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The Diamond Lil Site: Projectile Point Fragments as Indicators of Site Function

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THE Diamond Lil archaeological site (35LA 807) located on the western slopes of the Cascade Range, is situated on a ridge approximately one kilometer from, and 277 m. above, the Middle Fork of the Willamette River near Oakridge, Oregon (Fig. 1). Fifty contiguous 1 x 1-m. excavation units yielded over 20,000 lithic artifacts and nearly 800 bone fragments, mostly (52%) identified as medium-sized mammal remains. A technological analysis of all formed artifacts (n=147) and a representative sample of the debitage (65%) indicates that this unlikely site location was intensively utilized for a short period of time relatively late in prehistory. Ethnographic data, environmental information, and a site structural analysis of the spatial distribution of bone and debitage, suggest that the site location was employed to process deer and manufacture/rejuvenate flaked stone tools. However, experimental and archaeological data involving projectile point rejuvenation and breakage suggest the site served also as a deer kill location. Furthermore, the site assemblage, dominated by projectile point rejuvenation debitage and fragments of lanceolate, dart, and arrow points, is interpreted as representing a multiple weapons system technology utilized in a communal hunting situation.

ETHNOGRAPHICALLY DOCUMENTED USE OF THE ENVIRONMENT

Between approximately 183 and 1,067 m. above mean sea level in the central western Cascade Range, the natural vegetation is generally classified as part of the *Tsuga heterophylla* Zone (Franklin and Dyrness 1988). However, savanna and prairie, not coniferous forest, was the vegetation zone of the hills bordering the Willamette Valley in the pre-Euroamerican environment. This environmental zone dominated the Middle Fork of the Willamette River drainage below 683 m. elevation such as High Prairie (Fig. 1), an area of approximately 4.8 km.^{2} of tableland on the east side of the North Fork of the Middle Fork of the Willamette River above the present town of Oakridge (Patterson 1857). A mixed-conifer forest has gradually replaced what was once prairie and scattered trees.

Periodic, noncatastrophic fires were common in this area before modern fire suppression techniques were employed, which suggests the possibility of intentional underburning by aboriginal peoples. In a study of the ecosystem dynamics in the foothills surrounding the Willamette Valley, Cole (1977:184) found that frequent aboriginal burning acted as a "regular environmental input, to which both tree density and species composition were in adjustment."

Several studies of aboriginal burning in northern California and western Montana (Lewis 1973; Barrett 1980) document the intentional burning of low elevation forest and grasslands primarily in the fall to stimulate a new growth of browse for big game, to enhance the growth of woody food plants and berries, or to aid in gathering food or concentrating game in desired areas. According to an early Oregon settler:

> Fire was the agency used by the Calapooia tribes to hold their camas grounds and renew their berry patches and grass-lands for game and the millions of geese, brants, cranes and swans

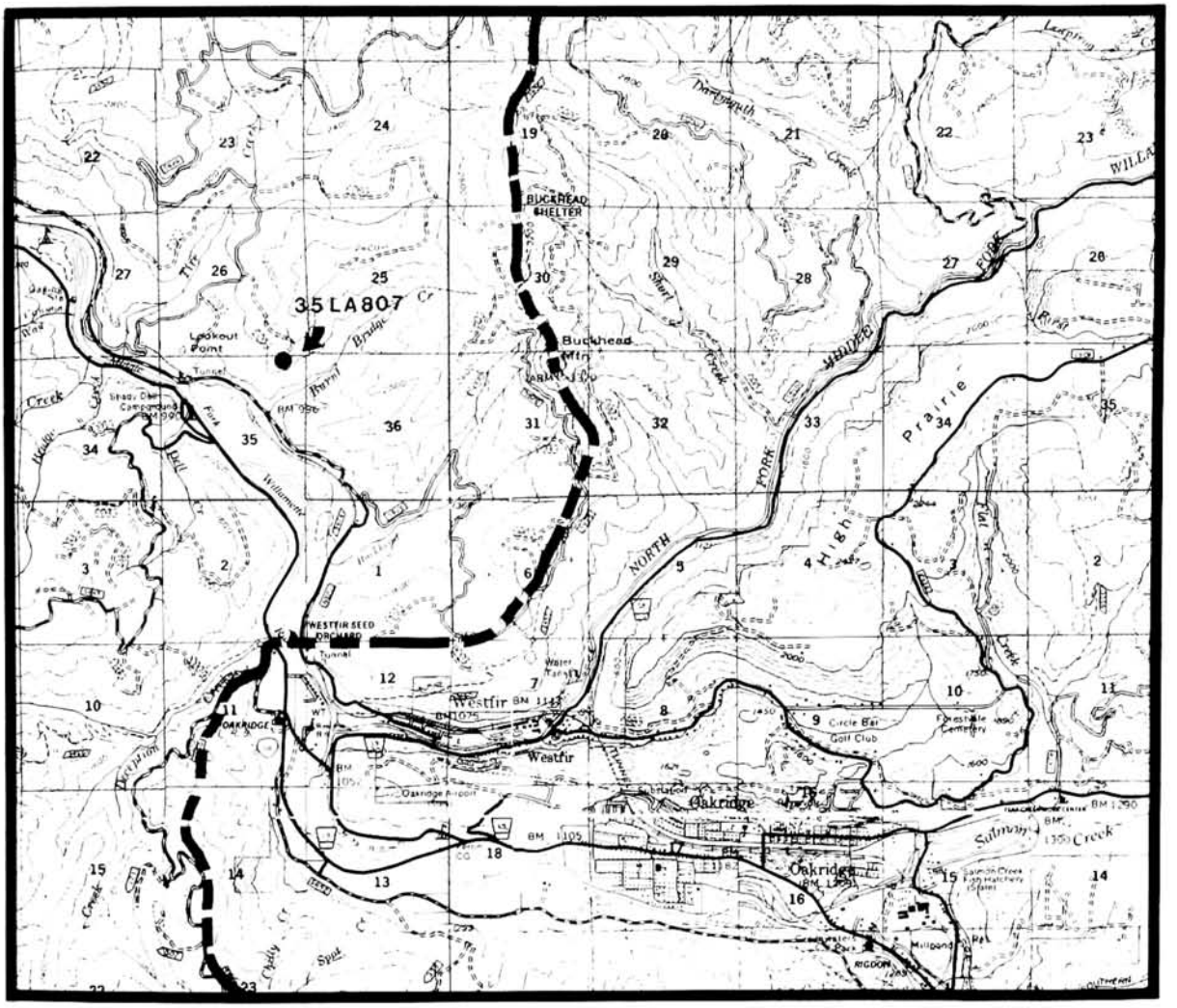

Fig. 1. The location of the Diamond Lil site, 35LA807.

