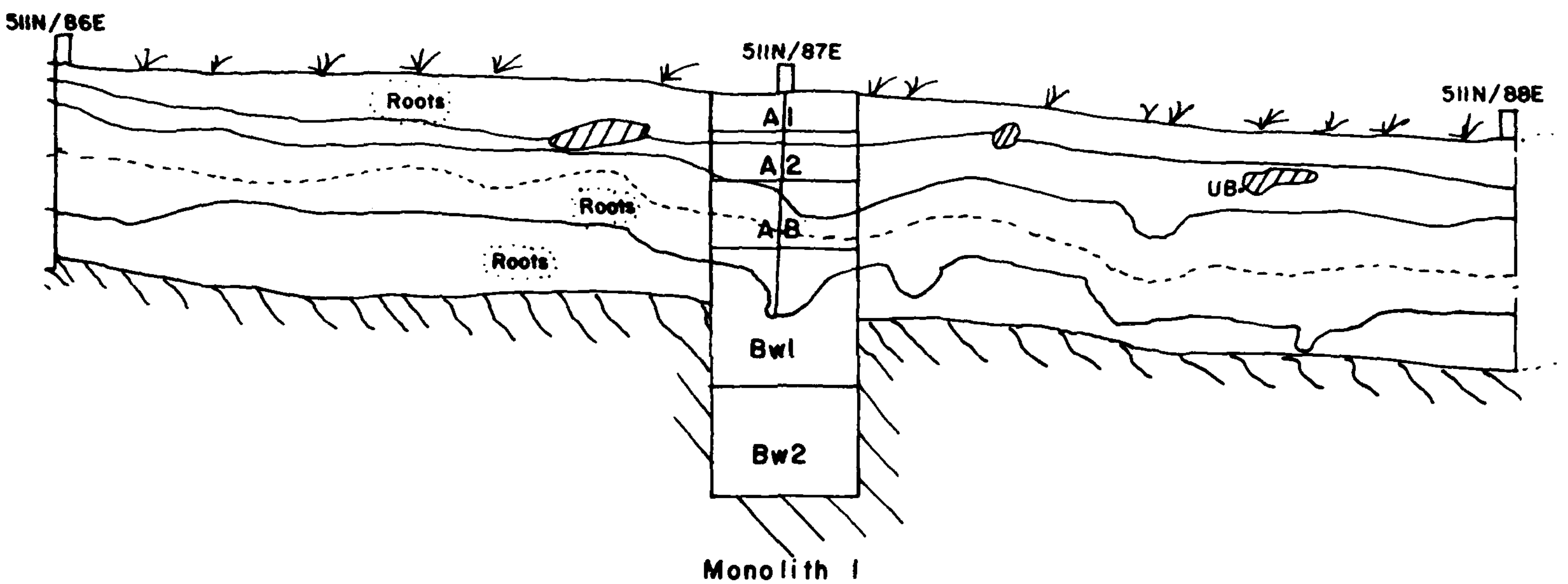


Fig. 13. Soil monolith 1 and north wall profiles of units 13 and 16 (10-CR-768). Scale 1:10.

AB (Stratum 2) 12-21 cm bs. Grayish brown (10YR 5/2) dry, very dark grayish brown (10YR 3.2/2) moist, sandy loam with weak, fine, granular structure. A few rhyolitic gravels. Noneffervescent. Boundary is abrupt, smooth, and parallel to the surface.

Bw1 (Stratum 1) 21-40 cm bs. Light brownish gray (10YR 6/2) dry, dark grayish brown (10YR 4/2) moist, fine loamy sand with weak columnar-weak fine subangular blocky structure. No visible gravels. Noneffervescent. Boundary is clear, smooth, and parallel to the surface.

Bw2 (Stratum 1) 40-55 cm bs. Light brownish gray (10YR 6/2) dry, dark grayish brown (10YR 4/2) moist, fine sandy loam with weak columnar-weak fine subangular blocky structure. No visible gravels. Noneffervescent.

Monolith 2 (Fig. 14*a*)

A1 (Stratum 3) 0-4 cm bs. Grayish brown (10YR 5/1.8) dry, very dark brown (10YR 2/2) moist, loam with weak, fine sized, granular structure. A few angular rhyolitic gravels. Noneffervescent. Boundary is abrupt, smooth, and parallel to the surface.

A2 (Stratum 3) 4-9 cm bs. Grayish brown (10YR 5/1.6) dry, very dark brown (10YR 2/2) moist, loam with weak, fine sized, granular structure. Noneffervescent. Boundary is clear and wavy, apparently due to disturbance.

AB (Stratum 2) 9-20 cm bs. Grayish brown (10YR 4.6/2) dry, very dark grayish brown (10YR 3/2) moist, loam with weak, medium sized, granular structure. A few rounded rhyolitic gravels and numerous cicada larvae sized krotavina filled with darker soil material. Noneffervescent. Boundary is clear and wavy.

Bw1 (Stratum 1) 20-32 cm bs. Light brownish gray (10YR 6/2.4) dry, dark brown (10YR 4/3) moist, sandy loam with weak, medium sized, subangular blocky structure. No visible gravels. Noneffervescent. Boundary is gradual, smooth, and parallel to the surface.

Bw2 (Stratum 1) 32-45 cm bs. Pale brown (10YR 6/2.6) dry, dark brown (10YR 4/3) moist, coarse sandy loam with weak medium sized, subangular blocky structure. Noneffervescent.

Monolith 3 (Fig. 14*b*)

A1 (Stratum 3) 0-6 cm bs. Grayish brown (10YR 5/2) dry, very dark brown (10YR 2/2) moist, loam with weak, fine sized, granular structure. A few very fine sized rhyolitic material gravels. One flake in horizon. Noneffervescent. Boundary is gradual, smooth, and parallel to the surface.

A2 (Stratum 3) 6-15 cm bs. Dark grayish brown (10 YR 4/2) dry, very dark brown (10 YR 2/2) moist, loam with weak, fine sized, granular structure. Noneffervescent. Boundary is gradual, smooth, and parallel to the surface.

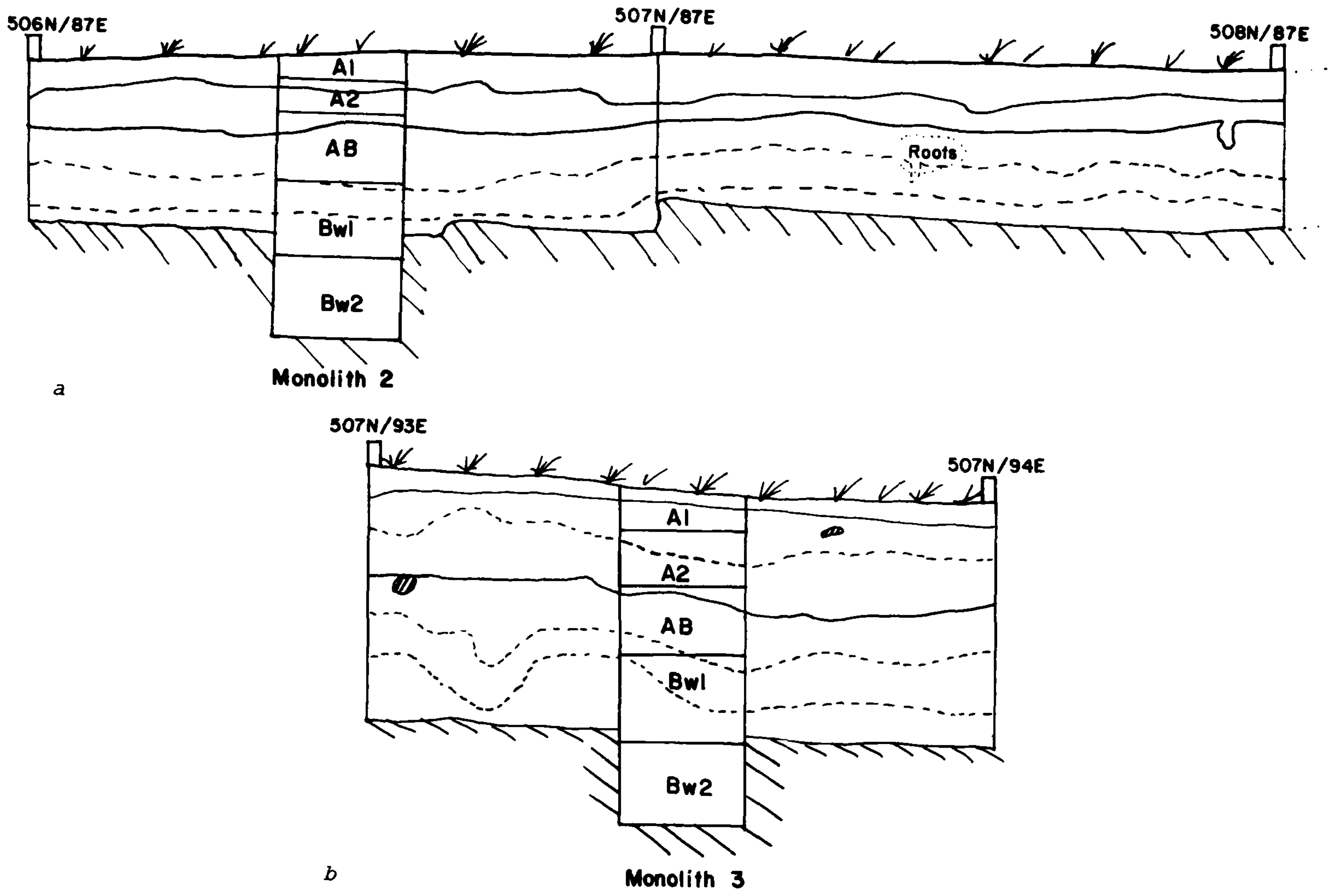


Fig. 14. Soil monoliths 2 and 3. *a*, Soil Monolith 2 and west wall profiles of units 20 and 23; *b*, Soil Monolith 3 and north wall profile of Unit 8. Scale 1:10.

AB (Stratum 2) 15-26 cm bs. Pale brown (10YR 6/3) dry, dark brown (10YR 4/3) moist, sandy loam with weak, medium sized, subangular blocky structure. Noneffervescent. Boundary is gradual, smooth, and parallel to the surface.

Bw1 (Stratum 1) 26-40 cm bs. Pale brown (10YR 6/3) dry, dark brown (10YR 4/3) moist, fine sandy loam with weak columnar-weak massive subangular blocky structure. Noneffervescent. Boundary is gradual, smooth, and parallel to the surface.

Bw2 (Stratum 1) 40-53 cm bs. Light brownish gray (10YR 6/2.4) dry, dark grayish brown (10YR 4/2) moist, fine sandy loam with weak columnar-weak, massive, subangular blocky structure. Noneffervescent.

The horizonation at this site reflects a considerable time span and in place gradual development. Deposition is water lain, as evidenced by the sandy nature of the horizons (not much gravel, but what exists is of rounded nature). The gravels are also somewhat unsorted. The degree of horizon development indicates a general sequence for at least several thousand years, on a scale equal to Mazama age based on personal familiarity with other locations in the area.

The distinction between the two major horizons makes it feasible to compress the five horizons into three strata: Stratum 1, the basal sands and gravel (Bw1, Bw2), Stratum 2, the transitional zone (AB); and the active horizons on the surface (A1, A2).

The subdivision of the B is based on subtle, distinct textural differences, because the B horizon is weakly developed.

During excavation the site appeared to be a single component with most cultural materials concentrated in the first 20 cm below surface, levels 1 and 2, and primarily in level 1. Laboratory analysis failed to distinguish more than one component; thus, for description and analytical purposes all materials (from all levels) have been collapsed into one vertical group.

Cultural Features

Introduction

All five features were exposed at the north end of the site near the talus slope (Fig. 15) in the first 10 cm level. They were tightly clustered in an area 6 m in length by 4 m in width (Fig. 16). The features consisted of two pits filled with charcoal and rock and three areas of rock concentrations; few artifacts were found in association with them. Two features have been radiocarbon dated to 165±75 BP (WSU 2663) and 1840±75 BP (WSU 2664) (Table 4).

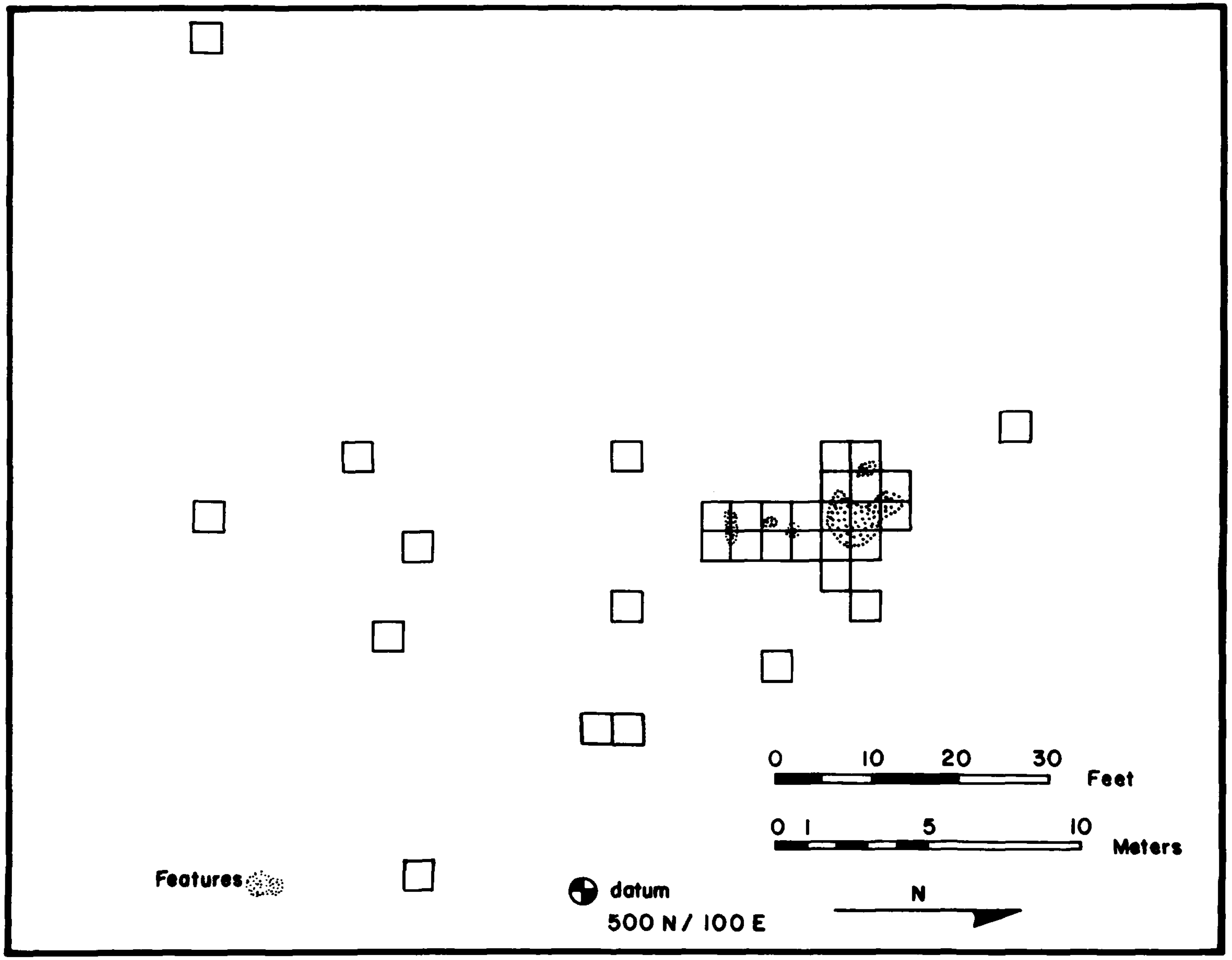


Fig. 15. Area of exposed features within site excavation (10-CR-768).

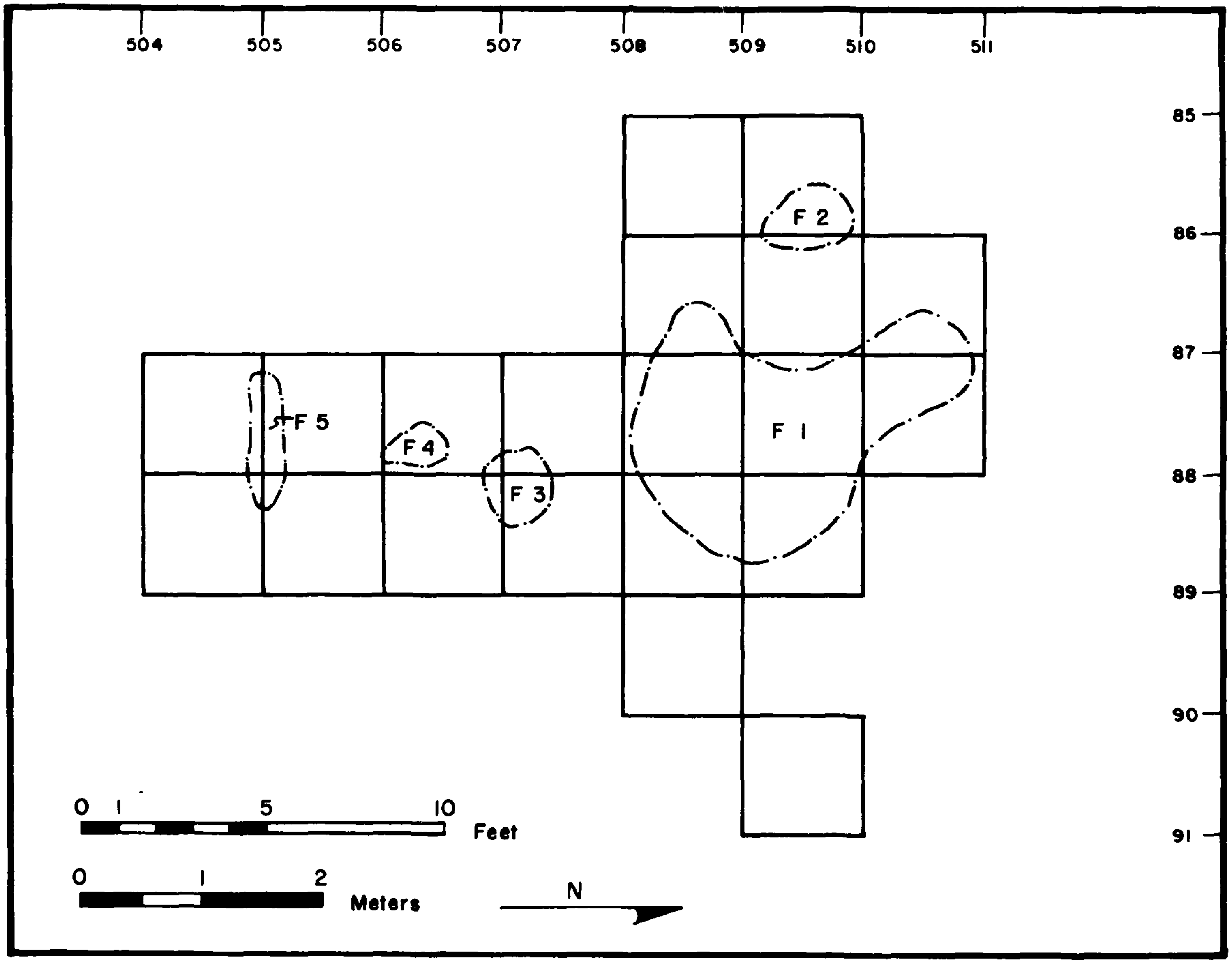


Fig. 16. Plan view of features 1, 2, 3, 4, and 5 (10-CR-768).

TABLE 4

Big Boulder Creek Site (10-CR-768) feature descriptions

Feature	Description	Artifacts	Fauna Frags	Size (cm)			Location Units	Depth (cm) bs		Radiocarbon dates	Comments
				Length	Width	Depth		top	bottom		
1	Rock Concentration: Large concentration of river cobbles and talus scattered over large area. Some fire cracked rock. Charcoal and bones present. No pit discerned.	Flakes (86) Core (2) Used Flakes (14) Battered Cobble (1)	14	300	200	15	2, 4, 5, 6	00	15		Hearth Scatter?
2	Pit with rock and charcoal: Basin shaped pit lined with rock, filled with charcoal, and covered with rock.	Flakes (3)	-	70	55	19	17	8	27	165±75 BP (WSU 2663)	Firepit: oven (?)
3	Pit with rock and charcoal: Shallow pit lined with rock, filled with charcoal, and covered with rock.	Flakes (5) Projectile point (1)	1[a]	70	65	22	20, 21	00	22	1840±75 BP (WSU 2644)	Firepit: oven (?)
4	Rock concentration: small concentration of fire cracked and decomposing rock with some charcoal.	Flakes (11) Battered cobble (1)	1	47	30	19	23	1	20		Hearth
5	Rock concentration: Linear concentration of talus and decomposing rock. Adjacent to lithic concentration.	Flakes (55) Used Flakes (2) Uniface (1)	1	130	45	20	28, 29, 30, 31	00	20		

[a] Fragment identified as *Ovis canadensis*

Feature 1: Rock Concentration

Feature 1 consisted of a large concentration of approximately 137 river cobbles and talus rock with fire-cracked rock, charcoal, and bone present (Table 4, Fig. 17). The feature spanned an area 3 m in length by 2 m in width. An area of 1.5 x 1.10 m was formed by accumulation of large river cobbles with charcoal and bone. The remainder of the feature consisted of rocks scattered more sparsely over a larger area. Several rocks forming the center of the feature were visible on the surface and the entire feature was exposed during excavation of level 1 (0-10 cm). No pit line was discerned and all rocks were removed before or at 15 cm below surface. A slight depressed area did exist after the rocks were removed.

Artifacts associated with the feature included flakes (86), used flakes (14), cores (2), one battered cobble (1), and both burned and unburned bone fragments (14).

The presence of charcoal, bone, river cobbles, and fire-cracked rock suggests that Feature 1 may have been a hearth area. It appears to have been originally concentrated (units 2, 4, 5, 6), and later scattered over a larger area.

Feature 2: Pit With Rock and Charcoal

Feature 2 was exposed at 8 cm below surface as a concentration of talus rock extending 19 cm in diameter (Table 4, Fig 18*a*). At 12 cm below surface the outline of a pit was discerned over an area 15 cm in diameter. This was exposed as a heavy concentration of charcoal and rock. Rock lined the sides of the pit and appeared to have covered it completely as well (Fig. 19a). Thick, dense layers of charcoal extended 3 cm below a layer of rock. The base of the pit was very compact sandy soil with a nearly complete absence of oxidized earth. Charcoal and rock appeared to be the only fill of the pit with charcoal--strips of bark and thicker limbs--located between, around, and beneath the rocks. No soil appeared until the base of the pit was reached. Removal of rock and charcoal exposed the original pit as basin-shaped (Fig. 19*b*).

Artifacts associated with Feature 2 consisted only of three flakes. The radiocarbon date for the feature is 165±75 BP (WSU 2663).

Feature 2 can be identified as a fire pit; although it may have served a number of functions, a small oven seems to be the most likely use. Lined and covered with rock, the very high, dense concentration of charcoal, and absence of oxidized earth as ash suggests a slow-burning fire. The basin-shaped fire pit resembles a feature identified as an earth oven during excavation on the Salmon River of the Dancing Cat Site (O'Conner 1974:Fig. 21*b*).

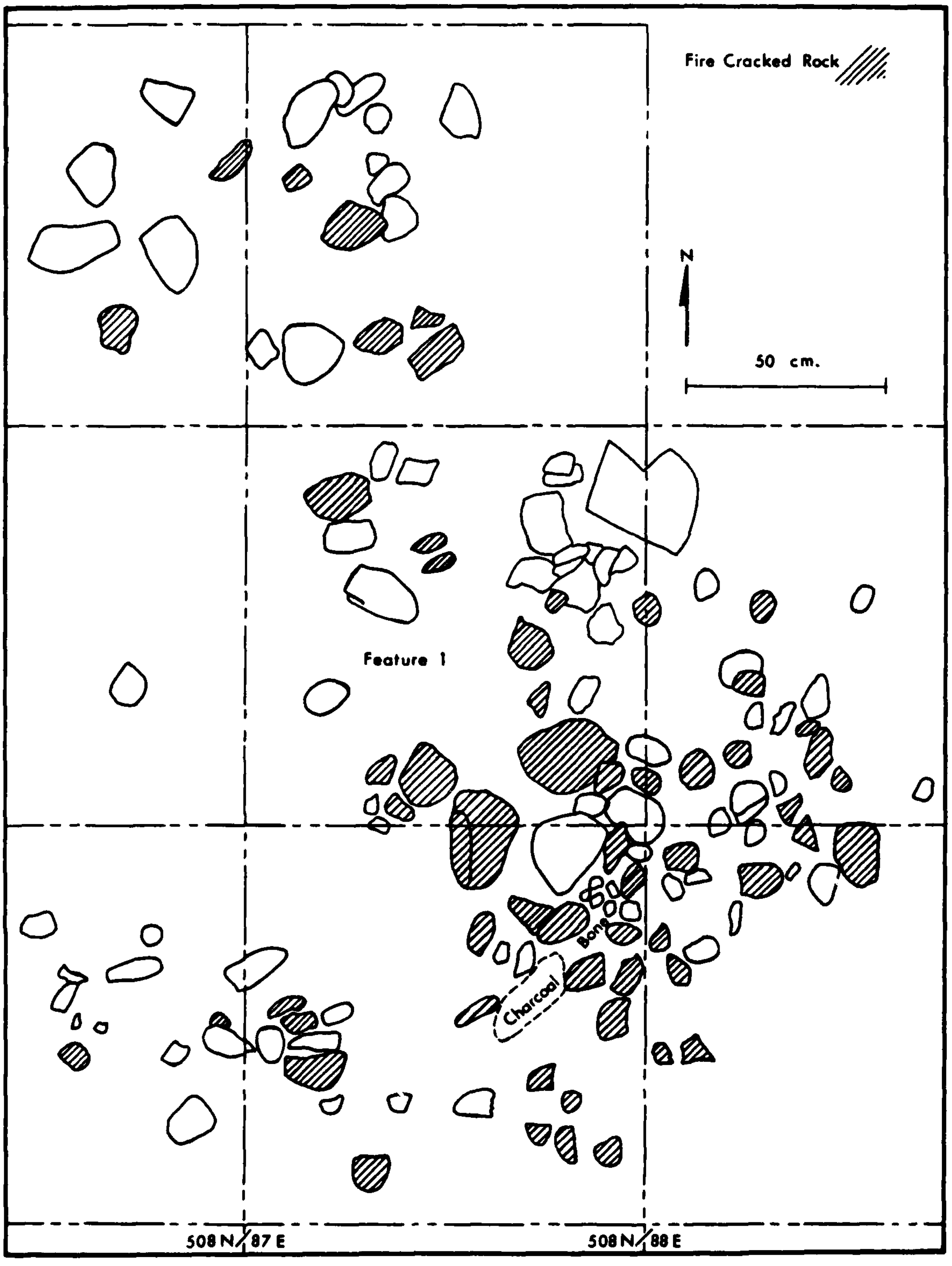


Fig. 17. Plan view of Feature 1 (10-CR-768).

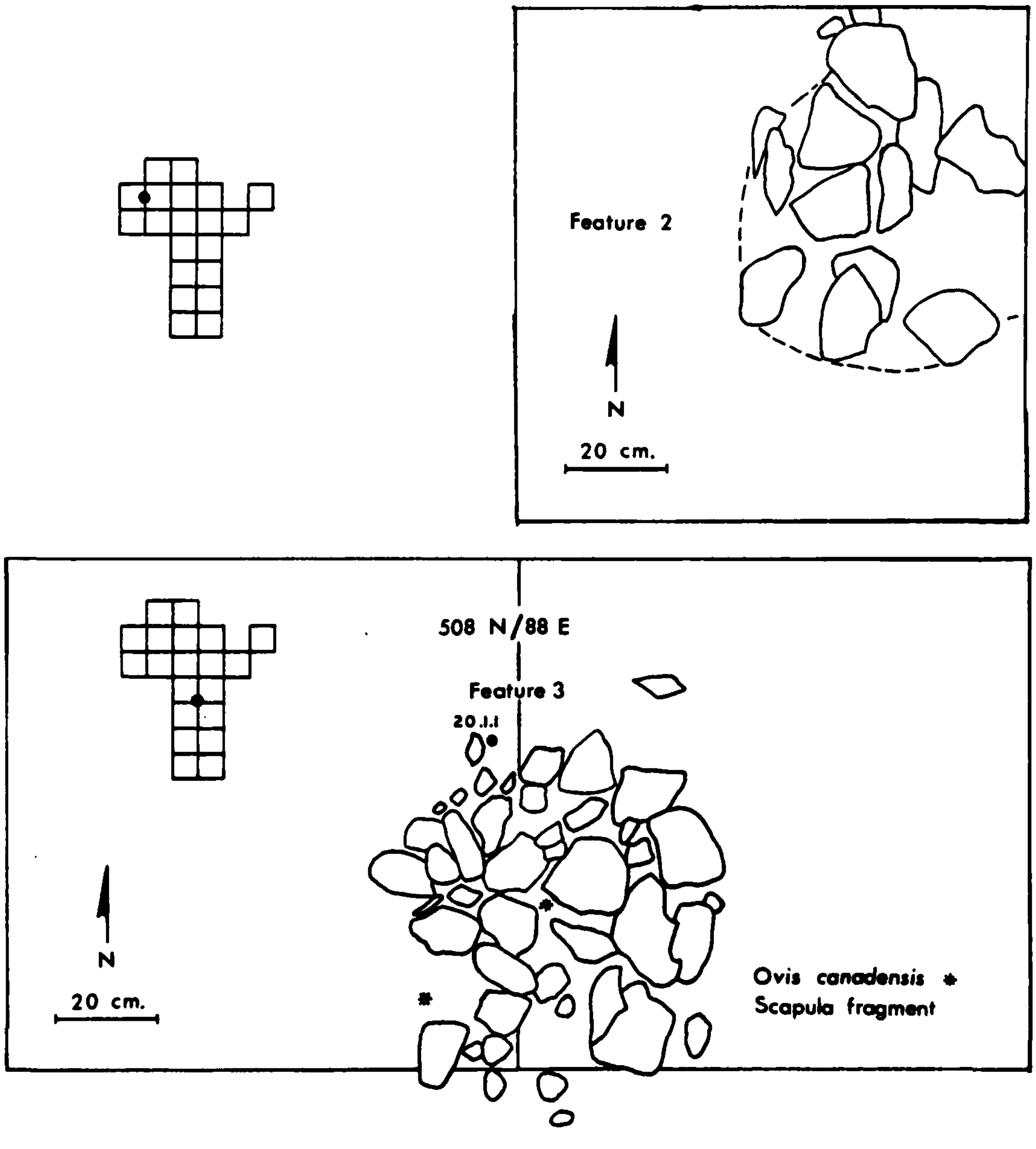
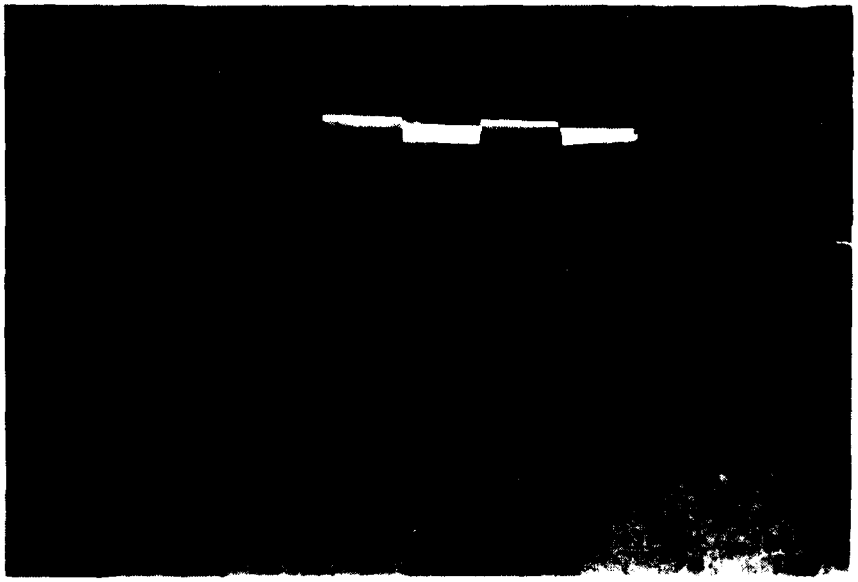


Fig. 18. Plan views of exposed features (10-CR-768); *a*, Feature 2; *b*, Feature 3.

a



b

Fig. 19. Feature 2 (10-CR-768); *a*, exposed cross-section of feature during excavation; *b*, basin-shaped pit remaining after removal of feature fill.

Feature 3: Pit with Rock and Charcoal

Feature 3 was exposed at surface level as a concentration of talus rock and angular fire-broken cobbles with charcoal present (Table 4, Fig. 18*b*). Approximately 30-40 rocks extended over an area 70 cm in length and 65 cm in width and appeared to cover a basin-shaped pit (Fig. 20). The pit fill consisted of loose, dark organic soil and charcoal with five flakes and a bone fragment. A scapula fragment (20.1.6) was identified as *Ovis canadensis* and cross-mended with a fragment from level 1 of unit 20. A projectile point (20.1.1) was also associated with this feature. The base of the pit was very compact. Charcoal collected from the fill of the pit dated to 1840±75 BP (WSU 2664).

Feature 3 was located ca. 3 m southeast of Feature 2 and dates nearly 2000 years earlier. The two pits may have functioned in a similar manner, although Feature 3 was less distinct, with associated rocks more scattered, possibly as a result of age and disturbance through site use.

