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THE ARCHAEOLOGY OF PASS CREEK VALLEY.
WATERTON LAKES NATIONAL PARKS

by
Brian Reeves

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DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
THE ARCHAEOLOGY OF PASS CREEK VALLEY,

WATERTON LAKES NATIONAL PARK

by

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with contributions by
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The following monograph presents a detailed account of the archaeology of Pass Creek Valley, located in Waterton Lakes National Park. The valley's distinctive environmental configuration is discussed along with brief consideration of past environments, historical exploration and relevant ethnohistorical and ethnological data on the known historic occupants.

The distribution of the sites in Pass Creek Valley is discussed in relationship to environmental factors, along with their typological, locational, and descriptive data. Fifteen habitation and kill sites were sampled to varying extents; these excavations, the cultural and natural stratigraphy and living floor characteristics are described in some detail.

A detailed analysis of the ceramic and non-ceramic artifacts is presented. Besides a description of the formal tool types, the latter also includes a study of the flake and core technologies, lithic types and utilization patterns. The faunal remains are described and discussed in terms of prehistoric butchering techniques and patterns.

Chronological techniques used in dating the archaeological components are described; these are integrated into seven archaeological subphases and represent an occupational continuum from 6500 B.C. to A.D. 1870. Summaries of the cultural characteristics of the subphases are presented and comparisons made with adjacent Plains and Rocky Mountain sequences.

The monograph concludes with summary statements on: 1) the prehistoric land and resource utilization patterns in relationship to both transmontane travel and as seasonal components of a larger settlement/subsistence pattern; and, 2) the cultural history of the valley, both internally and in broader archaeological perspective. These suggest that while the various prehistoric
human populations changed through time in both their cultural configuration and
degree of affinity to adjacent culture areas, they should be conceptualized as
distinctive mountain-foothill adapted cultures which primarily subsisted on the
communal hunting of the bison populations which ranged within the mountain
valleys.
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To Rachel Smith, my most competent and efficient research assistant and secretary in the winter of 1970-71, goes my sincere appreciation and thanks for her untiring efforts to see this monograph through to completion. Technician Judy Barry prepared the majority of the illustrations for the manuscript and my colleague, Bill Byrne, applied his critical eye to this manuscript during various stages of its preparation.

I should like to dedicate this monograph to my grandmother, Ada Louise Kemmis, who came from England to Pincher Creek in 1887 at the age of five, and made her first visit to Waterton ten years later.
INTRODUCTION

Waterton Lakes National Park, established in 1894, is located in the southwest corner of Alberta (Fig. 1, 2). The Park, totalling 203 square miles, is situated on the east slope of the Rocky Mountains adjacent to the International Boundary and Glacier National Park, Montana. Unique in its geological, biological and climatological configuration, it is best known for its extensive chain of valley lakes, known as the Waterton Lakes, the largest of which, Upper Waterton, is 7 miles long, 1/2 mile wide and in places over 450 feet deep. Elevations in the Park range from 10,800 feet above sea level (a.s.l.) on the top of Mt. Cleveland, located at the head of Waterton in Glacier National Park, to 4,200 feet a.s.l. at the foot of Knights Lake, the northern most lake.

The unique climate combined with a biotic distinctiveness unique in Canada -- the meeting of two major floral provinces, the Cordilleran and the Prairie (Seel 1969b) -- in a matter of miles, results in the extension of prairie flora communities inside the mountain valleys (Pl. 1a, 2b). These extensive valley grasslands and their bison populations, combined with the climate, hydroseres, and the presence of two major transcontinental passes, provided unique opportunities for prehistoric man.

Two major tributary valleys, Cameron and Pass Creek (Blakiston), lie on the west side of the Waterton Valley (Fig. 2, 3). The latter, characterized by extensive grasslands in its lower reaches, is the concern of this monograph.

HISTORY OF THE RESEARCH

Various archaeological sites have been known in the Waterton area for many years. In Pass Creek Valley, DgPl-1 and DgPm-1 have been collected on for some years by visitors and local residents (Reeves 1964).
The first systematic research in Pass Creek was undertaken in 1966 when, at the request of the National Park Service, a survey was made of proposed highway right-of-ways (Reeves 1966a). The writer was assisted on this endeavor, conducted on the weekends, by various members of a University of Calgary field crew -- Charlie Eyman, Ron Getty, and Ole Christensen -- who were working at the Head-Smashed-In Bison Jump, west of Fort MacLeod, Alberta. This work resulted in a contract with the National Park Service for salvage excavations along the proposed right-of-ways in 1967 (Reeves 1967), continued in 1968 (Reeves 1968), and completed in 1969 (Reeves 1969a). In the latter two years test excavations were also carried out at various sites in the Waterton Valley, with a major effort at the Narrows -- DgPl-4 (Milne-Brumley 1971). Twenty-four sites were located in 1966, 17 in 1967, 2 in 1968 and 4 in 1969, to give a total of 47 sites for the Valley. In 1970 the Inventory of the Park was completed, resulting in the location of a total of 208 archaeological sites within the Park Boundaries (Fig. 2) (Reeves 1970b). The sites outside the immediate valley (DgPl-13, 26, 33, 48, 49, 50, and 147), located in the Waterton Valley along the channel of Pass Creek, are not discussed in the following monograph.

The archaeological crews varied in composition over the years. In 1967 Ron Getty directed the excavations for a period from mid-May to September 1, and C.E. Eyman (Charlie Brown) carried out a frustrating search for burials in the area. Getty was assisted by his brother Ian, Al Shannon, Brian Avrell, Dave Sweetman, and Ole Christensen. Two volunteers, Don Cummings and Dave Keenlyside, assisted in July and August.

In 1968 another four month season was spent in the Park. The work was directed by Leslie B. Davis and the crew consisted of Laurie Milne, Jackie Foulkes-Jones, Ole Christensen, John Anderson, John Brumley, Larry Lahren,
Wayne Choquette, and Neal Vallance. Volunteers that summer consisted of Linda Thomas, Dennis Gibson, John Pohle, and Jim Cameron.

In 1969, the last of our four month programs, the crew consisted of a small supervisory crew directed by John Brumley and a large volunteer force. Operations were assisted by Laurie Milne, Michael Wilson, Russell Glover and Patsy Cummings. The volunteers were made up of over 24 university and college students from Canada and the United States. Of these Jim Downs and Michael Quigg deserve special mention for their assistance.

Of course, Park Service personnel assisted us greatly every season: Superintendents Jim Luney and Tom Ross, Wardens Al Sturco and Jack Christiansen -- who will always be remembered for the "grooved maul affair" -- and particularly Park Naturalist Kurt Seel, whose moral support will always be remembered.

During these three years the writer himself attempted to spend as much time as possible in the field, particularly in field survey, stratigraphic and paleo-ecological interpretation. However, far too much of the time was taken up with writing a minor essay (Reeves 1970a), and as a consequence the project and the essay suffered.

Many people visited the excavations during the seasons. Sites DgP1-1 and DgP1-42 were used by the Interpretive Service for on site interpretation to Park visitors. Visiting archaeologists included Scotty MacNeish in 1967, prior to his departure to warmer climes; Dick Forbis who arrived annually in late afternoon with briefcase in hand; Dave and Jane Kelley in 1969 with family, dogs and an overloaded station wagon; and Jervis Swannack one weekend in July of 1968. Other visiting professionals included Rufus Churcher in 1970, Nat Rutter in 1969 and Archie Stalker on his annual trips into the area. John Dormaar and Larry Ludwick were frequent visitors. In addition,
amateur archaeologists occasionally visited the sites. In July, 1968, 100 members of the Calgary and Lethbridge Archaeological Societies were given an interpretation and tour. Eight participants of the International Short Course on Administration of National Parks and Equivalent Reserves were lectured and toured in 1968, as were staff personnel of the Glacier National Park Naturalist Service in 1967 and 1968.

Other potentates, relatives, friends, and hangers-on visited with us over the years -- usually on weekends, much to our annoyance. By 1970 the Grand Tour, as it became known, developed into a smooth 3 hour operation which could be timed to within 15 minutes, providing our guests with a complete tour of the major excavations and sites in the Park, and culminating in the ritualistic display of the goodies with appropriate noises being made by all.

Many interesting experiences occurred over the years, not the least of which were the assorted accommodations which our crews resided in. The Central Motel, a structure built in 1921, was used as headquarters in 1967 and 1968. It was subsequently removed. In 1969 the Park Service kindly provided us, at nominal cost, accommodation in a motel built around the 1920's, which was also removed. (We always seem to be one step ahead of the wrecking crew.) More notable events included a tenacious brown bear who insisted on breaking into our back porch in order to eat our pork chops, occasional skunks under the floors, frozen water pipes, leaky ceilings, the sexual liberation of the crew in 1968, the visit of a film crew from the CBC program "The Nature of Things" to film our bods in living colour, and -- most significant -- John and Laurie's wedding at the end of the 1969 season.

Wonderful Waterton, known for its balmy summer breezes and warm summers, lived up to expectations, with occasional snow storms and torrential rains in mid-June, 2 feet of snow in May 1967 and a very rainy late-July through August in 1968. However, the summers were generally warm and dry from late-
June to the end of August, producing many bronzed bodies over the years.

REPORT FORMAT

The area and its salient geological and geophysical characteristics are described in Chapter 2, along with brief remarks on the history of exploitation, routes of travel, native inhabitants, recent landscape change and past environments. Chapter 3 discusses site types and distributions. Site excavations stratigraphy and features are described in Chapter 4. Cultural phases are described for the Valley in Chapter 5, along with brief comparisons to archaeological sites in the adjacent Rocky Mountains and Northern Plains. Resource and land use patterns are described in Chapter 6, which also presents concluding remarks on the culture history of the Valley.

Appendix I presents the description of the non-ceramic artifacts, and II the lithic technology. Ceramics are described in Appendix III by R. Getty, and compared to other sites by W.J. Byrne. Faunal analysis and butchering inferences are discussed in Appendix IV by R. Getty. Appendix V details the absolute and relative dating techniques employed in aligning the cultural components.

All tables and illustrations for the monograph are located at the end of the text, after Appendix V.
THE AREA

PHYSIOGRAPHY

Pass Creek Valley, lying in the Lewis Range of the main branch of the Rocky Mountains and encompassing an area of 68 square miles, is a major tributary valley system of the Waterton Valley (Fig. 1-3, Pl. 1a). The narrow, U-shaped mountain valley system is divisible into three major geographic units: the main valley (Pl. 2b-4b, 8-11) of Pass Creek, 34 square miles in area, lying below Red Rock Canyon and bordered by mountains whose peaks rise 2500-3000 feet above the valley floor; and the two tributary valleys above, Bauerman Brook (Pl. 5a), 15 square miles in area and Pass Creek (Pl. 5b), 19 square miles in area. The latter are separated by an intervening mountain block comprised of Anderson Peak, Lost Mountain and Mt. Bauerman, which rise 2500 feet above the valley floor.

The valley is rimmed in all directions but the east by a continuous mountain mass, extending from Crandell Mountain and Bellevue Hill on the east, westerly to the Continental Divide. This mountain ring is broken only on the south side by the low ice divide containing Crandell Lake, elevation 5500 feet a.s.l. The mountain mass is characterized by high arrete ridges with individual projecting peaks ranging in elevation from 6900 to 8900 feet a.s.l. The eastern terminus of the valley (Fig. 3, Pl. 1a, b) is marked by the mountain front -- Bellevue Hill -- and the western edge by a continuous arrete ridge trending northwest which forms the Continental Divide and the border between Alberta and British Columbia. This ridge, approximately 7500 feet a.s.l. in elevation and punctuated by small peaks rising to 8300 feet a.s.l., contains the South Kootenai (6903 feet a.s.l.) (Fig. 3, Pl. 5a) and Sage Creek (6900
feet a.s.l.) passes. Northerly facing cirque basins are found along the southern, western and northwestern valley rims, and small ephemeral and perennial stream valleys form the northern valley sides.

To the south of the valley lies Cameron Creek Valley, which is easily reached via the low ice divide south of Crandell Lake. In contrast, the valley systems to the north -- Galwey, Dungarven and Yarrow -- are isolated by the intervening mountain mass. To the northwest lies the headwaters of the east fork of the Castle River; this latter area is readily accessible from Bauerman Valley via the Castle River Divide Pass, elevation 6500 feet a.s.l.

The mountains, classifiable as early mature (Horberg 1954: 1097), rise steeply from the valley floor. They are composed of Belt series (Precambrian) sedimentary and igneous rocks (argillites, quartzites, sandstones, limestones, dolomites), diorite-gabbro dikes and sills, and amygdaloidal basalt flows (Purcell Basalt). Sediments faulted along low angle thrusts characterize the eastern mountain blocks of Crandell Mountain and Bellevue Hill. To the west the Blakiston, Dungarven and Anderson massives are characterized by westerly dipping, generally unfaulted, sediments. High ridges and cliffs are composed of the more resistant limestone, dolomite, basalt and gabbro units, and the valleys and lower slopes of argillites and quartzites. The present physiographic expression is both a result of differential mechanical and chemical erosion of the sediments, and glacial sculpting.

The mountain front rises abruptly 2500 feet, above the grass-covered, glacially produced Waterton Valley Plain (Fig. 2, Pl. 1a, b), locally known as the Badlands. To the east lies the Central Waterton Depression, containing Lower Waterton, Knights Lake and the Maskinonge. The Waterton River flows northward from the latter, reaching the Alberta Plains after passing through subdued grass-covered foothills 10 miles in width.
The stream channels -- Pass Creek and its tributaries, Lone, Lost Horse, and Bauerman -- exhibit a repeated pattern of narrow alluvial flood plains, broken by steep bedrock canyons, 50-100 feet deep, varying in length from 1 to 1 1/2 miles. These are present in Bauerman above Goat Creek, on Pass Creek above and below Long Brook, at and above the junction of the tributary streams at Red Rock Canyon, west of Coppermine Creek, and east of the mountain front in the Badlands section of the Waterton Valley. The canyons, their positions controlled by faults or former ice frontal positions, act as nick points with infilling of the channel above and below by coarse aggradational alluvial fill.

The stream channel is relatively straight below Red Rock Canyon, flowing along the southern edge of the valley floor with its position here being controlled by the large alluvial fans at the mouths of the tributary streams along the north side of the valley. A flood plain is generally absent on the south side of the stream, except in the DgPl-32 site area.

After passing out of the mountain front, the stream flows along the southern edge of the Badlands, dropping through a canyon onto a large alluvial fan, the growth of which has primarily been responsible for the separation of Knights and Lower Waterton lakes.

Lower Pass Creek Valley (Pl. 1a-4b, 8-11)

The valley rises gently 500 feet from the entrance to Red Rock Canyon. The former, marked by a bedrock spur projecting out into the valley from Bellevue Hill, constrains the flood plain to 1/8th mile in width. The valley floor gradually expands to a width of 1/2 mile in the vicinity of Coppermine Creek, west of which lies a projecting flank of Mt. Galwey which again abruptly constrains the valley to less than 1/8th of a mile; above that it gradually opens up to 1/4 mile in width below Red Rock Canyon.

The coniferous forest extends from the flood plain to the timber line on
the north facing slopes of Mt. Crandell, Ruby Ridge and Mt. Blakiston. It is broken in the Crandell Mountain Campground-Crandell Lake area by more open deciduous associations with grasslands interspersed. A narrow belt of deciduous forest lies in the flood plain on the north side of the valley, broken in the Coppermine Creek vicinity by an extensive grassland tract. Westward of Coppermine Creek the gallery forest contains a larger coniferous element while at Red Rock Canyon a closed coniferous forest characterizes the valley floor. Extensive grasslands dominate the north valley floor and slopes of Bellevue Hill, Mt. Galwey and Mt. Glendowan. These may, depending upon exposure, extend to the ridge crests and barren rocky slopes. Below Coppermine Creek aspen groves occur at lower elevations while coniferous stands are found higher on the mountain flanks and in the tributary stream valleys and canyons. The latter become more extensive above Coppermine Creek.

Tributary cirque basins flank the valley on the south side. Two small relic cirques lie at an elevation of 5800 feet a.s.l. on the north face of Crandell Mountain. Between Ruby Ridge and Mt. Crandell lies a low ice divide basin containing Crandell Lake, elevation 5000 feet a.s.l. A large cirque hanging valley, 1.5 square miles in area, containing Ruby Lake, elevation 6300 feet a.s.l., lies between Ruby Ridge and Mt. Blakiston. This basin is characterized by large alpine meadows on the east slopes of Mt. Blakiston and the southeast headwall.

On the north side of the valley a number of narrow ephemeral stream canyons break the mountain slope along Bellevue Hill and eastern portion of Mt. Galwey. To the west of these steep defiles lie the Coppermine and Lost Horse Creek basins (Pl.7a). The latter is a relatively large (2 3/4 square miles) basin, located on the southeast flank of Mt. Dungarven. The basin consists of three tributary valleys which join one mile above Pass Creek Valley. The
creek flows through a narrow, 200 foot deep, canyon before entering the main valley. Coniferous forests characterizes the valley floor and sides. Grasslands lie above on the east and southern exposures. Red Rock Canyon, an area of 1 1/2 square miles, is similar to Lost Horse Creek in its configuration, but is narrower with fewer grassland areas. In addition, minor intermittent, ephemeral and perennial streams and springs flow into the valley from the mountain slopes. Many are fed by snow melt and spring storms, others by ground water discharge.

The valley floor is characterized by a limited variety of surficial deposits. An extensive tract of hummocky ice disintegration moraine extends one mile above the junction of Pass Creek and Bauerman Brook, below which are preserved outwash and kame terraces. An area of subdued hummocky ice disintegration moraine occurs in the Ruby Creek-Coppermine Creek area. Small tracts of morainic topography are preserved along the base of Bellevue Hill and Mt. Galway, and older lateral moraines and kame terraces on the southeast corner of Bellevue Hill. A well preserved area of heavily subdued hummocky ice disintegration moraine and outwash deposits, which grade laterally westward into a morainic bench, lies at the base of Crandell Mountain. Glacial grooving is present on the valley sides, as are high benches, perhaps representing earlier Pleistocene erosional surfaces.

Post glacial deposits consist primarily of sets of alluvial fans, and alluvial and strath terraces, containing coarse to fine alluvial fills. These features dominate the valley floor, and their formation has obliterated many of the glacial deposits in the valley. The multiple (4+) fan levels found at the mouths of the tributary ephemeral and perennial stream valleys are best developed at the mouth of Coppermine Creek.

Multiple terrace levels, while not particularly well preserved in the
valley, may be grouped into two sets: a set of three low terraces lying 10-15 feet above the flood plain, developed in the last 2000 years; and a set of four higher terraces ranging up to 150 feet in elevation. The highest three terraces are Early Holocene or Late Wisconsin in age, and may be correlated with ice frontal positions up-valley. Strath terrace remnants are located along Mt. Galwey in the DgPl-14 and DgPl-89 site areas. The 10 foot terrace is the most extensive, and may be flooded in very high level floods.

Upper Pass Creek Valley (Pl. 4b)

Above the forks the forested valley is characterized by a narrow alluvial flood plain, and extensive alluvial fans lying between bedrock canyon sections. Older fan and terrace levels are occasionally preserved.

After an initial rise in elevation the floor levels off for about three miles to Lone Creek junction, where an extensive tract of hummocky ice disintegration moraine is located. Above this point the floor is relatively flat for a mile or so, and then divides into the tributary stream valleys which rise to the cirque basins. The latter, located at elevations of 6100-6500 feet a.s.l., are characterized by terminal moraines in front of the tarn lakes at the cirque lips, and small moraines below the headwalls. Two levels are present in some cirques.