> which wintered in Western Oregon . . . On the west face of the Cascades the Molallas claimed dominion, and fire was their agency in improving the game range and berry crops [Minto 1908:152-153].

Before their range was restricted following Euroamerican settlement, herds of white-tailed deer and elk congregated on the prairies of the Willamette Valley, especially during the winter months (Zenk 1976). The valley landscape, composed of open prairie, concentrations of oaks, fir groves, and riparian zones of ash and alder bound by mixed conifer forest, provided a high degree of habitat diversity (Boyd MS; Dasman 1964). It is not clear to what extent the white-tailed deer inhabited the Middle Fork of the Willamette River drainage, but they may have ranged as far as the Oakridge area (Winkler 1988). The riparian areas and grassy flats along the Middle Fork of the Willamette River, especially around Oakridge, remain prime elk winter range and were hunted there in proto-historic and historic times (cf. Grayson 1975:500). These species, as well as the black-tailed deer, utilized the forage and cover provided by the forest-grass ecotone. Black-tailed deer was the

most common species identified among elk, black bear, and mountain lion remains at Baby Rock Shelter and at Rigdon's Horsepasture Cave (Olsen 1975; Baxter et al. 1983). Mule deer, as well as several other small mammals, were also identified from faunal remains at these sites (Olsen 1975; Baxter et al. 1983).

Adapted to a bulky diet of herbs and browse, deer and elk require forage with a high nutritional content. As the growing season progresses, the maturing plants' nutritive value decreases and thus, these ruminants move upward in elevation and to cooler and shadier environments in search of vegetation in immature stages of growth (Nelson 1974:89-90) which may contain up to 15-20% protein (Chadwick 1983:79). Social behavior is adapted to this need; these animals disperse as individuals or small herds in search of favored habitats as spring and summer progress. With the onset of winter and snowfall, ungulates respond by migrating to areas with accessible forage, often following the same routes year after year and coalescing into large herds. White-tailed deer, black-tailed deer, and elk congregated in large herds in the prairie environments of the Willamette River drainage before Euroamerican settlement, especially during the winter months and the fall breeding season (Zenk 1976:64-66). Complex, diverse habitats with relatively stable resource availability, such as those found in mountain foothill environments along the Middle Fork of the Willamette River, support high density deer populations (Mackie 1983:112-115). Late fall is thus the first high density coalescence of ungulates after two seasons of dispersal. This is also the time of year for peak fat stores; male deer lose 10-15% of their body weight during the fall rut (Speth and Spielmann 1983:3) while females reach peak fat stores in November and December (Wallmo and Regelin 1981:396).

Environmental and ethnographic data do not provide an adequate basis to determine the nature of prehistoric activities performed at the Diamond Lil site. These data, however, suggest that the Diamond Lil location is advantageous for procurement and processing of deer, seasonally available in large numbers. Furthermore, ethnographic information indicates that aboriginal peoples used the area for deer hunting and artificially enhanced the resource through intentional burning practices.

DIAMOND LIL SITE STRUCTURE

Spatial patterning within the Diamond Lil cultural deposit was examined during excavation and analysis phases of the project (Flenniken et al. 1990). Concentrations of functionally distinct artifacts are good indicators of activity areas. Two such concentrations were distinguished during the analysis of artifacts recovered from the site. A concentration of bone fragments and an adjacent concentration of lithic debitage were isolated through spatial analysis within the excavation block (Fig. 2). A standardizing equation was used to make frequencies of bone and debitage comparable across the block regardless of the excavated volume and to express the density as a number per cubic meter measure.

The bone concentration was found to be highly localized in five contiguous excavation units (U4, U7, U8, U23, and U25) near the center of the block (Fig. 2). The concentrations of bone fragments within these units ranged from 153/m.^{3} to 396/m.^{3} with an average of 275/m.^{3} in the five units. The average concentration for the rest of the block is 26/m.^{3} with the expected fall-off pattern surrounding the high concentration. Five of the units (U33, U35, U36, U37, and U38) in the extreme southwest corner of the block and three of the units (U45, U46, and U50) in the extreme northeast corner of the block did not contain any bone.

The bone concentration is interpreted as a butchering center where meat was removed from the bones of the deer. Alternatively, the