Feature 4: Rock Concentration

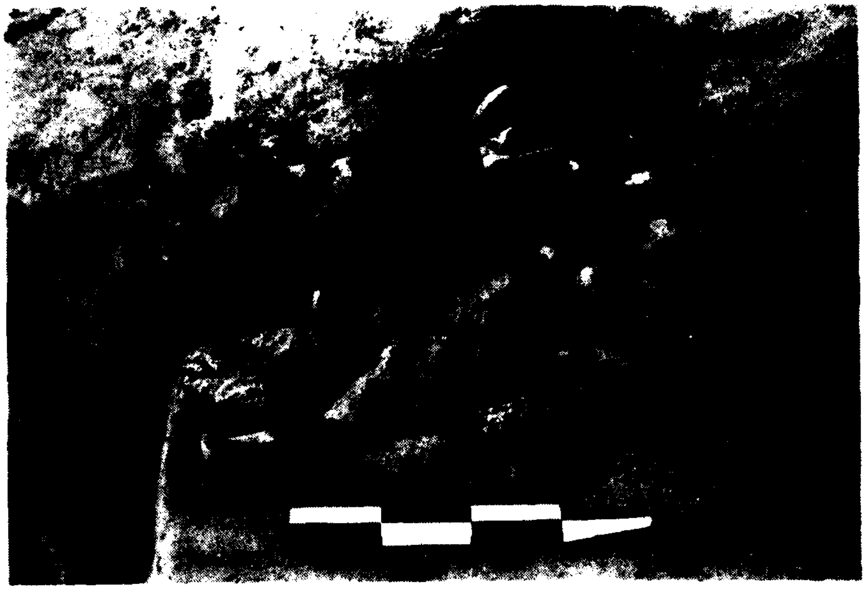
Feature 4 was exposed just below the surface as a small concentration of five fire-cracked and decomposing rocks with some charcoal present. Extending over an area 47 cm in length and 30 cm in width, the depth of the rocks extended to 20 cm below surface (Table 4). Small chunks of charcoal were present within the feature and surrounding area. Artifacts consisted of 11 flakes and a battered cobble; one bone fragment was also recovered.

The presence of fire-cracked rock and charcoal suggest that this feature may be the remnant of a hearth or of activity associated with a hearth.

Feature 5: Rock Concentration

Feature 5 was exposed at surface level as a linear concentration of large talus and decomposing rock extending to 20 cm below surface. Though no pit could be discerned, two talus rocks appeared to stand on edge as if in a depression. Some charcoal was scattered throughout this area.

Artifacts associated with this feature included 55 flakes, 2 used flakes, and 1 uniface (Table 4). Interestingly, Feature 5 was the southernmost feature encountered in this area and at this point artifacts begin to increase and become more dense than in units associated with the four features previously discussed. It is not known if this increase in cultural material, largely debitage, is directly associated with Feature 5 or indicates the beginning of high artifact densities found in units to the south of the feature area.



a

b

Fig. 20. Feature 3 (10-CR-768); *a*, top of Feature 3 exposed; *b*, cross-section of Feature 3.

Discussion

The fire pits (features 2 and 3) that contained dense charcoal, no ash, no burned bone, and covered by rock indicate slow burning fires. It is not certain what functions these features served, but they appear to be similar and to involve a slow burning, pit contained, fire enhanced by the placement of rocks within the pit and over the fire.

A variety of ethnohistoric references shed insights into the probable nature of these features. Townsend described aboriginal camas cooking on Camas Prairie as consisting "of fermenting it in pits under ground, into which hot stones have been placed" (1839:137). Spinden described the Nez Perce method as follows:

> A pit from six to ten feet in diameter and about three feet deep was lined with split dry wood to the depth of almost a foot. Upon this wood was placed a layer of smooth stones averaging about five inches in diameter. The wood was set on fire and the stones allowed to become red hot. When the fire had burned down the stones were leveled and some earth and a layer of coarce grass were spread over them then twenty or thirty bushels of camas bulbs, which had been previously cleaned and the black outer layers of the bulbs removed with the fingers, were thrown into the pits and arranged in a conical heap. The white bulbs were then covered with a layer of grass, some two or three inches thick. After this, water was poured on till the steam began to rise, and then the entire heap was covered with several inches of dry earth. Sometimes a fire was kindled around the base of the heap. the bulbs were allowed to steam for from twelve hours to three days. [Spinden 1908:201-202]

A third account of aboriginal camas cooking was provided by Father Pierre Jean De Smet who travelled through Idaho in 1845-1846:

> I cannot pass over in silence the camash root, and the peculiar manner in which it is prepared. It is abundant, and, I may say, is the queen root of this clime. It is a small, white, vapid onion, when removed from the earth, but becomes black and sweet when prepared for food. The women arm themselves with long, crooked sticks, to go in search of the camash. After having procured a certain quantity of these roots, by dint of long and painful labor, they make an excavation in the earth from 12 to 15 inches deep, and of proportional diameter, to contain the roots. They cover the bottom with closely cemented pavement [rocks], which they make red hot by means of fire. After having carefully withdrawn all the coals, they cover the stones with grass or wet hay; then place a layer of camash, another of wet hay, a third of bark overlaid with mold, whereon is kept a glowing fire for 50, 60, and sometimes 70 hours. [De Smet 1847, quoted by Gulick 1981:9].

A final ethnographic reference for the Northern Shoshoni notes that all groups studied employed individual earth ovens, while some groups employed communal earth ovens as well, with practices including lining the pits with rocks (Steward 1943:305).

Although camas is not known to exist immediately in the Big Boulder Creek area (Marion McDaniel 1982:personal communication), the site's altitude makes the area one of possible camas resources (Statham 1982:39). Other roots are known to exist here (Marion McDaniel 1982:personal communication) and resources other than camas were eaten "after undergoing a certain process of fermentation or baking" (Townsend 1839:138).

The large rock concentration of Feature 1, with some charcoal and bone as well as fire-cracked rock, may have served as a hearth and Feature 4 may have served a similar function. As indicated by the large span of time lapsing between features 2 and 3, it is apparent that the area was used at least several times. Hearths were, undoubtedly, constructed, scattered, and constructed again, obscuring the archaeological record. The archaeology indicates that the same portion of the site served similar functions over a 2000 year period. Feature dates indicate a long period of use, though vertical components could not be discerned in the field or in the laboratory.

The feature area did not have a high concentration of artifacts. Interestingly, the density of artifacts increases as distance from the features increases. Within the feature area itself, artifacts, specifically flakes, are more numerous near hearth-like features than oven-like features.

Faunal Remains

The greatest concentration of faunal remains was within the area of Feature 1 (Unit 5 with 70 fragments) and in the area of heavy lithic concentrations (Unit 7 with 52) (Fig. 21). The fragments of Unit 7 were unidentifiable, but a large number of fragments from Unit 9, six to the south, were those of the rodent *Citellus columbianus*.

Two features had identifiable specimens of *Ovis canadensis*. A complete left carpal (5.2.1) and a right femur, posterior shaft fragment with visible cut marks (5.2.3) of *Ovis canadensis* were recovered from Feature 1, the large rock concentration. Another *Ovis candensis* right dorsal margin of a scapula (20.1.6), also with visible cut marks, was recovered from the Feature 3 fire pit. This fragment cross-mended with a fragment from Level 1 of the unit. Five of the seven fragments identified as *Ovis candensis* or cf. *Ovis candensis*, were recovered from the feature area (Fig. 22). Both mountain sheep and ground squirrels were reportedly eaten by the Northern Shoshoni (Steward 1943:294-299).

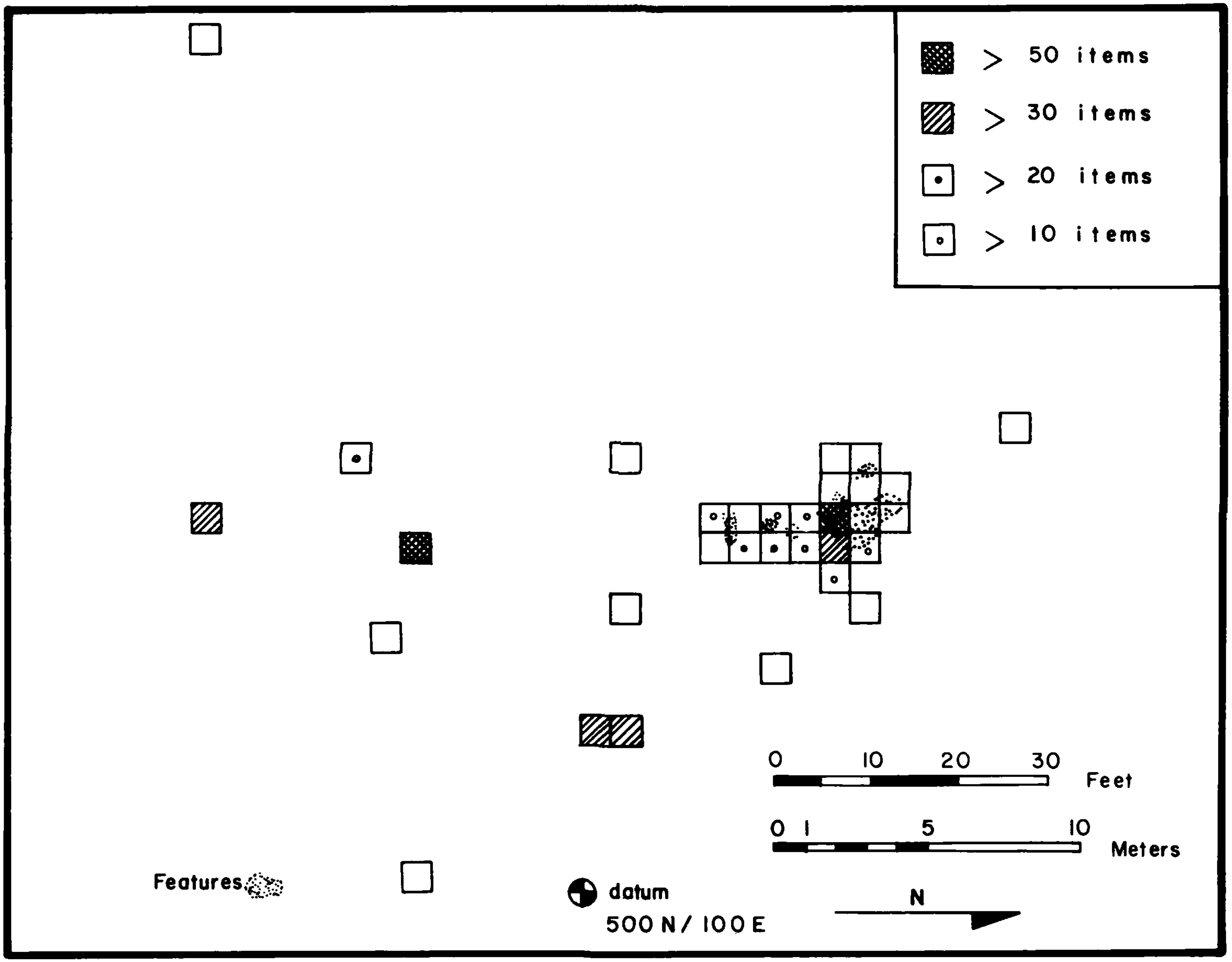


Fig. 21. Distribution of bone fragments (10-CR-768).

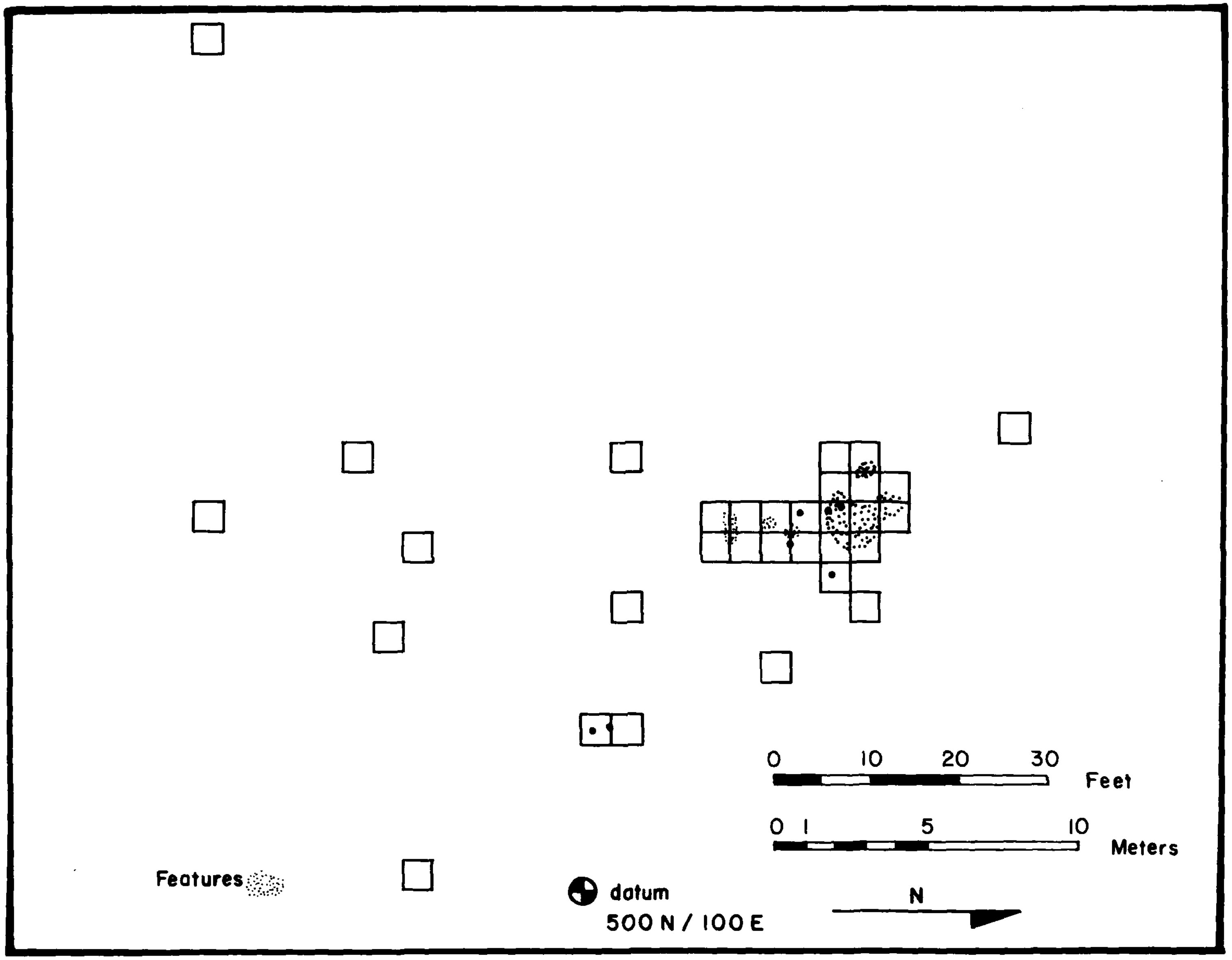


Fig. 22. Distribution of *Ovis canadensis* fragments (10-CR-768).

Discussion
by
Christopher L. Brown

The faunal assemblage from 10-CR-768 consists of 454 pieces of mammal bone. Every piece was found to be in a fragmented condition--no complete elements were present. Because of this high degree of fragmentation (the largest fragment did not exceed 78 mm), only a small portion of the assemblage was identifiable to element and species (Table 5). Bighorn sheep (*Ovis canadensis*) and Columbian ground squirrel (*Citellus columbianus*) were the only species identified from the sample. While both of these animals are known to have been exploited by native groups in the past, the occurrence of the ground squirrel may have been an accidental intrusion at the site. On the other hand, two of the bighorn sheep bone fragments (a scapula and femur) exhibited cut marks, indicating human butchering activity.

Approximately 11% (49/454) of the bones were burned or charred suggestive to some form of cooking or processing of body portions. The charring, when coupled with the extreme degree of breakage, may indicate a thorough form of animal processing that entailed not only the removal of meat from the bones, but also the crushing of the bones for marrow extraction. However, it must be emphasized that there are other cultural as well as natural means which could affect bones with similar results. In my opinion, none of these are more plausible than the idea of bone processing.

The paucity of identifiable skeletal remains at this site precludes any extensive analysis or conclusions about dietary preference and/or butchering practices, but it can be stated that a fore and hind limb and parts of the head of at least one bighorn sheep were exploited at this site locality.

The lack of more faunal data at this site may be simply the result of a limited excavation sample. More faunal remains from further excavations may help present a more complete image of the cultural activities centered about animal procurement and processing.

Lithic Material Culture

Virtually all cultural material recovered from the Big Boulder Creek site consists of lithic artifacts. A total of 3758 items including flaked tools, cobble tools, and debitage were recovered by surface collection, test excavation, and mitigation excavation. All items have been placed into general categories based on morphological, stylistic, and inferred functional attributes as discussed below.

Lithic materials were extremely diverse and indicate that the inhabitants of the site were familiar with the resources of a relatively broad portion of the surrounding region. The most frequent material was chert; this category subsumes a variety of materials commonly referred to as

TABLE 5

Identified bones from Big Boulder Creek site, 10-CR-768

Unit/Level	Taxa	Bone
5.2.1	*Ovis canadensis*	Left carpal--scaphloid (radial carpal), complete
5.2.3	*Ovis canadensis*	Right femur, posterior shaft fragment, cut marks are visible
9.2.6	*Citellus columbianus*	Right madible, dentary portion with Pm^4, M^1, M^2, M^3
	Citellus columbianus	Cervical vertebra
	Citellus columbianus	Right distal end of humerus
	Citellus columbianus	Right proximal end of ulna (fits with the above humerus)
	Citellus columbianus	Right humerus shaft fragment
	Citellus columbianus	Metacarpal, complete
	Citellus columbianus	Right scapula, blade fragment
	Medium Artiodactyl	Fragment of an incisor
9.3.3	cf.*Citellus columbianus*	Proximal femur head fragment
	cf.*Citellus columbianus*	Dorsal portion of thoracic vertebra
18.2.6	*Ovis* spp.	Distal metapodial, epicondylar fragment
20.1.6	*Ovis canadensis*	Right distal scapula fragment (fits fragment from 20,21.F3.4)
20,21.F3.4	*Ovis canadensis*	Right dorsal margin of scapula, cut marks are visible on infrascapular surface (fits fragment from 20.1.6)
32.2.18	*Ovis* cf. *canadensis*	Left distal humerus fragment, medial epicondyle
	cf.*Ovis canadensis*	Hypsidont tooth enamel fragment

jasper, chalcedony, petrified wood, cryptocrystalline silica, and so forth. Chert sources are common in the area, with quarry sites reported at Antelope Flat 36 km (22 mi.) northeast of the site and Road Creek Summit 32 km (20 mi.) east of the site. Silicified or petrified wood is available some 29 km (18 mi.) distant at Malm Gulch. A total of nine locations for jasper, agate, chalcedony, quartz crystal, and petrified wood have been reported within a 50 km (30 mi.) radius of the site (K. D. B. Enterprises, Inc. 1978).

Next in frequency is rhyolite, an igneous, opague, generally reddish brown material available some 5 km (3 mi.) down the East Fork at the East Fork Lookout quarry site (10-CR-358). A sample of this material was heat treated by J. Jeffrey Flenniken, Assistant Professor of Anthropology, Washington State University, at 300°C (572°F) for ten hours. While the color and other visual properties were not affected, the knappability of the material was definitely improved (Flenniken 1982:personal communication).

Other igneous materials encountered at the Big Boulder Creek site include obsidian, vitrophyre, and basalt. These materials are common throughout southern Idaho and elsewhere (Sappington 1981, 1982b) but do not occur in the vicinity of the site so that they may be considered "exotic". Because of the volcanic nature of their origin, each obsidian and vitrophyre source possesses a unique chemical "fingerprint" and by employing geochemical techniques it is possible to correlate artifacts with their source areas (Appendix).

Quartzite occurs in portions of central Idaho and a very few artifacts were made from this material; no bedrock sources are known in the area, but it is probable that quartzite was collected in the gravels of the East Fork where it is available today. Similarly, the local gravels were probably employed as the quarry for the cobble tools.

Projectile points

Projectile points are the most useful category of lithic artifacts for determining temporal and spatial affiliations of archaeological components. Styles change over time and different styles are characteristic of various cultural areas so that analysis of projectile points provides considerable insights into the inhabitants of archaeological sites. Projectile points are bifacially flaked and possess distinct hafting elements, such as side or corner notches, for attachment to arrow or atlatl shafts.

A total of six projectile points were recovered, two from excavations and four from surface collections (Figs. 23 and 24), and these may be placed into three general groups, based on size and location of corner notches and side notches.

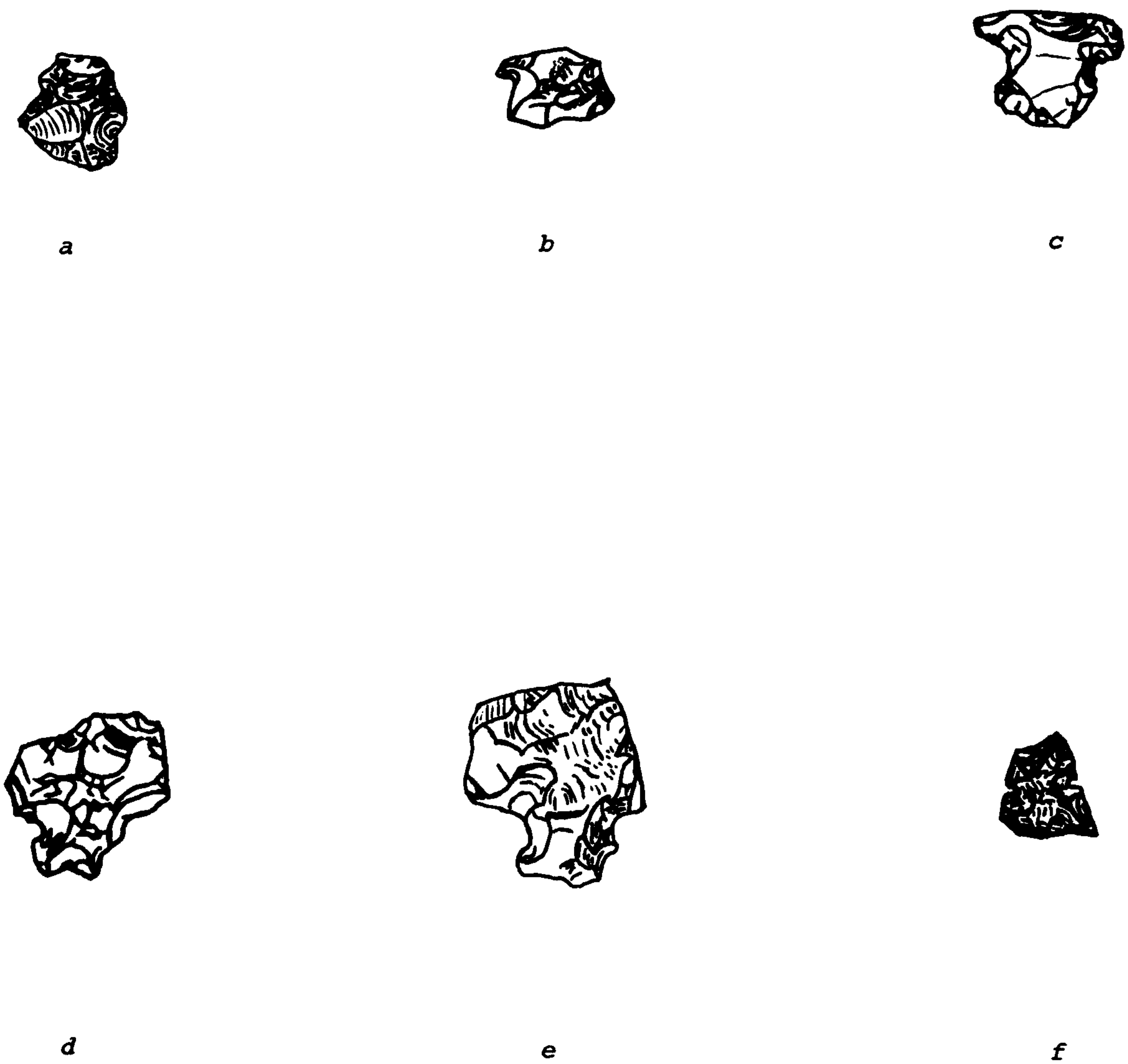


Fig. 23. Projectile points (10-CR-768); *a*, corner notched, vitrophyre (0.2.11); *b*, corner notched, chert (1.2.2); *c*, corner notched, chert (0.3.2); *d*, large side notched, chert (0.4.3); *e*, large side notched, vitrophyre (20.1.1); *f*, small side notched, chert (0.4.2). Scale 1:1.

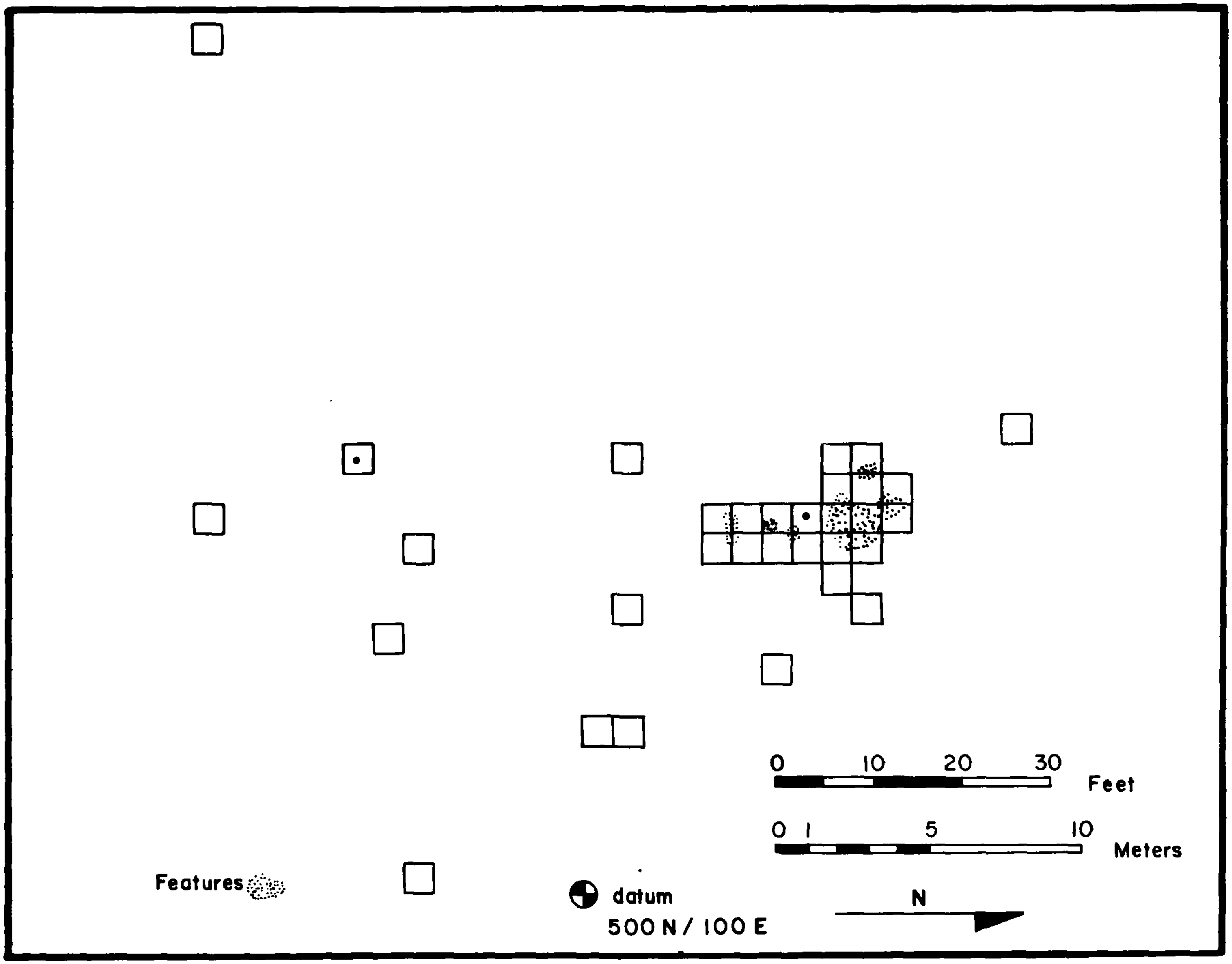


Fig. 24. Distribution of projectile points recovered from excavation units (10-CR-768).

Corner Notched Projectile Points

Three basal fragments of corner notched, or corner removed, projectile points were recovered from the Big Boulder Creek site (Fig. 23, Table 6). Lithic material include chert (0.3.2 and 1.2.2) and vitrophyre (0.2.11). Bases are both convex and concave. Their fragmentary condition inhibits adequate description.

Description	Range	Mean
Length	14+ - 22+ mm	18+ mm
Width	10 - 16 mm	13 mm
Thickness	4 - 5 mm	4.5 mm
Neck Width	12 - 12 mm	12 mm
Weight	0.8+ - 2.0+ g	1.4+ g

Corner notched points are common across the region, but they are not especially good time markers. The Elko series is dated 2000 BC-AD 1080 (Heizer and Hester 1978:159), while the Rose Springs series is dated AD 600 to the historic period (Heizer and Hester 1978:162). There appears to be a continuum between these two series corresponding to the transition from atlatls to arrows.

Large Side Notched Projectile Points

Two large side notched projectile points were also recovered at 10-CR-768 (Fig. 23, Table 6). Both items are broken crosswise with the distal ends missing. One of these (20.1.1) was excavated and associated with Feature 3; this item is vitrophyre. The other (0.4.3) was surface collected and is chert.

Description	Range	Mean
Length	26+ - 28+ mm	27+ mm
Width	22+ - 25 mm	23.5 mm
Thickness	4.5 - 6 mm	5.3 mm
Neck Width	9 - 12 mm	10.5 mm
Weight	2.3+ - 4.8+ g	3.6+ g

Large side notched projectile points are common throughout entral Idaho and the region in general and were employed for a considerably long time span. In Idaho, they have been dated ca. 7000-1000 BC (Heizer and Hester 1978:170).

Small Side Notched Projectile Point

A single small side notched projectile point (0.4.2) (Fig. 23, Table 6) was surface collected during the initial testing phase (Green 1981). This item is broken across the tip. Material is chert.

TABLE 6

Description and distribution of projectile points, 10-CR-768

Provenience and Registration Number	General Morphology	Material	Condition[a]	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Fig. No.
0.2.11	Corner notched	Vitrophyre	b c	14	14	5	1.4	23*a*
0.4.3	Large side notched	Chert	b c/1	27	17	4	2.3	23*d*
0.3.2	Corner notched	Chert	b c	22	16	4	2.0	23*c*
0.4.2	Small side notched	Chert	b c	14	12	3	1.0	23*f*
1.2.2	Corner notched	Chert	b c	14	10	5	0.8	23*b*
20.1.1	Large side notched	Vitrophyre	b c	28	24	6	4.7	23e

[a] Condition: b c = broken crosswise, b c/1 = broken crosswise and lengthwise.

Description	
Length	14+ mm
Width	13 mm
Thickness	2.5 mm
Neck Width	6 mm
Weight	1+ g

Small side notched projectile points are also common across the region. This item closely resembles those of the Desert Side Notched series, dated AD 1100 to the Historic Period (Heizer and Hester 1978:163-165).

Bifaces

Bifaces are lithic tools characterized by having been flaked on two surfaces with the result being the fabrication of at least one sharp edge. Bifaces are distinguished here from projectile points by their absence of hafting elements. Many bifaces are fragmentary greatly inhibiting description, but apparently a considerable variety of tools are represented. Undoubtedly a number of the thinner and highly shaped items are projectile point fragments, such as midsections, while some bifaces were probably employed as knives, and others may be incompletely worked or unfinished preforms (Figs. 25 and 26). Bifaces were recovered both from excavation units and surface collections throughout the site (Fig. 27).

One category of 11 bifaces includes items that are relatively thin, well shaped, and worked on all surfaces; all are fragmentary. Most likely, these items represent portions of projectile points, or possibly of projectile point preforms broken during manufacture. Description in terms of length, width, thickness, and weight is impossible due to the condition of these items (Table 7). Lithic materials are diverse and include chert (four items or 36.4%), obsidian (three items or 27.2%), vitrophyre (two items or 18.2%), and rhyolite (two items or 18.2%)

The most frequent biface category includes 14 items, most of which are again fragmentary. These items show a relatively much lesser degree of work, suggesting either that they were not intended to be used as projectile points or that they were broken during the earlier stages of manufacture. Cortex is retained on three items, indicating the lack of completeness of items in this category; the original flake detachment attributes, such as the bulb of percussion, are evident in all cases. Lithic materials include chert (ten items or 71.4%) and rhyolite (four items or 28.6%). Only two of these are intact enough for adequate description and are summarized below.