Three very inaccessible cirques lie along the northwestern slope of Mt. Blakiston and Mt. Hawkins, and five smaller cirques along the Continental Divide. Three of these contain small tarns. South Kootenai Pass lies in a low saddle (Pl. 5a) at an elevation of 6903 feet a.s.l. between two northerly Continental Divide cirques.

The closed coniferous forest, characteristic of much of the valley sides and floors, gives way to a slightly more open cover below timberline on the southeast slopes of Mt. Bauerman, Lost and Anderson peaks. Slightly more
extensive subalpine/alpine areas occur in the cirques along the Continental Divide. Small open meadows are found sporadically along the valley floor.

**Bauerman Valley (Pl. 5a)**

Bauerman Brook Valley is wider than Upper Pass Creek Valley, with more valley grasslands and grassy slopes in its lower reaches on the flanks of Mt. Glendowan. It's flood plain above Red Rock Canyon is also larger, and below Goat Canyon is characterized by extensive alluvial fans. A tract of hummocky ice disintegration moraine is preserved in the vicinity of Goat Creek. Above here the stream flows along a narrow alluvial flood plain to Snowshoe Cabin where it divides into its tributary streams, which rise into the tributary cirque basins of Twin and Lost lakes (Pl. 12). These both contain two cirque levels, ca. 5900 feet a.s.l. and 6100 feet a.s.l. in elevation. Fluvially modified hummocky ice disintegration moraine occurs in the lower level, and an unmodified moraine is found at the lip of the high level cirque. Two or more moraines are situated at the base of the headwalls.

Cirques are well developed on the northwest side of Mt. Bauerman, Lost and Anderson, along the Continental Divide and Avion Ridge. Sage Pass, elevation 6900 feet a.s.l., lies above the Twin Lake cirque, and the Castle River Divide Pass in the Lost Lake basin. These basins contain a relatively large alpine area and a more open subalpine forest. The lower valley slopes are heavily forested (Pl. 5a).

**TERRESTRIAL LIFE/VEGETATION ZONES**

The life zone configurations, controlled by two principle sets of variables, climate and topography, are primary factors in understanding the prehistoric resource utilization patterns in Pass Creek Valley, since they directly
control the seasonal behavior patterns of the ungulate biomass exploited by prehistoric man.

Merriam's (1899) scheme of Arctic-Alpine (alpine tundra), Hudsonian (subalpine forest), Canadian (mixed forest) and Transition categories has been used for classification of the terrestrial life zones in Waterton (cf. Seel 1969b, Soper 1967). Considerable general confusion has arisen between this scheme and others such as Weaver and Clements (1938) (cf. Love 1970). In Waterton the Hudsonian has been used to include both the subalpine ecotone and portions of Weaver and Clements' Subalpine Forest, and the Canadian to include portions of Weaver and Clement's Montane zone.

The writer (Reeves 1970b) has adopted, for archaeological purposes, the use of the European classification of five vegetational belts or zones as proposed by Love (1970).

1. Planar = Lower Austral (Merriam), or Plains and Lowlands (Weaver and Clements). This zone incorporates the grasslands/plains at the base of the mountains.

2. Colline = Upper Austral (Merriam), or Foothills (Weaver and Clements). The foothills, aspen/parkland is characterized in Waterton by extensive grasslands in the valley floors and uplands and deciduous forest belts, primarily aspen. Though presently restricted to valley sides and flood plains, aspen are rapidly invading many of the lower grassland areas, which must be considered as a subclimax formation in the valley floors and uplands. The grasslands have been maintained by factors such as fire and ungulates. Other grassland areas, such as those on the higher southerly exposed slopes of Pass Creek Valley, owe their maintainance to climatic and topographic factors.

3. Montane = Transition and Canadian (Merriam), or Montane and Subalpine (Weaver and Clements). The closed forest consists of both mixed coniferous/
deciduous forest at lower elevations and closed coniferous forest at higher elevations. Grasslands of varying sizes occur in the Montane zone on both the valley floors and exposed slopes.

4. Subalpine = Hudsonian (Merriam), or Forest-Tundra ecotone (Weaver and Clements). The forest/tundra ecotone extends from the closed montane forest line to the upper altitudinal treeline, and is characterized by krumholz and subalpine meadows, and a mixture of biota from both adjacent zones. The width of this zone depends upon climatic, topographic and latitudinal factors.

5. Alpine. This refers to the treeless arctic tundra.

Pass Creek Valley Life Zones

1. Alpine: The alpine belt is limited in its extent; many of the wind-swept ridges and peaks are all but devoid of biota. Restricted areas of alpine vegetation are to be found in the high cirques, on talus slopes, and along the mountain sides above timberline. Quite often there is a relatively abrupt transition from the subalpine ecotone to the barren rocky slopes. Long narrow extensions of the alpine zone follow avalanche slopes, and may reach 2500 feet down into the lower forests.

2. Subalpine - High Montane: The treeline elevation averages 7000 feet a.s.l., generally ranging from 6200 to 7500 feet a.s.l. It tends to be irregular and is controlled by factors such as climate, exposure, and the presence of avalanche slopes, active talus slopes, and cliffs; in some cases such features combine to depress it to the valley floor (Jamieson 1967). A real altitudinal tree limit does not seem to exist, the Alpine areas being maintained as a result of climatic, geologic and topographic factors (Jamieson 1967).

The Subalpine belt is particularly well developed in cirques such as Ruby, Lone, Twin, Lost and Goat lakes.

The subalpine vegetation zone (Jamieson 1967) includes both the subalpine
ecotone and portions of the high montane life zones. Extending down to 6000 feet a.s.l., it is characterized by Alpine Larch (Larix lyallii PARL) at 6700 to 7500 feet a.s.l.; White-Bark Pine (Pinus albicaulis ENGELMANN) between 5800 and 7300 feet a.s.l.; Alpine Fir (Abies lasiocarpa (HOOT.) NUTT.) at 5500 to 6500 feet a.s.l.; Engelmann Spruce (Picea glauca MOENCH) VOSS ssp. engelmannii PARRY TAYLOR] at around 7500 feet a.s.l., which is hybridized with and replaced by White Spruce (Picea glauca MOENCH) VOSS ssp. albertiana S. BROAN SARG.) in the lower forests, and Limber Pine (Pinus flexilis JAMES) ranging from 4000 to 7000 feet a.s.l.

In the lower Pass Creek Valley the climate, moisture and wind limit the forest to northerly exposed slopes and to the small tributary valleys and more protected slopes on southerly exposures. Grasslands which may extend to the barren rocky slopes are extensively developed on the southern exposures below and slightly above Red Rock Canyon.

3. Lower Montane: The lower elevations of the tributary and main valleys, ca. 5000 to 6000 feet a.s.l., are characterized by closed coniferous forests consisting of White Spruce, Engelmann Spruce, Douglas Fir (Pseudosuga menziesi), Lodgepole Pine (Pinus contorta latifolia) and a mixed deciduous/coniferous forest at lower elevations. These stands characterize the south side of the valley below Red Rock Canyon. Scattered conifer stands are also found on the slopes of Mt. Glendowan, Galwey and Bellevue Hill, particularly in protected valleys such as Lost Horse Creek.

4. Colline: The lower north slopes and valley floor from the entrance to Red Rock Canyon is characterized in many locales by extensive grasslands and interspersed aspen groves. Poplars (Populus sp) are common, as are birch (Betula sp), willow (Salix sp), and various shrubs such as Saskatoon [Amelanchier alnifolia (NUTT) NUTT], and Choke Cherry [Prunus virginiana L. var.
melanocarpa (A. NELS., SARG.). [The reader is referred to Stringer (1968) for a detailed study of the unique composition of the Waterton grasslands].

In summary, grasslands, diminishing in size westward to Red Rock Canyon, occur on the dry southern exposures of the north valley floor and side. Below Red Rock Canyon on the northern exposures lies a closed montane coniferous forest, grading altitudinally into the subalpine and barren alpine slopes. While the forest distributions have been influenced by factors such as fire and long term climatic trends, the distribution of grassland and deciduous forest in the valley below Red Rock Canyon has been controlled by both fire and grazing pressures. Soil studies from archaeological sites DgPl-1, 42, 85, and 86 indicate that these site areas, now covered with a dense deciduous forest, were formerly grasslands. Photographs from the early part of the 20th century indicate that a more extensive grassland existed below Coppermine Creek, and remarks such as Dawson's (1886: 44B) would suggest the area was considerably more open at that time.

In another sense the life zones of Waterton can be considered transitional; as Seel (1966b:2) points out, "the grassland and prairie vegetation zones, distinct in every way, meet the vegetation zones of the Rocky Mountains... This fact combined with the southerly latitude of the area, has produced over one hundred plant species which are found only in this part of the Canadian Rocky Mountains of Alberta".

Johnston (1969) lists the various plant species utilized by aboriginal man in the Northwestern Plains. Of the many species listed, some 50 species were utilized as food sources, and 40 of these are found in Waterton. While no distributional studies have been made, it is noteworthy that the major Saskatoon berrying grounds are located within and adjacent to the lower reaches of Pass Creek Valley.
HYDROSERES

Water habitats, while plentiful in Waterton, are restricted in Pass Creek Valley to the streams, high cirque lakes and beaver ponds. Native fish — cutthroat, Rocky Mountain White Fish, and Dolly Varden — may have been present seasonally in small numbers in Pass Creek and its perennial tributaries.

Beaver ponds occur east of the valley in the Badlands area, opposite site DgPl-51, and on the north side of the creek west of site DgPl-62. Former ponds are also to be found in Bauerman Brook Valley, below Goat Lake and below Lone Lake.

FAUNA

The native fauna of Waterton is abundant and varied. In addition to numerous fish and reptiles, 220 species of birds have been sighted in the Park (Seel 1969b) and 60 species — representing 6 orders, 16 families, and 39 genera — of mammals are present (Seel 1969a).

Sorex cinereus cinereus, KERR. Common Cinereous Shrew
S. vagrans obscurus, (MERRIAM) Dusky Mountain Shrew
S. palustris navigator, (BAIRD) Mountain Water Shrew
Microsorex hoyi hoyi, (BAIRD) American Pigmy Shrew
M. lucifugus alascensis, MILLAR Pacific Little Brown Bat
M. evotis pacificus, DALQUEST Northwestern Big-Eared Bat
Eptesicus fuscius pallidus, YOUNG Pale Big Brown Bat
Lasionycteris noctivagans, (LE CONTE) Silver Haired Bat
Ochotona princeps princeps, (RICHARDSON) Rocky Mountain Pika
Lepus townsendii campani, HOLLISTER White-Tailed Prairie Hare
L. americanus bairdi, HAYDEN Rocky Mountain Varying Hare
Marmota flaventris nosophora, HOWELL Golden-Mantled Marmot
M. caligata nivaria, HOWELL Montana Hoary Marmot
Spermophilus richardsonii richardsonii, (SABINE) Richardson’s Ground Squirrel
S. columbianus columbianus, (ORD.) Columbia Ground Squirrel
S. tridecembineatus pallidus, ALLEN
S. lateralis tescorum, (HOLLISTER)

Eutamias minimus oreocetes, MERRIAM
E. amoenus luteiventris, (ALLEN)
E. ruficaudus ruficaudus, HOWELL
Tamiasciurus hudsonicus richardsonii, BACH.
Glaucomys sabrinus fuliginosus, (RHOADS)
Thomomys talpoides talpoides, (RICHARDSON)
Castor canadensis missouriensis, BAILEY
Peromyscus maniculatus artemisiae, (RHOADS)
Neotoma cinerea cinerea, (ORD.)
Synaptomys borealis chapmani, ALLEN
Clethrionomys grapperi galei, (MERRIAM)
Phenacomys intermedius levis, HOWELL
Microtus richardsoni richardsoni, (DE KAY)
M. pennsylvanicus drummondi, (AUD. & BACH.)
M. longicaudus vellerosus, ALLEN

Ondatra zibethicus osoyoosensis, (LORD)
Zapus princeps idahoensis, DAVIS
Erethizon dorsatum nigrescens, ALLEN
Canis latrans lestes, MERRIAM
C. lupus irremotus, GOLDMAN
Vulpes fulva, (DESMAREST)
Ursus americanus cinnamomum, (AUD. & BACH.)
U. arctos horribilis, ORD.
Martes americana abietinoides, GRAY
M. pennanti columbiana, GOLDMAN
Mustela erminea invicta, HALL
M. rixosa rixosa, (BANGS)
M. frenata longicauda, BOMAPARTE
M. vison lacustris, (PREBLE)
Gulo luscus luscus, (LINNAEUS)
Taxidea taxus taxus, (SCHREBER)
Mephitis mephitis hudsonica, RICHARDSON
Lutra canadensis, (SCHREBER)

Pale-Striped Ground Squirrel
Hollister's Mantled Ground Squirrel
Timberline Chipmunk
Buff-Bellied Chipmunk
Rufous-Tailed Chipmunk
Richardson's Red Squirrel
Dusky Flying Squirrel
Richardson's Pocket Gopher
Missouri River Beaver
Sage Brush White-Footed Mouse
Grey Bushy-Tailed Wood Rat
Chapman's Lemming Vole
Gale's Red-Backed Vole
Alberta Phenacomys Vole
Richardson's Meadow Vole
Drummond's Meadow Vole
Northern Long-Tailed Mountain Vole
Rocky Mountain Muskrat
Idaho Jumping Mouse
Dusky Porcupine
Mountain Coyote
Northern Rocky Mountain Wolf
Red Fox
Rocky Mountain Black Bear
Grizzly Bear
Selkirk Marten
British Columbia Fisher
Little Rocky Mountain Weasel
Least Weasel
Prairie Long-Tailed Weasel
Hudson's Bay Mink
American Wolverine
Silver Badger
Northern Plains Skunk
River Otter
Felis concolor missoulensis, GOLDMAN
Lynx canadensis canadensis, KERR
L. rufus pallescens, MERRIAM
Cervus canadensis nelsoni, BAILEY
Odocoileus hemionus hemionus, (RAFINESQUE)
O. virginianus ochrourus, BAILEY
Alces alces shirasi, NELSON
Bison bison bison, (LINNAEUS)
Oreamnos americanus missoulae, ALLEN
Ovis canadensis canadensis, SHAW
Northern Rocky Mountain Cougar
Canada Lynx
Pallid Barred Bobcat
Rocky Mountain Wapiti
Rocky Mountain Mule Deer
Northwestern White-Tailed Deer
Yellowstone Moose
Plains Bison
Montana Mountain Goat
Rocky Mountain Bighorn Sheep

Of principle interest are the Artiodactyles, since they were the principle food resource exploited by aboriginal man. The following discussion is drawn largely from Soper (1967).

**Cervus canadensis**

Elk are presently the most abundant of the ungulates, with populations ranging from several hundred in the summer ranges in the high valleys, meadows and alpine tundra to close to 1000 in the winter range located in the low mountain valleys and grasslands. This animal appears to have been absent in the early part of the century, and may have only recently reoccupied (?) the area.

**Odocoileus hemionus**

Mule deer are the second most abundant ungulate. Soper suggests that "20 years ago" the winter deer population, then estimated at ca. 1,700 head, was larger than that of the elk. Deer occur in practically all habitats, ranging from grasslands to deciduous forests in the winter and the coniferous forest to the subalpine and alpine in the summer. They remain in the latter regions in small social groups until late autumn. Does with fawns, rather than moving to the higher feeding grounds, may remain in the river valleys
and aspen breaks during the summer.

**Odocoileus virginianus**

White tails are relatively scarce. Estimated at only a few dozen, their range is the same as the mule deer. Apparently they were more common in early historic times.

**Alces alces**

The Yellowstone Moose population is quite small, probably around a few dozen, and seems to be stabilized at this level. In winter they range through the deciduous and coniferous forest in close association with lakes, streams, and bogs in the lower valleys, and move to the alpine zone in the summer. Some remain in the valleys year round. The species seems to have only recently reappeared in the Park, ca. A.D. 1940.

**Oreamnos americanus**

Goats, while not abundant, are widely distributed in the wilderness areas, commonly ranging at 7000–8000 feet a.s.l. in the subalpine/alpine zones. Eighty head were estimated to be in the Park in 1947. The population has remained relatively stable through time. Some groups range in Pass Creek Valley along the Continental Divide, Goat Lake, Blakiston and Bauerman mountains.

**Ovis canadensis**

Third in abundance in the Park, ca. 200 animals, the bighorn sheep range from lower elevations on the valley sides and adjacent montane forest to the subalpine and alpine in the summer. Except for disease epidemics the population seems to have been relatively stable through time. One herd winters on the south slopes of Mt. Galwey and Bellevue Hill. Summer ranges in Pass Creek are found on Mt. Galwey, Bauerman and in the Continental Divide area.
Archaeological data indicates that the plains bison were the primary ungulate exploited by prehistoric man in Waterton. They probably disappeared from the landscape between 1850 and 1870, as no mention is made of them by Dawson in 1874, who suggests, however, that they moved onto the plains in the summer.

Bison remains have been found in all life zones from the valley floors to the cirques such as Goat Lake and Lost Lake (DgPm-2 and 19), indicating they had a seasonal migration pattern similar to that of the other ungulates -- occupying the lower valleys and grasslands in the winter and moving to the higher Montane and Subalpine grasslands in the summer. In addition to local herds which may have concentrated in the valley floors in the winter, historical documents suggest (Dawson 1874) that the herds from the plains moved into the adjacent foothills during the winter. Probably, during particularly severe winter conditions, local herds moved outside the present Park boundaries to forage in the foothills.

Contemporary studies of both free (McHugh 1958, Fuller 1960) and enclosed herds (Englehard 1970) allow for some inferences as to the general group composition of the local bison herds. The closest parallels may be drawn with McHugh's study of the Yellowstone Herd, which, while living in a more closed environment, free-ranges between meadows at elevations of 8000-9000 feet a.s.l. on the Yellowstone Plateau in the summer and lower open valleys at elevations of 6500 feet a.s.l. in the winter. The animals move into the summer range in late May - June and return to the winter range with the fall snows.

The herds consist of two distinct groups: a bull group, averaging four individuals, composed of barren cows and bulls; and a cow group, averaging 23 individuals, composed of cows, yearling calves, two year old bulls, occasional
three year old bulls, and (rarely) bulls over four years. One subgroup was distinguished by McHugh, a cow-calf group which tended to associate together as a unit within the larger group structure until the end of July.

The groups are usually separated, except at the time of rut, mid-June to mid-September, and even then may not integrate. Calving occurs from April 15 to May 30. There is little evidence in either the free or enclosed herds that calving or cow-calf bonding occurred away from the herd [it should be noted, however, that calving and bonding away from the herd is quite common among the European bison who live primarily in the forest environment (Englehard 1970)]. The various cow groups tend to fuse and split frequently.

This pattern may approximate that extant in Waterton in prehistoric times, although the wintering groups may have been considerably larger. With the coming of the fall snows in late-October to late-November the bull and cow groups would begin moving to the lower valleys, such as lower Pass Creek Valley and the Waterton Valley. Here they would overwinter, foraging in the valley grasslands and stream flood plains. Calving probably occurred soon after the winter snows began to melt, in late-March to May. As the snow melted in the higher montane zones the bulls would begin to move upwards before the cow group and new-born. The latter would stay in the sheltered valleys and aspen groves with the calves until the calves could fully move about. The green feed, water and shelter from the incessant winds would be important factors in controlling cow-calf movements during the early period, as it is with other ungulates today (Seel, pers. comm.). Late in the spring the cow group would gradually move into the montane and subalpine zones, where some fusion with the bull groups would occur during the summer rut.
Climate

The climate of Waterton and southwestern Alberta is influenced by two opposing climatic systems — the Arctic Continental and Pacific Maritime. In winter the Arctic Continental system brings cold, dry air into the area, causing extended cold periods, while in the summer its cold, moist Arctic air results in showers and spring rains. The Pacific Maritime system frequently breaks through the Arctic air mass in winter, causing chinooks.