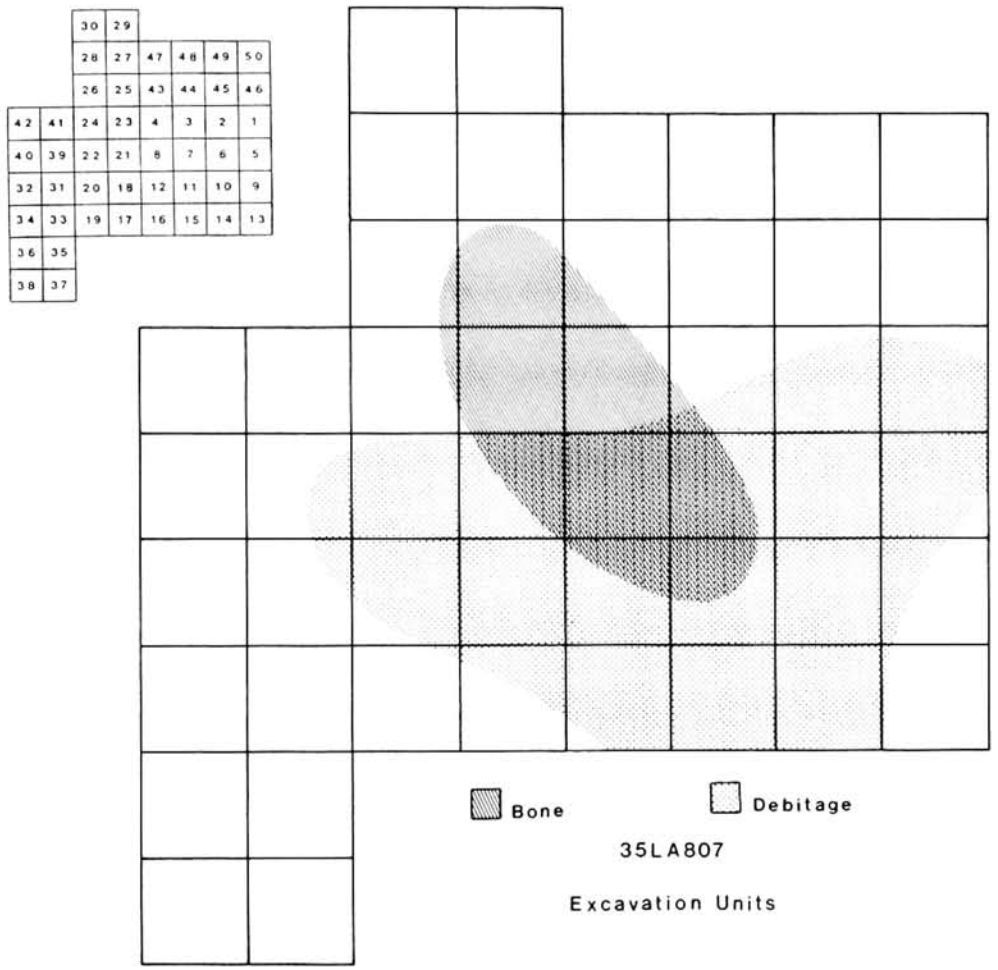

Fig. 2. The spatial distribution of bone and debitage within the block excavation at the Diamond Lil site.

bone concentration may represent a bone processing (e.g., marrow extraction) location or a secondary discard location for bone waste. The butchering center interpretation is favored here because of the close association of the debitage concentration containing the majority of the lithic debitage from the manufacture of butchering tools (microblades/cores and bipolar flakes/cores). The bone is very poorly preserved at the Diamond Lil site and does not lend itself to analysis of the degree of processing to which it has been subjected.

The lithic debitage recovered from the site was more evenly distributed across the block excavation, although a clear concentration was discernable around the southeastern periphery of

the bone concentration (Fig. 2). The highest debitage concentrations were recovered from seven excavation units (U1, U2, U11, U14, U15, U18, U20) that are not contiguous but rather are all immediately peripheral to the bone concentration (Fig. 2). The debitage densities in these seven units range from 2,036 to 3,329 flakes/m.^{3} and are connected by units (U7, U8, U12, U16, U21, U22, U39) containing only slightly lower concentrations (ranging from 1,421 to 1,998 flakes/m.^{3}). This group of 14 contiguous units averages 2,079 flakes/m.^{3} while the remaining 36 units average 1,005 flakes/m^3.

The spatial analysis suggests that the Diamond Lil site was intensively utilized to process deer, and to manufacture and rejuvenate broken or dulled flaked stone tools (Flenniken et al. 1990). Unfortunately, the spatial data and faunal analysis do not indicate whether primary or secondary butchering activities occurred, nor whether the animals were killed at the Diamond Lil location or some other location.

MULTIPLE WEAPON SYSTEMS

Native American use of multiple weapon systems for large game hunting was widespread even though actual documentation of such use is quite rare. For the Indians of North America:

> The bow and arrow was almost everywhere the chief weapon used. The thrusting lance was likewise nearly universal . . . The spear-thrower is reported by European observers only in the far north and extreme south . . . [Driver 1969:85].

On the Plateau, the Lower Chinook, Klickitat, Kalispel, Chilcotin, and Coeur d'Alene reportedly used the spear for hunting or stalking (Ray 1942:117, 152). The Klamath spear was "a short, stabbing lance, four to six feet long, bearing a large obsidian blade" (Spier 1930: 196). Among Northwest Coast Indians, spears were reportedly used to kill hibernating bears by the Bella Coola, Kwakiutl, Tsimshian, Haida, and Tlingit (Drucker 1950:174). Thrusting spears are reported for the Klamath, Modoc, Shasta, Wintu, Maidu, and Nisenan of northeast California (Voegelin 1942:73) and for five Northern Shoshoni bands in the Great Basin (Steward 1943:315), although Steward (1943: 273) interpreted its use as introduced from tribes east of the Rocky Mountains. Ishi, a member of the Yahi tribe of northern California, apparently used two weapons systems.

> He made arrow and spear points of different sizes and proportions, depending upon the game which they were intended to bring down, but they were always at the extreme of delicacy and sharpness for their particular size and purpose [Kroeber 1961:184].

An example of the use of both weapons systems is given in describing an incident in which Ishi was charged by a bear.

> Fortunately, before it closed with him, he had time to get in one shot which penetrated the heart region. For the *coup de grâce* he used a short obsidian-bladed spear of the kind which he ordinarily carried . . . [Kroeber 1961:195].

The use of the spear is noted by Curtis as he described the surround hunting technique used by the Northwest Coast Indians.

> . . . a party of hunters, ten or perhaps thirty men strong, would form at daylight a scattering line in the thicket at the base of a long, open slope, thus cutting off the usual retreat. At each end of the line a few men made a detour for the purpose of turning the animals back toward the hunters. Then the main party crept forward up the slope. Not only were the more distant deer driven back by the two parties of beaters, but any that were started up by the main body would usually dash along the line and attempt to escape into the gully, thus passing between two hunters, at least one of whom had a chance to hurl his spear [Curtis in Anell 1969:24-25].