Description	Range	Mean
Length	35 - 46 mm	40.5 mm
Width	21 - 54 mm	37.5 mm
Thickness	6 - 13 mm	9.5 mm
Weight	4.4 - 31.6 g	18.0 g

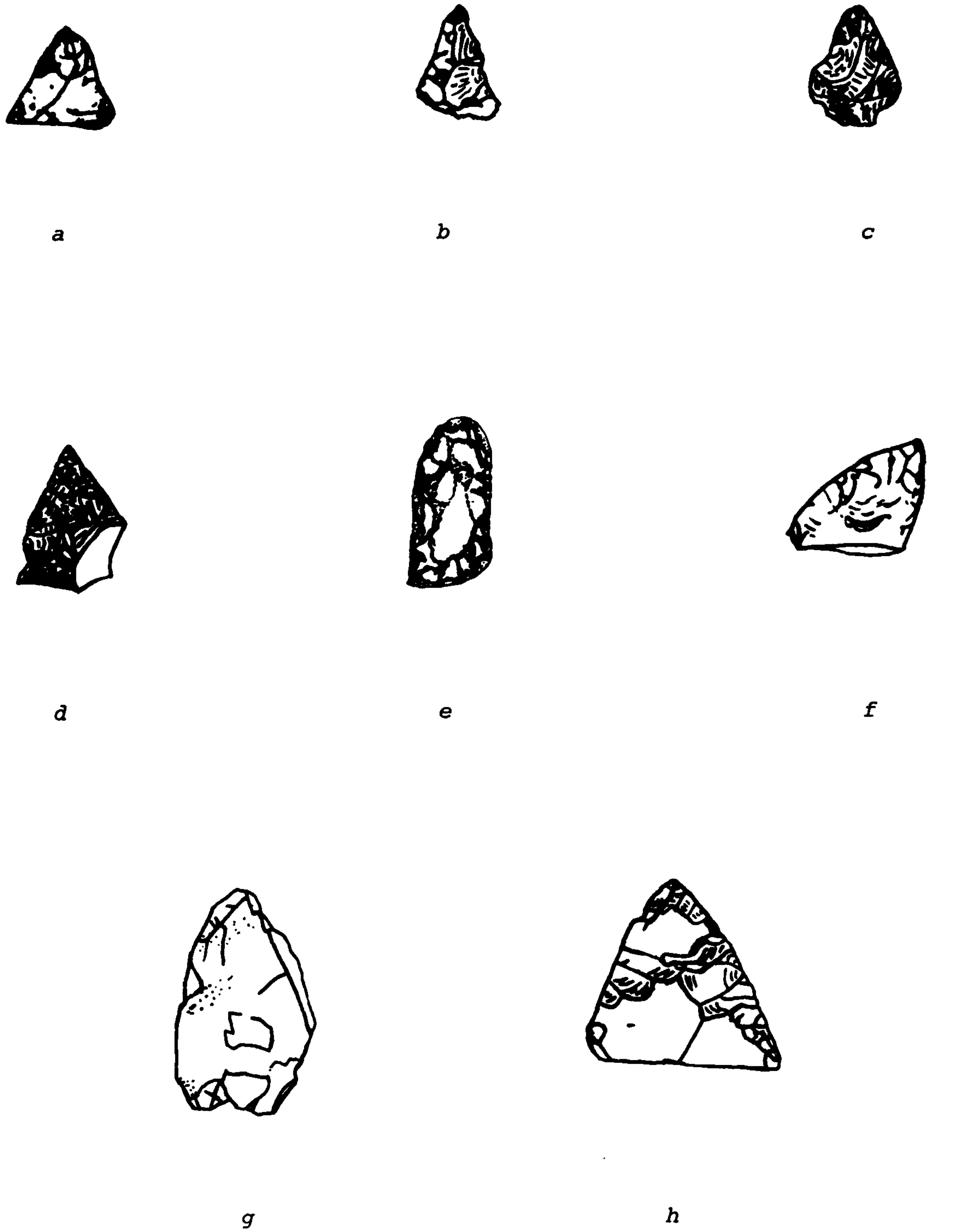


Fig. 25. Bifaces (10-CR-768); *a*, rhyolite (0.2.31); *b*, chert (0.3.3); *c*, vitrophyre (0.3.4); *d*, obsidian (3.2.1); *e*, chert (9.1.1); *f*, rhyolite (10.1.1); *g*, chert (11.2.1); *h*, chert (13.M1.1). Scale 1:1.

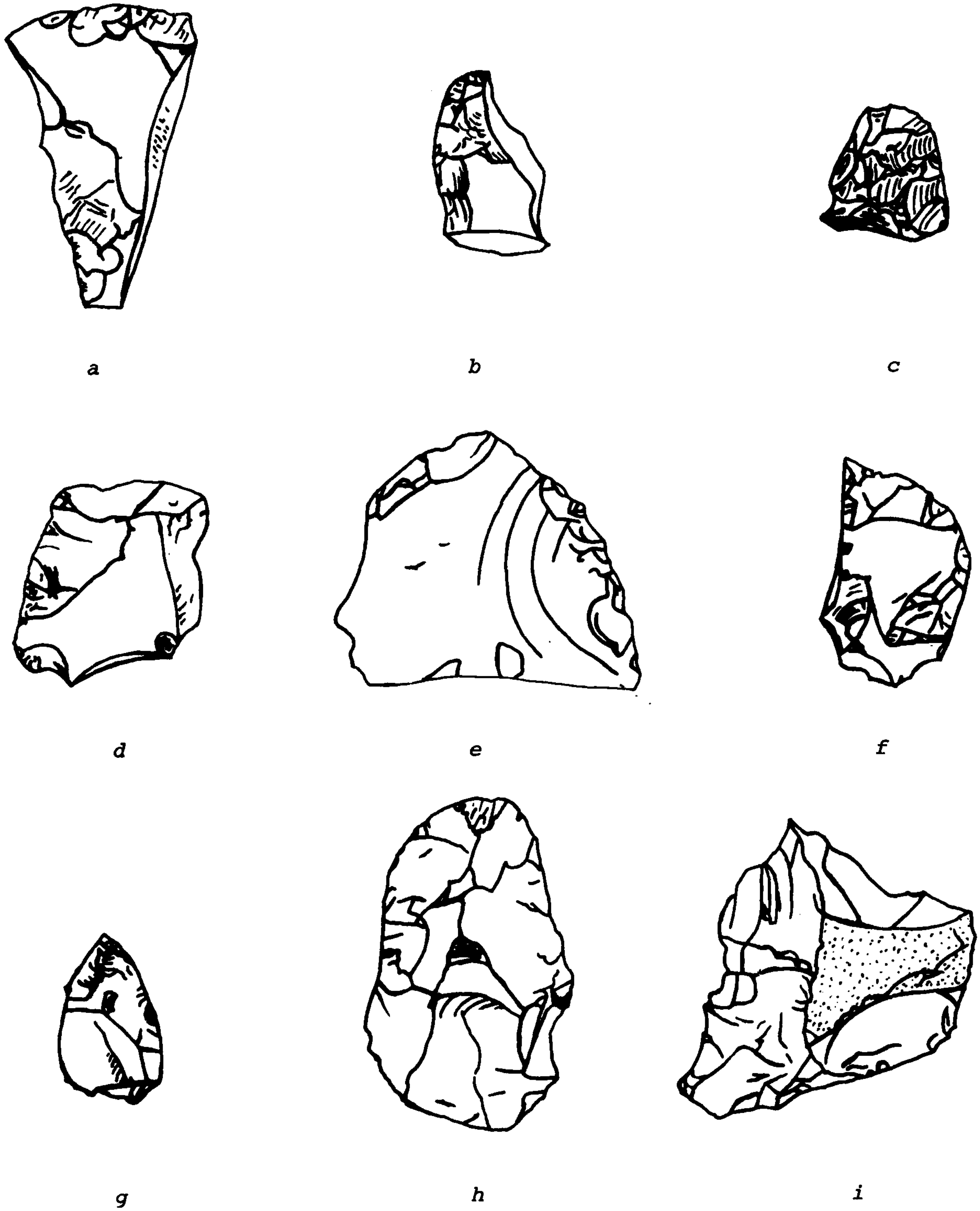


Fig. 26. Bifaces (10-CR-768); *a*, rhyolite (0.2.4); *b*, chert (0.2.23); *c*, chert (0.3.1); *d*, chert (0.3.11); *e*, chert (0.3.12); *f*, rhyolite (1.2.3); *g*, rhyolite (1.2.4); *h*, rhyolite (0.3.10); *i*, chert (1.2.1). Scale 1:1.

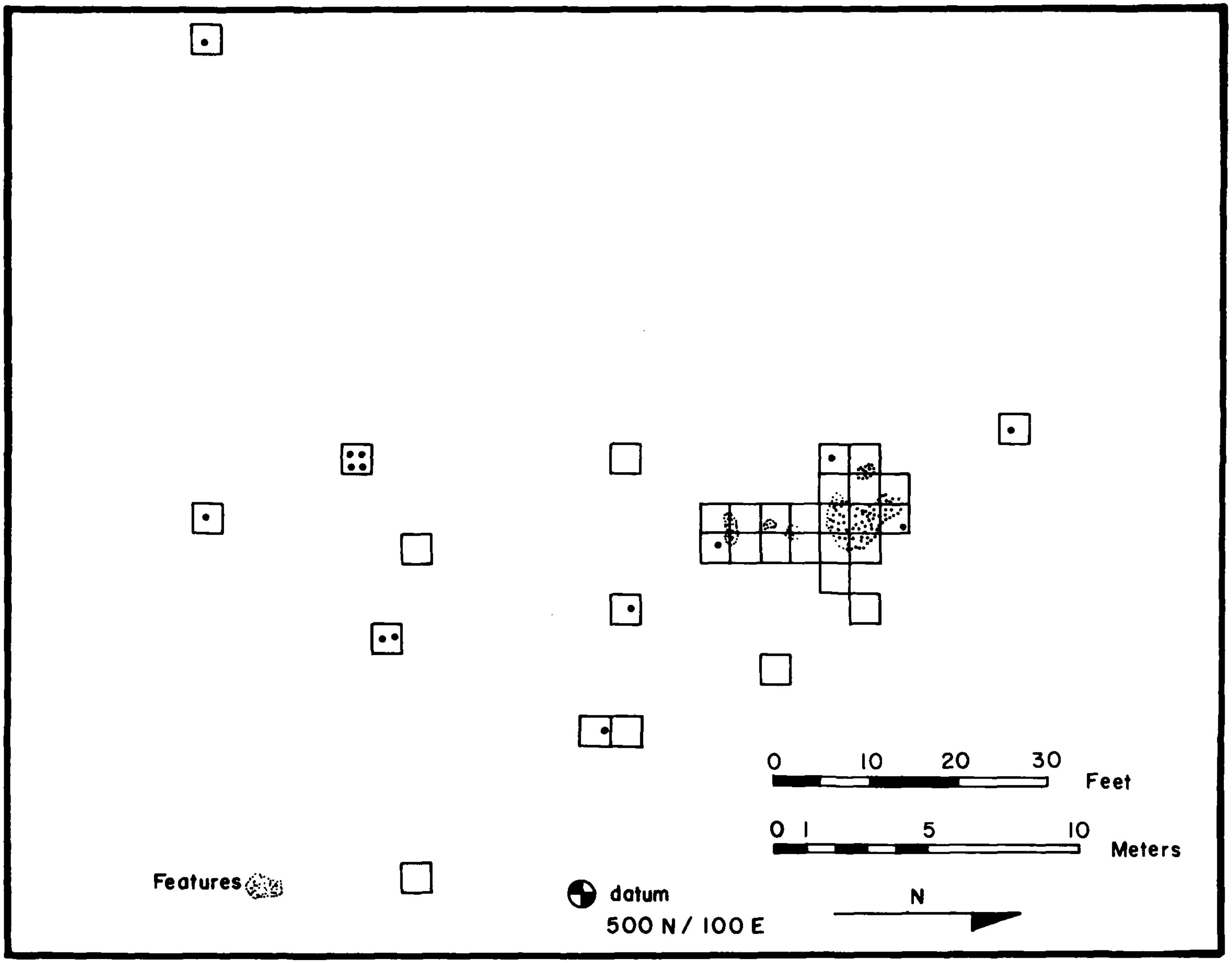


Fig. 27. Distribution of bifaces (10-CR-768).

TABLE 7

Description and distribution of bifaces, 10-CR-768

Item No.	Material	Condition[a]	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Comments	Fig. No.
0.2.4	Rhyolite	b c	50	32	5	9.2	Midsection	26*a*
0.2.23	Chert	b c/l	29	17	6	3.2	Edge fragment	26*b*
0.2.31	Rhyolite	b c	17	16	3	1.8	Tip fragment	25a
0.3.1	Chert	b c	22	20	5	3.5	Base fragment	26*c*
0.3.3	Chert	b c	17	13	3	1.0	Tip fragment	25*b*
0.3.4	Vitrophyre	b c	17	14	4	1.6	Tip fragment	25*c*
0.3.9	Chert	c	35	29	11	11.4	Core	26*h*
0.3.10	Rhyolite	c	56	42	16	30.2	Core	26*h*
0.3.11	Chert	b c	37	30	7	9.7	Midsection	26*d*
0.3.12	Chert	b c	50	40	6	18.4	End fragment	26*e*
0.5.3	Chert	b c	33	30	7	8.3	Midsection	
0.5.5	Rhyolite	c	58	43	14	31.5	Preform	
1.2.1	Chert	c	54	34	13	30.1	Preform	26*i*
1.2.3	Rhyolite	b c	35	22	7	7.8	End fragment	26*f*
1.2.4	Rhyolite	b c/l	15	12	3	0.7	Edge fragment	26*g*
1.2.8	Chert	b c/l	11	9	3	0.2	Edge fragment	
3.2.1	Obsidian	b c	24	17	5	1.7	Tip fragment	25*d*
8.2.3	Obsidian	b c	8	10	2	0.2	Midsection	
9.1.1	Chert	b c	31	17	5	3.4	Base fragment	25*e*
10.1.1	Rhyolite	b c	26	17	4	1.5	Tip fragment	25*f*
10.2.8	Chert	b c/l	17	11	4	0.8	Edge fragment	
11.2.1	Chert	c	35	21	6	4.4	Preform	25*g*
13.M1.1	Chert	b c	30	29	4	3.0	Tip fragment	25*h*
19.X.1	Chert	b c	15	8	5	0.6	Midsection	
26.1.1	Obsidian	b c	11	5	3	0.4	Tip fragment	
29.2.2	Obsidian	b c	18	17	2	0.6	Midsection	
32.1.3	Chert	b c	46	27	17	18.9	Tip fragment	

[a] Condition: c = complete, b c = broken crosswise, b l = broken lengthwise, b c/l = broken crosswise and lengthwise.

Finally, two bifaces are very irregularly worked over virtually all surfaces. The randomness of the work and the absence of any sharp edges indicate that these items are probably exhausted cores which were bifacially reduced, perhaps in order to conserve the raw material, rather than to fabricate a tool, per se. One is chert (0.3.9) and the other is rhyolite (0.3.10) (Fig. 26, Table 7). Both were surface collected.

Description	Range	Mean
Length	35 - 56 mm	45.5 mm
Width	29 - 42 mm	35.5 mm
Thickness	11 - 16 mm	13.5 mm
Weight	11.4 - 30.2 g	20.8 g

Unifaces

Unifaces are lithic tools flaked on only a single surface to form a generally steep or obtuse edge. The initial flake detachment morphology is still evident on these items, and in almost all case the retouch is on the dorsal surface. A total of 27 unifaces were recovered from 10-CR-768 (Table 8, Figs. 28, 29, and 30).

The most stylized category of unifaces includes four items worked to create a distinct tip or beak, which are referred to as gravers (Table 8, Fig. 28). All are of rhyolite and the durability of this material suggests a more stressful intended function such as working wood or bone.

Description	Range	Mean
Length	33 - 80 mm	50.7 mm
Width	24 - 47 mm	34.2 mm
Thickness	10 - 15 mm	12.2 mm
Weight	8 - 69 g	26.8 g

Another category of unifaces exhibit a single notch worked on an edge (Figs. 28 and 29). Similar items are commonly referred to as spokeshaves and have the inferred function of working wood or bone as the name implies (Aikens 1970:63). Half of these items (4 or 50%) are rhyolite followed by chert (3 or 37.5%), with a single item of quartzite (12.5%). Selection of more resistant materials such as rhyolite and quartzite again suggest use for more stressful tasks.

Description	Range	Mean
Length	24 - 59 mm	34.7 mm
Width	17 - 40 mm	23.1 mm
Thickness	4 - 17 mm	7.6 mm
Weight	1.9 - 29.3 g	6.7 g

A third category of unifaces exhibit multiple notches along a localized edge (Fig. 29, Table 8). These items are commonly referred to as denticulates because of their resemblance to a series of teeth and are

TABLE 8

Description and distribution of unifaces, 10-CR-768

Item No.	Material	Condition[a]	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Comments	Fig. No.
0.1.1	Chert	c	80	61	17	80.0	Denticulate	
0.1.3	Rhyolite	c	80	47	15	69.0	Graver	28*d*
0.2.5	Rhyolite	c	45	24	14	13.4	Graver	28*e*
0.2.21	Quartzite	c	36	18	7	5.8	Spokeshave	
0.2.22	Chert	b c	19	20	7	1.9	Worked on one side and end	
0.2.25	Chert	c	25	19	4	2.3	Spokeshave	
0.2.27	Chert	c	27	16	9	4.0	Denticulate	
0.3.8	Obsidian	c	24	21	8	5.1	Denticulate	29*e*
0.3.9	Rhyolite	c	34	29	6	5.0	Spokeshave	
0.3.13	Chert	b c	15	10	4	0.7	Worked on two sides	29*f*
0.3.14	Chert	c	34	29	11	10.8	Worked on one side and end	29*j*
0.3.15	Chert	c	59	40	17	29.3	Spokeshave	29*a*
0.3.18	Rhyolite	c	42	25	7	8.7	Denticulate	
0.3.20	Rhyolite	c	37	31	7	7.7	Denticulate	29*g*
0.3.30	Chert	c	37	20	13	1.9	Spokeshave	29*b*
0.4.4	Chert	c	22	19	2	1.8	Worked on all edges	29*c*
0.5.7	Chert	b c	16	22	4	1.4	Worked on one side and end	
1.2.5	Chert	b c/l	28	17	5	2.7	Worked on one side	29*h*
3.1.1	Chert	b c	31	19	9	3.2	Worked on one side	29*i*
3.1.2	Chert	b c	25	5	4	1.7	Worked on two sides	
7.1.3	Chert	b c	30	27	7	6.3	Worked on end	29*d*
7.2.1	Rhyolite	c	24	21	5	2.9	Spokeshave	28*a*
10.1.4	Rhyolite	c	33	27	10	8.0	Graver	28*f*
18.1.9	Rhyolite	c	30	21	5	3.6	Spokeshave	28*b*
23.1.6	Rhyolite	c	45	39	10	16.7	Graver	28*g*
32.1.1	Rhyolite	b c	33	24	18	5.7	Worked on two sides	
33.1.1	Rhyolite	c	33	17	4	2.5	Spokeshave	28*c*

[a]Condition: c = complete, b c = broken crosswise, b c/l = broken crosswise and lengthwise.

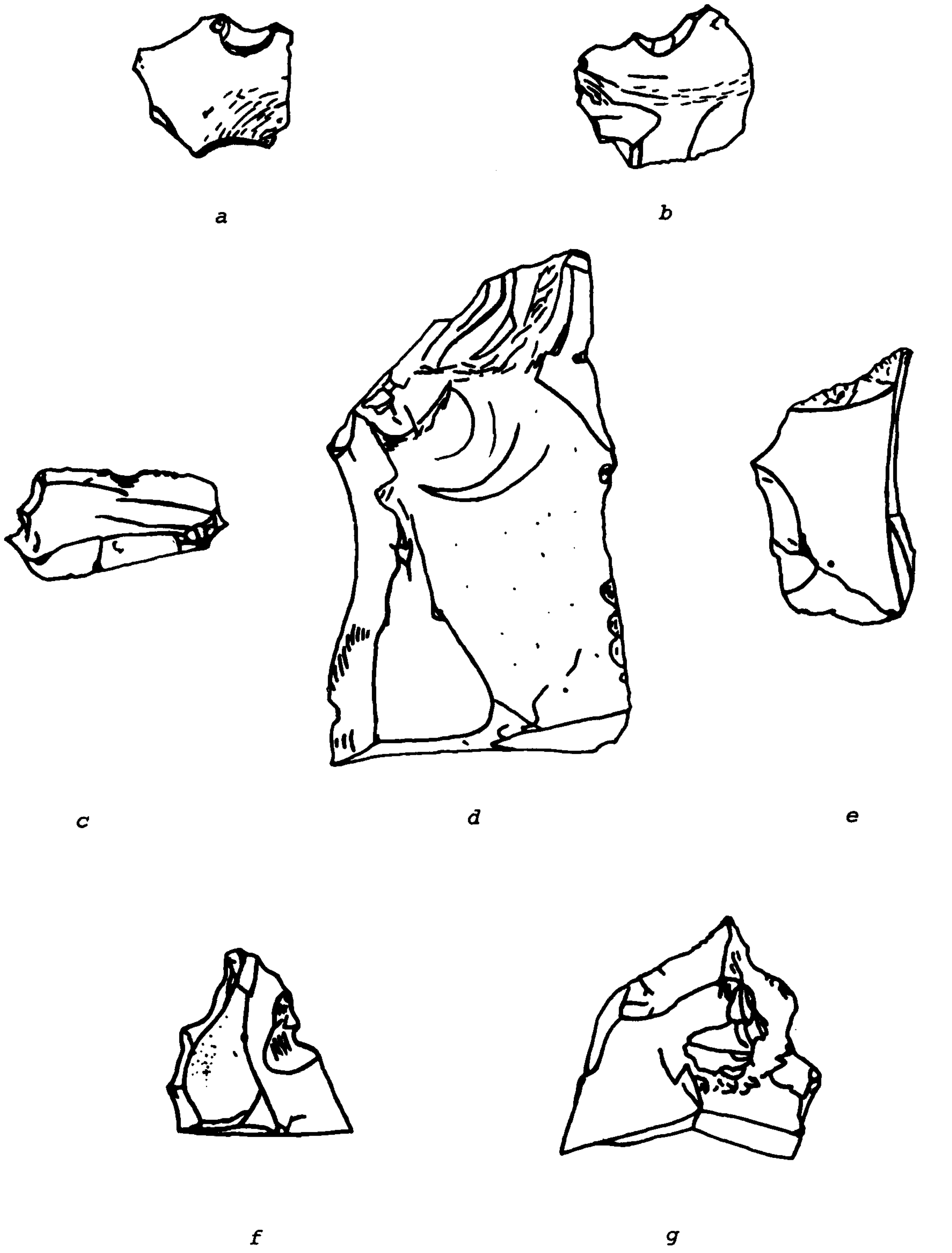


Fig. 28. Unifaces; spokeshaves and gravers (10-CR-768), *a*, rhyolite spokeshave (7.2.1); *b*, rhyolite spokeshave (18.1.9); *c*, rhyolite spokeshave (33.1.1); *d*, rhyolite graver (0.1.3); *e*, rhyolite graver (0.2.5); *f*, rhyolite graver (10.1.4); *g*, rhyolite graver (23.1.6). Scale 1:1.

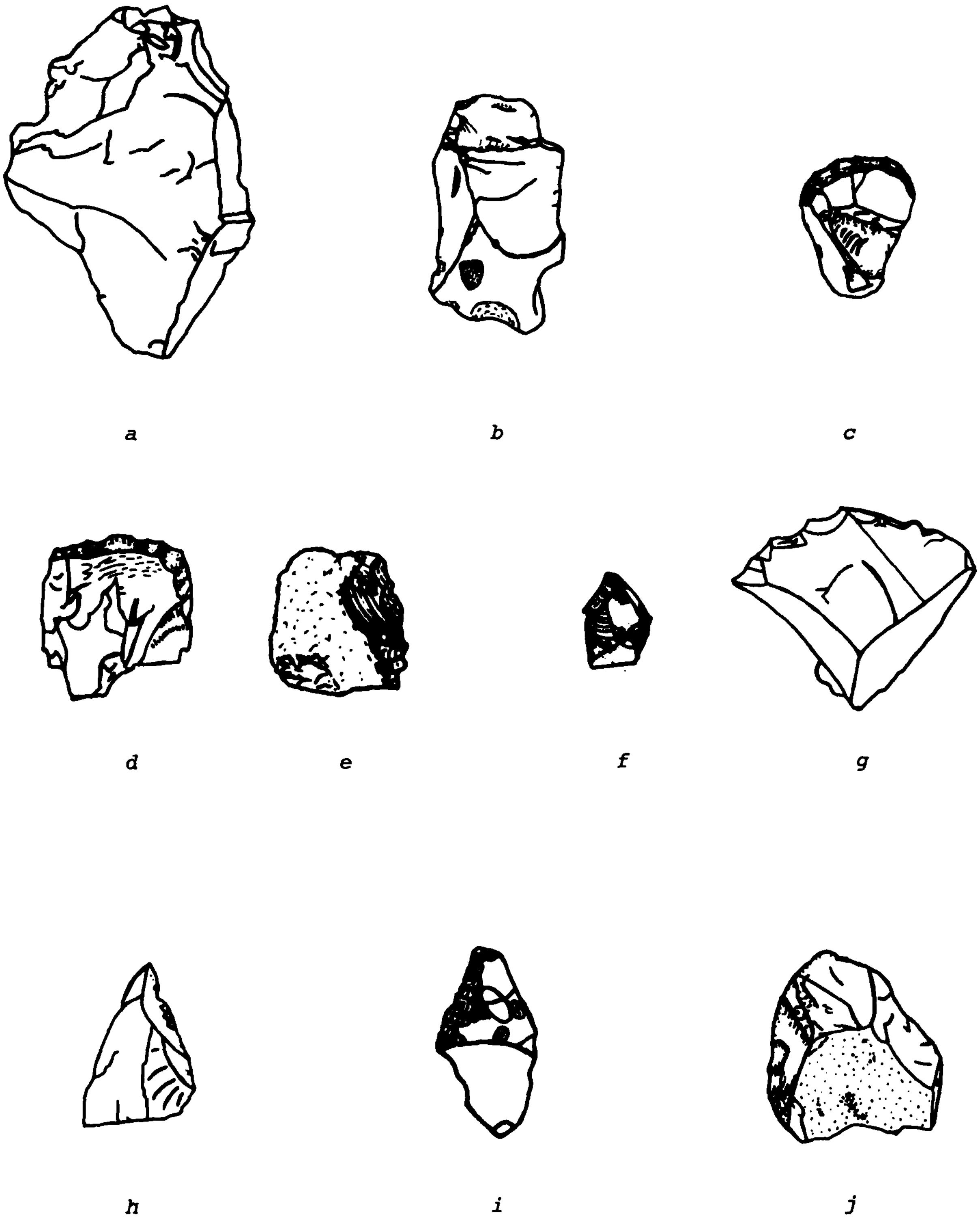


Fig. 29. Unifaces (10-CR-768); *a*, chert spokeshave (0.3.15); *b*, chert spokeshave (0.3.30); *c*, chert (0.4.4); *d*, rhyolite (7.1.3); *e*, obsidian denticulate (0.3.8); *f*, chert (0.3.13); *g*, rhyolite denticulate (0.3.20); *h*, chert (1.2.5); *i*, chert (3.1.1); *j*, chert (0.3.14). Scale 1:1.

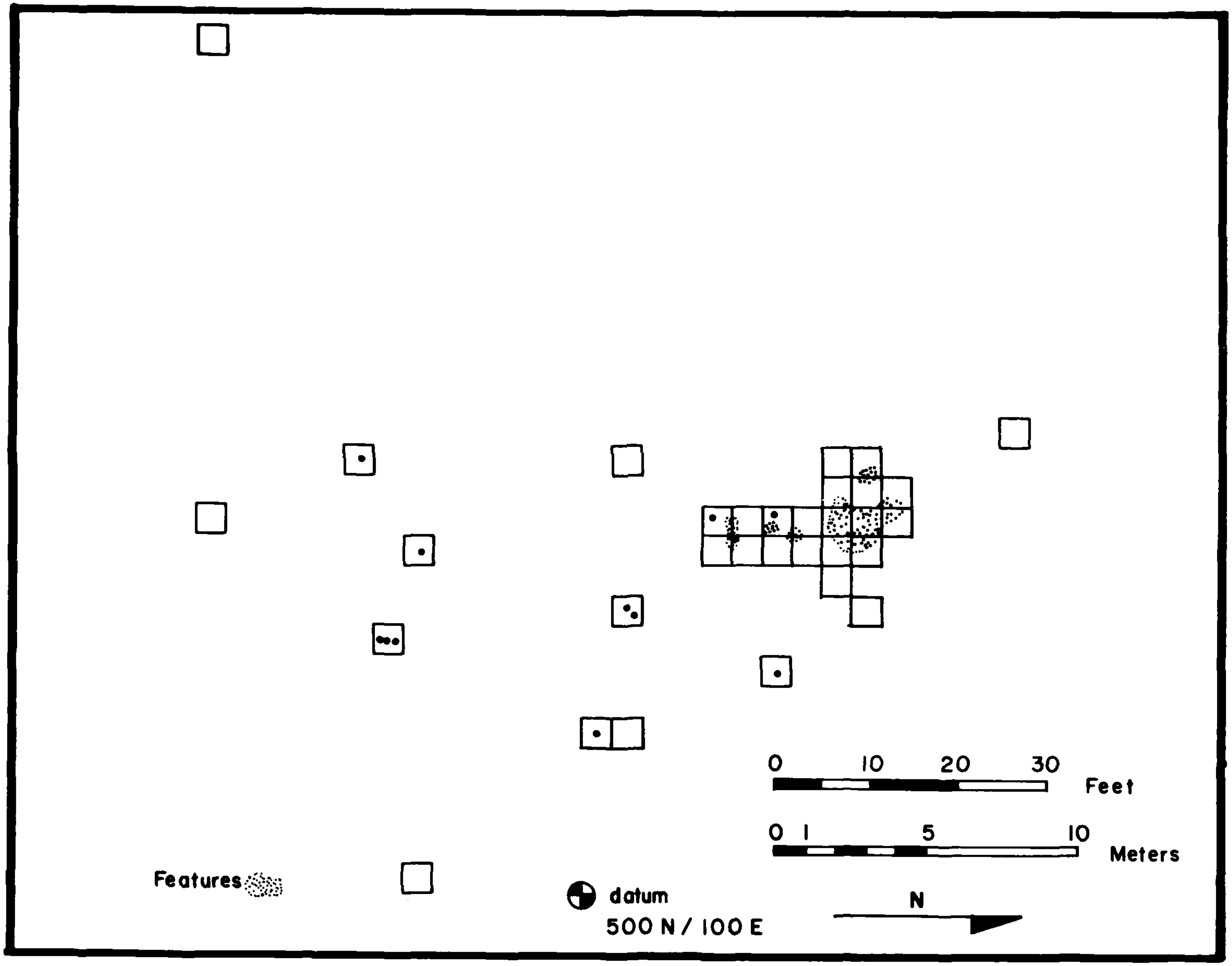


Fig. 30. Distribution of unifaces (10-CR-768), one uniface from Unit 34 not shown.

assumed to have been used for processing or shredding plant fiber (Plew 1976:24, 50; Jennings, Schroedl, and Holmer 1978:102). Lithic materials include chert (2 items or 40%), rhyolite (2 items or 40%), and obsidian (1 item or 20%).

Description	Range	Mean
Length	24 - 80 mm	42.0 mm
Width	21 - 61 mm	30.8 mm
Thickness	7 - 17 mm	9.6 mm
Weight	51 - 80 g	21.1 g

The final category of unifaces includes items unifacially retouched on all or a portion of their edges and/or ends (Table 8). The retouch on these ten items is generally in the form of an obtuse angle; these items are commonly referred to as "side scrapers" or "end scrapers" with the implication being that they were used to scrape something, such as hides, rather than for cutting purposes. Materials again include chert (8 or 80%) and rhyolite (2 or 20%). Most are fragmentary, suggesting breakage from on-site use.

Description	Range	Mean
Length	16 - 34+ mm	28 mm
Width	10 - 29 mm	19.2 mm
Thickness	2 - 18 mm	7.1 mm
Weight	1.8 - 10.8 g	6.3 g

Used Flakes

Flakes which exhibit damage along all or a portion of their edges in the form of crushing, step fractures, and/or small patterned scars are considered used flakes (Table 9). Because accidental breakage from trampling may resemble use wear damage (Knudson 1979; Flenniken and Haggarty 1979), none of the surface collected material is included in this category. Used flakes are among the most casual of tools with unmodified items selected for the task at hand, used, and then discarded. Fresh flakes are extremely sharp and most of these items were probably selected for cutting tasks. Ethnographically, a number of Northern Shoshoni groups employed unhafted flint blades or unretouched obsidian flakes as knives (Steward 1943:311, 368). Ease in manufacture and rapid attrition through use act together to make this the most frequent of all tool categories. Used flakes were recovered from across the site, especially in the center, but were relatively less common in the feature area (Fig. 31). Materials were most commonly chert (199 or 71.7%), followed by rhyolite (73 or 26.3%), with the remainder of quartzite (4 or 1.4%), vitrophyre (1 or 0.3%), and obsidian (1 or 0.3%).