The particular combination of topographic and physiographic features in Waterton produces a distinctive local climate, the most obvious feature of which is the prevailing southwesterly winds, which maintain an average velocity of 20 miles per hour the year round, and which may reach gale proportions of 120 miles per hour during any season of the year. The wind affects every physical feature of the Park, whether it be mountain, plant, animal, or man. Wind chill factors and severe blizzards in late-spring and early-fall may have a devastating effect on certain animal populations (Seel 1969b:IX). Pacific maritime air accompanies the winds and results in the highest chinook frequency in the province. These will often times not extend north of the Park boundary.

Waterton has "the warmest winters, the highest average annual minimum temperature, the most rain in winter, and the most snow of any known and documented region in Alberta" (Reinelt 1967-68: 20). One recording station — Waterton Park Headquarters — has the highest annual snow fall of any Canadian station east of the Rockies (228.5 inches), and its annual rainfall, 19.46 inches, is the highest in the Prairie provinces. The combined total, 42.31 inches, rivals those in eastern Canada. Precipitation ranges from 30" to 40", 60% of which falls in the winter. Summer precipitation peaks occur in late-May to June, with a smaller peak in September. These peaks coincide with the
mean position of the storm tracks moving north and south. Heavy rains occur when a well developed cold low is present over southern Alberta, often in excess of 1" in a 24 hour period and occasionally over 3". The largest single recorded fall was 9.52" in less than two days in June 1964 (Reinelt 1967-68). Rains may also occur in January. Heavy snows, often in excess of 24" in 24 hours, are usually caused by a severe outbreak of Arctic air moving in under the warmer Pacific Maritime air.

The above conditions result in a relatively rigorous climate. Temperatures range extreme, both seasonally and daily, particularly during the winter chinooks. In July maximum means range from 51.2 to 75.1, in January maximums from 9.9 to 27.0. Individual days in summer may range up to 90°, and in winter will plunge to a maximum of -40° below.

Hydrology

Gauging stations have not been maintained on Pass Creek; consequently no data is available for the seasonal variation in flows in this particular basin. However, records have been maintained at various stations in the Waterton Valley, and discharge data and flood frequencies are summarized in Water Resources Paper No. 113F. Peak runoff in non-flood years occurs in late-May to June and is a combination of both snow melt and heavy rains. Flash flood conditions in the valley are the result of extremely heavy rains in a short period of time combined with high temperatures and a sizable spring snow pack, e.g., June 1964. These floods have a devasting effect on the flood plain, resulting in radical shifts of the channel and extensive destruction of ground cover and terrace fills.

QUATERNARY ENVIRONMENTS (Fig. 4)

Upper Pleistocene time contains two major mountain glaciations - Bull
Lake and Pinedale (Richmond 1965, 1970). Bull Lake, extending from ± 70,000 to ± 130,000 B.P., consists of two major advances in Pass Creek which flowed outside the mountain front and coalesced with the Waterton Valley glacier. This composite ice flow moved to the northeast into the foothills, forming large peidmont lobes.

Bull Lake is separated from Pinedale by an interval of time, dating from approximately 70,000 to ca. 25,000 - 22,000 years ago. Pinedale, extending from the terminal Pleistocene to the early Holocene, ca. 6,000 B.C., contains four advances. In Pass Creek Valley, the Pass Creek Valley Advance I (Pinedale I) terminated at the mouth of the valley. It is separated by an interval of unknown duration from Pass Creek Valley Advance II (Pinedale II), at which time the valley glacier either readvanced or reactivated itself at a termini near Coppermine Creek. This event occurred at ca. 14,000 years ago. The Red Rock Canyon Advance (Pinedale III) sees an advance of the valley glaciers to a termini at Red Rock Canyon at between 9,500 and 8,500 B.C. (Fig. 27).

The last valley advance, Lone Brook (Pinedale IV), occurred in the early Holocene during the beginning of the Atlantic climatic episode. It dates ca. 6,500 - 6,000 B.C. At that time the glaciers advanced to the junction of Lone Brook and Goat Creek in the tributary valleys (Fig. 28). Level I occupation at site DgPm-1 dates within this interval, $62^{40} \pm 260$ B.C. years. A major non-glacial interval occurs between the last two valley glaciations, indicating that the glaciers had disappeared from the valleys and possibly the cirques.

Neoglacial episodes (Fig. 29-32), consisting of cirque glaciations of varying intensity, began at the close of the Atlantic climatic episode, ca. 3,000 B.C. The first advance, the Twin Creek Advance, is the most extensive of the Neoglacial episodes, advancing, for example, in the Twin Lake cirque to the end of the hanging valley. The following advance, Twin Lake, the last major
cirque glaciation, dates 500 B.C. - A.D. 250. Following this advance, which built end moraines at the ends of the cirque basins, there are at least two minor advances, termed Lost Lake I and II, dating ca. A.D. 900 - 1,100 and ca. A.D. 1500, respectively, which developed small moraines at the base of the headwall in the cirque lakes.

Other than the above events, the character of the Late Pleistocene and Holocene environments in the Waterton area can only be alluded to. Certainly during the periods of the last valley glaciations the general climate must have been considerably colder than today, with lower mean annual temperatures, possibly cloudier and cooler summers, increased winter precipitation, and the invasion of the polar air mass in winter over the area. What effect these climatic changes had on the biological components of the ecosystem is unknown.

The Atlantic period (commonly known as the Altithermal), a major period of world wide climatic change, represents a time of increased mean temperatures, and changes in precipitation patterns and total mean precipitation. Hansen's (1948) pollen profiles from west side of Glacier National Park show an increase in *Pinus ponderosa*, *Pinus monticola*, *Abies* and *Picea englemanii* in this interval. Other pollen profiles (Hansen 1949) show a NAP pollen maximum at the same time. This evidence suggests a change in the composition and latitudinal/altitudinal distribution of the vegetation zones. In Pass Creek it probably had little effect on the upper altitudinal tree line, which seems to be controlled primarily by other factors. It would, however, have changed the composition of the various forest communities and expanded the grassland areas in the valley.

Following the Atlantic period, the climatic conditions and vegetation distributions returned to patterns similar to today. The SubAtlantic sees a return to cloudier and wetter summers, stormier winters and cooler mean annual temperatures. Climatic fluctuations since then seem to have been rather minor.
deviations from present day patterns (Reeves 1969b).

RECENT LANDSCAPE CHANGE

In the 1860's extensive forest fires swept the lower and tributary valleys to above the Lone Brook junction in Pass Creek Valley and near Goat Creek in Bauerman Valley. Fires occurred in the early 1900's around Crandell Lake below Red Rock Canyon and in Upper Pass Creek Valley, below Lone Creek. A wagon road was built in the lower valley for access via Crandell Lake to the Oil City development in Cameron Valley in 1901. The area around DGPl-51 was used both for camping and equipment storage during this period. Subsequently, the road was extended to Red Rock Canyon, and later a fire road was built in Bauerman Brook Valley. As Red Rock Canyon became an increasingly popular visitor area the original road was improved and eventually a new route selected and a paved highway constructed. New trails were constructed in the early 20's to the various alpine lakes.

The first warden's cabin, Pass Creek Cabin, was constructed in 1920 at the entrance to the valley. Shortly thereafter a summer warden's cabin was built at Red Rock Canyon, and a line cabin, known as Snowshoe Cabin, at the end of the Fire Road in Bauerman Brook Valley. A new warden station was built at Red Rock Canyon in the 1950's.

Visitor facility developments include camping and picnic facilities and a horse concession development at Red Rock Canyon, and the Canyon Church Camp and the Crandell Mountain Campground opposite and below Coppermine Creek. Picnic shelters and parking lots are located at Coppermine Creek, Lost Horse Creek, and Snowshoe Cabin. Shelters were also constructed at most of the alpine lakes.

Red argillite barrow pits are located at various sites in the valley. They may have destroyed at least one buffalo jump. Land fills are present and
have destroyed at least one site, DgPl-33. Road rock spoil piles are located in a number of locales. These will eventually assume the aspect of aboriginally constructed cairns.

TRAILS, PASSES AND EARLY EXPLORATION

Three passes (Fig. 1, 3) lie at the head of Pass Creek Valley: the Transcontinental-South Kootenai and Sage Creek Passes, and the Intermontane Castle River Divide Pass. Sage Creek Pass lies at the headwaters of Bauerman Brook, above the Twin Lakes cirque. It provides access to the North Fork of the Flathead via Sage Creek (At-tlak-a Creek, Baker 1900). This route is more circuitous than the South Kootenai and was little used in historic times. The Castle River Divide Pass, located above Lost Lake in Bauerman Brook Valley, provides access to the east fork of the Castle River, which flows along an intermontane valley to the north into the Old Man River in the foothills west of Pincher Creek, Alberta.

South Kootenai Pass (Pl. 5a), lying at the head of Lone Brook, was the major pass utilized by Indians and early explorers (old trails and blazed trees still exist today). Known to the Kootenai Indians as the Buffalo Trail (Schaeffer 1966), it was one of the principle transmontane routes used in historic times by this and other intermontane groups (Flathead, Nez Perce, Coeur d'Alene, Kalispell, Spokane) to travel eastward to hunt buffalo in the plains and adjacent foothills. Apparently the Kootenai preferred this route to others to the north, such as North Kootenai (Fig. 1), known as the Rocky Trail (Schaeffer 1966), when on foot or traveling with heavily loaded horses.

Lieutenant Blakiston of the Palliser Expedition was the first White Man to officially explore the pass, crossing eastward from the Tobacco Plains in September 1858, camping at Red Rock Canyon on September 6 (Blakiston 1860). At that time he named the pass Boundary Pass, a name which never gained any
usage (Dawson 1886).

While the route had not been previously explored its existence was common knowledge for over half a century. It could well have been crossed by la Blanc and la Gasse (Schaeffer 1966) who spent five years with the Kootenais (A.D. 1800-1805). Blackfoot hostility in the intervening years was probably the main reason why it was not explored earlier.

The next official groups to travel the route from the Tobacco Plains were field parties attached to the Northwest Boundary Commission Survey in 1860 (Baker 1900, Bauerman 1885). They first recorded the Kootenai place-names for the area. In 1874 the pass was crossed to the west side of the Continental Divide by members of the International Boundary Commission (Dawson 1875). Dawson subsequently revisited the area in 1881, 1883 and 1884 (Dawson 1886). In 1883 he traveled the entire route to the Tobacco Plains. Dawson's observations are the only detailed accounts (Dawson 1874, 1881) available. In the intervening years the route was undoubtedly used by prospectors, settlers, and traders.

South Kootenai actually consisted of two passes, the eastern summit at the head of Pass Creek in Waterton, and a western summit on the MacDonald Range in Montana (Fig. 1). The latter provides access from the North Fork of the Flathead River in British Columbia and Montana to the Tobacco Plains and the Kootenai River in the Rocky Mountain Trench. A north-south trail in the Flathead Valley provides access from South Kootenai to the Flathead Lake country in Montana or northward to the Crows Nest Pass in Alberta and British Columbia.

In Waterton old travois trails running across the badlands converge on the valley entrance, following the north side of the creek (known as Kootenai Brook or Kin-nook-helht-nah-na; Dawson 1886: 44B) to the Red Rock Canyon area,
known originally as the Forks (Dawson 1874). The trail was easily traversable: "trail rough but not very bad,...passes sometimes along the bank of the stream and often climbs far up the slope of the mountains" (Dawson 1874: Aug. 14). At Red Rock Canyon, "the trail branches, but that going up the southwest valley evidently the most traveled" (Dawson 1874: Aug. 14). Here the trail fords Bauerman Brook following along the west side of Pass Creek above:

"sometimes near the stream and sometimes climbing up the mountain to avoid ravines, windfall, rocks, etc. Track much encumbered by windfall through some of which heavy fires had passed last spring. The Indians appear never to think of cutting a log or falling a tree if they could help it. Trail from year to year assumes new courses to avoid these obstructions and becomes very devious in consequence...As it was the horses did nothing but step over or scramble through logs and fallen trees for miles. Crossed the stream twice and left the main stream turning out of the valley to the left and began the ascent of the watershed ridge." (This is about five miles above Red Rock Canyon, and from here it is another mile and a half to the summit itself). "It is very steep, encumbered with trees and rocks and very trying to the horses." (Dawson 1874: Aug. 16)

From the summit the trail then descends along a minor tributary of Kis-e-nehn Creek to its junction with Akamina Creek. The descent in 1874 was full of windfall and was an "exceedingly narrow and treacherous path along the almost precipitous side hill" (Dawson 1874: Aug. 16). Dawson, however, had missed the main trail on the west side which, he found, turned off above the forks on the Kish-e-nehn.

Below the forks the trail follows Kish-e-nehn Creek downstream for a distance of 12 miles to the junction of it with the North Fork of the Flathead River, some three miles below the International Boundary. After fording the river the trail then ascends along the valley of Yak-in-i-kak Creek, a distance of 13 miles, to the summit on the McDonald Range (5119') then descending along Grave Creek (Ah-o-no-ho Creek), 23 miles to the Tobacco Plains. The total length of the route is 70 miles.
Ethnohistory

A variety of tribal groups - the Flathead, Pend d'Oreille, Spokane, Nez Perce and Upper Kootenai - traveled through the valley for the purpose of hunting buffalo in the adjacent plains and foothills in historic times. The area is on the fringe of the historic Peigan territory, and probably was not intensively used by them except to pass through while on horse raiding missions to Kootenai country to the west.

From historical and traditional accounts the Waterton area was part of the Kootenai domain in Protohistoric times. By A.D. 1800 their territory extended from Waterton to the North Saskatchewan River Valley on the east flanks of the Rockies, and on the west from the Tobacco Plains to the Columbia Lakes in the Rocky Mountain Trench. It would be presumptuous to assume that this area was exclusively Kootenai in Late Prehistoric times, and that Waterton was not visited -- as it was in Historic times -- by various groups such as the Flathead who also hunted and lived in the eastern mountain valleys and foothills of northern Montana.

Kootenai traditions suggest (Turney-High 1941) three alternate tribal origins. One tradition has it that they were either driven from an original Plains home westward across the mountains when the Blackfoot acquired the horse, or that they took up residence in their present territory a very long time ago when the ancestral group, known as TUNAXA (which may have included the Peigans), split, with one group moving west of the mountains. Alternatively, another tradition states that they always lived both on the west and east sides of the divide, and that the eastern group was driven westward in Protohistoric times by the Blackfoot. The fact that Kootenai culture is a synchronistism of both Plains and Plateau elements has led workers (Ray 1939) to consider them
as originally a Plateau peoples who acquired a venier of Plains culture with
the acquisition of the horse, or, conversely, a Plains group (Swadesh 1949)
who acquired Plateau culture traits as a result of their historic dislocation.

Ethnology

The Kootenai are divided into two groups, the Upper Kootenai, residents
of the Rocky Mountain Trench who had many Plains cultural elements in their
culture, and the Lower Kootenai who lived on the Kootenai Lakes in British
Columbia and on the Kootenai River in Idaho. The latter, primarily fishing
folk, had relatively few Plains cultural elements in their culture.

The Upper Kootenai subsisted primarily on bison, employing a variety of
communal hunting techniques in the Plains and Foothills. Caribou, deer, elk
moose, goat and sheep were hunted by individuals or small groups in the moun­
tain areas and interior valleys. On the west side of the mountains extensive
fowling was also engaged in, as was small animal trapping and fishing (Turney-
High 1941: 44). The Kootenai employed traps, wiers and hook and line to catch
salmon, Dolly Varden, suckers, whitefish and trout in the rivers and lakes on
the west side of the mountains.

A variety of plants were gathered to supplement their protein diet, prin­
cipally bitterroot and camus on the west side of the mountains, and saskatoon,
chokecherry and huckleberry on the east. The latter were considered of prime
economic importance for winter storage as they were the only berries in their
territory firm enough for drying (Turney-High 1941: 34).

In Historic times their seasonal subsistence/settlement cycle began with
moving to fishing stations on the rivers in the early spring on the west side
of the mountains. Then, after gathering bitterroot until mid-June, they made
the first trip of the year eastward over the mountains in the early summer for
the summer buffalo hunt. The latter lasted about four weeks, upon the conclu-
sion of which the Kootenais returned westward for the berrying season. In late summer and early fall they would again journey to the Plains for the fall hunt, returning before the winter snows. In mid-winter another trip was again made eastward to hunt buffalo.

The Flathead, in contrast to the Kootenai, wintered on the Plains and returned to the west in the spring. The Flathead considered the Plains their normal winter habitat while the Kootenai considered the west their wintering grounds and the Plains only as a region to exploit for food (Turney-High 1941: 54).

In historic times the Kootenai used the Plains skin-covered tipi, which Turney-High considers to have been a recent innovation; before this they had used a variant of the grass mat lodge. Historical sources (Coues 1897: 687) indicate that a grass covered wiki-up was also used. Water transportation was provided by bark canoes and bull boats. Dog traction was used to assist inland transport. Their material culture is not particularly noteworthy for archaeological purposes. Pottery was supposedly manufactured by those groups formerly resident on the western margin of the Plains (Schaeffer 1952).
THE SITES

LOCATIONAL METHODS

The distribution of archaeological sites (Fig. 3) and components of various ages in Pass Creek Valley reflects both natural/cultural factors which influenced past activity loci, and the vagaries of archaeological sampling and locational methods.

Location of sites east of Red Rock Canyon, effected by foot traverse in the years 1966, 1967 and 1969, rested primarily on finding surface indications—firebroken rock, butchered bone, and artifacts—of past cultural activity, exposed in stream cuts, road banks, trails and rodent mounds.

While exposures abound, relatively few sites were found by examination of stream cuts (e.g., DgPl-55), as the flood plain has remained relatively stable since ca. A.D. 1. Traces of occupation have therefore been obliterated by lateral channel migration. Many areas of the 10' terrace are characterized by extensive gravel mounds and overflow channels, and are therefore not particularly easy to traverse, and hence are not suitable for habitation.

Erosional exposures of the few remnants of earlier terrace sediments in the valley are almost entirely lacking. Sites on these earlier terraces were located both by examining road cuts and game trails for surface signs, and by random shovel testing of the terrace. The latter method located DgPl-1, 47, 68, 84, 85, 86, 87, and 149. The only substantial sites located by erosional exposures were DgPl-42, DgPm-1 and 4. One site was also located as a result of wind deflation, DgPl-89, the only deflation area in the valley.

Alluvial fan exposures are quite common. Examination of exposed sections and foot traverse of their surfaces in the fans west of DgPl-42 and east of DgPl-33 failed to locate any positive signs of human habitation, though occa-
sional bison bone was found eroding out of the alluvial fills. The fans, while utilized in the communal bison drives, are climatically exposed, which probably explains why they were not selected as habitation locales.

**Temporal Variables**

The sites located in the culturally-preferred areas in the valley reflect the differential preservation of land surfaces. Generally, it may be stated that once a portion of the flood plain became stabilized it was occupied; e.g., DgPm-1, DgPl-1, 42, 68, 85, 86. Consequently, one cannot assume that if a certain cultural period is poorly represented it is due to cultural or environmental factors rather than preservation or sampling. For example, the lack of pre-6500 B.C. components is most certainly the result of Early Holocene erosion, which almost totally removed the earlier outwash terrace deposits from the north side of the valley floor.