Thus, in addition to the bow and arrow, most Native American tribes also employed a thrusting or throwing spear, depending upon the hunter's circumstances and the type of game being hunted. The prehistoric use of the atlatl in the Cascade Mountain range as an additional weapon system to the bow and arrow and the spear probably lasted several thousand years as

indicated by the co-occurrence of dart points, arrow points, and lanceolate points in stratified archaeological assemblages (cf. Connolly and Baxter 1986; Daugherty et al. 1987a; Baxter 1989:116-124).

PROJECTILE POINT ASSEMBLAGE

The above brief discussion concerning site function, distilled from Flenniken et al. (1990), serves to isolate possible prehistoric activities that may have occurred at the Diamond Lil site on the basis of peripheral evidence. This evidence provides information common to "lithic scatter" site interpretation. However, in this situation, an important activity that took place at the site could not be identified by these rigorous traditional analyses alone. The analysis of the projectile points and fragments provided the additional data necessary to identify, perhaps, the most important function of the Diamond Lil site.

Experimental data concerning the fracture patterns and rejuvenation of projectile points used in simulated hunting situations are well-established in the archaeological literature (cf. Flenniken 1985; Flenniken and Raymond 1986; Titmus and Woods 1986; Woods 1988; Towner and Warburton 1990). Excavation of the Diamond Lil site produced 95 projectile points and fragments exhibiting fractures characteristic of impact damage as documented in the above experimental studies.

The analyses of these projectile points, point fragments, as well as debitage, indicate that two activities may have occurred. The primary use of the projectile points was to kill deer at the site location. Reusable projectile points were then rejuvenated and badly broken points were discarded and replaced. Association of remains from both of these activities in the same location indicate that repair of the tool kit likely occurred in conjunction with kill and butchery.

Projectile point rejuvenation occurred at the Diamond Lil site resulting in the replacement and discard of exhausted, but more or less complete, points, 24 of which were recovered during excavations (Flenniken et al. 1990). Exhausted points (Figs. 3, 4, and 5) are those that have been slightly broken for the last time in their use-lives during hunting activities. Also as a result of the refurbishment of the hunting tool kit, projectile point bases (n=26) broken in the haft (cf. Flenniken and Raymond 1986; Flenniken 1985) were discarded and replaced with functional points (Figs. 6 and 7). Broken basal point fragments adhering to the foreshaft were most likely retrieved after the kill because of the potential reuse of the point as well as the foreshaft.

In addition to these complete points and point bases, 45 point tips and midsections (including margin spalls and point barbs) were recovered from the Diamond Lil site (Figs. 8, 9, and 10). These specific point fragments are indicators of hunting activities where these events occurred, and were the result of impact damage. Projectile points were broken on impact with inanimate objects (missed targets) or inside animals (Flenniken 1985). Because of their small, unusable condition, tips and midsections were not retrieved and, therefore, remained at kill sites. Alternatively, these fragments may have been deposited at the butchering camp where the fragments were returned in the dispatched animals.

For the entire assemblage of projectile points and fragments recovered from the Diamond Lil site, the ratio of bases and complete points (indicative of rejuvenation and weapon repair) to tips and midsections (indicative of hunting activity) was found to be almost exactly one to one (Table 1). This ratio is nearly identical to ratios of complete exhausted points/bases to tips/midsections found at other sites in the Cascade Range functionally identified as primary butchery locations or kill sites such as Layser Cave (45LE223; Daugherty et al. 1987a) and Judd Peak Rockshelters (45LE222; Daug-

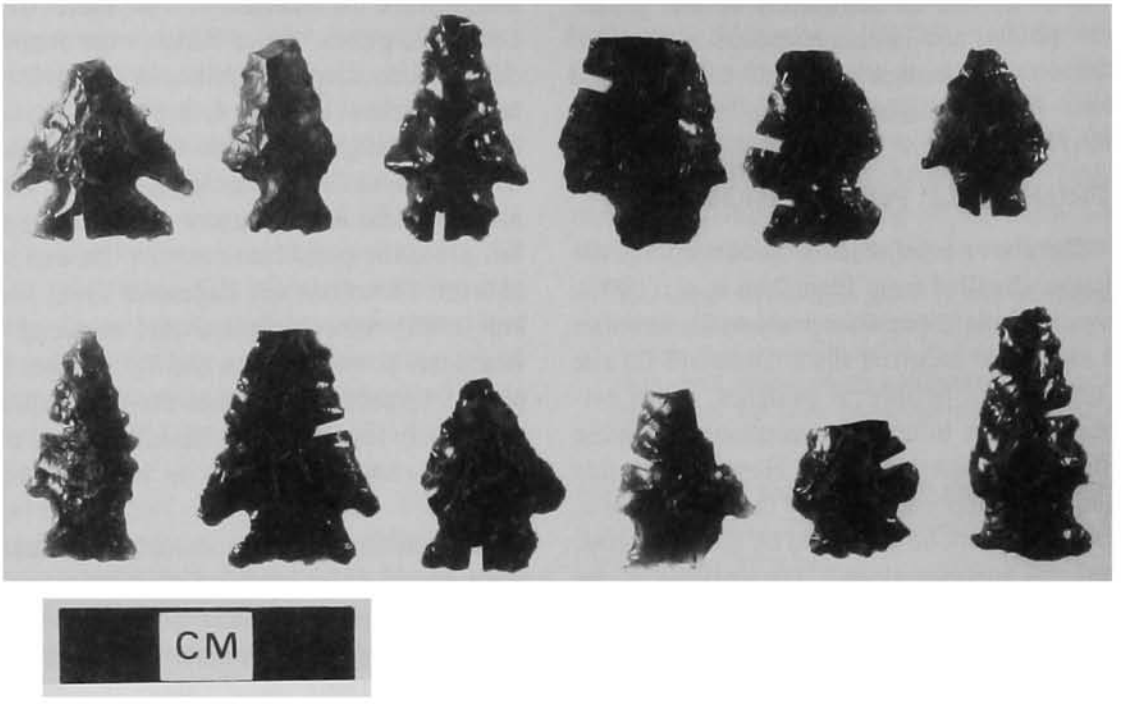

Fig. 3. Selected dart points from the Diamond Lil site.