TABLE 9

Description and distribution of used flakes, 10-CR-768

Item No.	Material	Condition	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
1.1.1	Rhyolite	b c	21	19	3	1.9
1.1.2	Rhyolite	b c	21	16	3	1.2
1.1.3	Rhyolite	b c	21	16	3	1.3
1.1.4	Rhyolite	b c	15	10	3	.6
1.1.5	Chert	c	28	19	4	1.8
1.1.6	Chert	c	30	26	5	5.5
1.1.7	Chert	b c/l	15	11	2	.6
1.1.8	Chert	c	17	9	4	.6
1.1.9	Chert	c	24	7	7	4.8
1.1.10	Chert	c	15	11	2	.3
1.1.11	Vitrophyre	b c/l	16	11	5	.8
1.2.6	Rhyolite	b c/l	18	11	2	.5
1.2.7	Rhyolite	b c/l	11	10	4	.2
1.2.9	Chert	c	23	11	8	.5
1.2.10	Chert	c	24	22	8	4.1
1.2.11	Chert	c	24	13	3	.9
1.2.12	Chert	b c	15	13	3	.7
1.2.13	Chert	b c	16	15	4	1.3
1.2.14	Chert	b d	24	20	5	2.4
1.2.15	Chert	c	19	14	2	.8
1.2.16	Chert	b c/l	17	12	2	.5
1.2.17	Chert	c	14	12	2	.4
1.2.18	Chert	c	13	10	3	.3
1.3.1	Chert	c	19	15	5	1.6
2.1.3	Chert	c	26	15	7	2.5
2.1.6	Rhyolite	b c	14	13	2	.5
2.2.1	Chert	b c	24	13	3	1.0
2.2.2	Chert	c	16	14	4	.6
2.2.7	Chert	b c/l	14	10	2	.2
3.1.3	Chert	c	31	10	8	2.6
3.1.4	Chert	b c	20	15	4	1.3
3.1.6	Chert	b c	23	15	4	1.1
3.1.7	Chert	b c	18	18	4	1.7
3.1.8	Chert	c	19	11	2	.6
3.1.9	Chert	c	14	12	4	.5
3.1.10	Rhyolite	b c	2	12	3	.8
3.2.3	Chert	c	15	14	4	.5
3.2.7	Rhyolite	c	16	11	3	.5
4.2.4	Chert	c	22	18	5	1.6
5.1.2	Chert	c	17	24	4	1.6
5.1.5	Chert	b l	19	13	5	.6
5.2.4	Rhyolite	b c	21	22	4	1.8
6.1.2	Chert	b c/l	20	11	7	2.6
6.1.3	Chert	c	12	14	2	.4
6.1.4	Chert	c	24	34	6	4.7
7.1.4	Chert	c	22	44	8	5.4
7.1.5	Chert	c	20	47	8	5.8
7.1.6	Chert	c	49	27	12	9.0
7.1.7	Chert	c	27	23	5	2.9
7.1.8	Chert	c	27	30	7	5.0
7.1.9	Chert	b c	27	13	2	1.0
7.1.10	Chert	c	21	21	7	3.4
7.1.11	Chert	b d	26	10	10	1.2
7.1.12	Chert	c	26	15	4	1.3
7.1.13	Chert	c	22	15	3	1.1

TABLE 9 *continued*

Item No.	Material	Condition	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
7.1.14	Chert	c	26	12	3	.7
7.1.15	Chert	b c/l	10	25	5	1.2
7.1.16	Chert	c	14	23	9	9.8
7.1.17	Chert	c	28	9	1	.7
7.1.18	Chert	c	23	15	1	.6
7.1.19	Chert	c	21	18	6	1.0
7.1.20	Chert	c	14	21	3	.8
7.1.21	Chert	b c	17	15	3	.7
7.1.22	Chert	b c	20	17	3	1.0
7.1.23	Chert	b c	22	18	4	1.2
7.1.24	Chert	b c	14	14	2	.6
7.1.25	Chert	b c	17	14	3	.7
7.1.26	Chert	c	10	19	4	.9
7.1.27	Chert	b c	19	19	3	1.1
7.1.28	Chert	b c	11	13	3	.5
7.1.29	Chert	bc	16	14	2	.5
7.1.30	Chert	c	19	12	4	.6
7.1.31	Chert	c	19	14	5	1.0
7.1.32	Chert	b c	17	7	3	.3
7.1.33	Chert	b c	17	11	2	.3
7.1.34	Chert	b c	15	12	4	.6
7.1.35	Chert	c	20	11	4	1.7
7.1.36	Chert	b c	17	3	2	.2
7.1.37	Chert	c	8	10	2	.3
7.1.38	Chert	b c	14	10	2	.3
7.1.39	Chert	b l	10	13	4	.6
7.1.40	Chert	c	14	14	4	.6
7.1.41	Chert	b c/l	9	9	3	.2
7.2.4	Chert	c	12	21	5	1.0
7.2.5	Chert	b c	20	22	5	2.1
7.2.6	Chert	b c	9	16	3	.4
7.2.7	Chert	c	22	14	3	1.1
7.2.8	Chert	b c/l	11	25	2	.9
7.2.9	Chert	b c/l	32	13	5	2.1
7.2.10	Chert	b c	23	17	4	1.7
7.2.11	Chert	c	18	25	7	2.9
7.2.12	Chert	b c	21	26	6	3.7
7.2.13	Chert	c	31	21	15	6.5
7.2.14	Chert	c	46	27	11	11.6
8.1.1	Rhyolite	b c/l	13	13	2	.4
8.1.2	Rhyolite	b c	15	18	4	1.3
8.1.3	Chert	c	15	17	5	1.0
8.1.4	Chert	c	3	9	1	.1
8.1.11	Rhyolite	b c	13	9	5	.6
8.1.12	Rhyolite	b c	12	15	3	.4
8.1.13	Chert	c	21	11	2	.6
9.1.8	Chert	b c	12	21	3	.7
9.1.9	Chert	c	17	20	3	.7
9.1.10	Chert	b l	13	18	4	1.2
10.1.5	Chert	b c/l	21	22	4	1.4
10.1.6	Chert	c	27	18	5	2.9
10.1.8	Chert	b c	15	17	3	1.2
10.1.9	Chert	b c	13	17	3	1.4
10.1.10	Chert	b c/l	10	15	2	.9
10.1.11	Chert	c	20	13	3	1.3
10.1.12	Chert	b l	12	19	4	1.5
10.1.13	Chert	c	21	16	5	2.0
10.1.14	Chert	b d	20	13	3	.7
10.1.15	Chert	b c	21	16	3	1.5
10.1.17	Rhyolite	b c/l	11	12	2	1.1
10.1.18	Rhyolite	b c	13	14	3	.4

TABLE 9 *continued*

Item No.	Material	Condition	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
10.1.19	Rhyolite	c	14	16	2	1.1
10.1.20	Rhyolite	b c	18	20	4	1.8
10.1.21	Rhyolite	b l	19	14	10	2.4
10.1.22	Rhyolite	c	20	13	2	.6
10.1.23	Rhyolite	b c	30	16	4	2.5
10.1.24	Rhyolite	c	25	17	6	1.8
10.1.25	Rhyolite	b c	14	11	4	1.2
10.1.26	Rhyolite	b c	23	24	4	2.5
10.1.36	Chert	c	33	24	15	9.5
10.1.37	Chert	b c	22	14	8	2.2
10.1.38	Chert	b c	9	15	4	1.3
10.1.39	Chert	c	18	14	6	2.2
10.2.2	Rhyolite	c	38	30	6	4.2
10.2.4	Rhyolite	c	19	23	11	3.5
10.2.5	Chert	c	23	20	9	3.8
10.2.6	Chert	b l	12	14	6	1.4
10.2.7	Chert	b c/l	22	12	2	1.3
10.2.9	Rhyolite	b c	35	22	12	8.6
10.2.10	Rhyolite	b c	26	19	6	3.7
10.2.11	Rhyolite	b c	11	13	3	1.1
10.2.12	Rhyolite	b c/l	11	14	7	1.3
10.2.13	Rhyolite	b c/l	11	15	3	1.2
10.2.14	Rhyolite	b c	12	12	2	.9
10.2.20	Rhyolite	b c	19	11	2	1.1
10.2.21	Rhyolite	b c	17	15	4	1.2
11.1.1	Chert	b c	29	11	6	2.3
11.1.2	Rhyolite	c	26	12	4	1.9
11.2.2	Rhyolite	b c	26	27	5	2.7
11.2.7	Chert	b c	16	10	3	1.1
12.1.1	Quartzite	c	21	27	8	3.5
12.2.1	Rhyolite	b c	7	12	2	1.8
12.2.2	Rhyolite	b c	7	16	5	1.0
13.1.1	Chert	b c/l	21	35	4	3.7
13.1.2	Chert	c	19	35	9	4.1
13.1.3	Chert	c	12	13	3	1.1
16.1.1	Chert	b c/l	10	17	2	1.0
17.1.1	Chert	b c	30	14	6	1.7
17.1.2	Chert	b c/l	16	11	4	.7
17.1.3	Chert	c	9	14	3	.4
17.1.4	Chert	c	12	12	2	.3
17.1.5	Chert	b c	11	20	3	.6
17.1.6	Chert	b c/l	11	16	2	.4
17.1.7	Chert	b c	11	11	3	.4
18.2.5	Rhyolite	c	20	30	13	3.7
19.1.1	Chert	c	20	8	1	.3
19.1.2	Chert	b c	19	15	9	1.8
19.2.1	Chert	c	27	18	7	3.1
20.1.2	Chert	b l	39	17	12	4.7
20.1.3	Chert	c	19	13	5	.9
21.1.1	Chert	c	29	23	6	3.3
21.1.2	Chert	c	27	16	5	2.4
21.1.3	Chert	c	22	22	6	2.9
21.1.4	Chert	c	16	18	3	.8
21.1.5	Chert	c	23	17	4	1.1
21.1.6	Chert	c	25	18	8	3.3

TABLE 9 *continued*

Item No.	Material	Condition	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
21.1.7	Rhyolite	b c/l	11	19	3	.8
21.2.1	Chert	c	9	6	1	.1
21.2.2	Rhyolite	b c/l	16	15	2	.4
22.1.5	Chert	b c	9	15	4	.7
22.1.7	Rhyolite	c	31	39	12	9.1
22.1.9	Chert	c	15	21	5	1.4
22.2.1	Rhyolite	c	39	32	11	12.2
22.2.2	Chert	c	25	11	5	1.1
22.2.3	Chert	b c/l	19	15	4	1.3
23.1.4	Chert	c	31	21	6	3.3
24.1.7	Rhyolite	b l	30	21	11	7.2
24.1.8	Chert	b c/l	21	11	3	.6
28.1.8	Chert	b l	19	15	4	1.2
28.1.10	Chert	c	15	9	2	.2
28.1.11	Chert	b l	18	16	4	1.2
28.1.12	Rhyolite	b c/l	27	18	3	2.1
28.1.13	Rhyolite	c	18	15	5	1.9
28.2.8	Rhyolite	b c	19	17	5	1.3
29.1.1	Rhyolite	b c	29	23	6	3.8
29.1.5	Chert	b c	30	23	6	3.8
29.1.8	Chert	c	18	14	4	1.0
29.1.9a	Rhyolite	b c/l	15	11	3	.4
29.1.9b	Chert	b c	15	7	3	.4
29.1.12	Chert	b d	14	8	3	.3
29.2.5	Chert	b c/l	15	12	3	.5
29.2.9	Rhyolite	b c	14	12	2	.4
30.1.2	Obsidian	c	21	16	2	.8
30.1.3	Rhyolite	b c	29	21	4	3.2
30.1.4	Rhyolite	b c/l	16	13	3	.7
30.1.5	Chert	c	20	12	3	.7
30.1.6	Chert	b c	16	15	4	1.3
30.2.1	Rhyolite	b c/l	19	18	3	2.0
30.2.2	Rhyolite	b c	18	17	4	1.5
30.2.3	Chert	b c	17	16	3	.9
30.2.4	Chert	c	22	20	5	2.3
30.2.5	Chert	b c	15	10	2	.4
31.1.2	Chert	b c	29	13	5	3.6
31.1.3	Chert	b d	28	13	6	1.5
31.1.4	Chert	c	15	12	2	.3
31.1.5	Rhyolite	c	24	22	7	3.5
31.1.6	Rhyolite	c	18	11	3	.5
31.1.7	Chert	b c/l	22	19	5	3.4
31.1.8	Chert	b c	25	20	6	3.7
31.1.9	Chert	c	17	10	3	.5
31.1.10	Rhyolite	b c	18	17	3	.9
31.2.1	Chert	b c	20	16	3	.8
31.2.2	Chert	b c	16	7	4	.4
31.2.9a	Chert	b c	15	8	3	.3
31.2.9b	Chert	b c	14	9	4	.3
32.1.2	Chert	c	45	31	10	11.7
32.1.4	Chert	b c	23	19	5	2.7
32.1.5	Chert	c	24	19	5	1.3
32.1.6	Chert	b c	20	11	5	1.4
32.1.7	Chert	b c	19	11	1	.4
32.1.8	Chert	b c	13	6	2	.2
32.2.1	Rhyolite	b c	20	18	4	2.1

TABLE 9 *continued*

Item No.	Material	Condition	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
32.2.2	Rhyolite	c	31	17	8	4.5
32.2.3	Rhyolite	c	11	9	3	.3
32.2.4	Rhyolite	c	15	12	4	.8
32.2.5	Rhyolite	b c	11	10	1	.2
32.2.6	Rhyolite	b c	19	16	3	.4
32.2.7	Chert	b l	21	12	3	.7
32.2.8	Chert	b d	17	16	5	1.2
32.2.9	Chert	b d	16	12	3	.7
32.2.10	Chert	b c/l	18	12	3	.5
32.2.11	Chert	c	16	10	2	.3
32.2.12	Chert	c	12	7	2	.2
32.2.13	Chert	b c	11	7	1	.2
32.3.1	Rhyolite	b c	22	20	8	3.4
32.3.2	Chert	c	26	13	3	1.1
32.7/8.1	Chert	c	22	13	2	.7
33.1.2	Chert	c	18	16	5	1.2
33.2.3	Chert	b c/l	13	11	3	.4
33.2.4	Quartzite	b c	22	16	3	.8
33.2.5	Quartzite	b c	13	11	1	.2
33.2.6	Quartzite	b c/l	11	8	1	.3
33.2.7	Rhyolite	c	31	17	6	3.3
33.2.8	Rhyolite	c	16	11	3	.4
34.1.1	Rhyolite	b c	17	12	3	.8
34.1.2	Rhyolite	b c/l	9	9	2	.2
34.1.3	Chert	b c	20	15	5	1.6
34.1.4	Chert	b c	21	10	3	.7
34.1.5	Chert	b c	13	9	3	.3
34.2.2	Chert	b c	16	11	3	.7
34.2.3	Chert	b c/l	13	9	2	.3
34.2.4	Chert	c	10	9	1	.1
35.2.1	Rhyolite	b c/l	33	25	9	8.1
35.2.2	Chert	b c	28	22	6	4.0
36.1/2.2	Rhyolite	b d	25	16	4	1.5
36.1/2.3	Rhyolite	c	14	10	3	.4
36.1/2.4	Rhyolite	b c/l	12	12	13	.8
36.1/2.5	Chert	c	27	22	6	3.6
36.1/2.6	Chert	b l	17	14	5	1.4
36.1/2.7	Chert	c	20	14	7	2.3
36.1/2.8	Chert	b c	19	10	2	1.0
36.1/2.9	Chert	c	22	13	3	.5
36.1/2.10	Chert	b c	17	11	4	1.0
36.1/2.11	Chert	c	17	13	3	.9
36.1/2.12	Chert	c	27	7	7	1.2
36.1/2.13	Chert	c	15	10	5	.6
36.1/2.14	Chert	c	16	10	5	.5
36.1/2.15	Chert	b d	14	11	3	.7
36.1/2.16	Chert	b d	17	11	4	.6
36.1/2.17	Chert	c	13	8	3	.3
36.1/2.18	Chert	b c/l	14	9	7	.5
28.F5.1	Chert	c	22	15	4	1.8
28.F5.3	Rhyolite	c	13	11	4	1.6

[a]Condition: c = complete, b c = broken crosswise, b l = broken lengthwise, b c/l = broken crosswise and lengthwise, b d = broken diagonally.

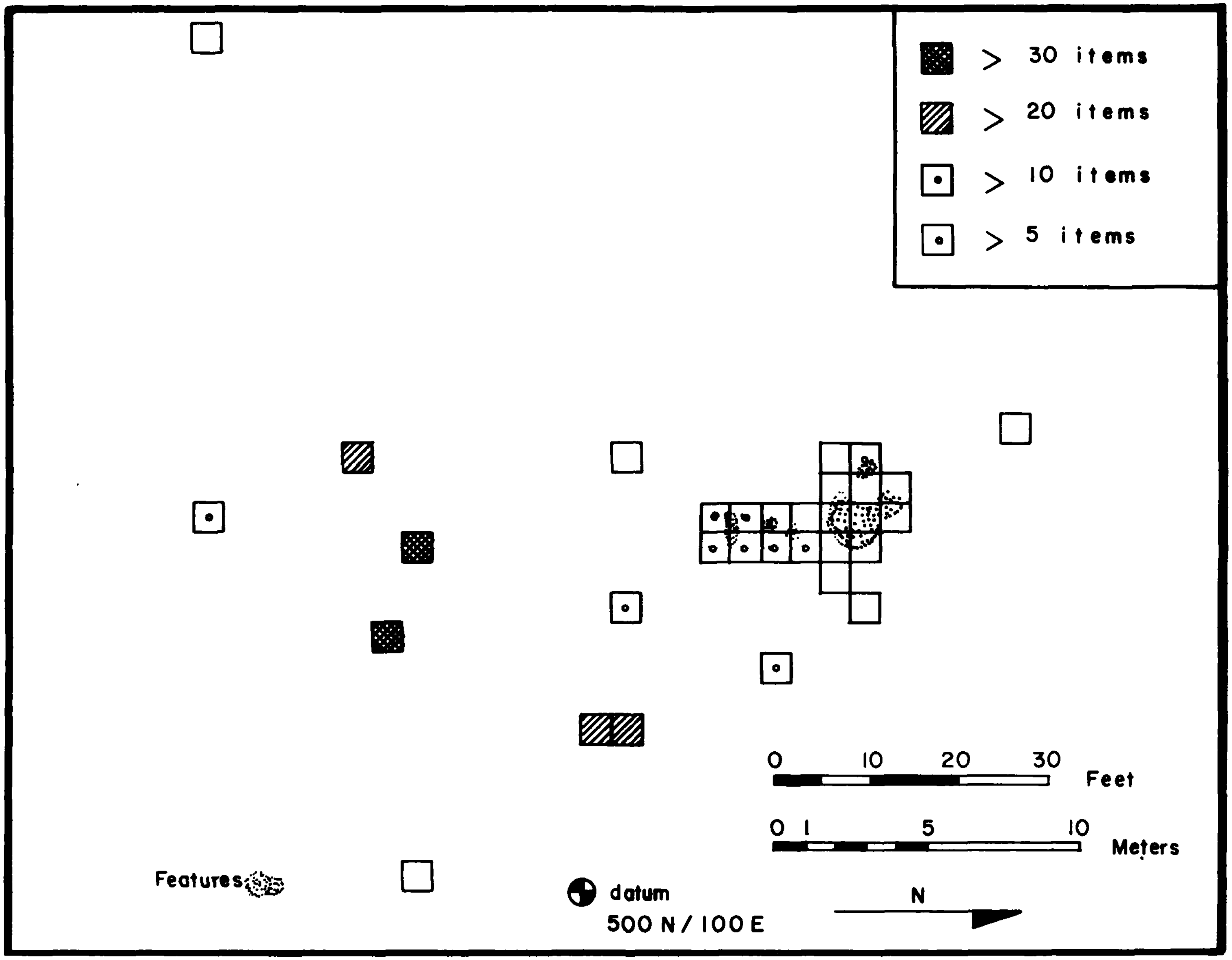


Fig. 31. Distribution of used flakes (10-CR-768).

Description	Range	Mean
Length	8 - 45 mm	20.7 mm
Width	6 - 47 mm	17.7 mm
Thickness	1 - 15 mm	4.9 mm
Weight	0.2 - 12.2 g	2.1 g

Cores

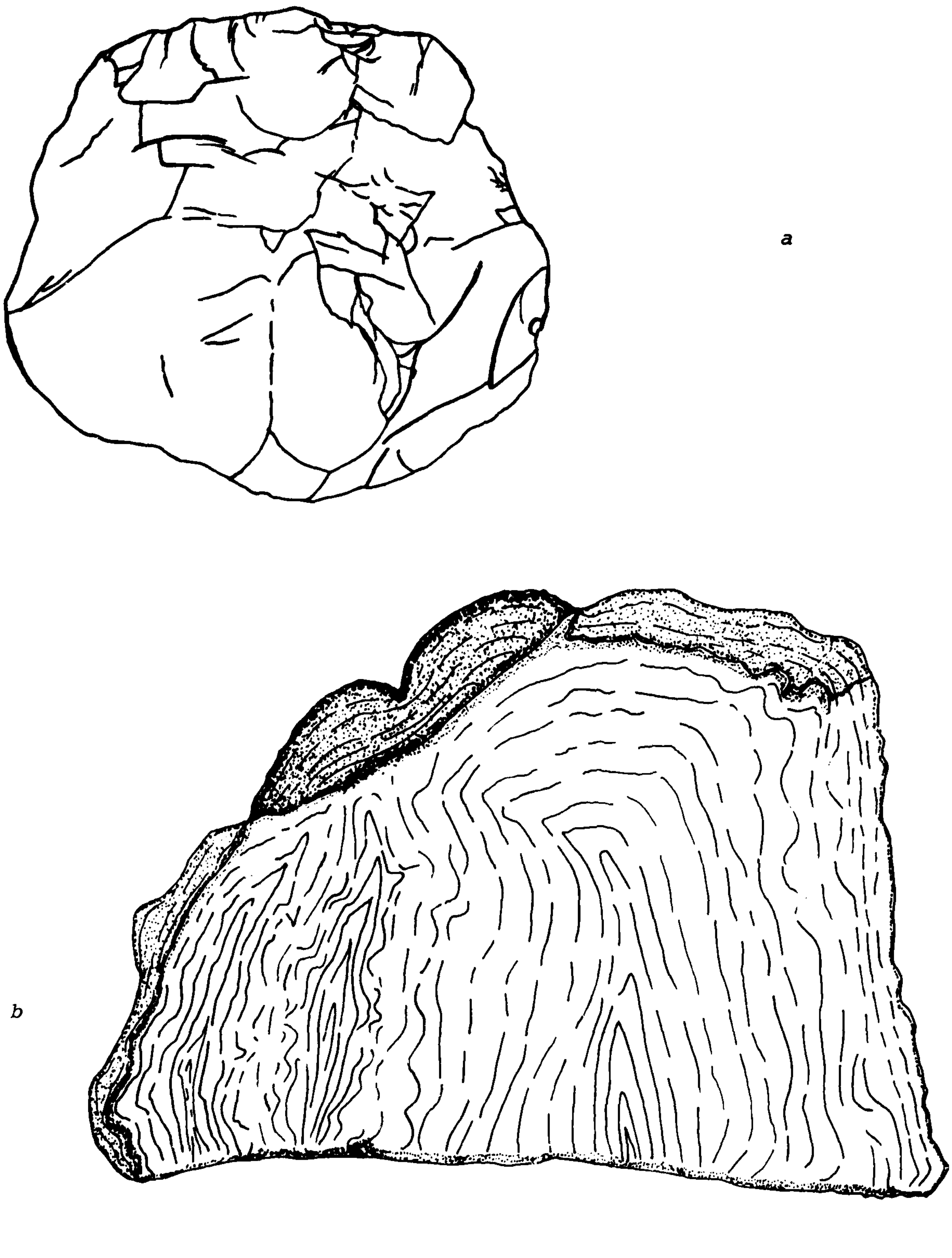
Cores are cobbles from which flakes have been removed for direct use or for modification into other tools (Fig. 32, Table 10). Cores are items which have been employed to provide raw material; elsewhere, cores have been employed as tools for various tasks, but none of the items recovered from 10-CR-768 exhibit any indications from such use. All cores from 10-CR-768 have been randomly worked, that is, flakes have been removed from any and/or all convenient platform surfaces in an irregular manner as compared to the removal of flakes relative to a prepared striking platform. Nearly all are chert (12 or 86%) with single items (7% each) of rhyolite and obsidian. Most were surface collected with four recovered from the general vicinity of the center of the site (Fig. 33).

Description	Range	Mean
Length:	28 - 110 mm	46.7 mm
Width:	18 - 90 mm	38.6 mm
Thickness:	12 - 60 mm	22.5 mm
Weight:	5.3 - 603.2 g	75.7 g

Debitage

Debitage refers to all flakes, chips, and shatter and represents the end product of tasks including tool manufacture, tool resharpening, attrition from use in contact with more resistant materials, and so forth. Flakes were by far the most frequent of lithic items recovered from 10-CR-768, accounting for over 90% of the collection (Table 11). Debitage likewise included the most diverse assortment of lithic materials among all six of the lithic tool categories. The most frequent material types were chert and rhyolite, indicating a direct and not too surprising relationship with the various tools discussed above. In addition, there is a very consistent pattern to both the number and mass of the various lithic materials.

Chert was the most frequent material, both by count (61.6%) and by weight (58.3%), followed by rhyolite, both by count (23.6%) and weight (38.8%). Obsidian was a more distant third, again by both count (12.2%) and weight (2.0%) with vitrophyre fourth, both by count (2.2%) and weight (0.5%). The remaining materials are essentially insignificant, but include basalt which is fifth by count (0.3%) but last by weight (0.1%) and quartzite which is last by count (0.1%) but fifth by weight (0.3%).



a

b

Fig. 32. Lithic items (10-CR-768); *a*, randomly worked core (0.2.1); *b*, unifacially flaked cobble (0.4.1). Scale 1:1.

TABLE 10

Description and distribution of cores, 10-CR-768

Item Number	Material (mm)	Length (mm)	Width (mm)	Thickness (g)	Weight	Fig. No.
0.2.1	Chert	110	90	60	603.2	32a
0.2.16	Chert	57	46	28	77.8	
0.2.17	Chert	49	54	28	71.0	
0.2.19	Chert	33	45	13	26.2	
0.3.32	Chert	55	52	28	92.9	
0.3.33	Chert	39	42	19	40.7	
0.3.35	Chert	36	41	26	31.0	
0.3.36	Chert	34	25	23	16.2	
0.3.37	Rhyolite	34	28	15	19.4	
0.5.1	Obsidian	28	18	12	5.3	
2.1.1	Chert	58	32	18	30.3	
7.1.2	Chert	34	20	16	10.1	
24.1.17	Chert	36	20	14	14.2	
36.1/2.1	Chert	51	28	15	22.1	

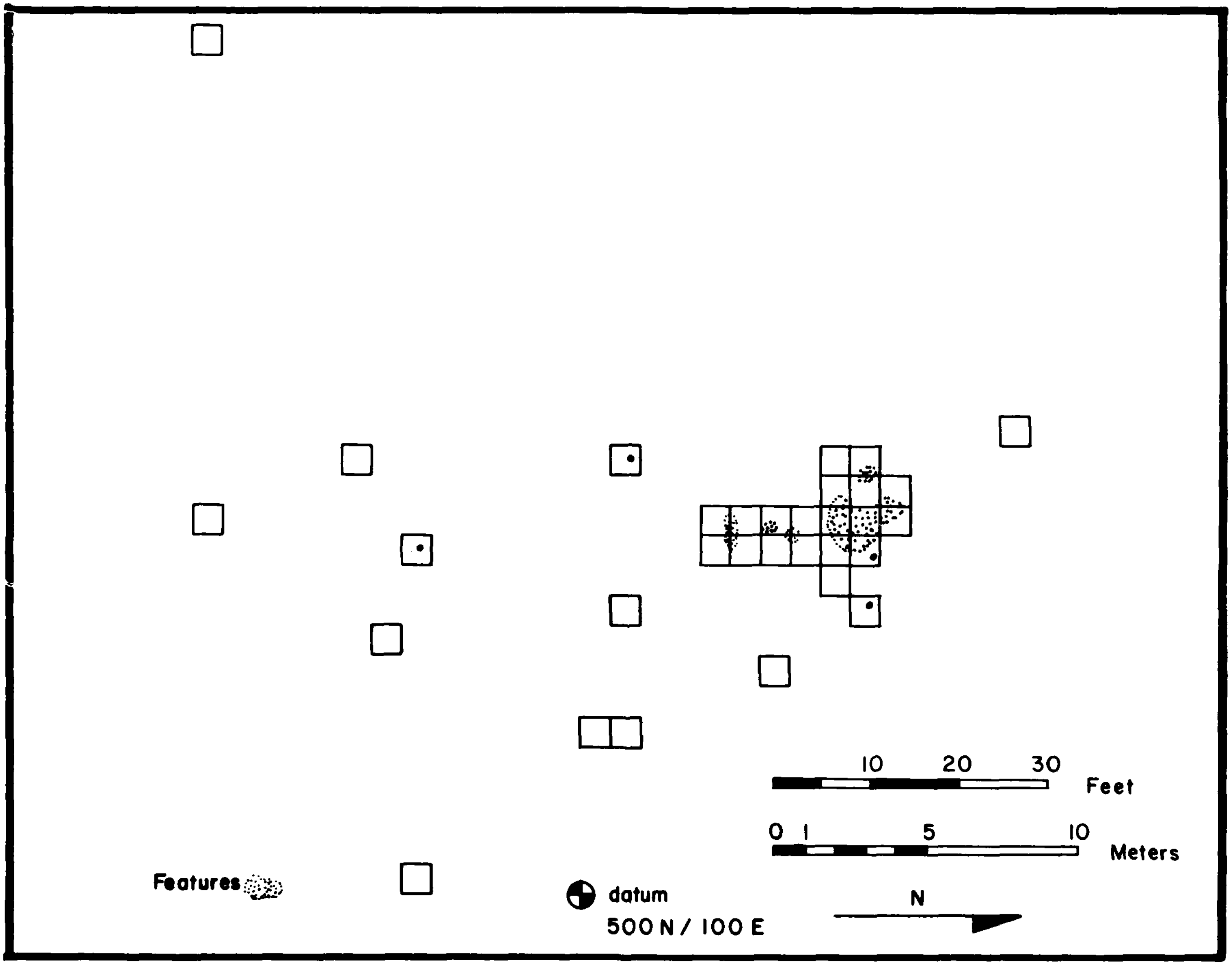


Fig. 33. Distribution of cores (10-CR-768).

TABLE 11

Distribution of flakes by number, weight, material, and unit, 10-CR-768

	Chert		Rhyolite		Quartzite		Obsidian		Vitrophyre		Basalt		Totals	
Units	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
0	195	412.0	109	329.5	1	4.2	6	1.3	4	3.9			315	750.9
1	383	91.3	141	79.1			24	1.4					548	171.8
2	3	1.6	3	1.1			9	.5					15	3.2
3	38	9.7	35	10.2			55	4.3	5	.1			133	24.3
4	32	1.5	9	2.3			15	1.3	3	.1			59	5.2
5	11	2.1	3	.1			2	.2	1	.1			17	2.5
6	7	.6	3	.4									10	1.0
7	443	85.3	73	6.8			10	1.2	8	.3			534	93.6
8	19	.7	41	4.2			12	.6					72	5.5
9	158	28.1	58	24.2			8	.3	1	.1			225	52.7
10	155	41.1	102	18.1			6	.6	1	.1			264	59.9
11	40	3.4	13	1.8			6	.3	4	.1	1	.5	64	5.6
12	15	2.4	28	26.1			7	.3	7	.2	1	.3	58	29.3
13	6	3.4	2	.5	1	.1	1	.1					10	4.1
14	8	.9	4	.1			3	.1	2	.1	2	.1	19	1.3
15	8	1.5	5	1.2			3	.1	1	.1	2	.4	19	3.3
16	2	.3	1	.7									3	1.0
17	10	16.4	4	6.1			1	.1					15	22.6
18	47	7.6	5	.7			12	.6	1	.1			65	9.0
19	29	6.4	2	1.7			1	.1	1	.1			33	8.3
20	10	3.1					5	.2					15	3.3
21	26	16.1	5	1.0			24	1.5					55	18.6
22	67	13.7	14	4.2	1	.2	45	2.9					127	21.0
23	38	8.9	15	4.5			30	1.4					83	14.8
24	24	1.6	6	1.2			11	.9	18	.7			59	4.4
25	1	.1	4	6.4									5	6.5
26	8	5.8	6	2.1			3	.3	1	.1	1	.1	19	8.4
27	21	8.2	10	4.6			6	.4					37	13.2
28	66	12.5	24	4.1			30	1.8	3	.3			123	18.7
29	57	6.8	11	3.4			42	3.2	6	.5	2	.4	118	13.3
30	25	5.9	9	3.5			7	.8	3	.1			44	10.3
31	32	12.0	12	4.1			16	1.3	2	.1			62	17.5
32	29	11.7	19	7.3			7	1.0					55	20.0
33	12	5.9											12	5.9
34	9	2.7	4	1.2									13	3.9
35														
36	19	7.2	7	3.6									26	10.8
UNIT TOTAL	2053	837.5	787	565.1	3	4.5	407	28.6	72	7.2	9	1.8	3331	1445.7
Features														
2	1	.2	2	.1									3	0.3
3	3	.8	1	.1			1	.1					5	1.0
4	6	2.8	2	.1			4	.3					12	3.2
5	33	15.5	14	3.4			6	.3	2	.1			55	19.3
FEATURE TOTAL	43	19.3	19	3.7			11	.7	2	.1			75	23.8
GRAND TOTAL	2096	856.8	806	569.8	3	4.5	418	29.3	74	7.3	9	1.8	3406	1469.5
%	61.6	58.3	23.6	38.8	0.1	0.3	12.2	2.0	2.2	0.5	0.3	0.1	100.0	100.0
Mean	0.41		0.71		1.5		0.07		0.1		0.2		0.43	

The sheer number and relatively small size of the items in the debitage category prevents exhaustive analysis, but all items were examined for the presence or absence of cortex (Table 12). Because decortication is one of the initial phases in the manufacture of any lithic tool, the presence or absence of cortex on debitage provides insights into some activities which may have occurred at 10-CR-768, especially the manufacture of lithic tools. Of the 3406 flakes, only 25 (0.7%) are primary decortication flakes, that is, their entire dorsal surfaces are covered by cortex, indicative of the very first stage in tool manufacture. Most of these are chert (16 or 64%), followed by rhyolite (6 or 24%), vitrophyre (2 or 8%), and basalt (1 or 4%).

Relatively more secondary decortication flakes, that is, flakes with cortex on only a portion of their dorsal surfaces, were recovered. Secondary decortication flakes were tallied by the location of the cortex, whether on the platform only, or on some part of the dorsal surface. Overall, 81 dorsal surface only secondary decortication flakes were recovered, most of which were chert (60 or 74.1%), followed by rhyolite (18 or 22.2%), and obsidian (3 or 3.7%). Considerably fewer flakes (29) retained cortex on the platform only; again, most of these were chert (23 or 79.3%) followed by rhyolite (5 or 17.2%) and obsidian (1 or 3.5%). Taken together, secondary decortication flakes represent just 3.2% of the debitage while all decortication flakes account for just 4% of the debitage. While it is apparent that fabrication of lithic tools did probably occur as one of the activities at 10-CR-768, it was only an ancillary aspect of the occupation and not one of the major tasks of the inhabitants of the site.