**SITE TYPES (Table 1)**

Archaeological reconnaissance (Reeves 1970b) has located a variety of site types in Pass Creek Valley (Fig. 2). Site types are discussed, and rock structures are described in this section, while habitation and kill sites, groupable into four geographic descriptive units — Valley Entrance, Crandell Mountain/Coppermine Creek, Red Rock Canyon and Montane Valley/Cirque Basin (Tables 1,2) — are described in the following section.

1. **Habitation Sites**

The various types of sites included under this general heading consist of seasonal camps which operated as a base for subsistence activities in the surrounding area.

a. **Base Camps** (N=0): These areally extensive sites occupy favorable locations in the valley floors — sheltered from the prevailing winds, adjacent to
water, with an eastern or southern exposure. This site type is not represented in Pass Creek Valley, even though valley sites (e.g., DgPl-55) were occupied in the winter. DgPl-1, a kill/campsite, has a long occupational history and may, in earlier times, have been a base camp.

b. **Hunting Camps** \((N=7):\) Small sites, usually located in the higher life zones, characterized by very little cultural material and occupied for a short period of time in any one year. These sites presumably represent small social groups who briefly occupied the site for purposes of exploiting the adjacent life zones. In Pass Creek these sites are located in the tributary valleys and cirques in the higher life zones -- montane and subalpine. Representatives of this site type include the Lost Horse Creek sites, DgPl-60, 61, and the cirque basin sites, DgPm-10 (Goat Lake), DgPm-15 (Lone Lake), DgPm-17 and 18 (Twin Lake), DgPm-19 (Lost Lake), and DgPl-125, 126 (Crandell Lake).

c. **Transitory Sites** \((N=11):\) Sites located along the major routes of travel and marked on the surface by a few butchered or burned bones and chipped stone artifacts. These sites probably functioned as brief stops for peoples traveling through the area. The sites are situated both in the tributary and lower valleys; i.e., DgPl-11, 12, 13, 14 in the Upper Pass Creek Valley, DgPm-2 and DgPl-75 in the Coppermine-Ruby Creek area. Of these, DgPl-75 has been test excavated. They also may have functioned in the higher valleys as hunting camps for exploiting the adjacent subalpine forest.

d. **Campsites** \((N=12):\) These sites, located along the major valley, may have been used contemporaneously or sequentially as base camps, hunting camps, or transitory camps. They are intermediate in size between the base camp and the latter two types. Their total occupational area and density of cultural items varies considerably, controlled by such factors as the surface area available for occupation and the distribution of forest cover on the site. In
the valley they are found on terraces on the lateral edges of the flood plain, and on spring lines from Red Rock Canyon to the Valley Entrance.

2. Bison Kills and Bison Kill/Camps

   a. Bison Kill/Camps (N=5): This category includes sites located on stream terraces on the valley floor in which both the primary activities of butchering, meat and hide processing, occurred. The sites, represented by excavated sites DgPl-1, 42, 47, 68, 86, cluster in the lower end of the valley and may or may not have been used for these multiple activities throughout all of their occupational history.

   b. Bison Kills: These sites consist of two types; individual kills (DgPl-43 and 66) where a single animal was killed and butchered, and bison kills proper (DgPl-84 and 87) where a number of bison were killed at one time. The kill was not necessarily used more than once.

   The bison kills and kill/camps are all located in the lower section of Pass Creek Valley, near the valley entrance. With the exception of DgPl-1, they are situated on terraces located in or slightly above the present flood plain. The slopes behind them are gentle and not too high, suggesting that the pounding technique was employed. A corral was probably constructed on the terrace level, and the bison driven into it from the valley sides above. No evidence of the drive lanes was found, suggesting that some type of brush construction was employed to mark the lanes to assist in guiding the herds to the pound.

   DgPl-1 is, in part, a jump, as bison bones have been found below the cliff sections; i.e., below DgPl-46 and 148 to the west and east of the excavated site area. At this site the animals may have been driven in from the Waterton Valley.
3. **Unknown Sites (N=3)**

"Activity loci whose function(s) is impossible to determine on the basis of present evidence. The term primarily applies to remains which might be indicative of either a camp or kill site" (Reeves 1970b: AA-9).

These sites (DgPl-33, 65, 67), located in the lower valley and situated on the lowest terrace, are characterized by scattered pieces of butchered bison bone eroding out of the terrace fill. They could represent a bison kill or a campsite.

4. **Paleontological (N=3)**

This grouping corresponds to death locales of individual bison which lack any evidence of cultural causation, located in alluvial fan deposits (DgPl-38, 41, 62) along the north side of the valley. All were test excavated. A relatively complete, semi-articulated skeleton was recovered from DgPl-62.

5. **Isolated Finds (N=3)**

Referring to the sporadic occurrence of artifacts without additional associated cultural debris, three sites (DgPl-36, 89 and DgPm-3) fall into this classification (the latter two also contain other features). DgPl-36 is an isolated find of a broken Avon Chert flake on a hillslope on the west side of Ruby Creek. The DgPl-89 find consists of a Plains Side Notched point found on the slope of Mt. Galwey, 200' above the campsite area. DgPm-2 consists of occasional flakes found on the summit of the South Kootenai Pass.

6. **Overlook/Ceremonial Site (N=1, DgPl-148)**

"Sites which are situated on topographically prominent, climatically exposed locales. Artifacts and rock cairns are common but very little debitage and practically no bone or firebroken rock is associated. The locale is suitable for observing game or human activity in adjacent valley areas or as a ceremonial loci." (Reeves 1970b).
7. Cairns (N=5)

Small rock cairns are located along the slopes of the lower valley (DgPl-34, 37, 40, 46) in locally prominent locales, and on the summit of the South Kootenai Pass (DgPm-2). Having a diameter of about 2', they are composed of from six to 24 stream cobbles (DgPl-34, 37, 40) or flagstones (DgPm-2 and DgPl-46), well grown over with lichen. DgPl-34, 40, 46, excavated in 1967, produced no cultural materials. DgPl-46 is situated at the south end of the DgPl-148 terrace; DgPl-40 on the surface of an alluvial fan, east and above DgPl-47; DgPl-34 in a gravel mound field on an alluvial fan on the east side of Coppermine Creek; and DgPl-37 on a glacial hummock on the west side of the creek. The latter site had been partially destroyed prior to its location in 1966. A large cairn was presumably destroyed in the construction of the Red Rock Canyon highway in the DgPl-148 site area.

8. Burial/Cache Rocks (N=2)

This category refers to large blocks of cliff fall rock found along the southeast base of Bellvue Hill, along and under the edge of which have been placed human remains and/or artifacts.

DgPl-26 was breached by the Park Service in quarrying activities in 1965. Potsherds and scattered bison bone were found in the disturbed area in front of the rectangular rock, which is approximately 8' high and 10' x 10' in diameter. The exposure was subsequently cleared in 1966. A series of flagstones, a projectile point, some chert flakes and a fragmentary human skull vault were found. Presumably it was a single bundle burial.

DgPl-76 (P1.7b), a rock of approximately the same size as DgPl-26, is situated some 300 meters northeast. It was located when some Avon Chert flakes were found eroding out of a gopher mound in the east side of the rock. The eastern edge was trenched and a large cache of Avon Chert flakes (N=576), two
One projectile point, one hammerstone, and some unidentifiable bone fragments were recovered. These had been cached at the base of the rock with flagstones placed over top. Some 300 other fall rocks are located in the area. Many probably have similar caches or burials underneath them.

SITE AREA DESCRIPTIONS

Valley Entrance (Pl. 8)

DgPl-65 and 67 are the only sites located on the south side of the valley opposite the entrance. They are situated in the alluvial deposits of a lightly forested stream terrace, 10 feet above the present stream channel. The sites have an eastern to northeastern exposure and are not particularly well sheltered from the prevailing westerly winds.

The north side of the valley entrance is defined by a bedrock spur (Pl. 2a) projecting southward from Bellvue Hill. This spur, elevation 100-150 feet above channel, is masked by fluvial sediments. Grass covers the climatically exposed areas. Aspen groves are encroaching on the sheltered east and west sides.

A number of sites are associated with this landform (Pl. 1b, 2a, 8). A small camp site, DgPl-58, is located 50 feet above the channel, at the northeast end of the spur, and two sites, DgPl-55 and 149, are situated at its southeast base (Pl. 1b). These have eastern exposures and are well sheltered from the prevailing westerly winds. DgPl-149 lies on a grass covered terrace (elevation 35 feet above channel), transected by a wagon road. Much of this site area was destroyed by stream erosion, subsequent to the alluviation of the lower terrace surface.

DgPl-55 (Fig. 5) lies on the 10 foot terrace surface directly below DgPl-149. The terrace surface is characterized by grassland with interspersed conifer stands on the southerly exposure, and an aspen grove along the base of the terrace. The surface is generally flat, although rilled and mounded.
in some locations. The soil cover is very thin, consequently coarse gravels are occasionally exposed on the surface.

The 1964 June flood destroyed an extensive area of the site, removing the foundations of the Pass Creek Ranger Station and machinery shed, both located south of the extant area. Prior to the flood a belt of conifers flanked the stream bank. The original area of the site was probably about 16,000 square meters. The site has been used by campers and picnickers for many years. Modern fire places litter the area and various abandoned wagon roads transect it's surface.

DgPl-148 (Fig. 6, Pl. 2a) lies on a grass covered terrace 125 feet above the channel on the crest of the bedrock spur. The site, as presently defined, is restricted to the top of the second highest terrace, an area of about 600 square meters. It probably extends along the entire length of the ridge crest. The site has a commanding view in both directions, overlooking both the southern portion of the Badlands and Pass Creek Valley westward as far as Coppermine Creek. Besides the material on the top of the terrace, artifacts may also be found below a 30 foot high rock outcrop located on the southwest face of the spur. Fall rock from Bellevue Hill also occurs on the surface of the site. The site is transected by the present highway, and was formerly used as a motor vehicle turn-around.

On the southwest side of the spur lies DgPl-1. It consists of two areas; a kill/campsite (3000 square meters) located on a densely wooded terrace remnant (the excavated area), 50-75 feet above the present channel and a kill area to the west on the hillside. The latter area, an occasionally utilized kill, is terminated by rock cliffs, 1200 feet to the west. Occasional bison bones and artifacts have been found at its base and on the hillside above.

West of the entrance barrier, the north side of the valley is characterized
by a series of alluvial fans and terrace remnants extending from the bedrock spur to the east flank of Mt. Galwey. Two sites, DgPl-84 and DgPl-86, located 2100 feet west of the valley, lie at the east end of this fan area. DgPl-86 (Fig. 7), a kill/campsite, extant area ca. 200 meters, is located 50-75 feet above the present channel on a small terrace remnant situated between two alluvial fans. A higher fan (125 feet above channel) lies behind the site. These fans have masked the original terrace surface forming a semi-enclosed depression, presently covered by dense aspen forest. DgPl-84, a bison kill, lies 35 feet below DgPl-86, on a 15 foot terrace remnant. The site area and the slopes of the fan above are covered with aspen and scattered conifers; the site itself consists of a bison bone bed, 15-20 cm. below surface, which may be equivalent in age to the latest bison death floor in DgPl-86.

DgPl-42, 43, and 68 (Fig. 8) are situated 3000 feet west of the valley entrance on the west side of the Blue Slate Canyon alluvial fan. DgPl-43, an individual bison kill, lies on the exposed surface of a low fan level. The latter forms a portion of the eastern boundary of DgPl-42, which occupies a 7800 square meter terrace area, 12-15 feet above the channel. The site is heavily forested. An old wagon road presently used as a horse trail runs across the surface.

DgPl-68, occupying an area of approximately 4000 square meters, lies immediately to the north and above DgPl-42, on an aspen forested terrace, 25-35 feet above the channel. The site, bordered on the east and west by alluvial fans, has a gently sloping surface.

The large alluvial fans west of DgPl-42 and 68 define the western boundary of the valley entrance area, which could have been exploited in Late Prehistoric times by communal bison hunting utilizing DgPl-42, 68, 84, and 86 as kill loci.
Summary

The clustering of sites at the entrance to the valley suggests that campsites; e.g., DgPl-1, 55, and 149, were located in this area to exploit both the valley and the adjacent Badlands. Site areas are well sheltered from prevailing winds, and have good southeastern exposures and lower standing snow depths than areas further up valley. They would, therefore, be suitable for winter habitation.

Crandell Mountain Campground/Coppermine Creek Area (Pl. 9, 10)

This area extends from the western border of the two alluvial fans which form the western boundary of the valley entrance section, to the southwest flank of Mt. Galwey. The area is characterized by a wide valley floor and extensive grasslands on the northern floor and valley sides.

DgPl-47 and 88 (Pl. 9), located at the eastern end of the sector, are situated on the northern edge of a heavily forested stream terrace, 15 feet above the channel, encircled on the north by two alluvial fans. A high water table results in the growth of a luxuriant, almost impenetrable plant cover in the summer. Immediately above and to the north lies DgPl-88, a campsite, situated on a small aspen covered terrace remnant, elevation 25-35 feet. The terrace sediments are masked by deposits from alluvial fans situated to the west and east of the site. The site is crossed by the highway and transected by a small drainage ditch, the walls of which contain occasional bones and firebroken rocks.

To the west of DgPl-47 and 88 lie a number of sites scattered along the valley floor and sides. DgPl-87, a single component bison kill, is situated 3000 feet westward of DgPl-88 at an elevation of 75-100 feet above channel in an aspen-covered topographic low formed by two coalescent alluvial fans. West of here lie two sites, DgPl-85 and 89, situated on high strath terraces. These
terraces are characterized by grasslands with interspersed aspen groves. DgPl-89, a campsite 1000 feet west of DgPl-87, is situated on a climatically exposed terrace, 125-150 feet above the channel. The site is defined by scattered cultural debris and artifacts eroding from a deflation surface.

DgPl-85 (Fig. 9) is situated 1300 feet further west in a small grassland-and-aspen grove on the west side of a small perennial spring line flowing from the base of Mt. Galwey. It has a southern exposure and is relatively sheltered from the prevailing winds.

DgPl-75 (Fig. 10) is located 15-25 feet above Coppermine Creek, on the left side, immediately adjacent to the mouth of Coppermine Creek Valley, at the north end of a grass covered alluvial fan terrace. A picnic shelter is located south of the site area.

On the lower flood plain terraces lie three sites, two on the north side (DgPl-33 and 51) and one on the south side (DgPl-32) of the creek. DgPl-51 (Fig. 11), situated on the 15 foot terrace, is partially covered by an aspen grove. The site, located 1000 feet northwest of the Crandell Mountain Campground junction, has a small spring fed stream running across the surface. An abandoned wagon road transects its surface.

DgPl-33 is situated on the 10 foot terrace, immediately east of Crandell Mountain Campground bridge. The site, defined by butchered bison bone eroding out three feet below the surface, has been destroyed by land fill.

On the south side of the creek, opposite and above DgPl-51 and 33, lies DgPl-32, a campsite situated on the 10 and 15 foot terraces. The site area, covered by grass, scattered conifer and aspen groves, is defined by scattered bison bone and firebroken rock. It has been badly disturbed by visitor facility construction in the Crandell Mountain Campground area.

Two sites, DgPl-14 and 63, are situated on strath terraces at the western
end of Pass Creek Canyon. DgPl-14 (Fig. 12), located on a 25-35 foot terrace on the north side of the stream below the southwest flank of Mt. Galwey, is defined by a surface scatter of cultural detritus and the occasional artifact eroding out of a wagon road which transects the southern edge of the terrace. It is sheltered from the prevailing winds, and largely covered with a conifer forest.

DgPl-63 is situated on the south side of the stream, on the west bank of Ruby Creek. The site, located on a small grass covered strath terrace, lies 30 feet above the present channel.

Summary

The general lack of large campsites as compared to the Valley Entrance area may reflect cultural rather than sampling variables. The area is the major grassland area of the valley and one might speculate the large campsites would not be located in the area, as they would disturb the game; the area might have been considered a game reservoir for hunting parties from camps located further down valley. While this is a plausible hypothesis, substantiated to some extent by the size of the campsites located in the area, it does not account for the general absence of bison kills in the area. The general direction of the drives would be down valley and downslope, and the pounds would be positioned in the flood plain area, perhaps east of DgPl-33 and 51. If so, they could have easily been removed by erosion. However, perhaps they are still present and lie undetected at the base of the higher terraces in that area.

Red Rock Canyon Area (Pl. 11)

Six sites (DgPm-1, 4, 5, 6, 7, 8) cluster at the junction of the two tributary valleys. Here the valley grassland gives way abruptly to the coniferous forest, growing on the surface of the hummocky ice disintegration moraine which fills the mouths of the tributary valleys.
DgPm-6, a transitory campsite, marked by a few scattered firebroken rock and bone fragments, is situated on a 10 foot stream terrace on the south side of Pass Creek, just below the forks. The site area, now totally destroyed by a former construction camp, lay in a small open meadow, enclosed on the north by aspen and on the south by coniferous forest. The site had a northeasterly exposure and was well sheltered from the prevailing winds.

DgPm-7 and 8 are located to the east of DgPm-6. DgPm-7, located 2000 feet east, is situated on a 50 foot terrace adjacent to a small ephemeral stream flowing off the slopes of Mt. Blakiston. It is badly disturbed by windfall clearing activities. A few firebroken rocks and bison bones are exposed in the disturbed area. Formerly the site area lay under an open canopy deciduous forest.

DgPm-8, another transitory campsite, defined by burned bison bone eroding out of the badly disturbed alluvial fan, is located 1600 feet east of DgPm-7, 50 feet above the channel. The site area, disturbed by windfall, was previously situated on a small grassy meadow in the coniferous forest.

To the west and north of these sites lie DgPm-1, 4, and 5. DgPm-5 (Fig. 13) is situated on a 10 foot terrace between the junction of the two streams. The site area, a small open meadow, is bordered along its eastern edge by an aspen belt and along the south by coniferous forest. The South Kootenai Pass horse trail transects the northeastern border of the site, fording Bauerman Brook to DgPm-4, which is immediately opposite DgPm-5 on the north side of the stream.

On the north side of Bauerman Brook lie the adjacent sites, DgPm-1 and 4. DgPm-4 (Fig. 14), covering a total area of 10,000 square meters, is situated on the 10 foot stream terrace. The site, covered with grass and scattered conifers, has a southerly exposure and is relatively sheltered from the prevailing winds. The terrace, relatively flat in the eastern area, is characterized to the west by abandoned channels and gravel mounds. The site is tran-
sected by the Red Rock Canyon highway and the South Kootenai Pass horse trail. In the western sector of the site various visitor facilities have been developed.

Above and to the north lies DgPm-1 (Fig.15, Pl. 6a, b ), located on the east side of Red Rock Canyon at a general level of 25-50 feet above the channel. Covering an area of 10,000 square meters, it's surface is characterized by alluvial fans, strath terraces, stream terraces and small relic areas of hummocky ice disintegration moraine. The site, which inclines gently northward, lies below a 100 foot high outwash terrace. Grasslands characterize the southern and western areas, where considerable visitor facility modification has occurred. Coniferous and deciduous forest clothe the eastern portions of the site. The latter area has been destroyed along it's southern edge by the highway.

Summary

The Red Rock Canyon area was selected as a campsite area because of its geographic location. The site area is one half to three quarters of a days walk from the lower part of the Waterton Valley, and was used historically by groups traveling either way over the South Kootenai Pass. Relatively few camping spots exist along the trail above until the next major stop is reached. The latter is located a days walk westward at the forks of Kish-e-nina and Akamina creeks.