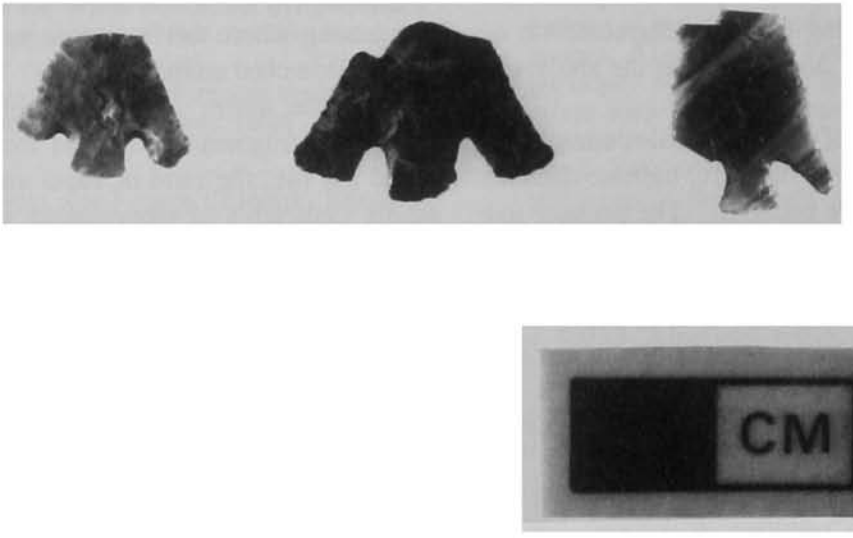

Fig. 4. Arrow points from the Diamond Lil site.

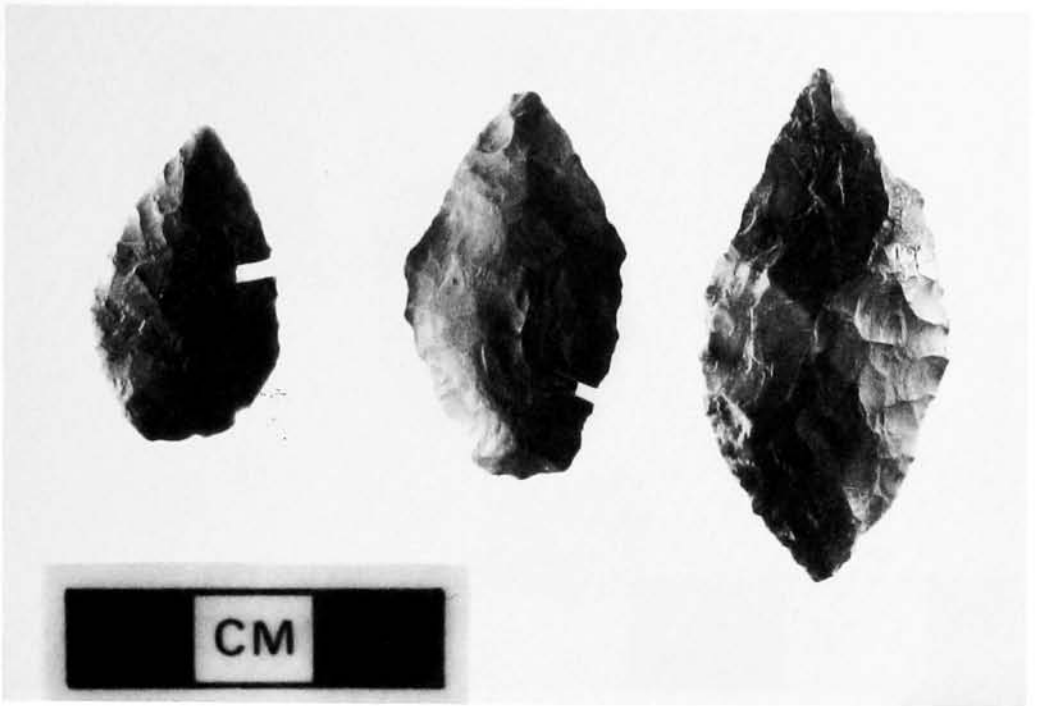

Fig. 5. Lanceolate points from the Diamond Lil site.