The distribution of the flakes is heaviest at the south central portion of the site in units 1, 7, 9, and 10 (Fig. 34). Relatively few of the flakes were recovered from the feature area at the north central end of the site, suggesting that different areas of the site were utilized for different tasks with knapping, related to tool manufacture and rejuvenation, occurring in a somewhat discrete area at one end of the site and food preparation at the other. Perhaps the distribution of debitage and features represents evidence of spatially oriented and sexual division of labor at 10-CR-768.

Cobble Tools

Despite the ready availability of cobbles in the immediate vicinity of 10-CR-768, very few cobble tools were recovered (Table 13). One explanation for this may be that the very abundance of cobbles provided enough material so that a new cobble was selected whenever one was required and, therefore, few items were employed long enough to receive enough damage to indicate having been used. An alternate explanation is simply that the occupants of the site had little need for cobble tools and thus few were ever employed at the site.

Two cobbles (13.M1.2, 23.F4.5) exhibit distinct evidence of battering on their ends, indicating use for some sort of pounding type tasks (Fig. 35). The removal of small flakes from the ends of these cobbles and

TABLE 12

Distribution of decortication flakes, 10-CR-768

Category	Chert		Rhyolite		Obsidian		Vitrophyre		Basalt		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Primary	16	64.0	6	24.0			2	8.0	1	4.0	25
Secondary, platform only	60	74.1	18	22.2	3	3.7					81
Secondary, dorsal surface	23	79.3	5	17.2	1	3.4					29
TOTAL NO.	99		29		4		2		1		135
TOTAL %		73.3		21.5		3.0		1.5	1	0.7	100.0

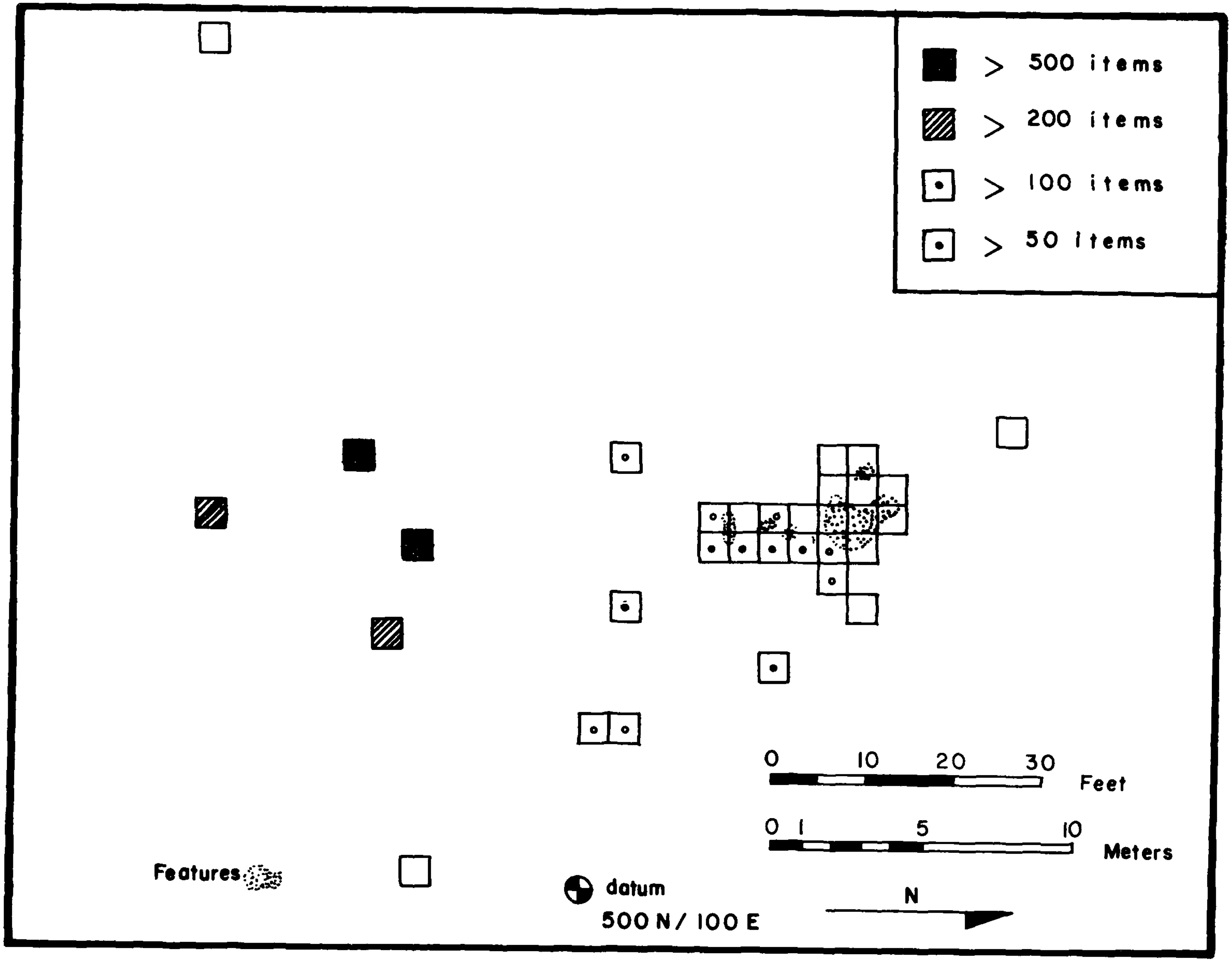
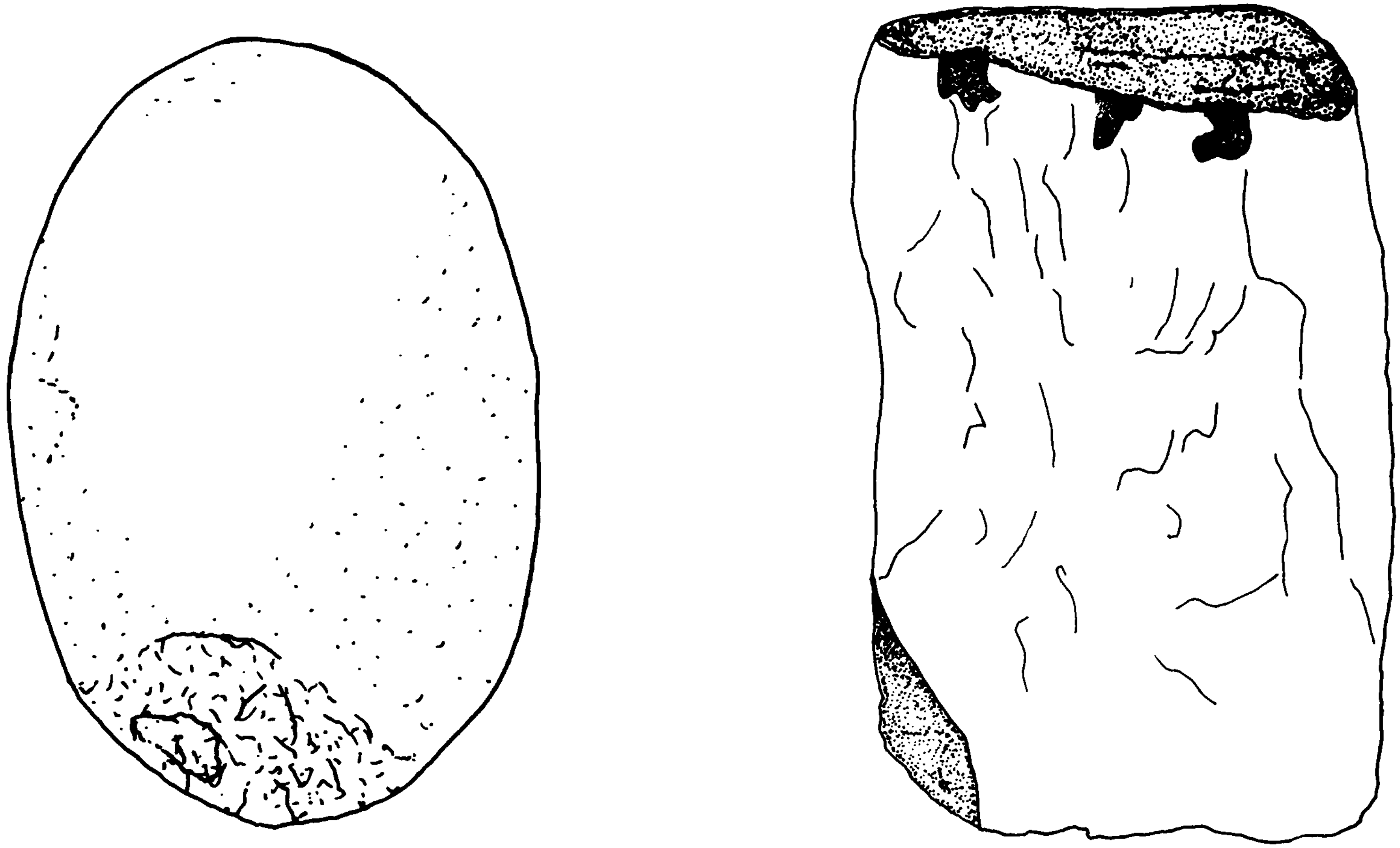


Fig. 34. Distribution of flakes (10-CR-768).

TABLE 13

Description and distribution of cobble tools, 10-CR-768

Item No.	General Morphology	Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Fig Number
0.4.1	Unifacial worked cobble	Granitic	14.5	9.5	2.5	630.0	32*b*
13.M1.2	End Battered Cobble	Granitic	11.0	7.5	4.0	649.4	35*a*
23.F4.5	End Battered Cobble	Granitic	11.5	6.9	5.3	987.3	35*b*



a *b*

Fig. 35. End battered cobbles (10-CR-768), *a*, 13.M.2; *b*, 23.F4.5. Scale 1:1.

the crushed appearance indicate contact with a more resistant surface; most likely, these tools were used in conjunction with another rock, in a manner analogous to a hammer and anvil. The material is granitic, indicating preference for a more resilient material, one which would gradually wear and crumble rather than shatter. Both were recovered by excavation in the feature area (Fig. 36).

The remaining cobble tool (0.4.1) (Fig. 32b) is a rather flat granitic cobble unifacially flaked to form a somewhat sharp and serrated edge similar to the flaked uniface denticulates discussed above. This tool also exhibits a degree of crushing along portions of its edge indicating use in contact with a more resistant surface. Similar items are commonly referred to as "choppers" and are considered to have been used for heavy chopping or cutting tasks. Experimental replication and use had demonstrated that such items make excellent tools for disarticulating and removing marrow from large mammal limb bones (Flenniken 1977). The association of mountain sheep elements with features 1 and 3 indicates that such a function may be a likely explanation at 10-CR-768.

Summary of Lithic Artifacts

A total of 3758 flaked lithic items (Table 14) and an additional three cobble tools were recovered from surface collection, test excavation, and mitigation excavation at the Big Boulder Creek site. Lithic materials were diverse and included a variety of local, semi-local, and "exotic" materials. The gravel deposits at the site probably provided the cobble tools and the quartzite items; chert, including chalcedony, jasper, agate, and silicified wood was probably obtained within a 50 km (30 mi.) radius of the site; rhyolite was probably obtained at 10-CR-358 5 km (3 mi.) distant; and obsidian, vitrophyre, and probably basalt were obtained at a number of locations across the region (Appendix).

Very few of the lithic tools recovered provide insights into the occupation of the site, but the projectile points suggest affiliations with other groups across south central Idaho and the Northern Great Basin. Both atlatl and arrow points are represented, with the maximum occupation span of some 9000 BP to the historic period, but more likely some 2000 BP to the late prehistoric period. This span includes the radiocarbon dates of 1840-165 BP.

Other bifaces and unifaces indicate that tools were both manufactured and utilized on-site with tasks including general cutting and scraping activities associated with food preparation as well as hide and bone working for bone tools and clothing. The relatively high percentage of used flakes indicate a similar range of activities.

The cores, as well as the debitage and tools, indicate that lithic tools were manufactured to a limited degree at 10-CR-768 as well. These materials indicate that raw material was carried as part of the general tool kit with the diversity of materials representing resources from across the region.

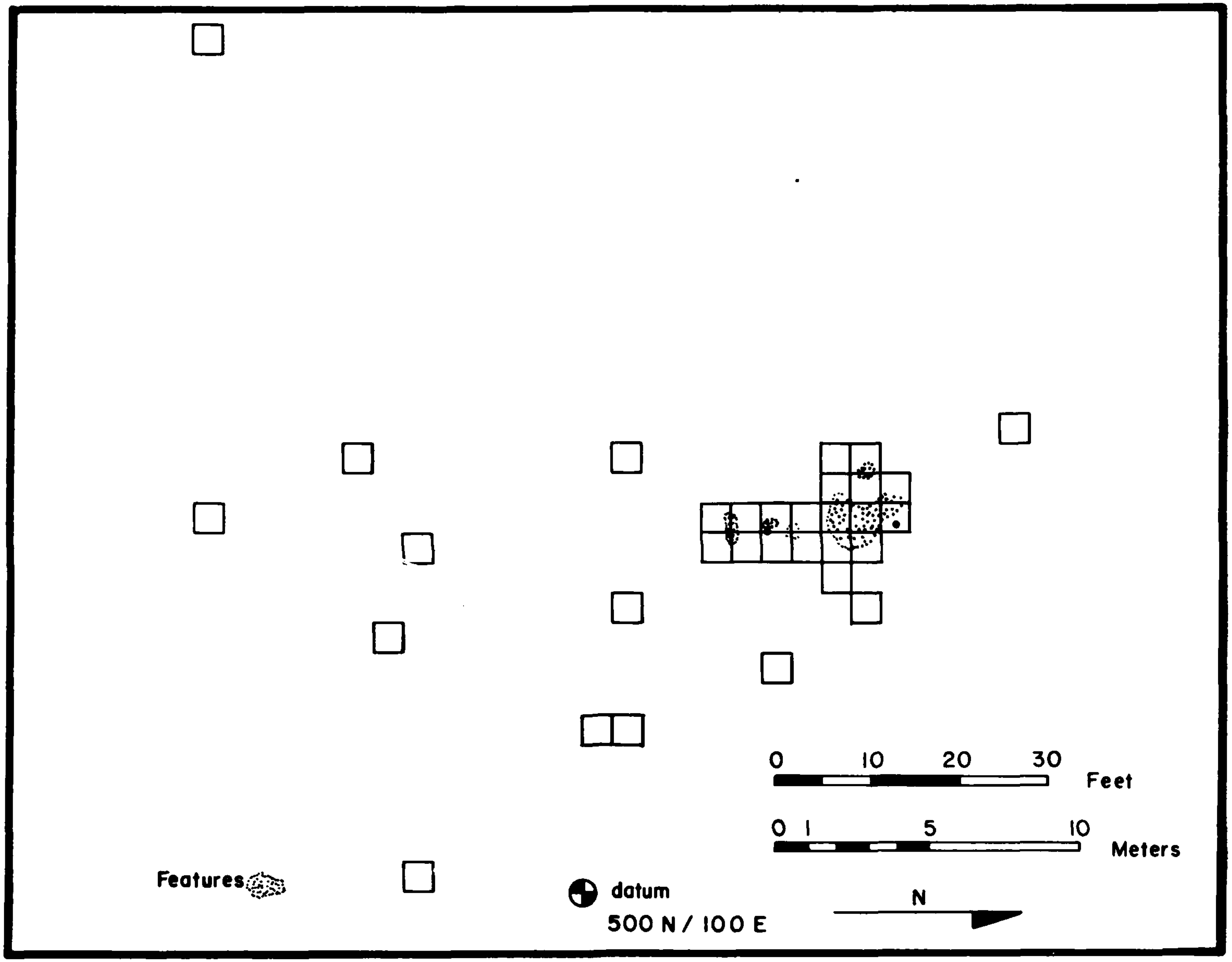


Fig. 36. Distribution of battered cobbles (10-CR-768).

TABLE 14

Distribution of all flaked lithic items by unit and count, 10-CR-768

Unit	Points	Bifaces	Unifaces	Category Used Flakes	Cores	Flakes	Total
0	4	12	17		10	315	358
1	1	4	1	24		548	578
2				5	1	15	21
3		1	2	9		133	145
4				1		59	60
5				3		17	20
6				3		10	13
7			2	49	1	534	586
8		1		7		72	80
9		1		3		225	229
10		2	1	37		264	304
11		1		4		64	69
12				3		58	61
13		1		3		10	14
14						19	19
15						19	19
16				1		3	4
17				7		15	22
18			1	1		65	67
19		1		3		33	37
20	1			2		15	18
21				9		55	64
22				6		127	133
23			1	1		83	85
24				2	1	59	62
25						5	5
26		1				19	20
27						37	37
28				6		123	129
29		1		8		118	127
30				10		44	54
31				13		62	75
32		1	1	22		55	79
33			1	7		12	20
34				8		13	21
35				2			2
36				17	1	26	44
F2						3	3
F3						5	5
F4						12	12
F5				2		55	57
GRAND TOTAL	6	27	27	278	14	3406	3758

Summary of Lithic Materials

Virtually all artifacts recovered from 10-CR-768 consist of flaked lithic material. Six general categories of raw material account for five types of tools plus debitage (Table 15). By far the most frequent overall is chert (including chalcedony, jasper, agate, and other similar materials) both by count (62.3%) and by weight (70.6%); chert is present in all six artifact categories and was a broadly used "all purpose" raw material. Rhyolite is second in frequency, both by count (23.9%) and weight (27.3%); rhyolite is present in all artifact categories with the exception of projectile points, indicating a general use for all but the finer pressure flaked tools. Obsidian is third both by count (11.3%) and by weight (1.2%); obsidian was obtained at a number of locations and was preferred for more refined tools, such as the biface fragments, many of which are probably broken projectile points; obsidian was also brought in infrequently as a raw material as indicated by the core and decortication flakes. Vitrophyre is a similar material and follows obsidian in frequency, both by count (2.1%) and weight (0.4%); vitrophyre was also preferred for projectile points and similar highly refined tools. Basalt was a very minor material, fifth in frequency by count (0.2%) and sixth by weight (0.1%); most basalt items are debitage, indicating on-site use or sharpening of curated tools. Finally, quartzite was sixth in frequency by count (0.2%) and fifth by weight (0.4%); quartzite is available locally in secondary deposits, but is not a common material; quartzite was selected for more casual tools, such as used flakes.

The variety of lithic materials at 10-CR-768 indicate that the inhabitants of the Big Boulder Creek site were well acquainted with the lithic resources of the area on a regional scale; the variety of tools within the various tool classes and differences in materials between categories indicate that raw materials were selected on a task specific basis.

Summary

A number of observations concerning the aboriginal occupation of the Big Boulder Creek site may be drawn from the surface collections, testing, and mitigation excavation. While diagnostic artifacts are somewhat limited, the features and radiocarbon dates indicate that there were at least two occupations of the site during the past 2000 years. Activities included cooking, presumably of vegetal foods, and preparation of mountain sheep and probably ground squirrel for consumption.

Lithic tools indicate that a number of other activities also occurred at 10-CR-768 including the manufacture of tools both from local and introduced materials, cutting and scraping associated with food and hide preparation, and processing of vegetal and other foods by pounding. Projectile point styles are similar to those reported from the Northern Great Basin, suggesting affiliations with the Northern Shoshoni, who occupied the area historically.

TABLE 15

Distribution of all flaked lithic items by material, 10-CR-768

Category	Chert No.	Chert Wt. (g)	Rhyolite No.	Rhyolite Wt. (g)	Quartzite No.	Quartzite Wt. (g)	Obsidian No.	Obsidian Wt. (g)	Vitrophyre No.	Vitrophyre Wt. (g)	Basalt No.	Basalt Wt. (g)	Total No.	Total Wt. (g)
Projectile point	4	6.1							2	6.1			6	12.2
%	66.7	50.0							33.3	50.0				
Biface	15	116.9	7	82.7			4	2.9	1	1.6			27	204.1
%	55.6	57.3	25.9	40.5			14.8	1.4	3.7	0.8				
Uniface	14	148.0	11	143.2	1	5.8	1	5.1					27	302.1
%	51.9	49.0	40.7	47.4	3.7	1.9	3.7	1.7						
Used Flake	199	318.5	73	145.9	4	4.7	1	0.8	1	0.8			278	470.7
%	71.7	67.6	26.3	31.0	1.4	1.0	0.3	0.2	0.3	0.2				
Core	12	1035.7	1	19.4			1	5.3					14	1060.4
%	85.8	97.7	7.1	1.8			7.1	0.5						
Debitage	2096	856.8	806	569.8	3	4.5	418	29.3	74	7.3	9	1.8	3406	1469.5
%	61.6	58.3	23.6	38.8	0.1	0.3	12.2	2.0	2.2	0.5	0.3	0.1		
GRAND TOTAL	2340	2482.0	898	961.0	8	15	425	43.4	78	15.8	9	1.8	3758	3519.0
%	62.3	70.6	23.9	27.3	0.2	0.4	11.3	1.2	2.1	0.4	0.2	0.1		

AD-A144 105 ARCHAEOLOGICAL INVESTIGATIONS ON THE EAST FORK OF THE SALMON RIVER CUSTER COUNTY IDAHO(U) IDAHO UNIV MOSCOW LAB OF ANTHROPOLOGY C D CARLEY ET AL. 1984 2/2

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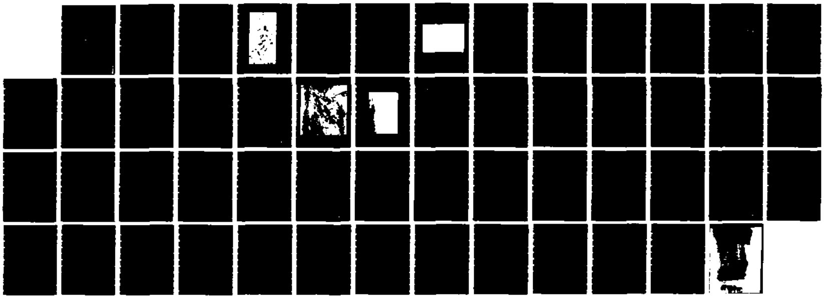
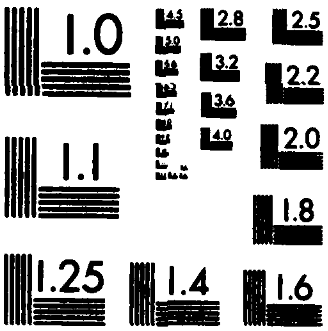




Overall, it appears that this site was intermittently occupied as a temporary camp by family groups who selected it because of its providing shelter, firewood, and water and access to surrounding resources such as mountain sheep and probably vegetal foods. These occupations appear to have been of short duration, but the radiocarbon dates demonstrate that this locus was selected at least twice during the past 2000 years, and possibly at other times as well.

3. ARCHAEOLOGY OF THE BAKER CREEK SITE 10-CR-789

Introduction

The flat located across the river from the Big Boulder Creek site was recorded as the Baker Creek site (Sappington 1982a). The construction of a weir for the Hagerman Satellite Fish Hatchery will impact a small portion within the estimated site boundaries. This area, on a small terrace between the flood plain and the second river terrace, where the major part of the site was recorded, was tested in May 1982 (Figs. 37 and 38).

Environmental aspects such as climate, geology, flora, and fauna of the Baker Creek site are similar to those described for the Big Boulder Creek site. One notable exception is the absence of bighorn mountain sheep on this side of the river (Department of the Interior 1977:2-61).

Archaeological Testing

Little lithic material was evident on the surface of the first terrace. Seven test pits were located throughout the terrace to determine the presence and extent of cultural material and soil depth and stratigraphy (Fig. 39); an additional unit was placed on the edge of the second terrace at the easternmost extent of weir placement. Due to gravels encountered, this latter unit (8) could only be taken to 20 cm below surface. Of the seven remaining 1 m^2 units, two (1 and 3) were excavated to 1 m in depth and five (2, 4, 5, 6, 7) to 50 cm. Material culture at the site was sparse and concentrated in the top 20 cm of soil. Limited cultural material was located to 40 cm, but below this, except for an isolated find, the soil was virtually devoid of cultural items. All material was excavated by hand tools and screened through 3 mm (1/8 in) mesh screen (Fig. 40) and all other methods were the same as employed at 10-CR-768 as discussed above.

Soils and Stratigraphy

A total of eight 1 m^2 test units were excavated at the Baker Creek site. All but one of these were excavated on the first terrace; Unit 8 was excavated at the edge of the upper terrace adjacent to the main site area, well above the modern flood level. The lower seven units were similar in that very little evidence of horizonation was evident; only three, and in one case four, natural strata were discernible. Deposits consisted of sand or very sandy soil with the top 5 cm a somewhat organic layer, brown (10YR 5/3) to a very dark grayish brown (10YR 3/2) in color (taken dry); a similar but slightly lighter colored level 5-20 cm below the surface ranging between dark brown (10YR 3/3) to yellowish brown (10YR 5/4); and a third level brown (10YR 4/3) to pale brown (10YR 6/3) in color at approximately 20 cm below the surface to the end of the excavation unit, generally at 50 cm below the surface (Munsell Soil Color Charts 1975 Edition). In Unit 1 (Fig. 41)

Fig. 37. Boundaries of Baker Creek site (10-CR-789).

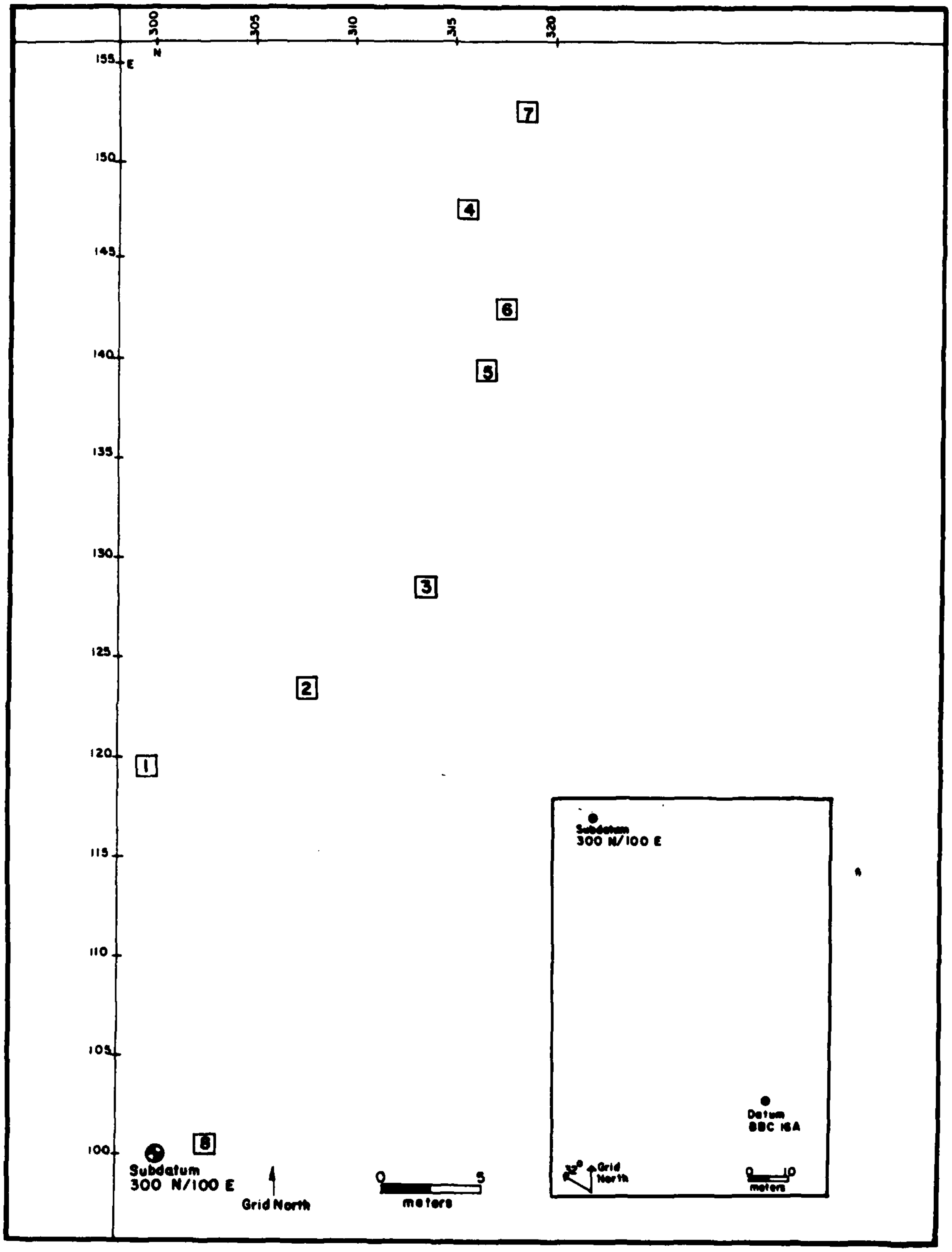


Fig. 38. Location of Baker Creek site test excavations (10-CR-789) in relation to topography and Big Boulder Creek site excavations (10-CR-768). Approximate areas of excavation are indicated.

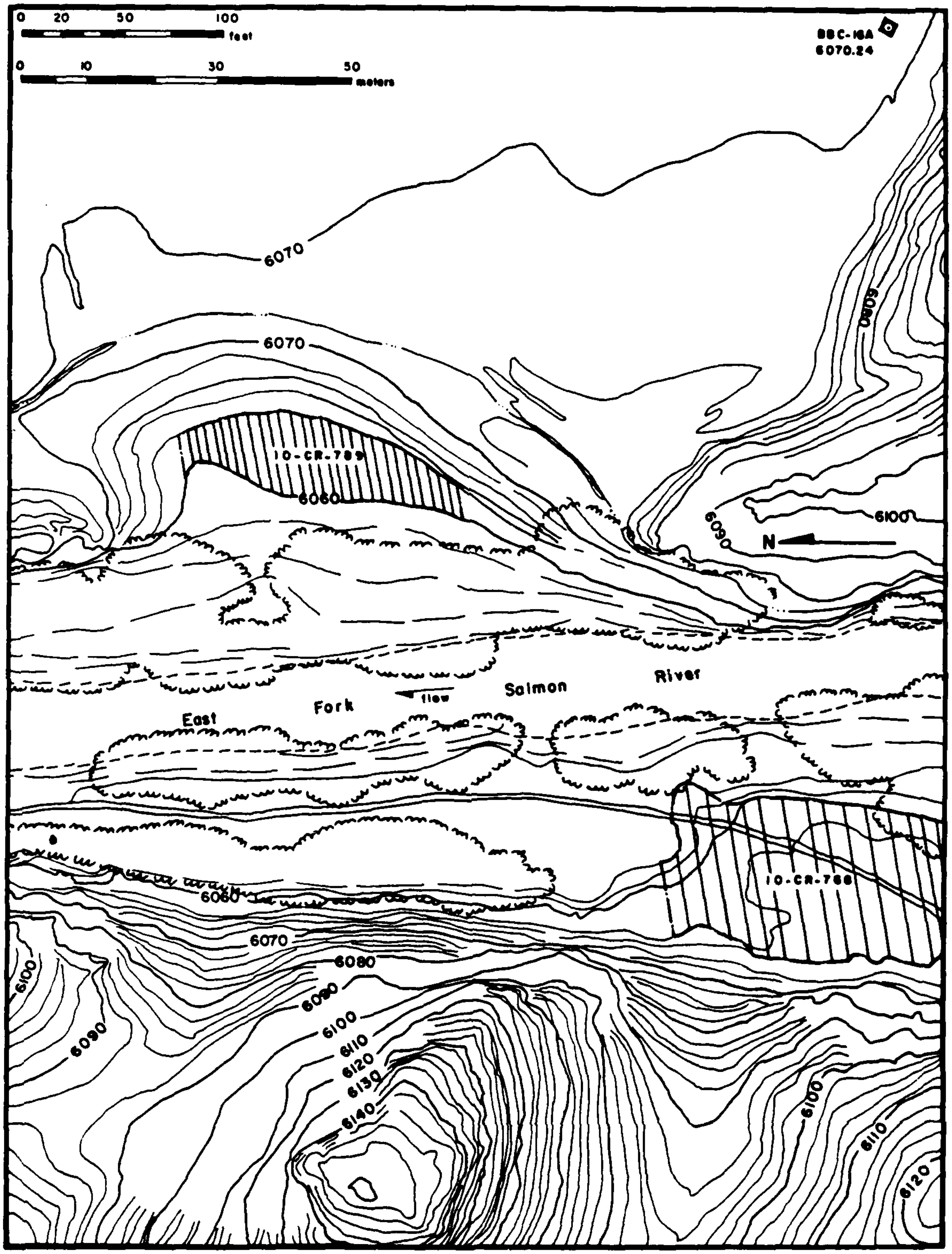


Fig. 39. Plat map of test excavations at Baker Creek site (10-CR-789).

Fig. 40. Baker Creek (10-CR-789) test excavations, looking north.