Early spring or late fall hunting camps could also be located in this area. From here one can hunt not only the tributary valleys of Bauerman and Pass Creek, but the valleys and slopes of Mt. Galwey and Dungarven downstream to Coppermine Creek.

The lack of sites between Red Rock Canyon and DgPl-14, a distance of approximately three miles, may reflect environmental, cultural and sampling variables. The valley floor between Lost Horse Creek and DgPl-14 is constricted and topographically irregular. While some small terrace remnants occur along
the lateral edge, they are comprised of gravel fills and lack exposures (no subsurface reconnaissance was undertaken of this area). The lack of sites could, however, be due to sampling, as one would expect small hunting camps to be located in the vicinity of Lost Horse Creek. As noted above, this section of the valley could be easily exploited from hunting camps located at Red Rock Canyon.

Montane Valleys and Cirque Basins (Fig. 3, Pl. 12)

Surface reconnaissance was undertaken in most of the higher habitable areas. Areas not covered include Ruby Lake cirque, the west branch of Lost Horse Creek, Red Rock Canyon Basin, the high cirques on the northwest faces of Blakiston, Hawkins, Bauerman, Lost and Anderson creeks, and the tributary side valley west of Red Rock Canyon. While some of these may contain small hunting camps, the location of sites in Crandell Lake basin, Lost Horse, Pass Creek, and Bauerman valleys, and in cirques along the Continental Divide, is reflective of the utilization patterns for these higher life zones.

The Lost Horse Creek sites provide an example of the small hunting camps located in tributary side valleys. Identified by butchered and calcined bone found in rodent mounds and in erosional cutes at a depth of 10 cm. below surface, the sites are situated on southeasterly exposed open meadows on terraces in the sheltered valley floors, adjacent to the streams and close to the major trail routes. The open grasslands on the southern exposure of Mt. Glendowan are easily accessible from these loci. One might presume that these sites were used in the early spring or late fall.

The sites located in the cirque basins, excepting those on the shores of Crandell Lake, would, in contrast to the above, probably be used during the summer to early fall. These, identified by occasional bone, artifacts and fire-broken rock, are situated on terraces (DgPm-18, 19) or moraines (DgPm-10, 15, 17) in small sheltered meadows or under the open canopy forest (DgPm-17) (Pl. 12) adjacent to streams flowing through the basins (DgPm-15, 18), or at the outlets.
of the cirque lakes (DgPm-17, 19) (Pl. 14). Bison bone has been identified from DgPm-10 and 19. The alpine and subalpine zones of the cirque basins and mountain slopes are easily accessible from these site loci. A point fragment from DgPm-17 places one occupation on the site in the Crandell Mountain Subphase. The other cirque sites, DgPm-10, 18, 19, must also date in the Late Prehistoric period.

Sites classified as transitory camps have been located both in valleys of Bauerman Brook and Upper Pass Creek (DgPm-11, 12, 13, 14) (the general absence of sites in Bauerman below Goat Creek is probably due to sampling). The sites in Upper Pass Creek Valley probably relate to travel across the Pass or to the higher subalpine areas. The sites, characterized by occasional artifacts, bone and firebroken rock, are located on small grassy meadows along the route of the present trail. Identifiable bison bones were found at DgPm-11 and 12. An asymmetric ovate biface from DgPm-1 places occupation in the Late Prehistoric period.

The two sites in Bauerman Brook (DgPm-2 and 9) are similarly situated to those described above, but were largely destroyed by construction. DgPm-9 could also have been used as an alternative hunting base camp to the cirque basin sites.
EXCAVATIONS AND STRATIGRAPHY

INTRODUCTION

Excavations were carried out at various sites in the valley during the seasons 1967-1969. In 1967, DgPl-42, 55, 148 and DgPm-1 and 4 were sampled, and DgPl-14, 43, 51, and 68 tested. Excavations were completed at DgPm-1 in 1968. In that same year excavations were also undertaken at DgPl-1 and 47, and tests at DgPl-32, 51, 75, and 149. In 1969, DgPl-1 and 42 were completed, and DgPl-68, 85, and 86 sampled. The size of the crew varied from four to seven in 1967, three to four in 1968, and 20 in 1969. In July to mid-August, 1969, five simultaneous site excavations were in progress.

Sampling techniques varied over the years. We were used to excavating Plains archaeological sites, which contained stratigraphically well-differentiated cultural or natural horizons, and initially attempted to employ horizontal stripping techniques developed for these sites to the sites in Waterton. While a useful method for initial tests and for salvage oriented excavations, it soon became apparent that the technique was not appropriate for the sites we were working on.

Excavations at a site began with an initial test excavation to evaluate the sites potential, utilizing arbitrary vertical intervals and shovel or trowel and screen. In 1967 major excavations designed to recover a representative artifact sample were carried out by shovel and screen at DgPl-55, 148, DgPm-1 and 4, and used as the initial test method at DgPl-42. Excavations at the latter were our first encounter with a typical Waterton site which contained multiple living floors lacking visible stratigraphic horizonation. At DgPl-42 we then reoriented our techniques to use of the trowel and brush method, utilizing arbitrary vertical sampling units, and plotting all the archaeological data on
floor plans for each level. At DgPm-1 shovel and screen were used in both seasons, as here we were able to maintain adequate stratigraphic control on the earliest living floor, the sampling of which was our prime interest.

In 1968 the excavations at DgPl-1, 47, and 148 were effected by trowel and brush. Proveniences for time diagnostic items, both horizontal and vertical, were recorded, and floor plans drawn for the arbitrary levels.

In 1969 the trowel and brush technique was employed at DgPl-1 and 42, utilizing 10 cm. arbitrary levels; all data was individually recorded in both horizontal and vertical modes, with floor plans being drawn for each level. All material except firebroken rock was saved. The latter was measured, weighed, identified as to rock type, and discarded. Back dirt was not screened from the trowel and brush sites in 1968 and 1969.

DgPl-68, 85, and 86 were excavated utilizing a combination of trowel/shovel/screen techniques to horizontally strip the sediments and expose the detritus littered floors, followed by the recording of artifacts as found and the drawing of floor plans on which were given all the vertical proveniences of every recorded item. This technique seems to be a suitable compromise in initial testing, provided small vertical sampling units can be employed and the floors are sufficiently littered with debris to allow for their definition.

Site stratigraphy consists essentially of a series of living floors contained within colluvial or alluvial fills. Within the colluvium is developed a mature soil profile ranging from degraded orthic chernozems to brunisols and podzols. In most sites the latest component lies at the base of the L-F-H in the surface of the A horizon. Earlier components occur at varying depths below in the BC and C horizons. Occupations usually extend throughout the colluvium to the underlying coarse alluvial fills of the landforms upon which the site is situated. When fine alluvial cultural bearing sediments are present
they are often altered by pedogensis.

A variety of vertical sampling units — geological, pedological, arbitrary and cultural — were employed. Pedological levels are of varying usefulness, depending primarily on the age of the land surface one is dealing with; on terrace surfaces of recent age the excavation of the L-F-H and Ah horizons was an effective sampling method, while on older surfaces the method was considerably less useful, depending upon the particular depositional circumstances at the site. At DgPm-1 for example, the latest floor occurs at the base of the L-F-H in the surface of the Ah or Ae horizon, and it could be effectively exposed by trowel or shovel stripping. Lower levels, approximately 2000 years older in age, occur 15 cm. below in the Ah/Ae and upper surface of the B, and would be mixed with the latest component if the Ah horizon was excavated as a unit. Arbitrary levels varied in thickness, but were usually 10 cm. intervals. Geological units could only be effectively employed at DgPm-1.

The universal grid system was employed at all sites, except DgPl-148, DgPm-1 and DgPm-4, which have alphanumeric designations. Scattered tests are designated alphabetically, as were the initial tests in the excavation areas. The two meter square was the general horizontal sampling unit used. Square designations are always based on the northeast corner coordinates, as are all horizontal and vertical measurements unless otherwise stated.

Backfilling was carried out only at vehicle accessible sites. In these sites, where the occupations extended into the litter mat, it was obvious that the backdirt should have either been completely removed from the site or placed on polyethylene, as the original ground surface was altered significantly when we returned to the excavations in subsequent years. Further, tracked vehicles cannot be effectively employed in backfilling these sites, and extreme care must be taken with rubber tired vehicles so as not to disturb the ground surface.
In the following pages each site is described separately in terms of its excavations, geological and cultural stratigraphy, floor characteristics and occupational features.

DGPl-l

Excavations

While bison skulls, bones and occasional artifacts had been found on the slopes of the hill in past years, evidence of occupation of the site proper was first found by the writer in 1963, when shovel testing of the terrace exposed a level of butchered bison bone 10 cm. below the surface. Some shovel testing was also carried out on the hillslopes in 1967 and 1968.

On the basis of the shovel tests we decided to begin test excavations at the site with an initial series of pits consisting of four contiguous two by two meter units [6N0W, 8N0W, 6N2W, 8N2W (Fig. 16)]. Troweling of the Ah horizon (10 cm. thick) uncovered a rock filled surface hearth, a light scatter of cultural debris, artifacts and comminuted bison bone. The initial two meter square, 6N0W, was then excavated into the underlying colluvium. Artifacts and cultural debris were recovered to a depth of 60 cm., where stream gravels were encountered, and the distributions indicated the presence of a number of living floors within the B horizon of the colluvium. Since the location of the terrace 50 feet above the stream suggested that some of the occupations might be of considerable antiquity, we decided to sample the site to determine the age and cultural affiliation of the components. Six weeks were spent at the site in June and July 1968, with a total of 20 squares excavated -- Areas A and B.

In 1969 excavations were continued in June and July -- Area C -- with the intention of obtaining stratigraphic control on the living floors and material for radiocarbon dating from the lowest component. A total of seven two meter squares were excavated to the underlying alluvium. One of these, 4S8E, was
was taken an additional 100 cm. into the underlying alluvium to probe for earlier components. The 1968 excavation area, which had been left open for use by the Interpretive Service, was also cleaned up.

Excavations in both seasons were carried out by two-man teams, utilizing trowel and brush. The backdirt was not screened. In 1969 all cultural items — artifacts, bone and stones — were plotted in vertical and horizontal dimensions, while in 1968 only the artifacts were plotted in all dimensions.

**Geological Stratigraphy (Fig. 17, 18)**

**Unit A: Alluvium**

Stream alluvium, consisting of coarse to fine gravels and sands of unknown thickness, lies below the Unit B colluvium. The channel fill deposit represents an Early Holocene aggradation fill, deposited more than 7500 years ago by the stream when its floodplain lay 50-75 feet higher than today. A test entered 100 cm. into the alluvium in 4S8E recovered fragmented bison teeth and a pine cone 60 cm. below the surface. No cultural materials were found in the test.

**Unit B: Colluvium**

Unit B consists of colluvial deposits overlying Unit A, within and upon which is developed the present soil profile. The composition varies from relatively fine grained materials (partially pedogenic in origin) in the upper 20 cm., to a relatively pebbly matrix below. Pebble orientations indicate the material accumulated gradually by mass wasting of the hillslope behind.

The colluvium varies in depth across the excavated area. In 4S8E, the pit closest to the hill, it is 120 cm. thick, while 14 meters west, in 4S2.3W, it is only 30 cm. thick. The unit exhibits a concave convex profile, indicating that the area closest to the slope is rapidly accumulating and the terrace edge is degrading by mass wasting. The age of the archaeological components in the colluvium indicate depositional rates have decreased through time as a state of dynamic equilibrium was approached, with an initial rate of ca. 10 cm./millenia
decreasing to ca. 5 cm./millenia by ca. A.D. 1.

Soil Profile

The soil may be classified as an accretionary degraded black chernozem. Its degraded state is a result of recent aspen invasion of the terrace surface. The depth of the profile varies, depending on the depth of the colluvial unit within which it is developed.

Horizonation is indistinct. In the excavation area the L-F-H horizon is 4-5 cm. thick, the AB horizon 60-80 cm., and the BC 20-40 cm. In some areas, e.g., 6S6E and 4S8E, a possible buried Ah horizon, 3 cm. thick, is preserved at a depth of 20-30 cm. below surface.

Cultural Stratigraphy

The cultural stratigraphy consists of a series of closely, vertically superimposed living floors (Fig. 17, 18) which vary horizontally across the excavation area. The majority of the floors are located below 20 cm. No attempt was made to establish and correlate floors between excavation units, nor to separate them into finer vertical divisions than the levels discussed below, which are based on the vertical distributions of artifacts, lithic types, and associated cultural debris.

Study of the artifact and lithic types indicate that the upper 20 cm. of the site is disturbed, primarily by downward movement of small artifacts; e.g., obsidian flakes associated in age with Level 2B, appeared in Level 2A and 1. This disturbance is caused by a number of factors, primarily rodent activity (which today is limited to the upper 20 cm.) and the lateral root systems of the aspen. Certainly lower components were also disturbed by heavy rains, downslope erosion, and the activities of the former human occupants.

Level 1: Level 1 consists of the archaeological living floors and artifacts
contained within the colluvial unit B, below the 20 cm. level. Variable in thickness, it contains at least three components definable on the basis of projectile point types. All other data is considered as a unit.

**Level 1A**: Characterized by Lusk projectile points (173), it is the earliest of the living floors lying directly on the surface of the underlying alluvium. Only two points were recovered, suggesting a limited occupation in the excavation area.

*Age*: ca. 6000 - 5500 B.C.

*Phase Association*: Valley Entrance

**Level 1B**: Characterized by Bitterroot and Salmon River side notched types (159), it is the major occupational unit in the site, and is comprised of a series of closely spaced living floors, 30-50 cm. in depth.

*Age*: ca. 5500 - 2500 B.C.

*Phase Association*: Bellvue Hill

**Level 1C**: Characterized by McKean Lanceolate points (170) in association with side notched types, it is the latest component of Level 1, located ca. 20 cm. below surface.

*Age*: 1695 B.C. +210 (GX1460)

*Phase Association*: Bellvue Hill

**Floor Characteristics**: The closely spaced floors are characterized by scattered cobbles, boulders, flagstones (Fig.17, Pl. 13), and artifacts. Charcoal has been blown out of the site, and only calcined bone is preserved. Fire cracked rock is very scarce and of a larger size than in Level 2B. In OS4E, in the interval 60-100 cm., the rocks have the following dimensions:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>14.5 cm.</td>
<td>9.245 cm.</td>
<td>7-40 cm. (N=38)</td>
</tr>
<tr>
<td>Width</td>
<td>11.5 cm.</td>
<td>4.929 cm.</td>
<td>7-22 cm.</td>
</tr>
<tr>
<td>Weight</td>
<td>8.044 lbs.</td>
<td>10.0056 lbs.</td>
<td>1-110 lbs.</td>
</tr>
</tbody>
</table>
Generally the rock types consist of basalt (N=10), dolomite (N=4), sandstone (N=1), and quartzites (N=19). Other rock types include gabbro, limestone and red and green argillites.

The general absence of firebroken rock, as compared to other components later in the sequence, would suggest that alternate cooking methods are being used. Many of the smaller cobbles are gabbro or basalts, suggesting that stone boiling may have been the common technique employed.

Features:

1. **Surface Hearth (?)**:

   **Provenience:** 2S2E Level 6; Depth 60 cm. b.s.
   **Form:** Circular concentration of calcined bone and scattered charcoal.

2. **Stone Platform Hearth (?)**:

   **Provenience:** 4N4W - 2N4W; Depth 25-30 cm. b.s.
   **Form:** Subcircular outline (80 x 60 cm.). Consists of inset flat slabs or flagstones forming a "stone platform". Rock types are gabbro (N=2), sandstone (N=2), conglomerate (N=4), and quartzite (N=1). Sandstone is slightly burned and cracked. No charcoal was recovered. Rock metrics are:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>20.889 cm.</td>
<td>5.512 cm.</td>
<td>16-23 cm.</td>
</tr>
<tr>
<td>Width</td>
<td>14.375 cm.</td>
<td>6.972 cm.</td>
<td>14-20 cm.</td>
</tr>
</tbody>
</table>

3. **Rock Pile** (Pl. 13a):

   **Provenience:** 4S8E (NE corner); Depth 80-100 cm.
   **Form:** Cairn-like feature (radius 1 meter, height 20 cm.), consists of two plus rows of rocks stacked on top of each other. Only one quarter of the feature was exposed.

   **Associated Artifacts:** Tables 6 - 9

   **Subsistence Activities:** Appendix IV
Site Type: Kill/Camp (?)

Level 2: Level 2 consists of a number of archaeological components in the upper 20 cm. of the colluvial deposits. On the basis of projectile point types four or five archaeological components could be defined; however, stratigraphic details and living floor associations suggest that two major components are represented. The point types which are not considered associated with these components -- Besant Side Notched (163), Samantha Side Notched, and Columbia Valley Corner Notched (157) -- represent very brief, temporally intermediate occupations.

Level 2A: Lying at the base of the degraded Ah horizon, 15-20 cm. below the surface, it is characterized by Pelican Lake and Hanna corner notched points.

Floor Characteristics: The floor is similar to Level 1 but less well defined, with a slightly higher frequency of large firebroken rock. Bone is poorly preserved. Charcoal is blown out.

Features: None

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Kill/Camp (?)

Age: ca. 1000 B.C. - A.D. 400

Phase Association: Blue Slate Canyon

Level 2B: Characterized by Plains Side Notched points, this level lies at the base of the L-F-H horizon in the top of the Ah horizon.

Floor Characteristics: The floors are characterized by a general scatter of small size fire cracked rock, large flagstones and boulders, occasional artifacts and scrap bone. In the 1969 area firebroken rock, charcoal, calcined and burned bone concentrated in the 08-6E, 084-4, 282E area,
suggesting an activity area centered around the hearth described below. Clusters of obsidian retouching flakes occur in OS^4E and 2S2E, indicating chipping activities in the general hearth area.

Features:

1. Surface Hearth
   Provenience: OS^4E, Level 1; Depth 10 cm.
   Form: Circular area (30 x 20 cm.) of ash and burned soil (1 1/2 cm. thick) around which is concentrated calcined and burned bone. Scattered firebroken rocks and sandstone slabs form a rough semi-circle around the ash area. It may represent a badly disturbed rock ringed hearth.

2. Rock Filled Surface Hearth (Pl. 13b)
   Provenience: 8N2W, 6N2W; Depth 12 cm.
   Form: Circular (90 x 70 cm.) rock filled surface hearth, 5-10 cm. deep. Rocks consist of gabbro (N=16), quartzites (N=6), sandstone (N=5), and conglomerates (N=6). Their sizes range:

<table>
<thead>
<tr>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.4 cm.</td>
<td>4.44 cm.</td>
<td>5-20 cm.</td>
</tr>
</tbody>
</table>

The hearth was originally constricted by arranging the rocks in a circular fashion and building a fire on top. In an equivalent level in OS2E a partially charred log was found, underlain by firebroken rock.

Associated Artifacts: Tables 6 - 9
Subsistence Activities: Appendix IV
Site Type: Kill/Camp
Age: A.D. 1730 ± 90 (GX2016)
Phase Association: Pass Creek Valley
Excavations

The site was tested in 1967 and revisited briefly in 1968. In 1967 test pits (2 x 1 meters) A and B (Fig. 12) were staked out adjacent to the wagon road where butchered bone scrap had been found the previous year. Excavations were carried out in 10 cm. levels to a depth of 25 cm., utilizing shovel and screen. The Ah horizon and litter mat were removed as a unit. A small amount of flakage, comminuted bone and firebroken rock was recovered from the Ah horizon. The initial tests were then expanded to two two-meter units (Al and Bl). After completion of these, two additional tests (C and D) were entered to the east of the wagon road. No diagnostic materials were encountered, and testing was terminated after two days. In 1968 a rock outcrop area some 100 meters northeast was troweled, with no results. Artifacts had supposedly been found here in previous years by a local collector.