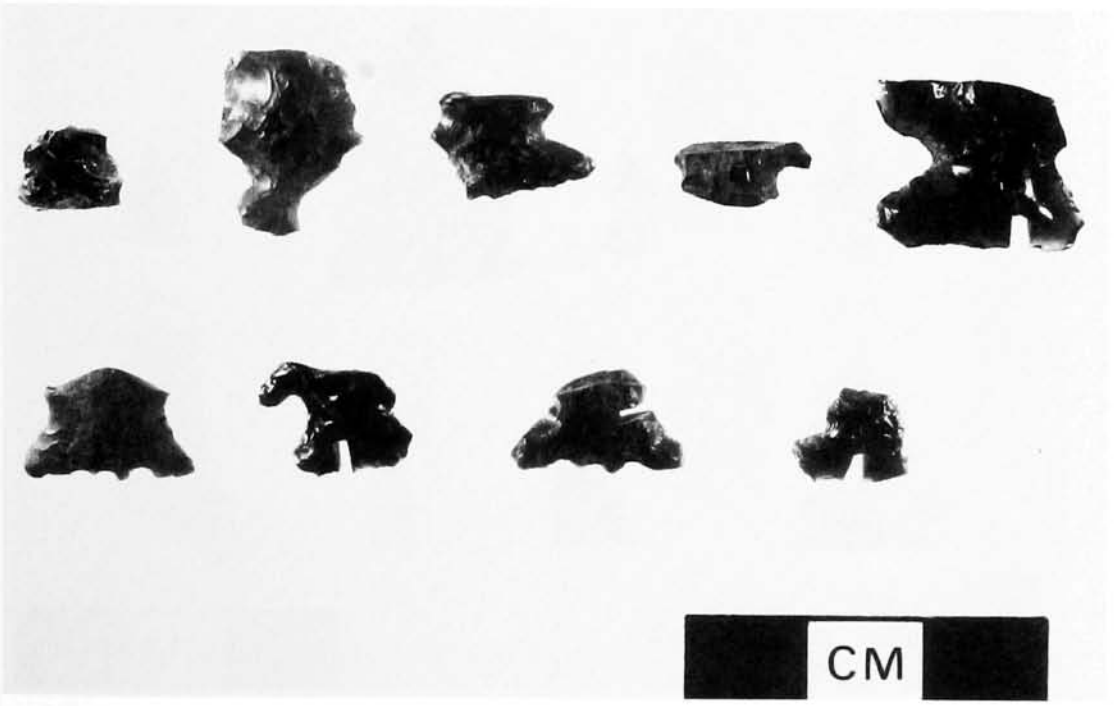

Fig. 6. Projectile point bases from the Diamond Lil site.

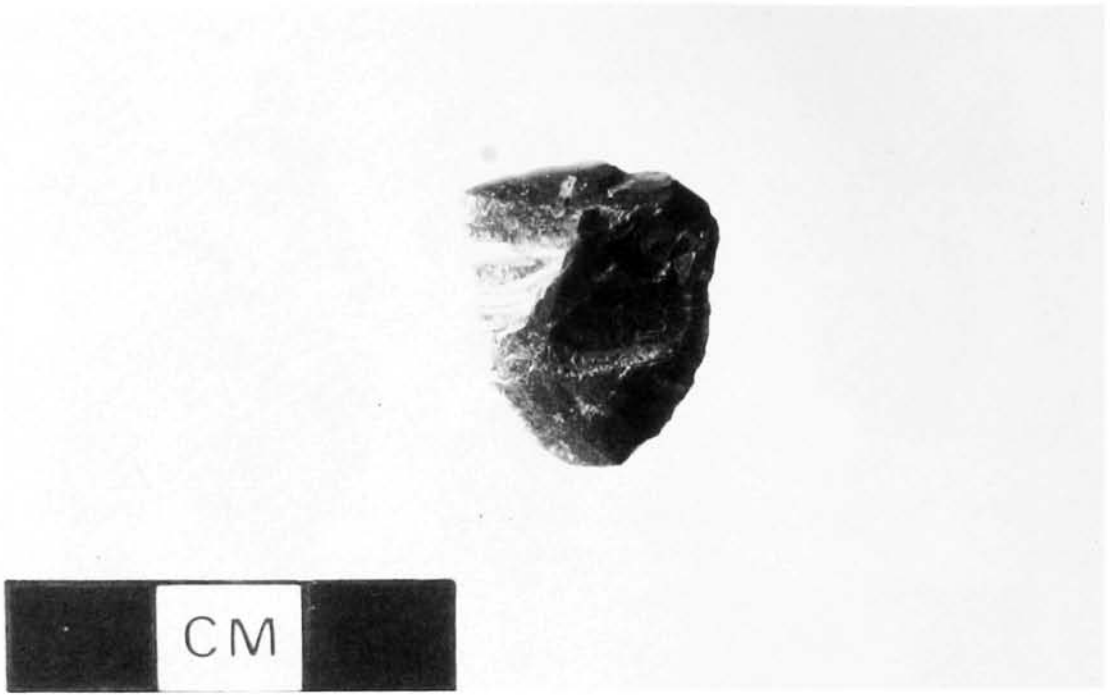

Fig. 7. Impact fracture on a lanceolate point fragment from the Diamond Lil site.

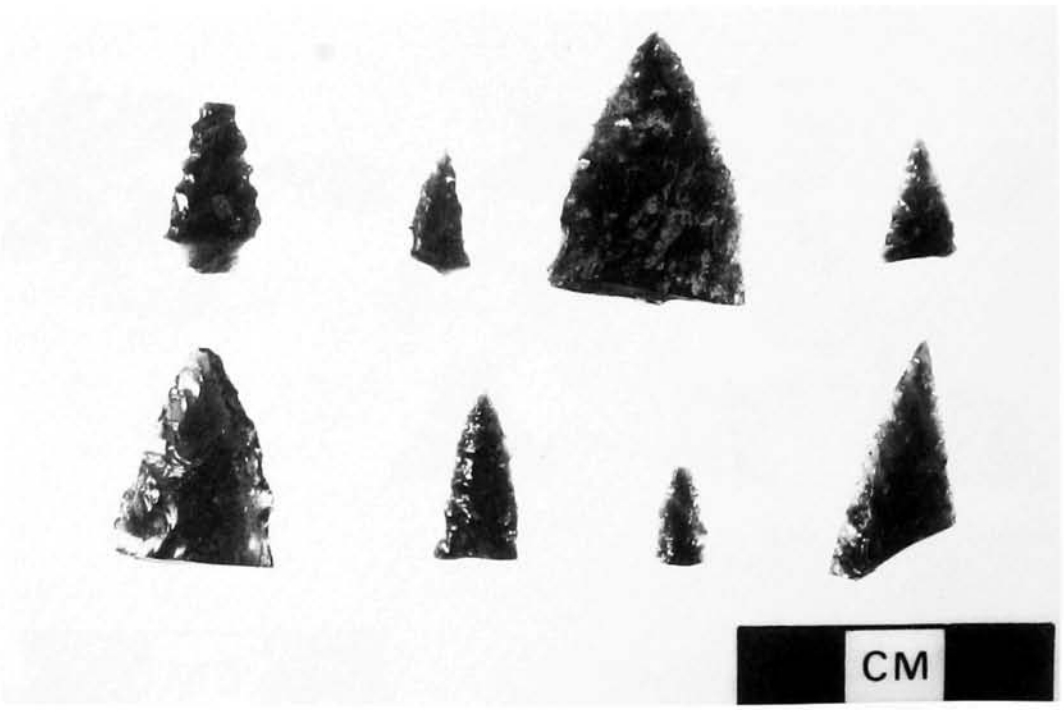

Fig. 8. Projectile point tips from the Diamond Lil site.