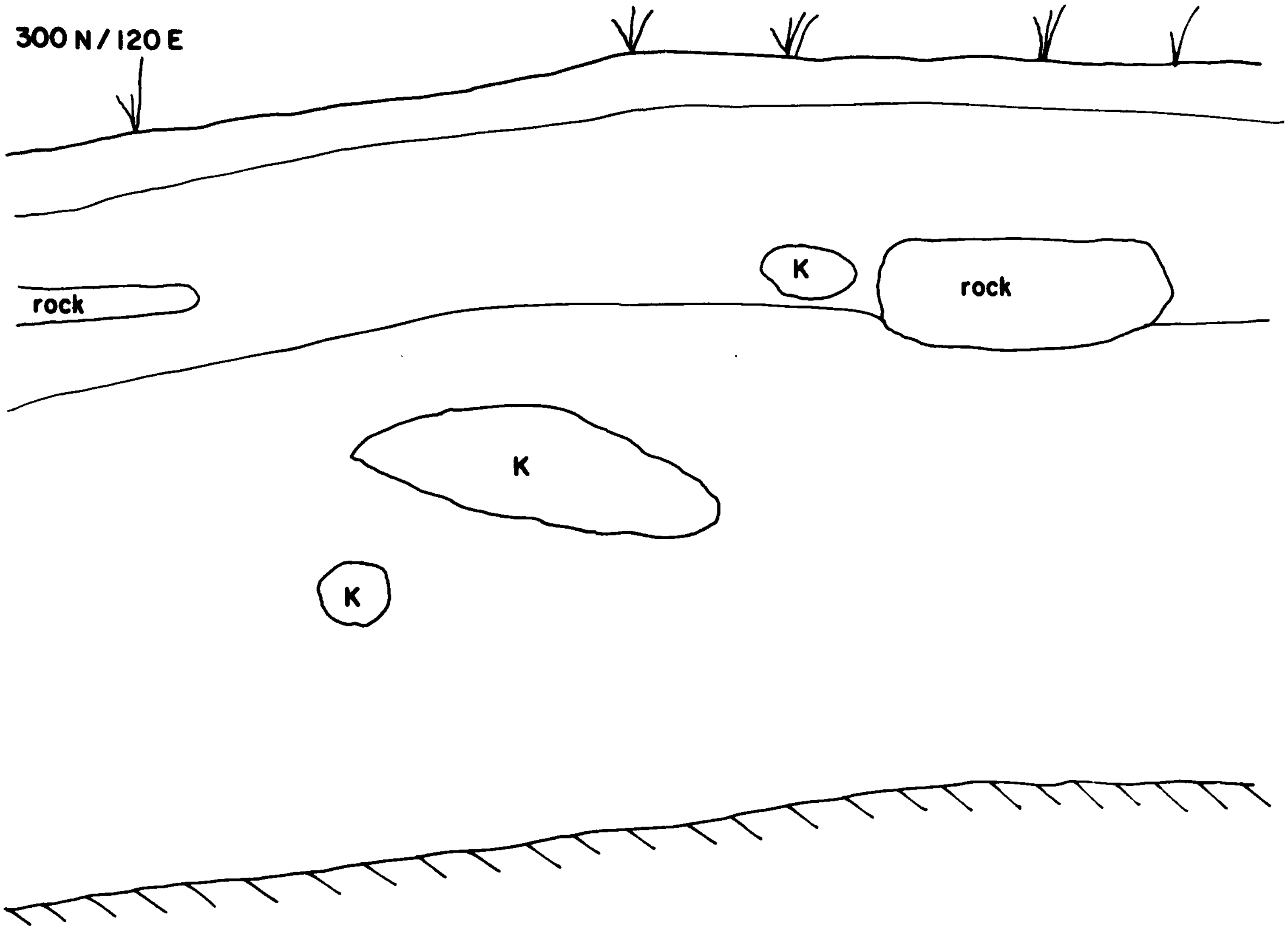


Fig. 41. East wall profile of unit 1 (10-CR-789). Scale 1:10.

there appeared a yellowish brown (10YR 5/4) subdivision from 27-100 cm below the surface but a similar layer was not noted elsewhere. Unit 8 was composed of gravel below the top 2 cm and only taken to 20 cm below the surface; no cultural material was recovered.

Rodent activity was noted in five of the lower seven units indicating considerable disturbance of the site's deposits. After consultation between the supervisor and the COAR it was deemed not worth the expense and difficulty at this phase of the project to take soil monoliths as we had done at 10-CR-768.

The absence of features, the near absence of tools, and the infrequency of debitage also influenced our decision not to take soil monoliths and not to emphasize soils and stratigraphy since it was apparent that the area tested was not heavily occupied. As will be discussed below, virtually all of the tools and debitage recovered came from the first 20 cm, with only one tool and 16 flakes, or approximately 10% of the total sample, below this point. In general, it appears that the lower seven units were situated on a recent landform created by overbank deposition of sand and very sandy soil which is still subject to occasional flooding; the lack of well defined horizons argue for a relatively recent age; the widespread rodent activity indicates that the stratigraphic integrity is fairly thoroughly disturbed.

Lithic Material Culture

A total of 160 lithic items were recovered during the testing phase at the Baker Creek site (Table 16). Six lithic materials were represented, all of which were encountered at 10-CR-768 and discussed above. Similarly, four of the six artifact categories represented at the Big Boulder Creek site were also found at Baker Creek with the exceptions being used flakes and cores. No used flakes were excavated and surface materials were considered to be invalid for determining used flakes due to possible trampling by cattle.

Projectile Point

A single projectile point (1.5.1) was excavated from Unit 1 at a depth of 50 cm below the surface (Fig. 42*a*, Tables 16, 17). Material is obsidian and this item is complete, with the exception of the tip which has been damaged, apparently by an impact fracture.

<u>Description</u>

Length	26 mm
Width	25 mm
Thickness	5 mm
Neck Width	12 mm
Weight	2.7 g

Similar projectile points are commonly recovered across the region and the Northern Great Basin as well, and are referred to as the Elko series,

TABLE 16

Distribution of all flaked lithic items by category and lithic material, 10-CR-789

Category	Chert		Rhyolite		Quartzite		Obsidian		Vitrophyre		Basalt		Total	
	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)
Projectile point							1	2.7					1	2.7
%							100.0	100.0						
Biface	4	26.2	3	64.9									7	91.1
%	57.1	28.8	42.9	71.2										
Uniface	1	34.0	2	52.9							1	125.9	4	212.8
%	25.0	16.0	50.0	24.8							25.0	59.2		
Debitage	91	69.0	30	18.4	1	0.2	14	4.0	9	2.0	3	10.8	148	104.4
%	61.5	66.1	20.3	17.7	0.7	0.2	9.4	3.8	6.1	1.9	2.0	10.3		
TOTAL	96	129.2	35	136.2	1	0.2	15	6.7	9	2.0	4	136.7	160	411.0
%	60.0	31.4	21.9	33.1	0.6	0.1	9.4	1.6	5.6	0.5	2.5	33.3		

TABLE 17

Description and distribution of flaked lithic tools, 10-CR-789

Item No.	Material	Condition[a]	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Comments	Fig. No.
0.1.1	Chert	c	48	48	16	34.0	Uniface	42*h*
0.1.2	Rhyolite	b c	40	59	18	49.6	Uniface, Spokeshave	
0.1.3	Basalt	c	87	59	20	125.9	Uniface	
0.2.1	Rhyolite	b c	62	29	10	23.3	Biface	42*g*
0.2.2	Rhyolite	b c	41	29	9	10.1	Biface	42*e*
0.2.3	Rhyolite	c	48	40	14	31.5	Biface, core	
0.2.4	Chert	b c	34	31	7	8.4	Biface	42*f*
0.2.5	Chert	b c/l	18	11	4	0.7	Biface	
1.5.1	Obsidian	c	26	25	5	2.7	Projectile point Corner notched	42*a*
4.1.1	Rhyolite	b c/l	28	14	11	3.3	Uniface	42*d*
4.1.2	Chert	c	35	27	13	10.8	Biface, core	42*c*
5.1.1	Chert	b l	43	28	6	6.3	Biface	42*b*

[a]Condition: c = complete, b c = broken crosswise, b l = broken lengthwise, b c/l = broken crosswise and lengthwise.

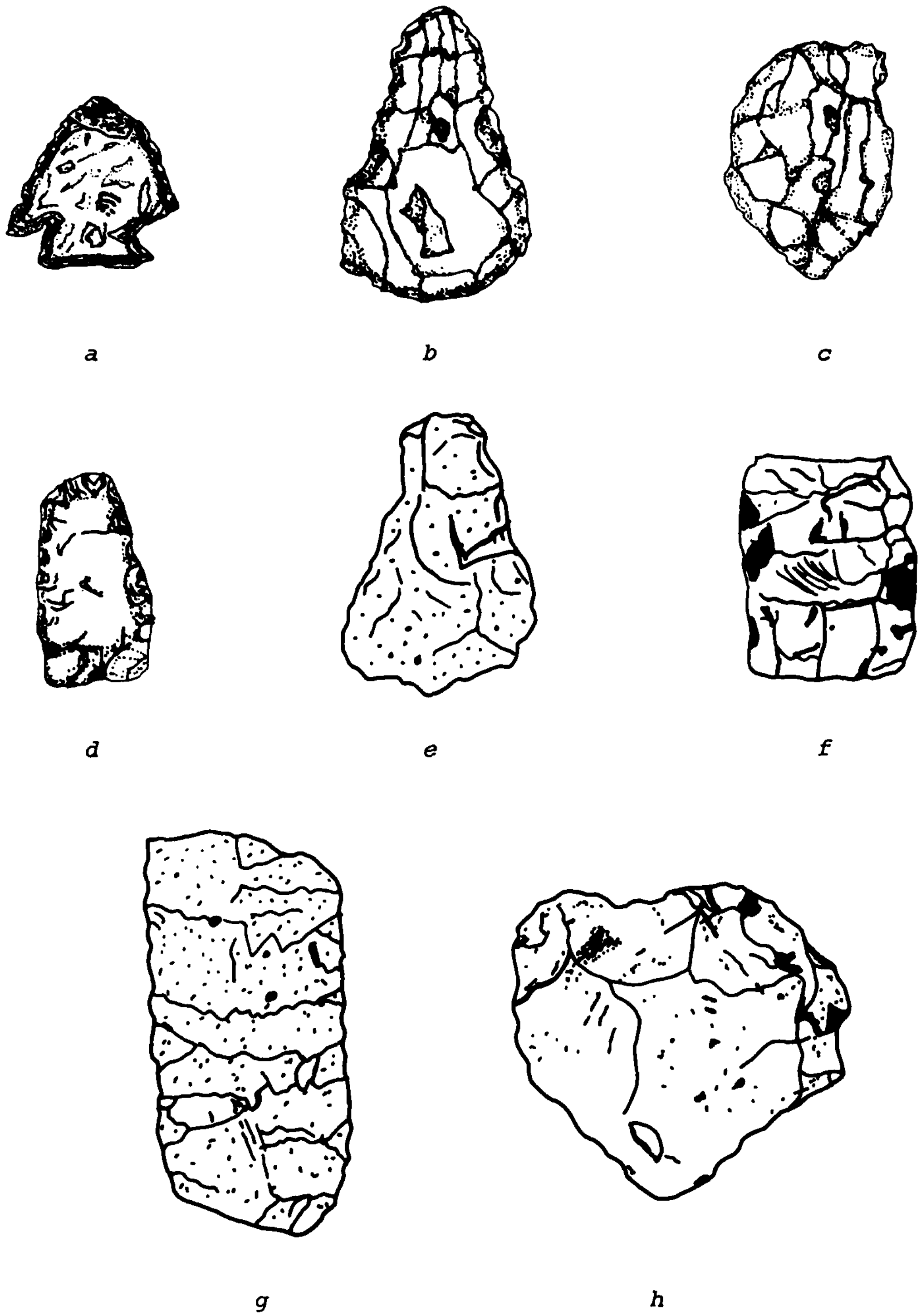


Fig. 42. Artifacts from Baker Creek site (10-CR-789) test excavations; *a*, corner notched projectile point, obsidian (1.5.1); *b*, biface, chert (5.1.1); *c*, biface, core, chert (4.1.2); *d*, uniface, rhyolite (4.1.1); *e*, biface, rhyolite (0.2.2); *f*, biface, chert (0.2.4); *g*, biface, rhyolite (0.2.1); *h*, uniface, chert (0.1.1). Scale 1:1.

dated ca. 2000 BC-AD 1080 (Heizer and Hester 1978:159-160). These points resemble both atlatl and arrow points and probably represent a transitional type gradually adapted from one to the other, making them not very useful for dating purposes. X-ray fluorescence trace element analysis correlated this item to the Big Southern Butte source located 14 km (90 mi.) to the southeast (Appendix).

Bifaces

A total of seven other bifaces were recovered, most of which were surface collected (Fig. 42, Tables 16, 17), and most of which are fragmentary. Three of these (0.2.1, 0.2.4, and 0.2.5) are medial fragments of large items, either projectile points or possibly knives and all were recovered from the knoll surface north of the excavation area. Their fragmentary condition prevents a summary description, but all are fairly thin and well shaped.

Another biface was recovered in the first level of excavation Unit 5 (5.1.1) (Fig. 42*b*). This item is relatively thin and well shaped and may have been a knife or perforator as indicated by its apparently having a tang which was broken. Material is chert.

A single biface (0.2.2) (Fig. 42*e*) is relatively thicker and less well shaped (Fig. 42*e*) and may represent a preform or intermediate stage in projectile point or knife manufacture as indicated by its relatively less finished appearance. It is damaged on one edge and broken across the tip. The material is rhyolite. This item was also surface collected from the knoll.

One of the remaining bifaces (4.1.2) (Fig. 42*c*) was recovered from the first level of excavation; the other (0.2.3) was surface collected from the knoll. These items have been irregularly worked on both surfaces so that sinuous edges are formed around the entire margin. Apparently, these items are exhausted cores worked bifacially to conserve the material since no discernible tool was produced. Many of the scars are similar to percussion flaking rather than the more controlled pressure flaking associated with most bifacial tools. Materials include chert and rhyolite.

Unifaces

Four unifaces were recovered from the Baker Creek site excavation area (Fig. 42, Tables 16, 17). One of these (4.1.1) was excavated and is an edge fragment of a larger tool; the remainder were surface collected.

The largest uniface (0.1.3) is a basalt primary decortication flake which has been retouched on the dorsal surface at the distal end to create a very steep angled edge somewhat analogous to a plane, presumably for some sort of scraping task. This item would traditionally be referred to as an "end scraper" due to the location of the retouch. Another uniface (0.1.1) exhibits retouch on the dorsal surface along one edge and the distal end with a prominent point at the converging "corner." Whether this morphology reflects that of the original flake or is a result of the deliberate retouch remains unknown, but the latter explanation may be justified. This chert tool would traditionally be referred to as an "end and side scraper" based on the location of the retouch.

The final uniface (0.1.2) is the proximal end of a large rhyolite flake broken crosswise with the retouch extending along both edges. On one edge the retouch extends along the existing edge on the dorsal surface; on the other there are two notches, one worked from each surface with the result being the creation of a single projection. Whether the intent was to create the notches or form the projection is unknown and either is possible.

Debitage

By far the majority of lithic artifacts recovered from 10-CR-789 are flakes which account for 92.5% of the sample (Table 18). Six categories of lithic material are represented. The most frequent is chert, both by count (91 or 61.5%) and weight (66.1%), followed by rhyolite (30 or 20.3%) and weight (17.7%). Obsidian is third in volume by count (14 or 9.4%) but fourth by weight (3.8%); vitrophyre is fourth by count (9 or 6.1%) and fifth by weight (1.9%); basalt is fifth by count (3 or 2%) but third by weight (10.3%); quartzite is sixth both by count (1 or 0.7%) and weight (0.2%). With the exception of basalt, which skews the sample due to the larger size of the few flakes, this breakdown is quite consistent, that is, the number of flakes of each material is complemented by the overall weight of that material.

All debitage was examined for the presence or absence of cortex in order to determine whether these items represent on-site manufacture of lithic tools as discussed in the initial section of this report (Table 19). Only a single primary decortication flake was encountered, representing just 0.7% of the debitage. Five flakes retained cortex on a portion of their dorsal surfaces, three of which are chert and two rhyolite; two chert flakes also retain cortex on their platforms. Taken together, 4.7% of the sample is represented by secondary decortication flakes and, overall, 5.4% of the sample is composed of decortication flakes representative of the initial stages of lithic tool manufacture. Lithic materials among decortication flakes include only semi-local chert and rhyolite. In summary, it appears that while a limited amount of tool production occurred at the Baker Creek site, of which only semi-local materials were employed, the manufacture of tools was not a major activity at the site. Apparently, most of the debitage is the result of sharpening and use of tools introduced to the site.

Summary

Initial reconnaissance of the Baker Creek site indicated that lithic materials were distributed across a broad area and the position of the landform on the first and second terraces above the East Fork suggested a

TABLE 18

Distribution of debitage, 10-CR-789

Unit No.	Chert		Rhyolite		Quartzite		Obsidian		Vitrophyre		Basalt		Total	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
0.1	3	2.3							1	0.7			4	3.0
0.2	10	50.1	4	8.4			5	2.0	1	0.2			20	60.7
1.1			2	0.1	1	0.2							3	0.3
1.2	1	2.6									3	10.8	4	13.4
1.3	2	0.7	1	0.9									3	1.6
1.4			1	0.4									1	0.4
2.1	3	1.7	1	0.2			2	0.3					6	2.2
2.2	4	0.3	3	0.7					1	0.2			8	1.2
2.3	2	0.2	1	0.3									3	0.5
3.1	1	0.2											1	0.2
3.2	1	0.1	1	0.2									2	0.3
3.3	1	0.4	1	0.3									2	0.7
3.4	1	0.2	1	0.2									2	0.4
4.1	21	3.0											21	3.0
4.2	5	0.5	2	1.0			2	0.3	2	0.3			11	2.1
4.3	1	0.3											1	0.3
4.4	1	1.5											1	1.5
5.1							1	1.0					1	1.0
5.2			1	0.5			1	0.1					2	0.6
5.4	2	0.2											2	0.2
6.1	13	2.1	5	2.7									18	4.8
6.2	1	0.6	3	1.0									4	1.6
7.1	13	1.6	2	0.6			2	0.1	2	0.4			19	2.7
7.2	4	0.3	1	0.9			1	0.2	2	0.2			8	1.6
7.3	1	0.1											1	0.1
TOTAL	91	69.0	30	18.4	1	0.2	14	4.0	9	2.0	3	10.8	148	104.4
%	61.5	66.1	20.3	17.6	0.7	0.2	9.4	3.8	6.1	1.9	2.0	10.4		
MEAN		0.76		0.61		0.2		0.29		0.22		3.6		0.70

TABLE 19

Distribution of decortication flakes, 10-CR-789

Category	Chert No.	Chert %	Rhyolite No.	Rhyolite %	Total No.
Primary	1	100.0			1
Secondary, platform only	3	60.0	2	40.0	5
Secondary, dorsal surface	2	100.0			2
TOTAL NO.	6		2		8
TOTAL %		75.0		25.0	100.0

possibility for deep and relatively older deposits. However, testing in the vicinity of the proposed weir on the first terrace, and at the edge of the second terrace, did not result in the recovery of a great amount of significant information. No features or radiocarbon dates were obtained and virtually all of the cultural material was collected from the surface. An exception was the corner notched obsidian projectile point broadly dated 4000-1000 BP and correlated to the Big Southern Butte source. This date and the source of this item, as well as of the other obsidian and vitrophyre items, is comparable to that discussed for the Big Boulder Creek site across the river.

Among the 160 lithic items recovered from the Baker Creek site, there are six lithic materials, the most frequent of which are chert and rhyolite followed by obsidian, vitrophyre, basalt, and quartzite. These items include four artifact categories with a single projectile point, seven bifaces, four unifaces, with the remainder being essentially undiagnostic debitage. Taken together, this collection represents several activities including hunting, lithic tool manufacture and rejuvenation, and food and hide preparation.

The Baker Creek site was apparently selected for its combination of natural resources including shelter, firewood, and water and was occupied by fairly small groups of migratory parties who camped there intermittently.

4. ARCHAEOLOGICAL INVESTIGATION OF THE PROPOSED ROAD FOR THE HAGERMAN SATELLITE FISH HATCHERY (10-CR-93)

Areas of Investigation

The proposed road to the Hagerman Satellite Fish Hatchery, near 10-CR-768, required further archaeological investigation in June 1982. The route of the proposed road, as well as the terrace on which it was located, were intensively surveyed by five individuals and several lithic concentrations were recorded. These were divided into five areas (A, B, C, D, E) for description, mapping, and other documentation (Fig. 43). Area A appeared to be the previously recorded 10-CR-93 and additional areas (B, C, D), due to their proximity, were documented as extensions of 10-CR-93. Area E was considered a southwest continuation of 10-CR-768 which had been mitigated and subsequently destroyed by this time.

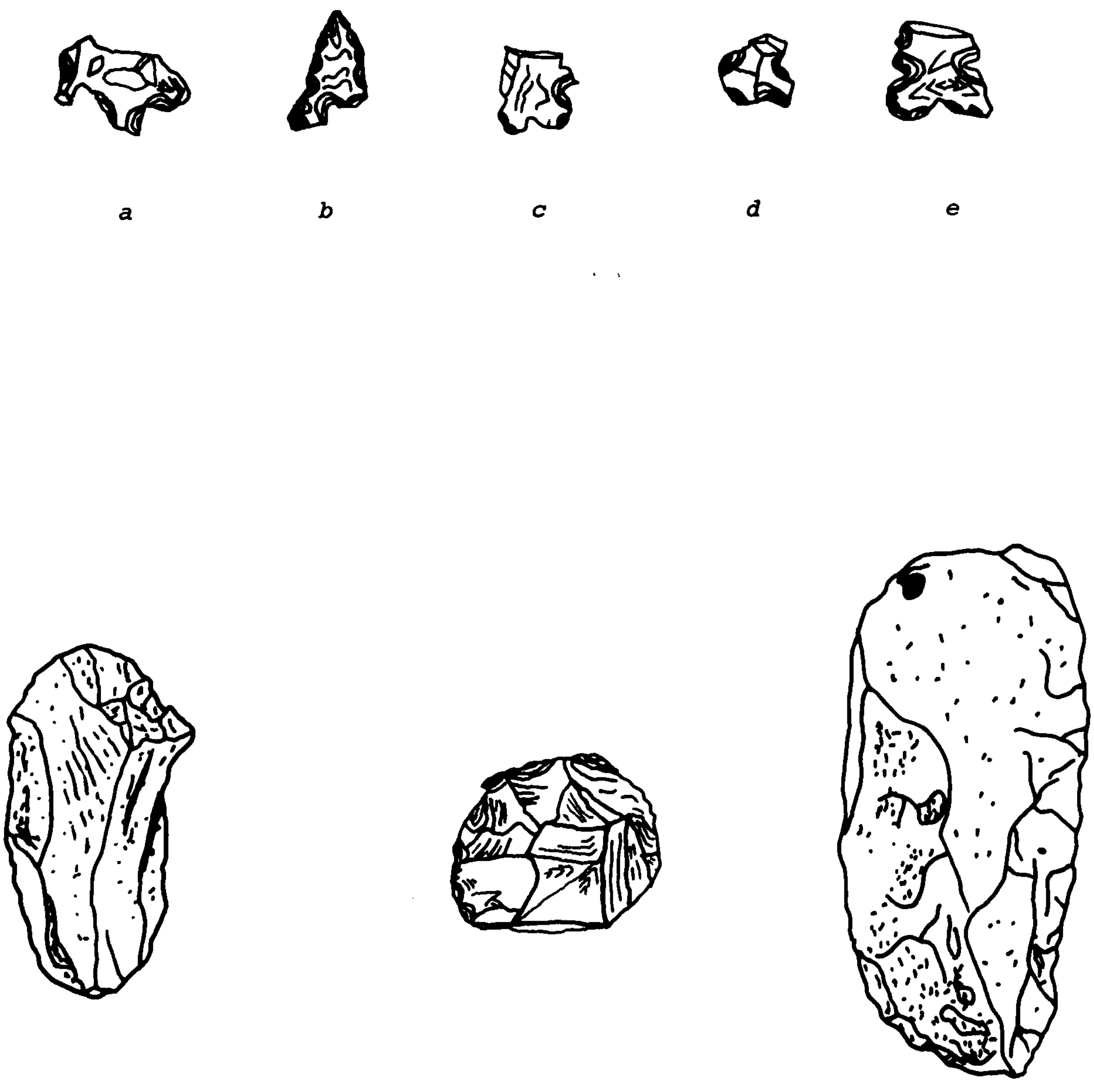
Diagnostic artifacts were collected by area and assigned catalogue numbers on a trinomial basis; each area was given a number (Area A, 1; Area B, 2; Area C, 3; Area D, 4). All artifacts from the surface carry "0" as the first of three numbers, followed by the area number, and the item number. Thus, 0.3.5 indicates the artifact was collected from the surface (0) of Area C (3), and was the fifth (5) item catalogued from this provenience. Two units were excavated in Area A to test site depth; these artifacts carry the number "1" or "2" replacing the "0" surface designation, followed by the level number and the item number.

Area A

This concentration of lithic materials is believed to be the previously recorded site of 10-CR-93. After close on-the-ground examination, it was concluded that the site sketch map incorrectly identified a nearby irrigation ditch as Big Boulder Creek. If the map reference to "Big Boulder Creek" is replaced with the "irrigation ditch," all other information of the map coincides with the location of Area A of this investigation.

The site is located at the NE¼ of the NE¼, Sec. 15, T9N, R17E, Boise Meridian at approximately 1865-1870 m (6120-6160 ft.) elevation on a terrace of sagebrush with numerous large boulders throughout the area (Fig. 44). Numerous rhyolite, chert, and obsidian items are present. Among the artifacts recovered are six projectile points: one Elko-eared base, four Desert side-notched bases, and one indeterminable mid-section all concentrated in an area to the south of the proposed road (Fig. 45*a*-*e*, Table 20). Two 1 m^2 test pits were excavated in 10 cm levels to a depth of 20 cm: deposits consisted mostly of gravel and at 20 cm large cobbles over 50 cm in diameter were encountered. It was determined that the site was largely a surface scatter; all materials from the road right-of-way and diagnostic

Fig. 44. Test excavation of Area A (10-CR-93), looking northwest. Baker Creek at top right.



a *b* *c* *d* *e* *f* *g* *h*

Fig. 45. Lithic items (10-CR-93); *a*, Elko eared projectile point, obsidian (0.1.1); *b*, Desert side notched projectile point base, chert (0.1.2); *c*, Desert side notched projectile point base, chert (0.1.4); *d*, Desert side notched projectile point base, chert (0.1.5); *e*, Desert side notched projectile point base, chert (0.1.6); *f*, biface, rhyolite (0.4.1); *g*, uniface, chert (0.3.6); *h*, uniface, chert (0.4.3). Scale 1:1.

artifacts from the surrounding area were collected (Table 20). A representative sample of rhyolite flakes were collected and obsidian was recovered for trace element analysis (Appendix).

Area A, that portion of 10-CR-93 through which the proposed road will be constructed, is considered important because of the large percentage of rhyolite items present and because of the number of projectile points found in a concentrated area. The site of 10-CR-93 is shallow and the road will disturb only a small portion, which has now been collected. Therefore, no further archaeological work is recommended along the proposed road right-of-way.

Area B

Located immediately south of the proposed road are two small knolls rising above the otherwise relatively flat terrace (Fig. 43). Several isolated artifacts were recovered from this area (Table 20) and a concentration of 119 chert flakes, 1 rhyolite flake, and 1 projectile point fragment was recorded and collected as a Segregated Reduction Location similar to those described elsewhere (Flenniken and Stanfill 1979). This area will not be disturbed by road construction and may be considered an extension of 10-CR-93. No further work is recommended.

Area C

A large concentration of chert items collected by Leroy Allen was recorded southwest of the proposed road near the present East Fork road and designated as Area C (Fig. 43). The high percentage of chert contrasts with the rhyolite concentration of Area B (Table 20). Although the lithic materials may represent another site, they are presently considered as a further extension of 10-CR-93. This area is in no danger from the currently proposed construction and thus no further work is recommended.

Area D

Located within the road right-of-way was a concentration of scattered bifaces and cores (Fig. 43, Table 20). These were collected from the area of possible road disturbance. No further work is necessary.

Area E

This concentration of lithic materials is primarily an extension of 10-CR-768 and in this vicinity the proposed road will join and follow the road presently used (Fig. 43). The area contains a high concentration of diagnostic artifacts. However, as no *new* construction is planned here, no further archaeological work is deemed necessary.

TABLE 20

Description and distribution of all lithic tools, 10-CR-93

Item No.	Material	Condition[a]	Length (mm)	Width (mm)	Thickness (mm)	Weight (mm)	Comments	Fig. No.
0.1.1	Obsidian	b d	17	15	4	1.0	Projectile point, Elko eared	45*a*
0.1.2	Obsidian	b c	17	12	3	0.4	Projectile point, Desert side notched	45*b*
0.1.3	Vitrophyre	b c	20	18	5	1.8	Biface	
0.1.4	Chert	b c	12	10	2	0.2	Projectile point, Desert side notched	45*c*
0.1.5	Chert	b c	10	10	3	0.2	Projectile point, Desert side notched	45*d*
0.1.6	Chert	b c	13	14	2	0.5	Projectile point, Desert side notched	45*e*
0.1.11	Rhyolite	c	110	75	110	610.0	Core, random	
0.1.12	Rhyolite	c	81	72	35	178.3	Split cobble	
0.1.14	Rhyolite	b d	20	25	5	2.8	Uniface	
0.1.15	Rhyolite	c	41	41	14	19.5	Uniface	
0.1.16	Rhyolite	c	38	46	13	25.7	Uniface	
0.1.17	Rhyolite	c	21	49	19	16.4	Core, random	
0.1.18	Rhyolite	c	23	26	4	3.5	Biface	
0.1.19	Rhyolite	b c/l	29	22	7	4.4	Biface	
0.1.21	Chert	c	79	55	38	139.7	Core, random	
0.1.32	Chert	b c/l	19	21	3	1.8	Uniface	
0.1.35	Quartzite	b c	76	79	26	205.8	Uniface, spoke-shave	46*b*
0.1.36	Rhyolite	c	125	80	55	421.6	Core, random	
0.1.37	Rhyolite	c	145	78	46	428.3	Core, random	
0.1.38	Rhyolite	c	68	58	10	33.3	Spall, biface, denticulate	47*b*
0.1.39	Quartzite	c	100	125	24	475.4	Cobble biface	46*c*
0.1.40	Rhyolite	c	65	76	18	101.0	Uniface	
0.1.44	Obsidian	b c	35	11	4	1.5	Biface	
0.1.46	Rhyolite	c	81	51	20	120.1	Biface	
0.1.47	Rhyolite	b c	103	109	40	270.7	Uniface, denticulate	46*a*
0.1.48	Obsidian	b c	11	12	2	0.4	Biface	
0.1.49	Obsidian	b c/l	13	9	3	0.4	Biface	
0.1.50	Obsidian	b c/l	15	10	3	0.6	Biface	
0.1.51	Obsidian	b c	13	8	4	0.5	Biface	
0.1.52	Obsidian	b c	14	12	4	0.9	Biface	
0.1.53	Obsidian	b c	6	12	3	0.3	Biface	
0.1.54	Rhyolite	b c/l	32	11	8	2.2	Biface	
0.1.55	Rhyolite	b c/l	29	14	7	2.3	Biface	
0.2.1	Chert	b c/l	21	15	4	1.4	Biface	
0.2.2	Rhyolite	c	110	93	50	400.1	Core, random	47*a*
0.3.2	Chert	c	58	35	28	52.7	Core, random	
0.3.4	Chert	c	30	16	14	8.5	Core, random	
0.3.6	Chert	b c	26	32	11	9.7	Uniface	45*f*
0.3.7	Chert	c	43	35	9	13.0	Uniface	
0.4.1	Rhyolite	b l	52	33	13	18.7	Biface	
0.4.2	Chert	b c	20	28	6	4.0	Biface	
0.4.3	Chert	c	79	35	10	30.8	Uniface	45*h*
0.4.7	Rhyolite	c	92	67	27	180.6	Biface	

[a]Condition: c = complete, b c = broken crosswise, b l = broken lengthwise, b c/l - broken crosswise and lengthwise, b d = broken diagonally.

Summary

The areas identified as cultural material concentrations, though extensive, are relatively shallow. During this investigation, they have been collected and recorded so that the surface road proposed to the hatchery will not significantly disturb the prehistoric remains.

But if plans change or additional construction is undertaken, the frequency of material dictates another walkover, with controlled surface collection and testing probably required.

Lithic Cultural Material

Projectile Points

A total of five diagnostic projectile points were recovered from the Hatchery Road investigations, all of which were found in Area A (Fig. 45, Tables 20, 21). Four of these are small side notched items, all of which are broken crosswise with their distal ends missing. Materials include chert (3 or 75%) and obsidian (1 or 25%).

Description	Range	Mean
Length	10 - 17+ mm	13+ mm
Width	10 - 14+ mm	11.5+ mm
Thickness	2 - 3 mm	2.5 mm
Neck Width	8 - 9 mm	8.2 mm
Weight	0.2 - 0.5+ g	0.3+ g

These four projectile points closely resemble those of the Desert Side Notched series dated AD 1100 to the historic period (Heizer and Hester 1978:163-165). A Desert Side Notched projectile point was also recovered at 10-CR-768, as discussed in that section of this report.

A single corner notched projectile point (0.11) (Fig. 45a), broken diagonally across the middle, was recovered from the same vicinity as the small side notched items.

Description	
Length	17+ mm
Width	15+ mm
Thickness	4 mm
Neck Width	12 mm
Weight	1.0+ g

Similar items are common in the region and are known as the Elko series dated 1000 BC to AD 1080 (Heizer and Hester 1978:159) and the Rose Springs series dated AD 600 to the historic period (Heizer and Hester 1978:162). A

TABLE 21

Distribution of all flaked lithic items by category and lithic material, 10-CR-93

Category	Chert		Rhyolite		Quartzite		Obsidian		Virophyre		Total	
	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)
Projectile point	3	0.9					2	1.4			5	2.3
%	60.0	39.1					40.0	60.9				
Biface	2	5.4	8	365.1	1	475.4	7	4.6	1	1.8	19	852.3
%	10.5	0.6	42.1	42.9	5.3	55.8	36.8	0.5	5.3	0.2		
Uniface	4	55.3	5	419.7	1	295.8					10	680.8
%	40.0	8.1	50.0	61.7	10.0	30.2						
Core	3	200.9	6	2054.7							0	2255.6
%	33.3	8.9	66.7	91.1								
Debitage	267	655.3	97	1292.5	13	36.2	106	24.6	34	15.7	517	2024.3
%	51.6	32.4	18.8	63.8	2.5	1.8	20.5	1.2	6.6	0.8		
TOTAL	279	917.8	116	4132.0	15	717.4	115	30.6	35	17.5	560	5815.3
%	49.8	15.8	20.7	71.1	2.7	12.3	20.5	0.5	6.3	0.3		

very similar item, also made of obsidian, was recovered from the test excavations at 10-CR-789, as discussed in that section of this report.