Geological Stratigraphy

Unit A: Alluvium, consisting of coarse gravels/sands overlying bedrock.

Unit B: Surface colluvium, varying from 20-85 cm. in thickness.

Soil Profile

A chernozemic soil (Ah 15 cm. thick) is developed in the excavation area. Podzols are present in the forested areas of the site.

Cultural Stratigraphy

The single component is located near the base of the Ah horizon, 10-15 cm. below surface, and is characterized by a very few bones, fireborken rock and flakes. Time diagnostic materials were not recovered in the sampled area. The site probably functioned as a small temporary campsite.
Tests and Excavations

Butchered bison bone was found eroding out of a bulldozer cut at the western end of the terrace in 1966. Subsequent inspection indicated that a site of major proportions was present. Since it would largely be destroyed by any road construction, test/excavations were undertaken in 1967. A series of test pits were staked out at the west end of the site (Fig. 8, Pl. 14) along the north edge of the wagon road. Testing began with the preparation of Test A and 2S4W as display units for the Park Service, with the exposure of butchered bison bone at 15 and 30 cm. below surface. Leaving these units exposed, excavations were then carried out in 2S2W by arbitrary 10 cm. levels, utilizing shovel and power screen, to determine if earlier components were present. Cultural materials (tools, flakes, comminuted bison bone and firebroken rock) were encountered throughout the 80 cm. of fine grained alluvial sands/silt deposits, which were underlain by sterile gravels. Projectile points indicated that these components could date within the first millennium B.C., and the associated cultural detritus suggested that the lower components represented a bison kill/campsite.

Visible stratigraphy was absent, and consequently all subsequent excavations were carried out by trowel, brush and screen with cultural debris (flakes, tools, firebroken rock and bone scrap) recorded in situ, in the hope that it would be possible to later reconstruct the living floors. A total of eight 2 x 2 meter units were eventually excavated in the area.

Tests were also carried out in other areas of the site to determine the nature and depth of the cultural, geological and pedological stratigraphy. Square 2S9E, located nine meters east of 2S0W, and 20 cm. higher in elevation, reached underlying gravels at a depth of 80 cm. Test G, located five meters
upslope from the main excavation, reached gravels at 60 cm. below surface. A large, excavated, rocklined, rockfilled hearth was encountered in the west half of the test, which was then extended to the west to completely expose the hearth. The latter, used as an interpretive exhibit, was reburied at the close of the season, and remains intact today.

Two further tests -- K and L -- were located in the eastern portion of the site (Fig. 8). Test K, located on the south edge of the wagon road, adjacent to the Blue Slate Canyon alluvial fan, was excavated in arbitrary levels by trowel, shovel and screen. Nails, White trade beads, and a few aboriginal artifacts were found intermixed in the first 20 cm. level, below which we encountered the surface of the Blue Slate Canyon alluvial fan. Topographic relationships indicated that the fan overlay the DgPl-42 terrace fill, and, in order to determine the thickness of the fan, a 2 x 2.5 meter area was first excavated to the terrace surface, marked by a soil developed on coarse alluvium 80 cm. below surface. The east half of the unit was then excavated in arbitrary levels by shovel to the top of the buried soil. Occasional bone, firebroken rock and flakes were recovered from the screen in the 20-50 cm. level. Excavation of the buried soil, 18 cm. thick, produced artifacts and cultural debris. The recovery of a Pelican Lake Corner Notched point permitted correlation of the paleosol with the alluvium in the main excavation area.

Test L (1 x 2 meter) was located at the base of the DgPl-68 terrace (Fig. 8). Trowel and screen were used to excavate the 30 cm. Ah horizon; bison bones and occasional artifacts were recovered. The underlying deposits, consisting of altered colluvium (BC soil material) were shoveled and screened to a depth of 60 cm. Only a few flakes were recovered. Excavation of a buried soil encountered at 60 cm. produced a small amount of cultural debris, including a Hanna Corner Notched projectile point. Coarse gravels were found 85 cm. below surface.
In 1969 excavations recommenced in late June with the object of both en-
larging the artifact sample and clarifying the cultural stratigraphy. A series
of four two-meter units were laid out along the south edge of the backfilled
1967 excavation (Fig. 19). Test A from 1967 was completed and an intermediate
square (10W/2S) excavated. As in 1967 the excavations were effected by trowel
and brush, with all items plotted in situ. The backdirt was not screened how-
ever. The 1969 excavations were backfilled the following year. A total of
76 square meters, one hundredth of the total site surface area, was sampled in
the two seasons.

Geological Stratigraphy (Fig. 20, Pl. 15a)

Main Excavation Area:

Unit A: This consists of two-meters of coarse gravel channel fill,
underlain by bedrock and characterized by gravels, cobbles and boulders up to
one meter in diameter. The latter protrude (Pl. 14a) into Unit B.

The time-stratigraphic relationships of these sediments to the overlying
Unit B alluvium is unclear. In the excavation area the surface of Unit A dips
southwest. In Test G gravels were encountered 55 cm. below ground surface, at
which point they are 75 cm. higher than in Test A. These data, plus the fact
that the Units A and B are nonconformable, suggest that the gravels are an
earlier channel fill eroded prior to the deposition of Unit B, and probably are
time-stratigraphic equivalent to those underlying the higher DgP1-68 terrace.

Unit B: The overlying fine alluvial fill is divisable into two members:

Member 1: The strata -- 1) fine gravels and sands, ca. 16 cm. thick,
containing occasional bone fragments, overlain by 2), a fine red clay (15 cm.
thick) band which bifurcates into two clay bands in some areas. This horizon-
tally bedded member, found only in the western portion of the excavation area,
is not conformable with Unit A.
Member 2: The overlying fine sand/silt/clay alluvium is usually very difficult to separate from Unit C, the surface colluvium, as both contain similar size fractions and have been altered by pedogensis to a B/C soil horizon. The unit progressively thickens to the southwest. In Pit 2S9E it is 40 cm. thick, in 2S8W it is 80 cm. thick, and in Test A, 120 cm. thick. Depositional features consist of the occasional sand lens and discontinuous charcoal stained bands. The living floors are primarily contained within the unit.

Unit B alluvium probably originated through overbank deposition during flood stages of Pass Creek. The composition of Member 1 suggests initial deposition in slow flowing water, followed by deposition in a still standing basin. The Member 2 sands/silts/clays, while requiring a slightly higher transport velocity, accumulated over a considerable period of time (ca. 1000 years), suggesting that they were deposited during flood stage onto the flood plain or into a backwater area. Since spring floods are generally destructive in the valley, Unit B probably accumulated as a result of increased meltwater discharge in summer months.

Unit C: The overlying colluvium contains a relatively higher pebble fraction, within which is developed the Ah soil horizon. This unit, similar to Unit B in color and composition, varies in thickness from 20-40 cm. In Test G, colluvium (50 cm. thick) directly overlies Unit A. The latest cultural components are contained within this unit.

Soil Profile: The soil developed in geological Units B and C may be classified as a degraded dark grey chernozem. Its Ah horizon is approximately 10-15 cm. thick. The underlying material is altered to a BC soil horizon.

Test Pits:

Test K:

Unit A: Coarse basal gravels and sands of unknown thickness.
**Unit B:** The fine grained alluvial sands/silts, 20 cm. thick, contain scattered gravels, within which is developed a paleosoil, whose Ah horizon is 19 cm. thick. Cultural materials found in this soil indicate an age equivalent to Unit B alluvium in the main excavation area.

**Unit C:** These alluvial fan deposits, 70 cm. thick, are characterized by alternating beds of coarse blue argillite fragments and fine clay bands (N=2), the latter altered by pedogenesis to incipient regosols. These sediments, derived from higher fans and argillaceous outcrops in Blue Slate Canyon, were deposited by the intermittent stream east of the site during periods of increased runoff -- perhaps in spring storms. The incipient soils suggest that the surface stabilized at least twice. The fan deposits in the upper portions of Unit C have been altered by pedogenesis into a B/C soil horizon. Occasional flakage and bone scrap is present in this unit, particularly in the upper 15 cm. The latter may be intrusive from Unit C components.

**Unit D:** This consists of surface colluvium 25 cm. thick, in which is developed the Ah and B soil horizons of a degraded grey chernozem. The deposits are characterized by a high proportion of argillaceous fragments derived by slope wash from the surface of the fan above. A mixture of aboriginal and Caucasian artifacts occur in this unit.

**Test L:**

**Unit A:** Coarse gravels and sands of unknown thickness occurring at a depth of 80 cm. below surface.

**Unit B:** Fine sand and silts, 20 cm. thick. Cultural materials found in this unit indicate that it is earlier than Unit B in the main excavation area.

**Unit C:** Surface colluvium, 60 cm. thick, characterized by a high percentage of pebbles derived by mass wasting of DgPl-68 terrace slope behind.
The bottom 40 cm. is altered by pedogenesis to a B/C soil horizon of a cumulic dark grey chernozem, whose Ah horizon is developed in finer grained colluvial sediments. Cultural materials concentrate in the 10-30 cm. levels.

Cultural Stratigraphy - Main Excavation Area

The cultural stratigraphy consists of a series of closely vertically - superimposed bison death/butchering/processing floors which vary in their horizontal distribution across the excavation area. The majority of these floors are contained within the Unit B alluvium. Because of the lack of visible stratigraphic control, the floors are lumped into three levels, correlatable with the geological/pedological units and phases represented at the site.

A certain amount of disturbance of the deposits, particularly in the upper 30 cm., has occurred; for example a Pelican Lake Corner Notched point was found 10 cm. below the surface, and resharpening flakes from the same biface were recovered from depths of 20 and 50 cm. in the same unit. This disturbance results from a number of factors. Rodent activity, primarily confined to the colluvium, is very frequent in the upper 30 cm., particularly in the western portion of the excavation area. One active burrow was found in Test A at a depth of 150 cm. below surface. The aspen forest root development, which has invaded the site's surface in the last 100 years, has also disturbed the upper 30 cm. of deposits, as has the construction and use of the historic wagon road across the site.

Level 1

Level 1 consists of those floors contained within the Unit B alluvium. At least four floors are represented, the latest in the surface of the alluvium 25-30 cm. below surface, the earliest on top of the red clay of Unit B, Member 1.

Floor Characteristics: The floors, characterized by scattered bison bone, firebroken rock, and artifacts (Fig. 21, 22), vary horizontally in their
distribution and characterization. Lineally it is very difficult to correlate any particular floor. In general the floors below the uppermost are very poorly represented in 4S8W and adjacent units to the west, where they consist almost solely of widely scattered large butchered elements. Most of the artifactual material is concentrated in the eastern half of the excavation area.

Overall activity patterns are, however, discernable (Fig. 21,22) by the concentration of processing tools and resharpening flakes in areas containing hearths, firebroken rock, and small amounts of skeletal materials. The floor areas away from these activity areas, in contrast, are characterized by localized accumulations of large butchered elements, butchering activity areas, and very low frequency of artifacts, resharpening flakes, and firebroken rock. We may infer that tool working, hide working and tool sharpening activities were localized around the hearth areas, where the meat was processed, while the carcass dismemberment and segmentation occurred away from the hearths.

The carcass processing areas tend to be relatively distinctive. In 4S8W and 2S10W mandible and maxilla processing areas occur (Fig.21). In the latter square a limb processing area (80 x 50 cm.) was also found in the northeast corner of the unit. It contained two astraguli, two calcaneous, one tibia, one naviculocuboid, one ulna, one scapula, one metacarpal, two metatarsals and one phalange, in association with three large rocks, possibly used as anvil stones. Another mandible processing area was found in 2S6W (equivalent to floor in Fig. 21).

Other processing areas include skull/vertebral segmentation areas in 2S6W at 60 cm. (equivalent to floor in Fig. 22), consisting of two skulls, and four axis, and in 2S4W at 60 cm., consisting of four skulls. Vertebral segmentation units occur in 2S8W at 35-50 cm. (equivalent to floor in Fig. 22) and 2S6W at 40-50 cm. (equivalent to floor in Fig. 22). Minor specialized areas included
a metatarsal processing unit, consisting of two proximal and distal metatarsals with anvil stones, found in 2S4W at 60 cm. (equivalent to floor in Fig. 22), a humerus unit in 2S8W at 80 cm. (equivalent to floor in Fig. 22), consisting of three humerii with anvil stones, and pelvic unit in the same level consisting of three left and three right ischiums.

Articulating skeletal units include humeral/radii in 2S4W at 60 cm., in 0S0W at 20 cm. and in 2S9E at 20 cm.; tibia/femur in 2S10W, Level 9; and tibia/metatarsal in 2S10W, Level 9, 2S4W at 33-45 cm., 2S4W at 60 cm., 2S8W at 20 cm., and 2S8W at 60 cm.

Features:

1. Rock Ringed Hearth

   Provenience: 2S0W; Depth 20 cm.

   Form: Circular (90 x 80 cm. diameter) rock ringed surface hearth. Small amounts of burned bone and charcoal associated. Semi-articulated bison thoracic vertebral segment found along northern edge of hearth. Basin may have been slightly excavated.

2. Surface Hearths (N=3)

   Provenience: 2a. 2S2W; Depth 30-40 cm.
               2b. 2S6W; Depth 60-70 cm.
               2c. 4S2W; Depth 70 cm.

   Form: Ill-defined subcircular (40-60 cm. diameter) carbon stained burned areas. May contain occasional firebroken rock (2b and 2c), calcined (2a) or burned (2c) bone.

3. Excavated Saucer-Shaped Slab-Lined Rock-Filled Hearth (Pl. 15b)

   Provenience: Test G - Ga; Depth 20 cm.

   Form: Circular (1.3 meter diameter) excavated hearth. Prepared by excavating a shallow pit, ca. 10-20 cm. deep and lining it with flagstones. The stones around the perimeter were set in at an angle, and fire was construc-
ted on the surface of the rocks. Scattered charcoal associated.

4. Rock Filled Surface Hearth (Fig. 22)

Provenience: 4S4W; Depth 48-62 cm.

Form: Circular area (90 x 84 cm.) characterized by scattered unbroken and broken firebroken rock, calcined bone, charcoal stained and fire burned earth. Bone fragments and artifacts are very common around and within it.

5. Firebroken Rock Concentration (Fig. 21)

Provenience: 4S2W; Depth 30-50 cm.

Form: Concentration (1 x 1 meter) of firebroken rock (N=100) in the northeast corner of 4S2W. Occasional charcoal, bone and artifacts are scattered throughout. Total weight, 265 pounds, consisting of gabbros, basalts, quartzites and occasional sandstones.

6. Arcurate Rock Line (Pl.15a)

Provenience: Test A; Depth 60-90 cm.

Form: An arcuate line of large flagstones and boulders trending from the southwest to the northeast corner of the square. The rocks (N=17) vary in size from 36 to 20 cm. and in weight from 30 to 70 pounds. Shattered bison bones are often associated. The function of this structure is problematical, but may have been associated with the construction of a corral at the site.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Kill/Camp

Age: 680 B.C. ± 160 (GX1196) - A.D. 480 ± 120 (GX2049)

Phase Association: Blue Slate Canyon

Level 2

Floor Characteristics: A single living floor, characterized by occasional bison bone, flakes, broken rock and artifacts, occurring at the base of
the colluvium. It is badly disturbed and consequently few artifacts can be positively associated with it.

**Associated Artifacts:** Tables 6 - 9; **Subsistence Activities:** See Floor 3  
**Site Type:** Kill/Camp; **Age:** ca. A. D. 1000  
**Phase Association:** Crandell Mountain

**Level 3**

**Floor Characteristics:** Widely scattered bison bone found in the Ah horizon, depth ca. 10 cm. The bone is usually burned on its upper surface.

**Features:** Rock Ringed Excavated Hearth; **Provenience:** 4S2W; Depth 10 cm.  
**Form:** Circular (100 cm. diameter), excavated, basin-shaped hearth. Edged by flat sandstone and quartzite slabs. Fill consists of 15 cm. of charcoal-stained and burned earth and ash.

**Associated Artifacts:** Tables 6 - 9; **Subsistence Activities:** Appendix IV  
**Site Type:** Kill/Camp; **Age:** A.D. 1815+100 (GX2014)  
**Phase Association:** Pass Creek Valley

**Cultural Stratigraphy - Test Pits**

**Test K**

**Level 1:** The archaeological materials found in Unit B - paleosol.  
**Phase Association:** Blue Slate Canyon

**Level 2:** The sparse amount of archaeological materials found at depth from 30-60 cm. in the alluvial fan (Unit C).

**Phase Association:** Unknown.

**Level 3:** The aboriginal artifacts and glass beads found in the colluvium (Unit c). They do not necessarily associate.

**Phase Association:** Aboriginal Historic Complex. Glass beads were not found in the main excavation area, and this component is considered to post-date the Pass Creek Valley component present in the latter area.
Test L

Level 1: The archaeological materials found in Unit B at depths of 60-80 cm.

Phase Association: Blakiston Brook

Level 2: The archaeological materials found in Unit C at depths of 20-50 cm.

Phase Association: Blue Slate Canyon

Level 3: The archaeological materials in the Ah soil horizon, depth ca. 1-20 cm. Two floors represented by butchered bone, at 5 cm. and 15 cm.

Phase Association: Crandell Mountain and Pass Creek Valley.

DGPl-47

Excavations

DGPl-47, first located by shovel testing in August 1967, was test excavated during a three week period in May/June 1968. Initially two 2 x 2 meter tests, designated 'A' (084W) and 'B' (Fig. 23) were staked out near the north edge of the site. Only heavily butchered and charred bison bone was recovered from B, while a hearth, bone, and a few artifacts were found in A (084W). On this basis, excavations were extended in the vicinity of Test A (084W), with an additional five 2 x 2 meter squares removed. Excavation was effected in 20 cm. levels by trowel and brush; the backdirt was not screened. Only a few artifacts were recovered and excavations were terminated when a rising water table flooded the pits.

Geological Stratigraphy

Unit A: Underlying culturally sterile alluvial sands and clays containing a high percentage of red argillite fragments.

Unit B: Surface colluvium, 30 cm. thick, consisting of fine grained mater-
ials derived from organic accumulation and mass wasting of the hillside behind.

Soil Profile

Black organic soil (A = 30 cm. thick) developed within the colluvium.

Cultural Stratigraphy

No visible separation of living floors was observed during excavation, however, the presence of three temporally discrete projectile point types, suggesting the existence of three occupations at the site, designated Levels 1-3. Most artifacts associate with Level 1.

Floor Characteristics and Features: A rock filled surface hearth, one meter diameter, was centered on the northeast corner of ON6W. The floor was characterized by randomly scattered firebroken and unbroken rocks (flagstones and boulders) and scattered bison bone.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Kill/Camp

Age: Level 1: ca. 1000 B.C. - A.D. 500
Level 2: ca. A.D. 500 - A.D. 1000
Level 3: A.D. 1550 ± 110 (GX2048)

Phase Association: Blue Slate Canyon, Level 1; Crandell Mountain, Level 2; Pass Creek Valley, Level 3.

DGPL-51

Excavations

DGPL-51, first located in 1966, was tested in 1967 and 1968. In 1967 three 2 x 2 meter tests were entered, tests A and B located adjacent to the wagon road, and C inside the aspen grove (Fig. 11). These tests, excavated in arbitrary 10 cm. levels by shovel and screen to depths of ca. 50 cm., produced a
small amount of butchered bone and scrap metal in the top of the Ah horizon. Tests were concluded after three days. In 1968 three additional days were spent testing an area adjacent to test C, with a $\frac{3}{4} \times \frac{3}{4}$ meter area eventually being excavated by trowel to a depth of 20 cm. below surface. Metal artifacts, butchered bone, and chipped stone tools were recovered.