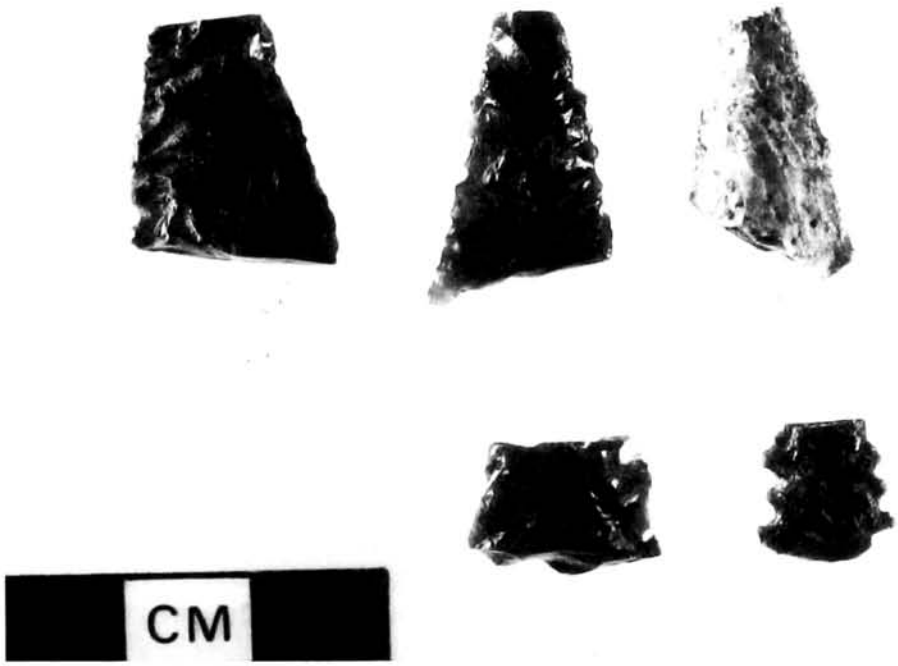

Fig. 9. Projectile point mid-sections from the Diamond Lil site.

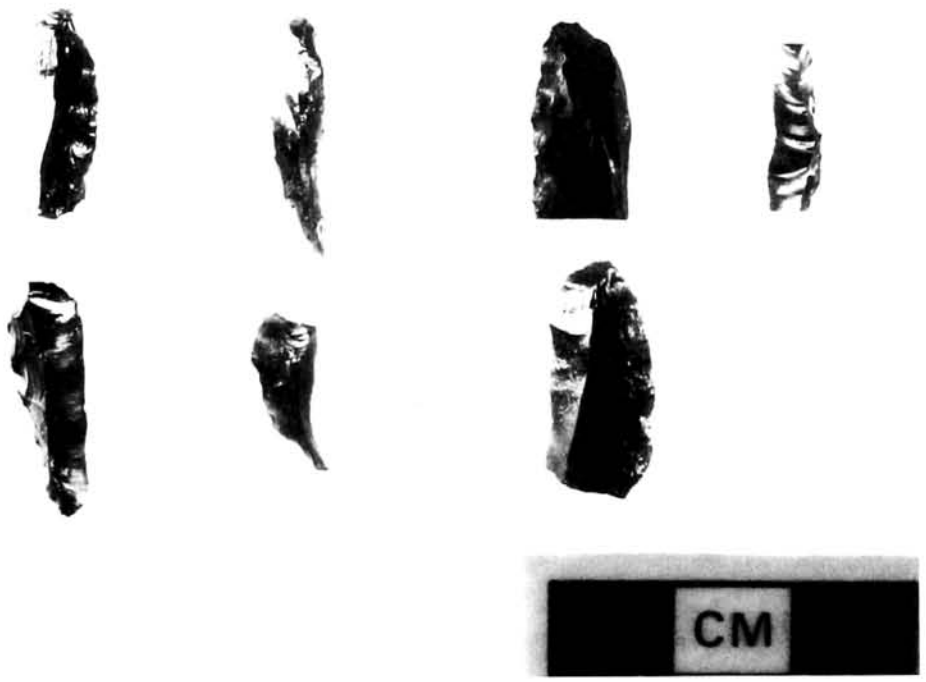

Fig. 10. Projectile point margin spalls from the Diamond Lil site.

Table 1
PROJECTILE POINTS AND FRAGMENTS FROM CASCADE RANGE SITES

	Diamond Lil No. (%)	Layser Cave No. (%)	Judd Peak No. (%)	Rigdon's Cave No. (%)	Warehouse No. (%)	Gate Creek No. (%)
Point Tips/ Midsections	45 (47%)	45 (49%)	121 (49%)	78 (22%)	2 (25%)	0 (0%)
Point Bases/ Exhausted Points	50 (53%)	47 (51%)	124 (51%)	281 (78%)	6 (75%)	5 (100%)
Totals	**95 (100%)**	**92 (100%)**	**245 (100%)**	**359 (100%)**	**8 (100%)**	**5 (100%)**

herty et al. 1987b). By contrast, other excavated sites in the Cascade Range have projectile point base/complete point to tip/midsection ratios of four to one or more. For example, sites with ratios of four to one include Rigdon's Horsepasture Cave (35LA39; Baxter et al. 1983) and the Warehouse site (35LA822; Flenniken et al. 1989). Both the Gate Creek (35LA295; Flenniken et al. 1990) and Packwood Lake sites (45LE285; Markos 1990) have ratios that exceed four to one. These sites have been identified as base camps or task specific sites but none are primary butchery or kill sites.