Bifaces

A total of 20 bifaces, including fragments, were recovered from the Hatchery Road investigations (Tables 20, 21, Fig. 45). Ten of these are probably fragments of projectile points, as indicated by their degree of thinning and reduction, but their condition prevents accurate categorization and description. Materials are most commonly obsidian (8 or 80%) followed by chert (2 or 20%); perhaps not coincidentally, these are the same materials employed for the projectile points.

Another six fragmentary items are distinguished from the above group by their generally larger size and less worked appearance; again, all of these are fragmentary preventing accurate categorization and description. Four of these are relatively thick (0.1.19, 0.1.54, 0.1.55, and 0.4.1) with a range of 7-13 mm and a mean of 8.7 mm which is considerably greater than that of the projectile points and presumed fragments. Quite likely, these items represent portions of preforms broken during manufacture, or knives broken during use; all are of rhyolite, a relatively more resistant material not selected for the manufacture of projectile points. The other two items (0.1.18 and 0.4.2) appear to be relatively incomplete with bifacial flaking on only a portion of their surfaces; these items are much thinner (4-6 mm, with a mean of 5 mm) but may represent intended projectile points or knives broken during manufacture as well.

Each of the four remaining bifaces represents a unique category. One of these (0.1.39) is a quartzite cobble broken across the middle and flaked to a bifacial edge on a portion of the distal end (Fig. 46*c*). The size and selection of a more resistant material suggests use, or intended use, for some sort of stressful task such as chopping or cleaving large mammal bones as was suggested for a similar item recovered at 10-CR-768 discussed above. A rhyolite primary decortication spall (0.1.38) has been serrated by removing steep angled flakes from both surfaces to form a denticulated edge (Fig. 47*b*); such a tool would be useful for processing vegetal or faunal remains, as discussed for 10-CR-768. A partially decorticated rhyolite cobble (0.1.46) randomly worked over a number of surfaces exhibits evidence of bifacial work along one edge; this item is similar to presumed bifacial cores recovered from 10-CR-768. Finally, a rhyolite cobble (0.4.7) has been flaked to a rather sinuous bifacial edge along one side; whether this item represents initial decortication of a cobble, the fabrication of a cobble biface, or another category of tool remains unknown.

Unifaces

A total of ten unifaces were recovered from the Hatchery Road investigations (Tables 20, 21, Figs. 45 and 46). Eight of these are simply flakes which exhibit unifacial retouch on portions of their edges; several are primary decortication (0.0.16) or secondary decortication (0.1.15,

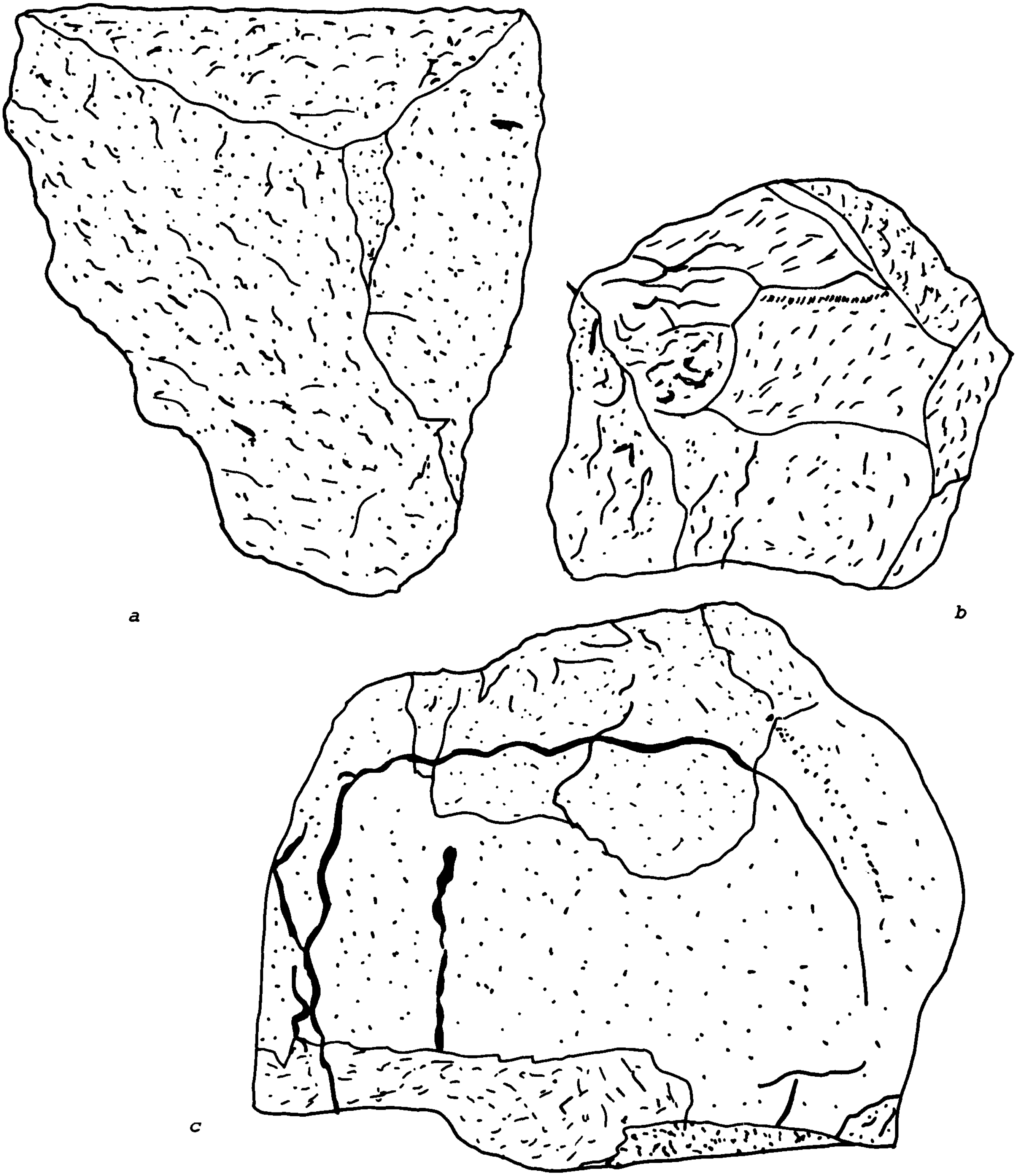


Fig. 46. Lithic items (10-CR-93); *a*, uniface, denticulate, rhyolite (0.1.47); *b*, uniface, spokeshave, quartzite (0.1.35); *c*, cobble biface, quartzite (0.1.39). Scale 1:1.

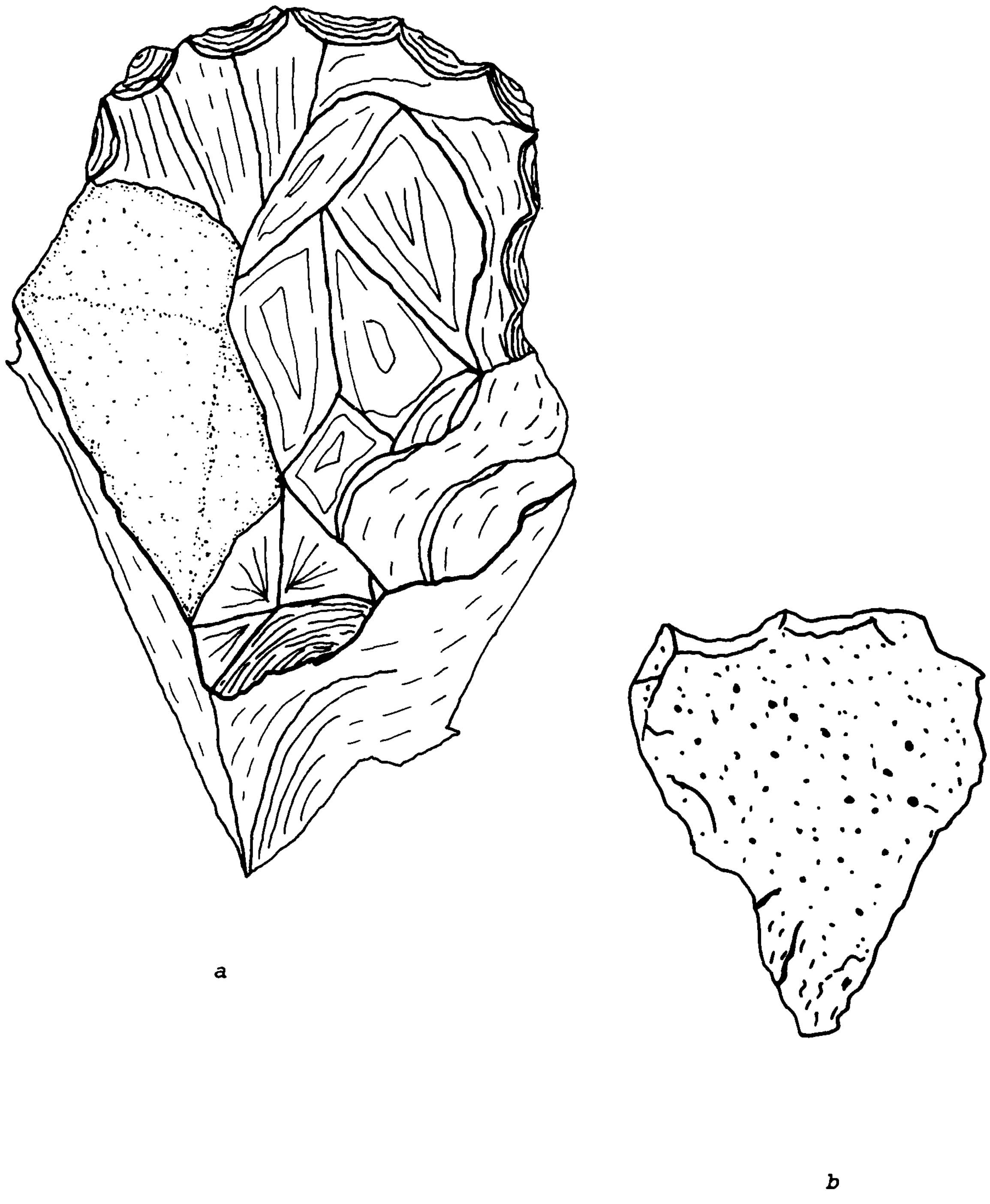


Fig. 47. Lithic items (10-CR-93); *a*, core, rhyolite (0.2.2); *b*, cobble spall biface, denticulate, rhyolite (0.1.38). Scale 1:1.

0.1.40, and 0.4.3) flakes. These items may have been employed for cutting or scraping tasks as discussed previously.

Two unifaces are somewhat more specialized. One of these (0.1.47) (Fig. 46*a*) is a large rhyolite secondary decortication flake which has been worked on the dorsal surface to create a series of notches; this denticulate tool could have been employed for shredding or similar tasks. A quartzite primary decortication flake (0.1.35) was worked on a portion of one side to form a shallow steep angled notch; this spokeshave could have been designed for working wood or bone.

Cores

Nine cores were recovered from the Hatchery Road investigations (Tables 20, 21). Most of these (6 or 66.7%) are rhyolite (Fig. 47*a*) with the remainder (3 or 33.3%) chert. All are randomly worked and one (0.1.12) is simply a rhyolite cobble split prior to reduction or perhaps to test the quality of the material.

Description	Range	Mean
Length	21 - 145 mm	84.3 mm
Width	16 - 80 mm	58.1 mm
Thickness	14 - 110 mm	43.9 mm
Weight	8.5 - 610 g	250.6 g

Debitage

A total of 517 flakes, chips, and shatter was collected from the Hatchery Road investigations (Tables 21, 22). In contrast to the earlier phases of the work in conjunction with the construction of the Hagerman Satellite Fish Hatchery, much of this material was judgmentally collected as a representative, rather than a comprehensive, sample. The collection might have included thousands of items had we attempted to collect all debitage; many of the areas were not directly in the path of road construction, so that it was not deemed necessary to salvage all flakes, which would have been impossible, at best.

Debitage was by far the most frequent category of cultural material recovered, with five types of lithic material represented, all of which were also collected at 10-CR-768 and 10-CR-789. Chert was the most frequent by count (51.6%), followed by obsidian (20.5%), rhyolite (18.8%), vitrophyre (6.6%), and quartzite (2.5%). By weight however, rhyolite was most frequent (63.8%), followed by chert (32.4%), quartzite (1.8%), obsidian (1.2%), and vitrophyre (0.8%). Due to sampling biases, there was probably a preference in collecting obsidian and vitrophyre and therefore the percentages by weight may be a much truer picture of the lithic materials present than are those based on count.

The amount of debitage and the collecting biases prevent any detailed debitage analysis other than a breakdown according to the presence or absence of cortex (Table 23). Overall, 51 decortication flakes were

TABLE 22

Distribution of debitage, 10-CR-93

Unit No.	Chert		Rhyolite		Quartzite		Obsidian		Vitrophyre		Total	
	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)
0.1	93	323.6	60	414.3	10	27.0	103	23.9	34	15.7	300	804.5
0.2	9	28.9	13	226.4	3	9.2					25	264.5
0.3	30	161.6	4	51.1							34	212.7
0.4	8	26.2	7	592.2			1	0.1	16		16	618.5
0.5	119	110.0	1	1.2							120	111.2
1.1	4	1.5	9	5.0			1	0.5			14	7.0
2.1	4	3.5	3	2.3			1	0.1			8	5.9
TOTAL	267	655.3	97	1292.5	13	36.2	106	24.6	34	15.7	517	2024.3
%	51.6	32.4	18.8	63.8	2.5	1.8	20.5	1.2	6.6	0.8		
Mean	2.44		13.32		2.78		0.23		0.46		3.91	

recovered, most of which are secondary decortication flakes (42 or 82.4%), rather than primary decortication flakes (9 or 17.6%). Among the primary decortication flakes, there were an equal number of rhyolite and obsidian items (3 or 33.3% each), followed by vitrophyre (2 or 22.2%) and chert (1 or 11.1%). Five of the secondary decortication flakes had cortex on their platforms only, most of which were chert (4 or 80%) followed by rhyolite (1 or 20%). Finally, a total of 37 flakes retained cortex on a portion of their dorsal surfaces, most of which are chert (22 or 59.5%), followed by rhyolite (8 or 21.6%), obsidian (6 or 16.2%), and vitrophyre (1 or 2.7%). The relatively larger percentage of flakes with cortex at Hatchery Road, compared with 10-CR-768 and 10-CR-789 is due to the differences in means of collection, that is, most of the debitage from the first two sites was collected in the 3 mm (1/8 in) mesh screen and would have been unnoticed in a surface collection. The Hatchery Road surface material contains relatively much larger items and therefore contains a greater potential for items retaining cortex.

Summary

A total of 560 lithic items were recovered from four areas associated with the investigations of the Hatchery Road; no non-lithic material was recovered. Although two test pits were excavated in Area A, virtually all material was recovered on the surface and the site is a very shallow one. Diagnostic projectile points date the occupation from some 2000 BP to the historic period. Other tools and fragments indicate that the site was occupied for the purposes of hunting, processing food and probably hides, and tool manufacture.

Lithic materials are diverse indicating acquaintance with the resources of the region, and obsidian and vitrophyre source analysis indicate access to those materials as far as 135 km (220 mi.) distant (Appendix).

All aspects of the Hatchery Road investigations point to similarities in artifacts and inferred activities between the inhabitants of these four areas and those of 10-CR-768 and 10-CR-789; in all likelihood the Hatchery Road areas were occupied by parties contemporary with, and similar to, those who inhabited these adjacent sites.

TABLE 23

Distribution of decortication flakes, 10-CR-93

Category	Chert		Rhyolite		Obsidian		Vitrophyre		Total
	No.	%	No.	%	No.	%	No.	%	No.
Primary	1	11.1	3	33.3	3	33.3	2	22.3	9
Secondary, platform only	4	80.0	1	20.0					5
Secondary, dorsal surface	22	59.5	8	21.6	6	16.2	1	2.7	37
TOTAL NO.	27		12		9		3		51
TOTAL %		52.9		23.5		17.7		5.9	100.0

5. CONCLUSIONS

Lithic Materials

The patterns of lithic material procurement and selection are comparable at all sites in the project area (Tables 24, 25). Multiple lithic materials were encountered at all sites, and the frequency of the various types of material is remarkably consistent across the project area. Chert was always the most frequent of all materials both overall and at each of the sites; rhyolite was next in frequency overall and at each of the sites, with obsidian and vitrophyre third and fourth, respectively, overall and at each of the sites. The minor materials varied more with quartzite fifth in frequency overall, but sixth at 10-CR-768 and 10-CR-789, and basalt sixth overall, but fifth at 10-CR-768 and 10-CR-789 and absent at 10-CR-93.

Chert and obsidian were selected as the raw material for items in all categories indicating preference for these materials based on their knapping quality, rather than their availability, with obsidian originating at multiple sources across the region. Rhyolite was present in all categories with the exception of projectile points; this situation reflects both its local availability as well as its relative resistance to pressure flaking. Quartzite is a similar material and was present in most categories with the exception of cores and projectile points, perhaps due to its relative toughness. Vitrophyre was selected for more refined tools such as projectile points and bifaces, with a single used flake and debitage representing the remainder of the sample. Finally, basalt, another exotic material was represented by only one tool, a uniface; the basalt debitage represents rejuvenation and use of curated items brought into and carried out of the study area.

Tool Categories

Projectile points were recovered at all sites investigated. While often fragmentary, these items represent only a few general types. Large side notched items were recovered only at 10-CR-768; while stylistically dated from as early as 9000 BP to 3000 BP, the association of one of these with a radiocarbon date of 1840 BP argues in favor of the more recent end of the period. Corner notched points were recovered at all three sites; these date approximately 4000 BP to the historic period and generally support the later date for the large side notched points as well as provide a contemporaneous date for the occupation of the general study area. Finally, small side notched points were recovered at 10-CR-93 and 10-CR-768; these items date AD 1100 to the historic period and again indicate a contemporaneous occupation for the area and tie this occupation to the ethnographically reported occupants of the area, the Northern Shoshoni. The projectile points indicate the use of both atlatls as well as bows at these sites and indicate that hunting and related activities occurred in the study area.

TABLE 24

Distribution of all flaked lithic items from all sites in the vicinity of the Hagerman Satellite Fish Hatchery by lithic material

Site No.	Chert		Rhyolite		Quartzite		Obsidian		Vitrophyre		Basalt		Total	
	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	No.	Wt. (g)	no.	Wt(g)
10-CR-768	2340	2482.0	898	961.0	8	15.0	425	43.4	78	15.8	9	1.8	3758	3519.0
%	62.3	70.6	23.9	27.3	0.2	0.2	11.3	1.2	2.1	0.4	0.2	0.1		
10-CR-789	96	129.2	35	136.2	1	0.2	15	6.7	9	2.0	4	136.7	160	411.0
%	60.0	31.5	21.9	33.1	0.6	0.0	9.4	1.6	5.6	0.5	2.5	33.3		
10-CR-93	279	917.8	116	4132.0	15	717.4	115	30.6	35	17.5			560	5815.3
%	49.8	15.8	20.7	71.1	2.7	12.3	20.5	0.5	6.3	0.3				
TOTAL	2715	3529.0	1049	5229.2	24	732.6	555	80.7	122	35.3	13	138.5	4478	9745.3
%	60.7	36.2	23.4	53.7	0.5	7.5	12.4	0.8	2.7	0.4	0.3	1.4		

TABLE 25

Distribution of all flaked lithic items by category and lithic material for all items from sites in the vicinity of the Hagerman Satellite Fish Hatchery

Category	Chert No.	Chert %	Rhyolite No.	Rhyolite %	Quartzite No.	Quartzite %	Obsidian No.	Obsidian %	Vitrophyre No.	Vitrophyre %	Basalt No.	Basalt %	Total No.	Total %
10-CR-768														
Projectile point	4	66.7							2	33.3			6	0.2
Biface	15	55.6	7	25.9			4	14.8	1	3.7			27	0.7
Uniface	14	51.9	11	40.7	1	3.7	1	3.7					27	0.7
Used flake	199	71.7	73	26.3	4	1.4	1	0.3	1	0.3			278	7.4
Core	12	85.8	1	7.1			1	7.1					14	0.4
Debitage	2096	61.6	806	23.6	3	0.1	418	12.2	74	2.2	9	0.3	3406	90.6
Subtotal	2340	62.3	898	23.9	8	0.2	425	11.3	78	2.1	9	0.2	3758	100.0
10-CR-789														
Projectile point							1	100.0					1	0.6
Biface	4	66.7	2	33.3									6	3.8
Uniface	1	25.0	2	50.0							1	25.0	4	2.5
Used flake														
Core			1	100.0									1	0.6
Debitage	91	61.5	30	20.3	1	0.7	14	9.4	9	6.1	3	2.0	148	92.5
Subtotal	96	60.0	35	21.9	1	0.6	15	9.4	9	5.6	4	2.5	160	100.0
10-CR-93														
Projectile point	3	60.0					2	40.0					5	0.9
Biface	2	11.0	7	38.9	1	5.6	7	38.9	1	5.6			18	3.2
Uniface	4	36.4	6	54.6	2	9.0							11	2.0
Used flake													0	0.0
Core	3	33.3	6	66.7									9	1.6
Debitage	267	51.6	97	18.8	13	2.5	106	20.5	34	6.6			517	92.3
Subtotal	279	49.8	116	20.7	15	2.7	115	20.5	35	6.4	0	0	560	100.0
Projectile point	7	58.3					3	25.0	2	16.7			12	0.3
Biface	21	41.2	16	31.4	1	2.0	11	21.5	2	3.9			51	1.1
Uniface	19	45.2	19	45.2	2	4.8	1	2.4			1	2.4	42	0.9
Used flake	199	71.6	73	26.2	4	1.4	1	0.4	1	0.4			278	6.2
Core	15	62.5	8	33.3			1	4.2					24	0.5
Debitage	2454	60.3	933	22.9	17	0.4	538	13.2	117	2.9	12	0.3	4071	91.0
Total	2715	60.7	1049	23.4	24	0.5	555	12.4	122	2.7	13	0.3	4478	100.0

Bifaces and unifaces were also recovered at all sites in the study area. Bifaces include broken projectile points, knives, and preliminary tools such as preforms; the bifaces support the evidence for a general hunting orientation at these sites. Similarly, the unifaces probably represent evidence for a number of tasks, chiefly associated with the processing of foodstuffs and animal hides.

Used flakes were common at 10-CR-768 and were probably present at the other sites as well, where they were not collected due to problems with surface disturbance. Used flakes could have been employed in any and a number of activities, most of which are again related to processing foodstuffs and raw materials for clothing.

Cores and debitage represent on-site manufacture of lithic tools, such as those discussed above and both categories were represented at all sites. Cores include both local material such as rhyolite as well as exotic material such as obsidian. The cores and debitage together illustrate that tool production was another activity at these sites, although the relative infrequency of decortication flakes suggests that this activity was not the major focus of the occupation but rather associated with maintenance of a lithic tool kit by mobile parties. Most of the debitage probably originated from sharpening and rejuvenating curated tools, rather than from the fabrication of new ones (Table 26).

Features

In addition to providing the radiocarbon dates at 10-CR-768, the features from that site indicate several activities in which the inhabitants of the area participated. Two features (features 2 and 3) indicate cooking in shallow pits in slow burning fire; the absence of bone and ethnohistoric descriptions suggest that vegetal foods were baked in these "earth ovens". Two other features (features 1 and 4) are more open and include more scattered charcoal as well as some bone indicating their use as hearth for roasting, warmth, and/or light, rather than for baking. Feature 5 was not well defined but may have had a similar function as indicated by the concentration of rock and the scattered bits of charcoal.

In contrast to the relatively greater amount of bone in the feature area, there was a decrease in the amount of lithic tools and debitage. The nature of this relationship is problematical, but perhaps there was an effort to keep broken tools and sharp flakes apart from the food preparation area. No features were encountered at the other sites in the project ar a and overall it appears that 10-CR-768 was the most heavily occupied site in the vicinity.

Temporal and Concluding Considerations

Radiocarbon dates were obtained at only one site, 10-CR-768, but these dates indicate that the area was occupied during at least two periods; at approximately 2000 BP and again just prior to the historic period. Whether

TABLE 26

Distribution by count of decortication flakes from all sites in the vicinity of the Hagerman Satellite Fish Hatchery

Site No.	Chert	Rhyolite	Quartzite	Obsidian	Vitrophyre	Basalt	Total
<u>10-CR-768</u>							
Primary decortication flake	16	6			2	1	25
Secondary decortication flake	60	18		3			81
Cortex on platform only	23	5		1			29
SUBTOTAL	99	29		4	2	1	135
<u>10-CR-789</u>							
Primary decortication flake	1						1
Secondary decortication flake	3	2					5
Cortex on platform only	2						2
SUBTOTAL	6	2					8
<u>10-CR-93</u>							
Primary decortication flake	1	3		3	2		9
Secondary decortication flake	22	8		6	1		37
Cortex on platform only	4	1					5
SUBTOTAL	27	12		9	3		51
GRAND TOTAL	132	43	0	13	5	1	194

the area was intermittently or constantly occupied between these dates remains unknown, although the somewhat ephemeral cultural material argues for a more sporadic habitation. Occupation during the past 2000 years is also well substantiated by the temporally sensitive projectile points which cover the same time span.

The projectile point styles are all fairly typical for the region and serve to tie these sites both to others in the area as well as to the ethnographically known population of the region, the Northern Shoshoni, at least during the later phases of the occupation of these sites.

Overall, it is apparent that these sites are all similar to each other in many ways and might best be considered as a complex, rather than as individual sites. Temporal and stylistic ties between them are quite similar; other intersite ties exist as well, including procurement and selection of the same lithic materials, a general hunting orientation, and activities associated with maintenance of a lithic tool kit and processing food and resources for clothing and other needs.

Management Recommendations

Most, if not all, of the impact to the sites in the vicinity of the Hagerman Satellite Fish Hatchery has now occurred. The Big Boulder Creek site, 10-CR-768, was tested and recommended for mitigation excavation, the results of which are reported here. The site has been levelled and construction begun so that no additional archaeological work pertinent to 10-CR-768 is necessary.

Similarly, prior to construction reconnaissance across the river resulted in the recording of the Baker Creek site, 10-CR-789. It was recommended for testing, and the results are reported here. The Baker Creek site is relatively large in extent, but testing was only conducted in the immediate area of the weir for the fish hatchery; a minimal amount of cultural material recovered indicated that this portion of the site was ephemerally occupied and no further archaeological work was deemed necessary for mitigation. However, any future road work or other construction elsewhere at 10-CR-768 has the possibility of adversely impacting a potentially significant site and therefore, testing should precede any such activities.

The final phase of archaeological work conducted in conjunction with the construction of the Hagerman Satellite Fish Hatchery involved reconnaissance and testing in the vicinity of 10-CR-93. The size and location of this site are somewhat different and greater than originally recorded; our reconnaissance resulted in the designation of four areas, one (Area A), in the immediate path of the proposed road, was test excavated. Testing involved the excavation of two shallow 1 m^2 units which resulted in the determination that the site was extremely shallow and essentially a surface manifestation. No further testing was recommended prior to the construction of the road since it would be an improvement of an existing dirt road rather than new construction. However, any future construction in the vicinity of 10-CR-93 should have an archaeological reconnaissance prior to any ground disturbing activities, as a considerable amount of diagnostic cultural material was recovered during this reconnaissance.

At this point, reconnaissance, test excavation, and mitigation of all sites to be adversely impacted by the construction of the Hagerman Satellite Fish Hatchery has been completed and no further archaeological work is recommended. However, the widespread distribution of surface material, as well as the potential for older stratified deposits bearing features and radiometric dates is considerable. According to 36 C.F.R. 800, these sites "have yielded" and "are likely to yield" information significant to the prehistory of the region; therefore, additional archaeological work should precede any future construction activity in the vicinity of the Hagerman Satellite Fish Hatchery.

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APPENDIX

X-RAY FLUORESCENCE TRACE ELEMENT ANALYSIS OF OBSIDIAN AND VITROPHYRE ITEMS FROM THREE SITES IN THE VICINITY OF THE HAGERMAN SATELLITE FISH HATCHERY, ON THE EAST FORK OF THE SALMON RIVER, CENTRAL IDAHO

Robert Lee Sappington

One hundred twenty four obsidian and vitrophyre items from three sites (10-CR-93, 10-CR-768, and 10-CR-789) in the vicinity of the Hagerman Satellite Fish Hatchery, on the East Fork of the Salmon River, central Idaho, were analyzed by non-destructive energy dispersive x-ray flourescence in order to determine their geological source area. The system employed for this analysis was provided by the Idaho Bureau of Mines and Geology and consists of a Tracor Northern NS-880 instrument, a Nuclear Semiconductor 512 amplifier, a silicon (lithium-drifted) detector with a New England Nuclear americium 241 100 mCi source and a dysprosium secondary target, attached to a PDP 11/05 computer and a Decwriter II printer. All items were analyzed in the air for a 300 second counting period and the intensities of ten trace elements (Table 27) were recorded. Four of these elements (Fe, Sn, La, and Ce) are unreliable for determining sources; the remaining six were employed as the variables for SPSS discriminant analysis using the Mahal stepwise method. Comparisons were made with 28 regional sources in Idaho, Oregon, Montana, and Wyoming (Fig. 48).

Ninety three (75%) of these items were correlated to nine source groups at acceptable probabilities (greater than .6800) (Table 28). Timber Butte, located 145 km (90 mi) west of the project area, is the most frequent source overall (75 items or 80.7%) and predominates at all three sites as well. The secondary source area is located in eastern Idaho and in the vicinity of Yellowstone National Park at a maximum distance of 290 km (180 mi.); five sources are represented by a total of 12 items (12.9%). Finally, a minor amount of material (6 items or 6.4%) originated at sources to the south and southwest, the most distant of which is Reynolds Creek located 220 km (135 mi.) southwest of the project area.

These results provide several insights into aboriginal procurement of lithic materials by the inhabitants of these sites. First, the results from all three sites are nearly identical, that is, Timber Butte obsidian predominates with material from sources in the Yellowstone Park area secondary, indicating similar procurement strategies. Also, multiple sources are present at all sites indicating comparable and widespread access to resources on a regional scale.

In conclusion, it is apparent that the inhabitants of these sites followed similar lithic procurement patterns that included resources on a regional scale, in a manner like that reported by the author at numerous other sites in central Idaho (Knudson and others 1982).