Geological Stratigraphy

- **Unit A:** Stream alluvium, characterized by coarse to fine gravels/sands.
- **Unit B:** Surface colluvium 50 cm. thick.

Soil Profile

Orthic chernozem (Ah, 10-20 cm. thick) presently degrading in the aspen grove area.

Cultural Stratigraphy

The site area had been utilized as an equipment dump in the early 1900's, and consequently artifacts associated with this activity are intermixed with trade goods and aboriginal tools in the first 10 cm.

- **Associated Artifacts:** Tables 6 - 9
- **Subsistence Activities:** Appendix IV
- **Site Type:** Campsite
- **Age:** ca. A.D. 1840-1870
- **Phase Association:** Aboriginal Historic Complex

DGPI-55

Excavations

Artifacts have been collected from the surface of DgPl-55 by local residents for many years. In 1967 potsherds were found eroding out of the cutbank and the site was excavated for a two week period to determine the nature and age
of the occupation upon it.

A 2 x 2 meter grid system was imposed on the site (Fig. 5, 24). Excavation was effected in two meter squares by trowel, shovel and screen. Artifactual material was not usually recovered in situ. The sod (ca. 0-5 cm. thick) was stripped separately from the underlying Ah/C soil horizons (5-15 cm.).

The first area, 'A', opened up along the edge of the cutbank, totaled 52 square meters. Ceramics were immediately encountered in the first square, along with aboriginal and historic White artifacts, mixed together. A second area, 'B', located 33 meters north of the initial excavation, was opened and excavated to determine the characteristics of the occupation in this area; a total of 30 square meters were excavated here.

Geological Stratigraphy

Channel fill deposits characterized by coarse gravels, boulders, and occasional sand lenses. Ten feet of these sediments are exposed in the cutbank. Many of the boulders are exposed on the surface.

Soil Profile

A very thin regosol, 15 cm. thick, developed upon the alluvium.

Cultural Stratigraphy

While the artifacts were found intermixed, they are easily separable into two groups. Vertical disturbance is not a factor of importance, although it has occurred, and some horizontal displacement has occurred by flooding and White activities in the area.

Level 1

Floor Characteristics: The floor is topographically irregular, characterized by a scattering of butchered bone, and occasional firebroken rock. The latter is small in size and very scarce, less than three dozen pieces being
recovered. An obsidian workshop area was found in 31N12E and 29N12E.

Features: Surface Hearths (3)
Small circular (diameter 40 cm.) hearths marked by a carbon stained area. Found in both excavation areas.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Campsite

Age: ca. A.D. 1500

Phase Association: Pass Creek Valley

Level 2

The Historic White occupations of the site, dating from ca. A.D. 1900.

DGPL-68

Excavation

DGPL-68 was located by shovel testing in 1967. A subsequent test (#1) was entered in the western perimeter of the terrace that year, and a few artifacts were recovered in the 10 cm. of colluvium which overlies the alluvial fan deposits. In 1969 the site was investigated for four weeks with an initial test (#2) entered 30 meters east of test 1. It revealed a similar set of stratigraphic units. In order to minimize the amount of fan deposits a third test (2SOW) was entered 60 meters east of test 2 in the area of the least possible fan deposition. Excavated in arbitrary 10 cm. levels by shovel and screen, it revealed the presence of three living floors contained within 40 cm. of colluvial deposits underlain by stream alluvium. The initial test was then enlarged, resulting in the eventual excavation of seven 2 x 2 meter squares in a 'T' configuration (Fig. 8, 25). The deposits were sampled by living floors using trowel, shovel and screen, with all cultural items recovered in situ being
plotted in. A stratigraphic test was also entered in 8S0W to a depth of 100 cm. in the underlying alluvium.

**Geological Stratigraphy** (Excavation area only)

**Unit A:** The culturally sterile underlying terrace alluvium consists of two members: fine sands and gravels, and a localized coarse channel fill, found at a depth of 20 cm. in 4S0W and adjacent portions of 6S0W and 4S2W. The latter consisted of coarse gravels, and boulders up to two feet in diameter and 200 pounds in weight.

**Unit B:** The cultural bearing surface colluvium (20-50 cm. thick) is composed of fine grained sediments and a moderate amount of blue argillite fragments.

**Soil Profile**

A brunisol was developed in the excavation area; L-F-H 5 cm., Ah 20 cm., and Bf 40 cm.

**Cultural Stratigraphy**

While considerable amount of disturbance, as evidenced by artifact and lithic type vertical distributions, has occurred in the upper 20 cm., three levels may be defined. Levels 2 and 3, separated by only 5-10 cm. are badly disturbed by rodent activity in 4S2W, 4S6W and 4S8W, and throughout the area by the lateral root systems of the large limber pines present on the site. The coarse channel fill has acted as a topographic high, resulting in severe compression of the overlying components.

**Level 1**

The lowest cultural level, occurring 5-10 cm. above the Unit A alluvium.

**Floor Characteristics:** The floor is poorly defined, characterized by the occasional rock (rarely firebroken) and a few artifacts. Firebroken rocks
range from 10-20 cm. in size. Bone is not preserved in this level.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Unknown

Site Type: Unknown

Age: ca. 2000 B.C.

Phase Association: Bellevue Hill

Level 2

This level is well defined horizontally, and occurs at a depth of 20-30 cm. at the base of the Ah horizon.

Floor Characteristics: Characterized by small firebroken rock, occasional anvil stones, butchered (and occasionally burned) bone, calcined bone and artifacts.

Features: In 4SOW firebroken rock and calcined and burned bone concentrated in a circular area, 60 cm. diameter, which may represent a badly disturbed surface hearth.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Kill/Camp

Age: ca. A.D. 500

Phase Association: Crandell Mountain

Level 3

Occurs at the base of the L-F-H horizon in the top of the Ah at a depth of 5-10 cm.

Floor Characteristics: Similar to Level 2. Much of the bone is burned on the upper surface only, suggesting it occurred as a result of a forest fire. Firebroken rock is finely divided and in 4SOW it had the following measurements (N=68):
Excavation

DGPL-75, located in 1967 when a small amount of butchered bone was found eroding out of a gopher hole, was tested in 1968 with a total of two 2 x 2 meter pits excavated by trowel to a depth of 20 cm. below surface (Fig. 10). The excavation uncovered a hearth, some bison bone and an end scraper. Testing terminated after two days work.

Geological Stratigraphy

Unit A: Underlying alluvial terrace fill, whose sediments vary from large boulders (1 meter in diameter) to fine sands and gravels.

Unit B: Surface colluvium, 30 cm. thick.

Soil Profile

Chernozem (15 cm. thick Ah) developed upon the colluvium.

Cultural Stratigraphy

One component occurring 10 cm. below surface.

Floor Characteristics and Features: Semi-circular (90 x 162 cm.), rock-filled surface hearth with scattered bison bones around it.
Associated Artifacts: One end scraper

Subsistence Activities: Appendix IV

Site Type: Transitory Campsite

Age: Middle Prehistoric (?)

Phase Association: Unknown

DGPI-85

Excavations

DGPI-85 was located in 1969 by random shovel testing. An initial 2 x 2 meter test placed near by, excavated in 10 cm. levels, revealed the presence of three living floors separated by sterile intervals. Over a four week period in summer 1969 a total of seven 2 x 2 meter pits were eventually excavated (Fig. 9) by horizontal stripping of the living floors, using trowel, shovel and screen.

Geological Stratigraphy

Unit A: The underlying stream terrace alluvium, characterized by coarse to fine gravels, sands, and silts. A coarse channel fill deposit, consisting of cobbles up to 30 pounds in weight, was found in 0S2W.

Unit B: Surface, fine grained, colluvium (25-40 cm. thick) derived by mass wasting of the moranic knob north of the site.

Soil Profile

While relatively little cultural data was recovered, three undisturbed living floors were spatially definable.

Floor Characteristics: Level III, the best defined of the floors, is characterized by a very sparse scatter of firebroken and unbroken rock (N=46), occasional bone and artifacts. In Level II 58 rocks were recovered, only a few of which were firebroken. Level I is characterized by a few widely scattered stones. The latter is the lightest of the three occupations.
Bone and charcoal is not present in the lower levels.

Features: Firebroken rock pile, 80 x 40 cm. in diameter, found in OS2W, Level 3 (N=50).

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Campsite

Age(s): Level 1 pre-5500 B.C.; Level 2 ca. 5500-1500 B.C.; Level 3 ca. A.D. 1380+40 (GX2194)

Phase Association: Level 1 - Red Rock Canyon or earlier
                   Level 2 - Bellevue Hill
                   Level 3 - Crandell Mountain

DGPI-86

Excavations

DGPI-86 was located in 1969 by shovel testing. Projected road widening would effect the site and tests were therefore initiated to determine the age and cultural affiliation of the components. Four 2 x 2 meter units (Fig. 7) were excavated to an average depth of 100 cm. in the colluvium, by trowel, shovel and screen over a four week period in 1969. A 1 x 1 meter test was extended 40 cm. into the underlying alluvium. Excavation was carried out in 10 cm. levels with the recording of all in situ data.

Geological Stratigraphy

Unit A: The culturally sterile underlying alluvial terrace fill is divisible into two members:

1. Fine sands and gravels of unknown thickness.

2. Fine yellow clay band (10 cm. thick) capping the underlying sediments. This layer contained charcoal and numerous fossil rodent burrows.
Unit B: The cultural bearing overlying colluvial deposits consisting of angular green/blue argillite fragments in a matrix of fine sediments derived from three source areas, a higher alluvial fan remnant north of the site surface, and lower alluvial fan remnants lying to the west and east of the site. While the colluvial deposits have primarily accumulated by mass wasting, the lower part of Unit B may be water lain alluvial fan sediments.

A few large fall rocks were encountered, the base of which lay at 60 cm. below surface. These represent a uniform period of rockfall, since they were not encountered at other levels in the excavated area.

Soil Profile

The present soil developed in the colluvial deposits may be classified as a degraded chernozem. Horizonation of the A/B/C is no longer distinct. The litter mat (L-F-H), 4-6 cm. thick, contains a burned zone. The AB horizon is 50 cm. thick, integrating into a BC horizon, 50 cm. thick.

Cultural Stratigraphy

While cultural materials are scattered throughout the profile, examination of the vertical distributions of cultural debris suggests the existence of at least four well defined floors at depths of 8-13 cm., 15-24 cm., 40-50 cm., and 90-100 cm. However, the association of diagnostic artifacts and lithic types with these floors cannot be established with a high degree of reliability because of the relatively small sample size and extensive rodent disturbance.

The latter feature is quite extensive throughout the deposits; for example, the western half of Level 2 in 2S2W was completely disturbed. The organic fill of the rodent holes in lower levels suggests this activity is relatively recent. Geological factors, such as the large fall rocks, probably also disturbed the lower components, as would the processes of sedimentation. Lateral
root systems would also disrupt the levels, particularly the latest. Evidence of this disturbance is seen in the distribution of projectile points; for example, the Timber Ridge Side Notched type (a Level 4 type) was recovered at depths ranging from 10 to 30 cm. In addition, obsidian hydration dates, which associate with Level 4 were derived from samples which were recovered from 10-50 cm. below surface.

**Level 1-3:**
These levels occur at depths of 90-100 cm., 40-50 cm., and ca. 20 cm. below surface.

**Floor Characteristics:** Occasional firebroken rock of large size, 10 cm. plus in Levels 1-2, slightly higher frequency in 3. A higher frequency of unbroken rock in Levels 1 and 2. Only molars and calcined bone are preserved in the lowest levels. Badly eroded elements are present in Level 3.

**Associated Artifacts:** Tables 6 - 9

**Subsistence Activities:** Appendix IV

**Site Type:** Kill/Camp (?)

**Ages:** Level 1 and 2 ca. 5500 B.C.; Level 3 ca. 1500 - 1000 B.C.

**Phase Associations:** Bellevue Hill - Levels 1 and 2
Blakiston Brook - Level 3

**Level 4:** Occurs immediately below the L-F-H horizon, in the A horizon, 8-13 cm. below surface.

**Floor Characteristics:** The floor, much similar to that in Levels 2 and 3 in DgPl-68, is characterized by scattered firebroken rock and comminuted bison bone. The firebroken rock in 2S2W is of a small size and has the following measurements (N=64):

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5.6555 cm.</td>
<td>1.801 cm.</td>
<td>4-10 cm.</td>
</tr>
<tr>
<td>Width</td>
<td>4.333 cm.</td>
<td>0.927 cm.</td>
<td>4-8 cm.</td>
</tr>
</tbody>
</table>
Features: No definite features noted; however, two areas of concentrated burned bison bone and firebroken rock about 68 cm. in diameter were uncovered in the northwest corner of 2S0W and northwest corner of 2S2W.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Kill/Camp

Age: ca. A.D. 700

Phase Association: Crandell Mountain

DGPl-148

Excavations

Artifacts had been found on the surface of DGPl-148 for many years. Since the site would be largely obliterated by any further widening of the present highway, excavations were carried out in 1967 to determine the site's function(s).

The area first selected for excavation, Area A (Fig. 6), was adjacent to a large argillite fall rock, with an initial test (A1) spotted on the northeast side of the rock. This initial test recovered an interesting group of materials from the Ah horizon, including a lynx skull, bone knapping tools, a stone ball and some retouched flakes. Excavations in this and subsequent units was effected by shovel and screen, excavating the L-F-H/Ah horizon, ca. 15 cm. thick, separately from the underlying B horizon (15-30 cm. thick). An additional four units were excavated adjacent to the rock, and tests placed to the east, Test D, a 1 x 2 meter pit, and across the highway, Test B, a 2 x 2 meter pit. In all units the cultural materials were concentrated in the A horizon, and only a few items were recovered from the underlying B horizon.

C.E. Eyman excavated around the base of a rock (Test F) on the edge of a terrace above the DGPl-148 site area. Here he recovered a ceremonially killed
ceramic vessel, bone fragments and chipped stone tools. In addition to excavated materials, chipped stone tools and a portion of a ceramic vessel were recovered from the rock outcrop to the south of the excavation area.

Geological Stratigraphy

Bed rock (Atlyn Formation) is exposed on the western edge of the DgPl-148 terrace. Above it lie two unconsolidated stratigraphic units.

Unit A: Coarse to fine Late Pleistocene alluvial gravels and sands. Thickness of the unit is unknown, but is probably less than one meter in the immediate excavation area.

Unit B: Sandy/gravelly colluvium accumulated through mass wasting of the terrace behind. In the excavation area the unit is 25-50 cm. thick.

Soil Profile

A grey chernozem, A horizon 10-20 cm. thick and B horizon 30 cm. thick.

Cultural Stratigraphy

Projectile points representing most valley subphases and complexes since ca. 3000 B.C. were found mixed together in the Ah horizon, thus precluding any possibility of establishing levels.

Floor Characteristics: While floors are not definable, the cultural deposit lacks firebroken or unbroken rock or butchered bone fragments. Debitage and broken arrow point fragments are very frequent.

Features: The concentration of items around the fall rock in the excavation area and Test F and the rock outcrop suggests some significance may have been attached to these rocks.

Associated Artifacts: Tables 6 – 9

Site Type: Overlook/Ceremonial

Age: ca. 5500 B.C. - A.D. 1840

Subsistence Activities: Appendix IV
Phase Association: All subphases except Red Rock Canyon and Valley Entrance.

DGPM-1

Excavations

Tests were undertaken between the wagon road and the terrace edge to determine if any occupation had occurred upon it, with an area of 12 square meters being excavated by trowel and screen to a depth of 15 cm. below surface.

Geological Stratigraphy

Unit A: Coarse gravel alluvial terrace fill.
Unit B: Surface colluvium, 15 cm. deep.

Soil Profile

A chernozemic soil profile is developed within the colluvium.

Cultural Stratigraphy

Depositional rates preclude the establishment of meaningful archaeological units for the site.

Floor Characteristics: None definable. No firebroken rock, occasional butchered bone.

Associated Artifacts: Tables 6 - 9

Site Type: Campsite

Age: ca. 2500 - 1500 B.C., A.D. 1200 - A.D. 1840

Phase Association: Bellevue Hill, Pass Creek Valley

DGPM-1

Excavations - Main Excavation Area

Artifacts have been found eroding out of trails and road cuts in the
DgPm-1 site area for over 50 years. In 1966 a small amount of cultural detritus was found eroding out of the Ah soil horizon in a freshly cut road bank. Since this area would be destroyed in any road widening, it was selected for excavation (initiated in May 1967, continued in August 1967 and completed in August 1968).

An initial series of tests (A, B, C, A1, B1, C1, G, J - totalling a 4.5 x 3 meter area - designated as XU A) was laid out adjacent to the cutbank (Fig. 15, Pl. 16a). The L-F-H and Ah horizons were first removed by trowel and screen, then the lower deposits were excavated in 15 cm. levels by shovel and screen. Small amounts of cultural material were found in the Ah horizon. Hearths present in this level were exceedingly hard to differentiate, as the surface had been burned in a recent forest fire, ca. A.D. 1860-70.

Excavation of the lower colluvial and alluvial deposits (BC soil horizon) recovered materials to a depth of 60 cm. Among the artifacts recovered were Agate Basin and Lerma points, indicating that archaeological components of considerable antiquity had been encountered. We decided then to carry out major excavations at the site to sample these early levels, since they would be among the earliest occupations in the Park. The site area was prepared for the subsequent excavations, and the crew moved onto other sites after the initial 10 day program.

Excavations were recommenced on August 15, beginning with the excavation of XU A to the surface of the underlying glacial till, 90 cm. below surface. Channel fill gravels, underlain by fine alluvium, were observed in the profile of the northeast corner of the unit at a depth of 45 cm. Although occasional gravels had been encountered in Unit A, the alluvial material had been altered by pedogenesis, and it was difficult to locate the colluvial/alluvial interface. The alluvium under the gravels was unaltered, and consequently we decided to
extend the excavations to the north, since stratigraphic control could be more easily maintained in this area.

XU's B and C (1/4 x 1/4 meters), located in the above area, were divided into south and north halves for excavation. The L-F-H and Ah-Ae soil horizons were first removed and screened, with recovery of a small amount of cultural items. Excavation of XU C terminated at the top of the gravel fill, 50 cm. below surface, as a shovel hole dug into this fill indicated that it was thickening rapidly eastward, and we felt our time could be more efficiently spent excavating units adjacent to the edge of the fill.

Excavation of XU B proceeded with the removal of the deposits to the top of the gravels at 45 cm. Included in the artifacts recovered were an Oxbow and two Pelican Lake Corner Notched points; these provided our first identification for the age and cultural association of the living floors in the colluvium. The south half of XU B was further divided into SW and SE (2 x 2 meter) quadrants, and excavated to the surface of the till at a depth of 140 cm. Above the till a contorted red clay band provided our first evidence for the existence of a cold climate during the earliest occupation of the site. The SW quadrant, excavated subsequently, produced, among other artifacts, the base of a Lusk point, adding to the characterization of the early level. The north half of XU B was also divided into quadrants, and only the northwest quadrant was excavated to the till at 140 cm. as the gravels, 40 cm. thick, were thickening rapidly to the north and east. In the quadrant and in the northern portion of B - SW, a second gravel layer was encountered just above the eroded till surface. The surface of the latter was contained by a number of large, striated, partially-exposed boulders.

XU D, excavated prior to XU B - NW, was also divided into north and south halves for excavation. The south half was removed first, and till was encoun-
tered at 110 cm. Channel fill was restricted to the northeast quarter. Among the artifacts recovered was a percussion blade (Pl. 297) found in situ at 122 cm., only 15 cm. above the eroded till surface. The site was completely back-filled by the Park Service after completion of the 1967 season.