RECONSTRUCTION OF A KILL EVENT

The following model was developed as a result of the analyses of the ethnographic and archaeological data as well as the topographical information associated with the Diamond Lil site area. The deer, ultimately killed at the Diamond Lil site, were "gathered" from the Middle Fork of the Willamette River Valley near the present town of Oakridge, the Salmon Creek Valley, and from the High Prairie area, and with light pressure in the form of noise and commotion, were pushed and herded toward the Burnt Bridge Creek Valley (Fig. 1). At locations where the deer may have had the opportunity to stray from the intended route, fences, nets and people aiding the hunters, kept them "in route" on the desired path to the Diamond Lil site.

Once the deer reached the ridge, they were driven uphill toward the kill site. The ridge or potential "drive lane" was narrow and provided a constricted travel route up to, and through a narrow "chute" in the basalt cliff onto the flat kill area (the site proper). The narrow ridge may have been improved as a drive lane by the use of a drift fence made of vegetation piled in a linear fashion parallel to the ridge sides. After the deer were on the ridge and within the drive lane, pressure in the form of increased noise and commotion, panicked the deer to run uphill through the chute. The hunters with bows and arrows and atlatls and darts were hidden by blinds made of vegetation (Fig. 11), and ambushed the deer. Nets may have been used to contain the animals within the area during the final stages of the kill (Fig. 11). Injured and net-trapped deer were dispatched by other hunters with spears tipped with lanceolate projectile points used as bayonets. When the hunt ended, numerous deer, perhaps 20, 30, or more animals, had been dispatched at Diamond Lil.

After the animals were collected and the hunting equipment secured, the deer were butchered and processed at the site of the kill. Expedient tools were manufactured and used in butchering, and hunting equipment was repaired. Projectile points and fragments left at the site provided evidence for interpretation of kill events that occurred there.

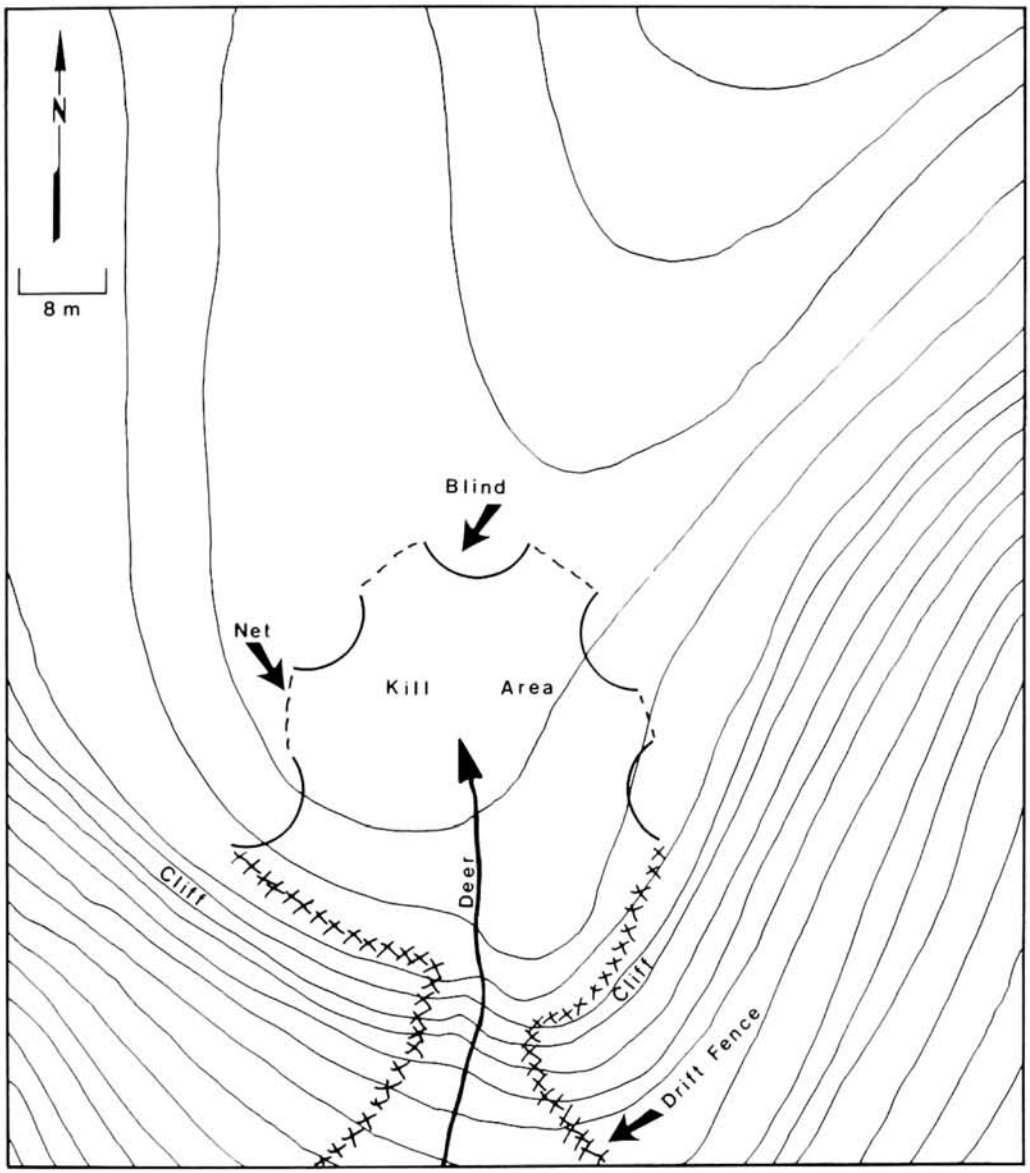

Fig. 11. Reconstructed depiction of the Diamond Lil site features.

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