TABLE 27

Trace element intensities

Item Number	Fe	Rb	Sr	Y	Ze	Nb	Sn	Ba	La	Ce
10-CR-768										
0.5.1	1379	0532	0000	0363	0781	0405	0157	00000	0031	1107
0.5.2	0711	0120	0045	0051	0474	0156	0016	02495	0007	0307
1.1.11	0751	0272	0034	0145	0632	0223	0071	08237	0000	0599
0.3.8	1120	0282	0057	0188	1163	0379	0081	12705	0068	1508
0.2.11	0999	0358	0000	0179	0832	0323	0147	12402	0064	1345
20.1.1	0641	0350	0053	0209	0940	0311	0117	18839	0000	1665
0.3.4	1068	0288	0000	0225	0907	0335	0129	13030	0000	1159
3.2.1	0428	0345	0000	0159	0229	0247	0069	00627	0000	0041
29.2.2	0662	0134	0000	0071	0344	0143	0049	03517	0000	0377
26.1.1	0699	0170	0000	0178	0300	0406	0108	00000	0000	0291
28.1.4	0822	0163	0000	0068	0440	0179	0085	03962	0000	0431
29.1.3	0823	0191	0025	0113	0424	0140	0083	03747	0010	0434
1.1.12.1	0669	0245	0004	0113	0156	0198	0038	00209	0000	0114
1.1.12.2	1158	0176	0020	0073	0565	0149	0045	02545	0000	0313
1.1.12.3	0925	0141	0000	0022	0431	0169	0030	01860	0000	0271
1.2.21.1	1206	0210	0043	0090	0531	0183	0047	02473	0000	0327
2.1.11.1	0521	0240	0038	0090	0155	0162	0040	00155	0021	0007
2.2.5.1	0415	0122	0000	0060	0075	0086	0083	00103	0017	0000
3.1.12.1	0667	0274	0026	0104	0121	0226	0053	00180	0000	0000
3.1.12.2	0729	0284	0000	0063	0104	0144	0083	00113	0000	0000
3.1.12.3	0415	0141	0004	0050	0037	0101	0034	00022	0000	0024
3.1.12.4	0431	0182	0000	0072	0087	0142	0029	00210	0017	0072
3.1.12.5	0433	0177	0000	0064	0059	0126	0025	00089	0000	0000
3.1.12.6	0479	0200	0001	0071	0061	0133	0004	00147	0000	0000
3.2.5.1	0586	0204	0018	0105	0103	0166	0051	00096	0000	0076
3.2.5.2	0610	0218	0003	0126	0142	0168	0054	00214	0000	0048
3.2.5.3	0735	0252	0000	0097	0137	0185	0079	00167	0022	0059
3.2.5.4	0404	0159	0000	0055	0079	0120	0076	00216	0000	0021
3.2.5.5	0465	0168	0000	0056	0063	0111	0118	00125	0005	0078
4.0.1.1	0823	0169	0019	0096	0653	0196	0071	05267	0000	0694
4.2.1.1	0601	0181	0000	0049	0099	0146	0068	00135	0000	0067
5.2.5.1	0704	0202	0000	0065	0106	0102	0034	00109	0000	0075
7.1.43	1092	0349	0000	0420	0728	0592	0178	00000	0018	0475
7.3.1	1522	0525	0000	0626	1076	1365	0258	00000	0000	0647
10.1.31.1	1810	0311	0000	0214	2046	0343	0076	00000	0016	1059
18.2.1.1	0574	0163	0000	0070	0058	0106	0077	00046	0006	0018
18.2.1.2	0328	0066	0000	0016	0022	0065	0069	00040	0005	0082
21.1.8.1	0433	0122	0000	0082	0050	0094	0058	00056	0007	0038
21.1.8.2	0485	0209	0027	0074	0093	0160	0002	00197	0000	0020
21.1.8.3	0503	0186	0004	0083	0067	0144	0019	00128	0015	0117
22.1.1.1	0445	0141	0012	0050	0034	0074	0044	00061	0000	0042
22.1.1.2	363	0081	0000	0013	0000	0048	0047	00056	0005	0006
22.1.1.3	0357	0082	0000	0027	0039	0083	0040	00076	0000	0060
22.1.1.4	0410	0124	0000	0030	0040	0064	0067	00110	0000	0055
22.1.1.5	0471	0191	0018	0091	0066	0173	0056	00115	0000	0038
22.1.1.6	0501	0186	0000	0070	0072	0142	0066	00139	0007	0100
22.2.4.1	0392	0146	0000	0034	0034	0100	0023	00063	0012	0040
22.2.4.2	0530	0295	0015	0114	0158	0210	0048	00172	0000	0012
23.2.1.1	0420	0155	0000	0063	0054	0133	0048	00049	0000	0041
23.2.1.2	0465	0174	0010	0083	0098	0161	0067	00072	0000	0016
23.2.1.3	0630	0207	0005	0074	0120	0128	0054	00092	0010	0013
23.2.1.4	0333	0080	0000	0003	0029	0084	0074	00050	0000	0013
24.2.1.1	0474	0206	0011	0061	0098	0180	0069	00055	0001	0003
24.2.1.2	0678	0295	0003	0128	0147	0218	0050	00260	0000	0036
28.1.1.1	0572	0215	0000	0090	0118	0191	0020	00179	0000	0029
28.1.1.2	0360	0190	0006	0065	0101	0128	0056	00085	0000	0127
28.1.1.3	0589	0162	0000	0046	0048	0135	0100	00140	0000	0028
28.2.1.1	0526	0258	0020	0116	0108	0190	0068	00241	0000	0000
29.1.2.1	0538	0201	0000	0077	0080	0141	0030	00129	0004	0019
29.1.2.2	0535	0290	0000	0112	0192	0259	0079	00165	0000	0042
29.1.2.3	0478	0245	0000	0085	0077	0155	0063	00105	0000	0009
29.1.2.4	0557	0115	0000	0023	0013	0103	0050	00066	0000	0035
29.1.2.5	0457	0136	0000	0068	0061	0146	0064	00130	0000	0000
29.1.2.6	0498	0203	0000	0070	0081	0154	0085	00114	0000	0049

TABLE 27 *continued*

Item Number	Fe	Rb	Sr	Y	Ze	Nb	Sn	Ba	La	Ce
29.2.1.1	0685	0335	0008	0136	0134	0224	0059	00248	0000	0032
29.2.1.2	0443	0168	0000	0045	0063	0095	0039	00111	0047	0056
29.2.1.3	0564	0179	0000	0050	0068	0133	0086	00180	0002	0039
29.2.3.1	0387	0200	0012	0085	0136	0172	0057	00091	0000	0000
31.2.3.1	0469	0254	0019	0094	0111	0154	0054	00166	0006	0089
31.2.3.2	0449	0259	0000	0102	0091	0152	0090	00147	0000	0006
31.2.3.3	0715	0309	0000	0082	0134	0178	0071	00184	0000	0046
32.2.16.1	1019	0108	0009	0077	0597	0131	0084	02932	0000	0288
32.2.16.2	1024	0190	0032	0065	0678	0262	0048	05011	0021	0722
32.2.16.3	0399	0189	0000	0075	0101	0185	0112	00066	0000	0011
32.2.16.4	1687	0568	0000	0823	1453	1720	0523	00000	0000	1514
<u>10-CR-789</u>										
1.5.1	0456	0208	0009	0065	0086	0153	0032	00206	0000	0000
2.1.2	1164	0324	0000	0387	0670	0874	0186	00000	0000	0506
4.2.2	0526	0077	0000	0025	0237	0079	0032	02263	0000	0253
4.2.3	0651	0162	0008	0078	0333	0141	0064	02786	0039	0293
4.2.4	1784	0609	0000	0832	1362	1796	0409	00000	0000	1166
5.1.1	0775	0198	0020	0097	0370	0182	0086	03341	0000	0291
7.1.3	0389	0137	0000	0077	0095	0147	0050	00034	0000	0000
7.2.1	2308	0479	0000	0332	2978	0522	0114	00000	0000	1313
0.1.6	0532	0332	0000	0153	0239	0354	0066	00513	0000	0000
0.2.9.1	0980	0226	0013	0112	0707	0257	0048	03922	0000	0538
0.2.9.2	0448	0169	0000	0076	0081	0123	0055	00187	0000	0000
0.2.9.3	0341	0047	0048	0041	0060	0±107	0025	00529	0061	0000
0.2.9.4	0776	0146	0000	0044	0315	0086	0045	01449	0000	0209
0.2.9.5	0652	0149	0006	0087	0342	0147	0076	03834	0000	0230
0.2.10.1	0000	0086	0000	0015	0028	0058	0013	00185	0000	0000
<u>10-CR-93</u>										
0.1.3.1	0126	0108	0000	0047	0051	0064	0065	00155	0026	0000
0.1.41.1	0114	0118	0012	0074	0361	0118	0064	06495	0289	0827
0.1.41.2	0554	0237	0000	0163	1585	0284	0101	00000	0644	2058
0.1.41.3	0571	0108	0069	0064	0866	0097	0051	07266	0249	0820
0.1.41.4	0204	0038	0002	0046	0219	0054	0004	03760	0165	0409
0.1.42.1	0229	0050	0000	0048	0179	0067	0055	02980	0130	0439
0.1.42.2	0458	0063	0000	0080	0725	0151	0033	00000	0158	0467
0.1.42.3	0191	0045	0000	0002	0126	0036	0020	01761	0064	0197
0.1.42.4	0168	0021	0000	0022	0160	0056	0040	01884	0080	0230
0.1.43.1	0279	0112	0000	0065	0587	0098	0045	00000	0120	0426
0.1.43.2	0203	0057	0000	0024	0236	0050	0031	01597	0025	0214
0.1.43.3	0178	0023	0010	0014	0211	0039	0064	01221	0046	0157
0.1.43.11	0277	0048	0031	0044	0295	0047	0017	01815	0076	0234
0.1.43.18	0227	0042	0000	0060	0236	0076	0021	03295	0112	0490
0.1.44	0140	0088	0009	0072	0254	0090	0058	03411	0073	0378
0.1.48	0408	0143	0023	0080	0754	0118	0039	00000	0206	0543
0.1.49	0168	0048	0000	0009	0206	0044	0071	02927	0167	0367
0.1.50	0909	0182	0000	0125	0756	0178	0055	00000	0443	1039
0.1.51	0211	0094	0000	0052	0258	0058	0015	03804	0115	0422
0.1.52	0176	0128	0012	0030	0059	0048	0056	00081	0000	0054
0.1.53	0322	0093	0029	0045	0234	0064	0007	01275	0047	0268
0.1.45.1	0190	0034	0010	0017	0138	0029	0067	00876	0056	0162
0.1.45.2	0172	0072	0000	0106	0182	0262	0107	00000	0090	0159
0.1.45.3	0118	0043	0008	0005	0035	0019	0020	02295	0000	0032
0.1.45.4	0317	0049	0015	0041	0245	0048	0039	01369	0025	0241
0.1.45.5	0035	0052	0001	0035	0036	0045	0029	00085	0000	0046
0.1.45.6	0049	0054	0005	0039	0061	0067	0039	00139	0040	0044
0.1.45.7	0012	0062	0002	0033	0028	0050	0031	00109	0042	0074
0.1.45.8	0275	0054	0000	0083	0156	0189	0064	00000	0025	0152
0.1.45.9	0132	0080	0000	0032	0021	0043	0043	00063	0000	0031
0.1.45.10	0214	0043	0000	0026	0178	0027	0037	01053	0091	0233
0.1.45.11	0053	0096	0000	0045	0020	0054	0017	00092	0035	0000
0.1.45.12	0229	0050	0004	0026	0233	0057	0000	01393	0097	0249
0.1.45.13	0201	0068	0000	0033	0105	0057	0067	00013	0048	0141
0.1.45.14	0246	0171	0000	0223	0435	0540	0180	00000	0211	0720

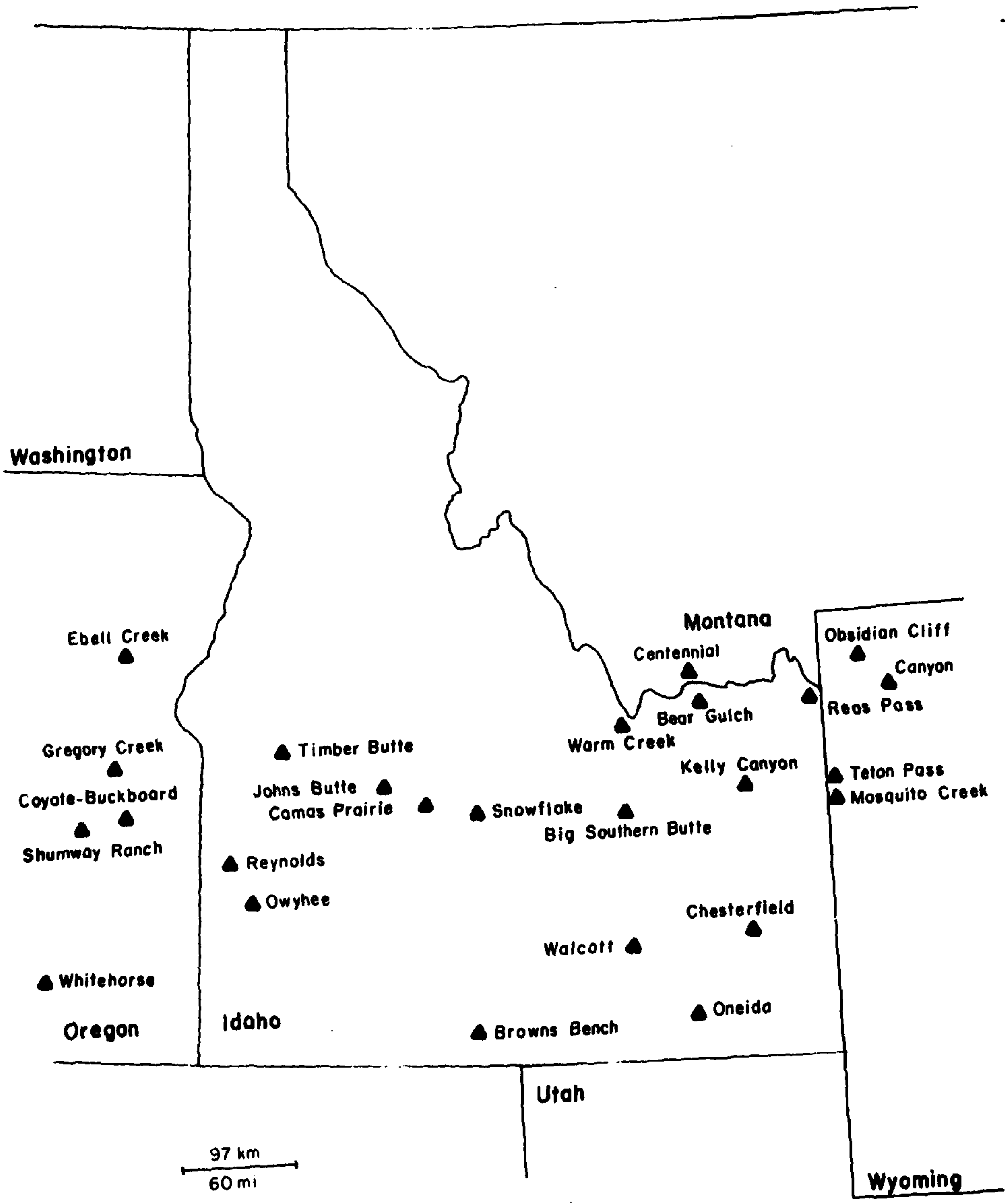

Fig. 48. Location of sources used in this study. Scale is 1 in. = 60 mi.

TABLE 28

Correlations of the obsidian items in the sample. Probability of the fit is in column P(G/X)

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
10-CR-768										
0.5.1	Reynolds	0.5823	0.9982	Obsidian Cliff	0.0016	-5.3245 1.7661	-3.5640	-6.6677	0.1592	3.7410
0.5.2	Reas Pass	0.0002	0.5797	Canyon	0.2040	-0.4368 -2.2984	-1.7731	-1.6932	2.8370	-2.8922
1.1.11	Canyon	0.5380	0.7112	Reas Pass	0.2329	-0.2282 -0.7100	-0.8871	-2.6534	0.1560	0.2424
0.3.8	Bear Gulch	0.8219	0.9753	Reas Pass	0.0135	-0.6861 -1.7694	-0.5141	1.6364	-0.3689	0.6552
0.2.11	Warm Creek	0.1372	0.3724	Canyon	0.2728	-0.9915 -1.0220	-0.0834	-2.3300	-2.6377	1.9215
20.1.1	Walcott	0.3140	0.6336	Warm Creek	0.3580	1.1100 0.1435	0.4094	-0.4951	-2.5105	2.5418
0.3.4	Kelly Canyon	0.8582	0.4392	Warm Creek	0.1996	-1.3512 0.1760	0.0188	-0.5023	-2.4452	0.2831
3.2.1	Timber Butte	0.5661	0.5821	Obsidian Cliff	0.3904	-3.6317 -0.5242	-1.2293	-6.9305	0.7954	0.8950
29.2.2	Canyon	0.0323	0.5132	Reas Pass	0.4181	-0.9319 -1.3171	-1.2657	-2.9521	0.9198	-2.9092
26.1.1	Timber Butte	0.0000	0.9942	Snowflake	0.0022	-7.4928 -1.2098	0.6977	-2.1252	1.8231	-2.9993
28.1.4	Reas Pass	0.0699	0.4834	Canyon	0.4716	-1.1221 -1.9650	-1.3183	-2.7044	0.6376	-2.2799
29.1.3	Canyon	0.0221	0.4813	Timber Butte	0.2925	-0.3016 -0.4918	-1.8077	-3.4095	1.4918	-1.6958
1.1.12.1	Timber Butte	0.9998	0.9733	Obsidian Cliff	0.0263	-3.0711 -0.9056	-1.0703	-5.8130	1.5117	-0.9849
1.1.12.2	Canyon	0.0024	0.5864	Reas Pass	0.2548	-0.0993 -1.9587	-2.7151	-2.6016	1.6699	-2.0053
1.1.12.3	Reas Pass	0.0011	0.3618	Timber Butte	0.3150	-1.1752 -3.1729	-1.8559	-2.6756	1.2957	-2.7137
1.2.21.1	Timber Butte	0.0046	0.7422	Canyon	0.0980	-0.6662 -1.8743	-2.1793	-2.9118	2.3605	-1.2027
2.1.11.1	Timber Butte	0.7407	0.9850	Obsidian Cliff	0.0142	-1.9263 -1.1952	-1.2563	-5.7067	2.7399	-0.7254
2.2.5.1	Timber Butte	0.0675	0.9975	Obsidian Cliff	0.0024	-1.3235 -0.7779	-1.4695	-4.8500	1.9646	-3.3272
3.1.12.1	Timber Butte	0.9669	0.9904	Obsidian Cliff	0.0093	-3.4091 -1.4342	-0.5258	-6.0877	2.1568	-0.1770
3.1.12.2	Timber Butte	0.6034	0.9274	Owyhee A	0.0562	-1.8107 -1.7358	-1.5345	-7.2784	1.1728	0.0443
3.1.12.3	Timber Butte	0.2720	0.9988	Obsidian Cliff	0.0011	-1.6204 -1.1687	-1.1414	-5.2312	2.0334	-2.8597
3.1.12.4	Timber Butte	0.8151	0.9966	Obsidian Cliff	0.0033	-2.2414 -1.1599	-1.0798	-5.4472	1.6507	-2.1306

TABLE 28 *continued*

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
3.1.12.5	Timber Butte	0.7507	0.9972	Obsidian Cliff	0.0027	-2.0144 -1.1635	-1.1232	-5.6277	1.7063	-2.2002
3.1.12.6	Timber Butte	0.9179	0.9951	Obsidian Cliff	0.0047	-2.0793 -1.1063	-1.1254	-5.9744	1.6195	-1.7368
3.2.5.1	Timber Butte	0.8632	0.9885	Obsidian Cliff	0.0114	-2.6060 -0.6236	-0.9566	-5.4353	2.2408	-1.6958
3.2.5.2	Timber Butte	0.8969	0.9460	Obsidian Cliff	0.0531	-2.6831 -0.1801	-1.2808	-5.6252	1.6197	-1.6024
3.2.5.3	Timber Butte	0.9999	0.9807	Obsidian Cliff	0.0190	-2.8123 -1.1902	-1.1539	-6.1794	1.3366	-0.7936
3.2.5.4	Timber Butte	0.4836	0.9983	Obsidian Cliff	0.0016	-1.8202 -1.3266	-1.1799	-5.2328	1.7476	-2.5311
3.2.5.5	Timber Butte	0.5620	0.9975	Obsidian Cliff	0.0023	-1.6807 -1.2165	-1.2637	-5.5586	1.7328	-2.3471
4.0.1.1	Reas Pass	0.0954	0.4586	Canyon	0.3377	-0.4135 -1.7318	-1.8294	-1.3587	0.9115	-2.0678
4.2.1.1	Timber Butte	0.7574	0.9988	Obsidian Cliff	0.0012	-2.1820 -1.8327	-1.0723	-5.3505	1.6550	-2.0625
5.2.5.1	Timber Butte	0.5653	0.9793	Obsidian Cliff	0.0114	-1.2635 -1.0729	-1.7471	-6.0696	1.5743	-1.6754
7.1.43	Big Southern Butte	0.0000	1.0000	Snowflake	0.0000	-17.6702 -1.2081	3.7794	-.9377	1.0902	-0.5635
7.3.1	Big Southern Butte	0.1009	1.0000	Snowflake	0.0000	-25.2445 -0.7575	5.7884	2.6090	0.3552	2.0308
10.1.31.1	Johns Butte	0.0062	0.9905	Whitehorse	0.0095	0.3769 -3.4855	-9.9703	2.7834	0.9300	-0.4724
18.2.1.1	Timber Butte	0.4624	0.9954	Obsidian Cliff	0.0045	-1.6994 -0.7818	-1.3280	-5.5383	1.7920	-2.5164
18.2.1.2	Timber Butte	0.0023	0.9988	Canyon	0.0006	-1.0840 -1.4957	-1.1660	-4.2281	2.2239	-4.3044
21.1.8.1	Timber Butte	0.0708	0.9955	Obsidian Cliff	0.0044	-1.6950 -0.2242	-1.2963	-4.9057	1.9999	-3.4246
21.1.8.2	Timber Butte	0.8525	0.9970	Obsidian Cliff	0.0030	-2.2406 -1.3821	-0.8536	-5.5278	2.4827	-1.3767
21.1.8.3	Timber Butte	0.8488	0.9952	Obsidian Cliff	0.0048	-2.3702 -0.8683	-0.9868	-5.5705	1.8085	-2.0677
22.1.1.1	Timber Butte	0.1265	0.9974	Obsidian Cliff	0.0019	-0.9956 -0.9150	-1.3893	-5.3846	2.3077	-2.7851
22.1.1.2	Timber Butte	0.0063	0.9994	Canyon	0.0002	-0.7407 -1.4135	-1.2950	-4.7454	2.1475	-3.9636
22.1.1.3	Timber Butte	0.0091	0.9993	Canyon	0.0003	-1.3800 -1.4461	-1.1118	-4.2978	2.1429	-4.0219
22.1.1.4	Timber Butte	0.0655	0.9982	Obsidian Cliff	0.0009	-0.8393 -1.3038	-1.4926	-5.2268	1.9324	-3.1403
22.1.1.5	Timber Butte	0.8232	0.9969	Obsidian Cliff	0.0030	-2.8564 -0.9498	-0.5959	-5.3045	2.2914	-1.9038
22.1.1.6	Timber Butte	0.8703	0.9969	Obsidian Cliff	0.0030	-2.2825 -1.1997	-1.0320	-5.5998	1.6515	-2.0410

TABLE 28 *continued*

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
22.2.4.1	Timber Butte	0.3301	0.9993	Obsidian Cliff	0.0006	-1.5425 -1.5845	-1.1357	-5.3790	1.8422	-2.7112
22.2.4.2	Timber Butte	0.9724	0.9522	Obsidian Cliff	0.0468	-3.0279 -1.1425	-1.0737	-6.5418	1.6704	0.1384
23.2.1.1	Timber Butte	0.5295	0.9986	Obsidian Cliff	0.0014	-2.2601 -1.1884	-0.9426	-5.1884	1.8239	-2.6643
23.2.1.2	Timber Butte	0.6649	0.9971	Obsidian Cliff	0.0029	-2.6407 -1.0635	-0.8897	-5.0168	2.0908	-2.2921
23.2.1.3	Timber Butte	0.8052	0.9886	Obsidian Cliff	0.0102	-1.7267 -1.1227	-1.5257	-5.8430	1.7375	-1.5853
23.2.1.4	Timber Butte	0.0077	0.9995	Canyon	0.0002	-1.3278 -2.0678	-1.0020	-4.3022	2.1406	-3.9614
24.2.1.1	Timber Butte	0.9289	0.9988	Obsidian Cliff	0.0012	-2.7560 -1.9121	-0.7401	-5.4533	1.9564	-1.5247
24.2.1.2	Timber Butte	0.9736	0.9236	Obsidian Cliff	0.0728	-3.4002 -0.8083	-0.9870	-6.6283	1.2329	-0.0061
28.1.1.1	Timber Butte	0.9903	0.9948	Obsidian Cliff	0.0052	-3.1045 -1.2922	-0.8283	-5.5265	1.5092	-1.5406
28.1.1.2	Timber Butte	0.7485	0.9954	Obsidian Cliff	0.0043	-1.8049 -1.2787	-1.3412	-5.6051	1.8524	-1.8942
28.1.1.3	Timber Butte	0.6283	0.9993	Obsidian Cliff	0.0007	-2.1946 -1.6575	-0.8532	-5.3197	1.7505	-2.4358
23.2.1.1	Timber Butte	0.9915	0.9716	Obsidian Cliff	0.0276	-2.8864 -0.7031	-0.8627	-6.1889	2.0173	-0.5893
29.1.2.1	Timber Butte	0.9333	0.9939	Obsidian Cliff	0.0060	-2.2141 -1.0624	-1.1579	-5.8520	1.5865	-1.7571
29.1.2.2	Timber Butte	0.9386	0.9818	Obsidian Cliff	0.0177	-4.0618 -1.6929	-0.7380	-6.0352	1.1562	-0.0970
29.1.2.3	Timber Butte	0.9905	0.9856	Obsidian Cliff	0.0138	-2.3903 -1.0967	-1.1598	-6.5764	1.3867	-0.8720
29.1.2.4	Timber Butte	0.1154	0.9998	Obsidian Cliff	0.0002	-1.7395 -1.7776	-0.8523	-4.8728	1.9852	-3.3138
29.1.2.5	Timber Butte	0.2651	0.9991	Obsidian Cliff	0.0009	-2.5829 -1.1326	-0.7407	-4.6861	1.8964	-3.0857
29.1.2.6	Timber Butte	0.9672	0.9966	Obsidian Cliff	0.0033	-2.4364 -1.3773	-1.0077	-5.7814	1.5745	-1.6914
29.2.1.1	Timber Butte	0.5780	0.8342	Obsidian Cliff	0.1512	-3.4135 -0.7407	-0.9840	-7.3409	1.2283	0.8383
29.2.1.2	Timber Butte	0.4267	0.9967	Obsidian Cliff	0.0021	-1.3009 -1.3600	-1.4372	-5.6902	1.7276	-2.2946
29.2.1.3	Timber Butte	0.7708	0.9986	Obsidian Cliff	0.0013	-2.0314 -1.6155	-1.0418	-5.5559	1.6576	-2.0945
31.2.3.1	Timber Butte	0.8882	0.9950	Obsidian Cliff	0.0050	-2.5838 -1.2586	-1.0447	-5.2167	2.0266	-1.7477
31.2.3.2	Timber Butte	0.9325	0.9733	Obsidian Cliff	0.0248	-2.0672 -0.9508	-1.2783	-6.4111	2.0038	-0.5789
31.2.3.3	Timber Butte	0.9484	0.9534	Obsidian Cliff	0.0443	-2.3042 -0.6811	-1.3409	-6.7919	1.3197	-0.6483

TABLE 28 *continued*

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
31.2.16.1	Timber Butte	0.6386	0.9514	Obsidian Cliff	0.0328	-2.3876 -1.6705	-1.3974	-7.3120	1.0429	0.4761
32.2.16.2	Canyon	0.0006	0.4613	Reas Pass	0.4091	0.0711 -1.5246	-2.8022	-1.3856	1.5002	-3.5039
32.2.16.3	Bear Gulch	0.0517	0.7318	Reas Pass	0.2328	-1.3603 -3.3026	-1.2028	-1.0116	1.3113	-1.4456
32.2.16.4	Timber Butte	0.8682	0.9983	Obsidian Cliff	0.0017	-3.0849 -1.5379	-0.7190	-5.1825	1.6567	-2.0274
<u>10-CR-789</u>										
1.5.1	Big Southern Butte	0.0000	1.0000	Snowflake	0.0000	-31.9838 0.2999	7.4599	6.4259	0.2553	1.8805
2.1.2	Timber Butte	0.9530	0.9972	Obsidian Cliff	0.0027	-2.2517 -1.5239	-0.9771	-5.7648	1.8391	-1.4896
4.2.2	Big Southern Butte	0.0000	1.0000	Snowflake	0.0000	-16.2108 -1.1745	3.3173	0.5040	1.1931	-0.9067
4.2.3	Canyon	0.0006	0.5886	Reas Pass	0.2978	-0.2114 -1.6701	-1.5359	-3.0554	1.5248	-3.9711
4.2.4	Timber Butte	0.0359	0.7595	Canyon	0.1509	-0.9136 -1.2300	-1.5224	-3.5568	1.2807	-2.3474
5.1.1	Big Southern Butte	0.0000	1.0000	Snowflake	0.0000	-33.7537 -0.1016	8.6809	5.8573	0.0748	2.6916
7.1.3	Timber Butte	0.1407	0.8965	Canyon	0.0472	-1.3665 -1.2461	-1.1667	-3.5455	1.3867	-1.5575
7.2.1	Timber Butte	0.2189	0.9983	Obsidian Cliff	0.0017	-2.5404 -0.9804	-0.9601	-4.5515	1.9215	-3.1178
0.1.6	Camas A	0.0002	1.0000	Johns Butte	0.0000	0.0830 -4.3146	-13.6669	5.3982	0.0831	2.3201
0.2.9.1	Timber Butte	0.0838	0.9582	Obsidian Cliff	0.0284	-5.8225 -1.6710	0.0122	-5.7888	0.8813	0.5939
0.2.9.2	Reas Pass	0.0599	0.5630	Canyon	0.2274	-1.6306 -2.2349	-2.0730	-1.8999	0.8038	-1.1267
0.2.9.3	Timber Butte	0.5823	0.9951	Obsidian Cliff	0.0048	-1.9474 -0.8318	-1.2399	-5.3890	1.7250	-2.4150
0.2.9.4	Timber Butte	0.0000	0.9841	Reas Pass	0.0140	-1.4576 -1.2477	-0.4306	-2.8505	3.8990	-4.4337
0.2.9.5	Timber Butte	0.0040	0.8185	Owyhee A	0.0956	-0.0570 -1.6357	-2.4047	-4.0264	1.4237	-2.6841
0.2.10.1	Canyon	0.0500	0.5111	Reas Pass	0.3736	-0.9310 -0.9481	-1.1633	-3.1137	0.9852	-2.5921
<u>10-CR-93</u>										
0.1.3.1	Canyon	0.2136	0.5918	Reas Pass	0.3874	0.0346 -0.2952	-0.6347	-1.6591	-0.0090	-3.3076
0.1.41.1	Johns Butte	0.0909	0.9999	Whitehorse	0.0001	0.1393 -3.8758	-8.8792	3.3133	1.3291	-2.0213
0.1.41.2	Bear Gulch	0.0097	0.8342	Canyon	0.1125	1.7087 -1.7143	-2.5175	0.0503	0.5834	-2.6492

TABLE 28 *continued*

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
0.1.41.3	Canyon	0.0048	0.6581	Reas Pass	0.3316	0.1082 -0.7974	-1.0830	-2.4738	1.0245	-4.1730
0.1.41.4	Canyon	0.0007	0.6319	Reas Pass	0.3557	0.2334 -1.5387	-1.0239	-2.4352	1.2682	-4.5309
0.1.42.1	Canyon	0.0387	0.6795	Reas Pass	0.2917	-0.4524 -0.4016	-1.2881	-3.1159	0.9268	-2.9524
0.1.42.2	Reas Pass	0.0295	0.5057	Canyon	0.4796	-0.3374 -1.4196	-1.0673	-1.9485	0.8341	-3.5464
0.1.42.3	Johns Butte	0.2007	0.9975	Whitehorse	0.0025	0.1773 -2.4933	-5.1709	-0.9569	1.8006	-3.1761
0.1.42.4	Canyon	0.0156	0.6309	Reas Pass	0.2821	-0.4446 -1.2402	-1.1427	-3.2644	1.0168	-3.2389
0.1.43.1	Johns Butte	0.0073	0.9965	Whitehorse	0.0020	-1.5502 -2.1406	-4.1196	-0.7258	1.8302	-3.3078
0.1.43.2	Reas Pass	0.0111	0.5450	Canyon	0.4477	-0.5350 -0.6600	-0.9457	-2.0943	0.9467	-4.0737
0.1.43.3	Timber Butte	0.0341	0.9959	Obsidian Cliff	0.0037	-0.9991 -0.4545	-1.6089	-5.0401	1.9954	-3.4142
0.1.43.11	Timber Butte	0.0000	0.3809	Canyon	0.3456	-0.0034 -1.7429	-1.7735	-2.8200	2.6942	-3.4767
0.1.43.18	Timber Butte	0.0042	0.9988	Canyon	0.0006	-0.7866 -1.5204	-1.4345	-4.4414	2.1396	-3.9880
0.1.44	Timber Butte	0.0000	0.4719	Kelly Canyon	0.4079	-10.7417 -1.0819	1.7109	-0.4586	1.7682	-3.0022
0.1.48	Timber Butte	0.0002	0.9947	Canyon	0.0033	-0.4417 -0.5384	-1.6107	-4.3039	2.3020	-4.6520
0.1.49	Timber Butte	0.0026	0.9983	Obsidian Cliff	0.0006	-1.1570 -0.6894	-1.2708	-4.3052	2.1976	-4.3057
0.1.50	Timber Butte	0.0378	0.9857	Obsidian Cliff	0.0133	-1.0463 -0.6304	-2.0773	-4.5978	2.0778	-3.0167
0.1.51	Timber Butte	0.0000	0.9945	Reas Pass	0.0026	-5.8680 -0.5379	0.2298	-2.5215	2.0388	-3.8008
0.1.52	Kelly Canyon	0.0000	0.5131	Timber Butte	0.4349	-10.3917 -1.2847	1.7703	-0.3960	1.8676	-3.3800
0.1.53	Canyon	0.0000	0.4453	Timber Butte	0.3167	-0.1520 -1.4388	-1.7865	-3.1247	1.9774	-4.6161
0.1.45.1	Canyon	0.0068	0.5651	Reas Pass	0.3970	0.3903 -1.3297	-1.6355	-1.3091	0.7178	-3.9849
0.1.45.2	Kelly Canyon	0.0000	0.9866	Reas Pass	0.0113	-10.7180 -0.4461	1.8148	0.5737	2.1088	-4.4624
0.1.45.3	Timber Butte	0.0009	0.9979	Obsidian Cliff	0.0008	-1.0455 -0.5134	-1.2715	-4.0892	2.6570	-4.3337
0.1.45.4	Reas Pass	0.0005	0.5433	Canyon	0.4471	-0.0274 -1.2478	-1.1225	-1.6811	1.2425	-4.8198
0.1.45.5	Timber Butte	0.0073	0.9976	Obsidian Cliff	0.0011	-1.0491 -1.0063	-1.5685	-4.2902	2.0753	-3.8727
0.1.45.6	Timber Butte	0.0002	0.9902	Reas Pass	0.0078	-2.1201 -0.8652	-0.8026	-3.3859	2.3343	-4.8916

TABLE 28 *continued*

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
0.1.45.7	Timber Butte	0.0000	0.9933	Reas Pass	0.0037	-5.8952 -0.9328	0.0281	-2.3768	1.9542	-3.4897
0.1.45.8	Reas Pass	0.0004	0.5075	Canyon	0.3955	-0.1981 -0.0941	0.1556	-2.7673	2.2747	-4.0456
0.1.45.9	Reas Pass	0.0003	0.7244	Canyon	0.2499	-0.8279 -1.8377	-1.4715	-1.8994	2.0912	-4.1778
0.1.45.10	Canyon	0.0000	0.4538	Ebell Creek	0.3347	1.0867 -0.6036	-0.1965	-2.6325	2.4907	-4.5324
0.1.45.11	Timber Butte	0.0003	0.9954	Canyon	0.0027	-0.7866 -1.2107	-1.2824	-4.0579	2.3225	-4.7201
0.1.45.12	Canyon	0.0000	0.6893	Reas Pass	0.2988	0.5765 -1.6437	-1.7631	-2.4805	1.8678	-5.1606
0.1.45.13	Reas Pass	0.0000	0.4377	Timber Butte	0.3330	-0.8543 -1.5634	-1.3629	-2.6615	2.3183	-4.5617
0.1.45.14	Timber Butte	0.0000	0.9719	Reas Pass	0.0268	-4.6163 -1.0196	-0.0837	-2.3441	2.2272	-4.5312

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