Excavations in August 1968 were directed towards obtaining additional materials for radiocarbon dating, as our sample from the previous year proved too small. An excavation area (XU's E and F) adjacent to XU D was selected, as here we felt we could maintain both stratigraphic control and avoid the thick channel fill. The surface deposits were cleaned off to 15 cm. below ground surface, as they had been destroyed by the National Park Service during back-filling operations of the previous years units. Excavation unit E (2 x 1 meters), located west of XU D, was taken down in arbitrary 20 cm. levels to the surface of the alluvial unit. The latter was trowelled for charcoal fragments, at which time a number of flakes, the base of an Agate Basin point and a Scots-bluff point were encountered at a depth of 100 cm. The till rose sharply in the northwest corner of the unit, indicating that we were approaching the sides of the fossil channel.

Excavation unit F was excavated in a similar manner. Here the channel fill, encountered only in the northeastern corner, lay some 45 cm. below the surface. The eroded till, encountered at 120 cm. below the surface, dipped steeply towards the southeast. Our efforts to obtain a charcoal sample met with success with the collection of a large sample from a basin shaped hearth located in the middle of the pit at a depth of 120 cm.
Test Excavations

A series of tests (D-L) were placed at various distances (Fig. 15) from the main excavation area in order to obtain additional information on the cultural and geological history of the site.

Test D: A two meter unit, located 10 meters north of the main excavation area, was excavated by shovel and screen to the surface of the channel fill, encountered at a depth of 25-35 cm. below the surface. A small amount of cultural materials were recovered. Later a one meter area of the square was dug by shovel to a depth of 40 cm. in the channel fill in an unsuccessful attempt to determine the thickness of the latter.

Test E: a 2 x 1 meter unit, located 10 meters east of the excavation area. The L-F-H and Ah soil horizons were troweled and screened, producing a few flakes and bone fragments. The underlying BC soil horizon was excavated to a depth of 20 cm. below the surface; one flake was recovered. The test terminated at this level.

Test F: a one meter square unit, located 10 meters northwest of the excavation area, where a partially-exposed bison skull was found. The unit, taken down by trowel and screen through a seven centimeter thick L-F-H horizon to a depth of 15 cm. below surface, produced one piece of long bone. Subsequently the unit was dug by shovel, but not screened, to a depth of 130 cm. Channel fill was encountered at a depth of 27 cm.

Test H: a 2 x 2 meter unit, located 50 meters east of the main excavation area on the slope of the DgPm-1 terrace, where bone had been found eroding out of a bulldozer cut the previous year. The test, taken by trowel/screen to a depth of 30 cm., produced a semi-articulated vertebral column.

Test I: a 2 x 2 meter unit located 40 meters north of the main excavation area. The pit was trowelled and screened to a depth of 40 cm. A Pelican Lake
Corner Notched point and some flakage was recovered 10 cm. below the ground surface at the base of the Ah horizon. The B/C soil horizon, developed in colluvium, was shovelled and screened to the surface of the underlying gravels.

Test K: a 1.5 square meter unit located 100 meters north of the main excavation area at the extreme northern end of the DgPm-1 alluvial fan terrace. The test, dug by trowel and screen to a depth of 20 cm., produced one flake at a depth of 10 cm. in the Ah horizon. The A/B soil horizon was further shovelled to a depth of 40 cm.

Test L: a 2 x 2 meter unit located 60 meters west of the main excavation area. The pit, excavated by shovel and screen, produced no cultural materials from the 15 cm. thick Ah horizon. Heavy lag gravels resting on till were encountered 10 cm. below.

Geological Stratigraphy and Soils (Fig. 26, P1. 16b)

The following discussion of geological strata and processes relates only to the excavation area and certain tests, and should not be considered applicable to the site as a whole.

Unit A: Till, deposited as a hummocky ice disintegration moraine during the Red Rock Canyon valley glaciation, forms the basal, culturally-sterile deposits. The light buff oxidized sediment (10Y/R/6/4) is characterized by a fine clay/silt/sand matrix containing small to large striated pebbles and boulders. It is not particularly stoney in the excavation area. In areas where the gravel channel fill was absent above, it was extremely difficult to locate the till/alluvial contact during excavation, as both units had been altered by pedogenesis.

The till, presenting an eroded topography with large boulders often partially eroded out of the matrix (Fig. 26), dipping from west to east and south to north in the excavation area, exhibits a concave profile. The overlying
unit - B - increased in thickness in this direction. On adjacent high points (eroded glacial hummocks) east and west of the excavation area the till comes to within 20 cm. of the surface.

Unit B: Alluvium, containing the earliest cultural level and characterized by horizontally bedded gravels/sand/silts/clay, overlies the eroded till surface. The unit thickens to the east and north, exhibiting a convexo-plano cross section. It was deposited as channel fill in a fossil channel of the Red Rock Canyon Alluvial Fan.

Two members may be differentiated: 1) interbedded sand/silt/clays up to 100 cm. thick, containing scattered gravels which underlie and integrate laterally with 2) coarse gravels up to 50 cm. thick which thicken markedly to the north and east as one approaches the center of the fossil channel. The gravel fill is absent in the south and western areas of the excavation. A second gravel member, lying 10 cm. above the till, was found in the southwest and northwest quadrants of XU B, and a contorted red clay band was observed 15 cm. above the eroded till in the north wall of the southeast corner of XU B (Pl. 16b). The character of the latter feature suggests the existence of a frost climate contemporaneous with the Unit B depositional interval. An undisturbed hearth found in these deposits suggests that this channel was only seasonally occupied by waters, probably during periods of peak runoff in the mid-summer.

The fine fractions which serve as the subsurface discharge channel for ground water in the area of Unit B, where they are not capped by the coarse gravel member, have been altered by pedogenesis, making it extremely difficult during excavation to locate the contact with the overlying colluvium.

Unit C: Surface colluvium, ca. 40-50 cm. thick, consists of a sand/silt/clay and red/green argillite matrix in which is developed buried and modern forest-podzolic and grassland-chernozemic soils. In the grassland area (SW area
of the excavation) a chernozemic profile (Ah 10 cm. thick) is present, containing a buried Ah horizon 20 cm. below surface. However, a buried Ae was not found in the podzolic forested area. Here a charcoal horizon of natural origin, containing pockets of ash and underlain by burned soil, was encountered 15 cm. below the surface. Discontinuous charcoal lenses, probably of cultural origin, occur below this level.

Pebble orientation studies indicate the primary source of colluvial deposition was the northwest. The material was probably moved in by slope wash during intervals of high precipitation and surface runoff. Soil creep from the glacial hillock to the west also aided in its accumulation. The excavated area, a local topographic depression, would serve as a catchment basin for materials during times of surface runoff.

A gradual change in size fraction occurs in the colluvium, with a gradual decrease in the coarse fractions towards the surface. This decrease in rock content may reflect a change in depositional rates as a result of either decreased surface runoff or precipitation, or the approachment of grade on the surface. Changes in the vegetation and soils on the site may also have affected it. The presence of a buried Ah horizon in the grassland area suggests that the surface had been stable at some period in the past.

**Cultural Stratigraphy**

Cultural materials were found throughout the geological and pedological profile from the alluvium (Unit B) to the Ah/Ae soil horizon. However, three archaeological units (levels), correlating in part with the depositional and pedological units, may be defined.

The levels, as defined below, vary in the degree of disturbance they have undergone. Burrowing rodent activity is very limited, being restricted to the colluvium in the grassland area. The coniferous tap root systems, however, have probably disturbed the floors considerably with the growth of successive stands
on the site's surface. Cryturbation of the early deposits would also result in vertical and horizontal displacement of the artifacts, as would slope wash on the surface of the colluvial Unit B. There is no evidence of water rolling of the artifacts in Level 1. Aboriginal activities would also have disturbed the components in Unit C, since the latter has been accumulating over the past 7500 - 8000 years.

The primary displacement seems to have been downward movement of small artifacts, primarily resharpening flakes. One group, struck off the same bi-face, appears at depths of 15 cm., 30 cm., and 45 cm. below surface.

**Level 1:** Level 1 is located in the alluvial channel fill, primarily within the fine sand/silt/clay member of Unit B. Since the alluvium varies in thickness and lacks a gravel cap in many areas, it was occasionally mixed with the overlying colluvium. Artifacts were recovered at various levels in the alluvial sediments. However, the great majority of material and the hearth were found 10-20 cm. above the till. The character of the alluvium would suggest that while more than one living floor may be present, it accumulated in a relatively short time and we may, therefore, consider it as a single archaeological level.

**Floor Characteristics:** Characterized by widely scattered tools and flakage, and occasional charcoal flecks. Firebroken rock, unbroken rock and bone detritus are all absent in this level. The latter has been flushed from the profile as a result of pedogenesis.

**Features:** *Excavated Basin-Shaped Earth-Filled Hearth*

**Provenience:** XU F, center of unit; depth 100 cm.

**Form:** Circular excavated basin, 30 cm. diameter, 20 cm. deep, with charcoal stained earth fill. Three small post molds - 10 cm. in diameter, 20 cm. deep, with pointed cross sections - were spaced evenly around the hearth,
20 cm. from the rim. Possibly represents a wooden tripod.

**Associated Artifacts:** Tables 6 - 9

**Subsistence Activities:** Appendix IV

**Site Type:** Campsite

**Age:** 6270 B.C. ± 260 (GX1435)

**Phase Association:** Red Rock Canyon

**Level 2:** Consists of those artifactual materials and cultural debris found in Unit C (colluvium), 40-50 cm. thick, below the Ah/Ae soil horizon. Two types of projectile points recovered in stratigraphic super-position in levels 10-25 and 25-40 cm. in XU B indicate the existence of at least two discrete archaeological components, designated herein as 2A and 2B.

**Level 2A:**

**Floor Characteristics:** Characterized by a few scattered artifacts, charcoal flecks (not necessarily cultural), occasional burned bone, and rare firebroken rocks.

**Associated Artifacts:** Tables 6 - 9

**Subsistence Activities:** Appendix IV

**Site Type:** Campsite

**Age:** ca. 5500 - 1500 B.C.

**Phase Association:** Bellevue Hill

**Level 2B:**

**Floor Characteristics:** Characterized by scattered artifacts, charcoal flecks, ash, burned soil (not necessarily cultural), firebroken rock and bone. Less than 50 firebroken rocks recovered from both levels, size 5-15 cm.

**Features:** Surface Hearth (?)

**Provenience:** XU B, south half; depth 20 cm.

**Form:** Circular (40 x 45 cm.) area containing ash, charcoal, burned earth, firebroken rock. May be natural.
Site Type: Campsite

Age: ca. 1000 B.C. - A.D. 500

Phase Association: Blue Slate Canyon

Level 3: Floor located in the Ah/Ae horizon, 2-10 cm. below the base of the L-F-H.

Floor Characteristics: Light scatter of artifacts, firebroken rock, less than 5 cm. in size (N=less than 50), burned (on upper surface only), and unburned bone. Charcoal and burned earth quite frequent, probably result of forest fires.

Features: Surface Hearth

Provenience: XU A, Test B; depth 10 cm.

Form: Circular area (1.5 x 1.2 m.), characterized by ash, charcoal, burned and unburned bone, burned earth, and small firebroken rocks.

Excavations

DgPm-1, located in 1966 when butchered bison bone was found exposed in a horse trail, was test excavated for a two week period in May-June 1967. A point fragment, flakage and firebroken rock were found at a depth of 10 cm. below surface in the initial test 'A', a 2 x 2 meter square (Fig. 14). A
total of eight tests were eventually entered at various locations and excavated by trowel and one-eighth inch mesh screen to the underlying alluvium.

**Geological Stratigraphy**

Unit A: Underlying alluvial channel fill, grading from coarse to fine sands and gravels, occur at a depth of 15-25 cm. below surface. The fine sands and gravels are discontinuous. In some areas gravel mounds appear on the surface.

Unit B: Surface organic/colluvial accumulation, 15 cm. thick.

**Soil Profile**

Weak regosol (Ah, four cm. thick) developed on Unit B.

**Cultural Stratigraphy**

At least two aboriginal components are present, one defined by the glass beads (Level 2) and the other by the chipped stone artifacts (Level 1).

**Floor Characteristics:** The floors in the scattered excavation units are characterized by very few artifacts, occasional bone fragments and firebroken rock (less than 30 for the total excavation area). The firebroken rock is small in size, averaging five cm. in length.

Associated Artifacts: Tables 6 - 9

Subsistence Activities: Appendix IV

Site Type: Campsite

Age: ca. A.D. 1700 - 1870

Phase Association: Pass Creek Valley, Historic Aboriginal Complex

DGPM-5

Excavations

DGPM-5 was located in 1966 when a small amount of bone was found eroding
out of the horse trail across the site surface. Two days were spent testing the site (Fig. 13) in 1968, with a total of eight square meters excavated to the underlying alluvium, encountered at a depth of 10 cm. below surface.

Geological Stratigraphy and Soils

Deposits on the site surface consist of coarse alluvium of similar character as the terrace fill at DgPm-4. The surface of the site presents a hummocky appearance in the northwestern edge, characteristic of gravel bars in an alluviating channel. The southeastern surface of the site is flat, and a higher terrace remnant lies to the southwest. Developed on the coarse alluvium, boulders of which extend to the surface, is a thin regosol, 15 cm. thick.

Cultural Stratigraphy

Both chipped stone tools (N=1), recent White artifacts, and occasional bone scrap were found intermixed in the regosol.

Associated Artifacts: one leather strap, one Plains Triangular point

Site Type: Transitory Campsite

Age: ca. A.D. 1700

Phase Association: Pass Creek Valley
A phase is defined as "an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived whether the same or other cultures" (Willey and Phillips 1958: 72). The smaller spatial unit - subphase - is used herein, as Waterton would be only part of the total area exploited by any one culture.

Phases are time/space "cultural configuration" units relatable to cultural traditions. The latter are defined as "persistant temporal configurations in a number of cultural systems which interact to produce an archaeological unit distinct from all others conceived on the same criteria" (Reeves 1970a: 22-23). They serve to articulate phases into ongoing space/time cultural continuums.

The cultural configurations consist of data sets relating primarily to the resource utilization systems of prehistoric hunting cultures - technology, tools, waste, and inferred behavior relating to the killing, butchering and processing of animals and the manipulation of their usable biproducts. These exhibit a certain configuration which is unique in the integration of its elements and changes through time in response to a number of internal and external cultural and environmental stimuli.

The classificatory term complex is used for components which cannot be related on the basis of the present data to the cultural traditions established for the area. For example, the Historic aboriginal occupations at DgPm-4, DgP1-42 and 51 cannot be related to each other, or to the cultural tradition represented in the latest prehistoric phase, hence remain as a complex.

The archaeological components are integrated into six subphases - Red Rock Canyon, Valley Entrance, Bellevue Hill, Blakiston Brook, Blue Slate Can-
yon, Crandell Mountain and Pass Creek Valley - and three complexes - Besant, Waterton River, and Historic Aboriginal. These are based primarily on the study of the differential temporal frequencies of the artifact types, utilizing comparisons across components aligned chronologically on the basis of relative stratigraphic position, artifact content and radiocarbon and obsidian hydration dating.

A number of factors - site specificity, time, and disturbance - affect the phase constructs. The sites in Pass Creek Valley represent only a part of the total extant cultural pattern for any one particular culture. Consequently the artifact assemblage is not representative of the total range of variation which exists for any one subphase. Further, the sites do not all represent the same subsistence/settlement type. DgPm-1/Level 1, for example, a small seasonal campsite, is the only site sample for the Red Rock Canyon Subphase. In contrast, the Pass Creek Valley Subphase includes a winter campsite (DgPl-55), two kill/campsites (DgPl-1/Level 2B and DgPl-68/Level 3), and a spring-fall campsite (DgPm-1/Level 3).

The differential preservation of land surfaces of varying ages affects the sample size available for any one subphase. The earliest subphase, Red Rock Canyon, is based on one component, while the latest subphase, Pass Creek Valley, is based on seven components.

Disturbance of the components affects the definition of the subphases by mixing of discrete artifact assemblages. In most instances the mixed components can be separated on the basis of distinct artifact and lithic types. DgPl-148 and 149 are sites with totally compressed stratigraphy, and their artifact content cannot be used in subphase definition(s).

In summary, the above factors affect the content and comparability of the subphases defined in the following section. Blue Slate Canyon and Bellevue Hill are best defined, followed by Pass Creek Valley, Crandell Mountain, Red
PHASE SUMMARIES

RED ROCK CANYON SUBPHASE (Fig. 4, 28)

Component Sample: N=1

Temporal Duration: 7000 - 6000 B.C.

Technological System:

- **Projectile Points**: Agate Basin, Lusk, Lerma, and Scotsbluff
- **Bifaces**: Stemmed and asymmetric ovate
- **End Scrapers**: Type 19 - Large oval form
- **Side Scrapers**: Only broken forms present
- **Drills/Perforators**: Absent in sample
- **Burins**: N=1
- **Graver/Cutters**: Type 10, 11, 13, 14, 15, 20. Notched forms most common
- **Pieces Esquillees**: Absent in Sample
- **Marginal Retouch**: Limited number of forms present. Flaking well controlled and similar to that in Bellevue Hill.

Large Cutting and Scraping Tools: Cobble chopper and decortication flake tools (infrequent in sample).

Ground Stone: Edge ground cobble, incised pebble and quartz crystal

Flake/Core Technology: While no cores were recovered, two distinct technologies are used in this subphase: 1) the production of prismatic blades from conical, unidirectional cores by hard hammer percussion, perhaps using edge ground cobble hammerstones, and 2) the production of parallel sided to expanding triangular flakes by soft ham-
mer percussion from unidirectional conical cores.

**Lithic Utilization Patterns:** The pattern is characterized by the use of both cryptocrystalline and microcrystalline materials. Avon Chert is a common type, as is cream chert. Basalt and obsidian also occur.

**Internal Settlement Pattern:** Firebroken rock absent. An excavated, basin-shaped, earth-filled hearth is associated.

**Resource and Land Utilization Patterns:** Generally unknown. DgPm-1 represents a spring-fall hunting camp. Presence of bison teeth indicates such animals were exploited.

**Environment:** Boreal II - Atlantic I. Time of last valley glaciation, the Lone Creek Advance, ca. 6500 - 6000 B.C. Climate considerably different than present; lower annual mean temperatures, increased precipitation values.

**VALLEY ENTRANCE SUBPHASE** (Fig. 4, 28)

**Component Sample:** N=1

**Temporal Duration:** 6000 - 5500 B.C.

**Technological System:**

- **Projectile Points:** Lusk
- **Bifaces:** No determinate associations
- **End Scrapers:** No determinate associations
- **Side Scrapers:** No determinate associations
- **Drill/Perforators:** No determinate associations
- **Burins:** No determinate associations
- **Gravers/Cutters:** No determinate associations
- **Pieces Esquillees:** No determinate associations
- **Marginal Retouch:** No determinate associations
- **Large Cutting and Scraping Tools:** No determinate associations
Ground Stone: No determinate associations

Flake/Core Technology: No determinate associations

Lithic Utilization Patterns: Indeterminate. Avon Chert present

Internal Settlement Pattern: Insufficient sample

Resource and Land Utilization Patterns: Unknown. Probably same as in subsequent phases.

Environment: Atlantic I - II. Return to climatic conditions similar to today.

BELLEVUE HILL SUBPHASE (Fig. 4, 29)

Component Sample: N=5

Temporal Duration: 5500 - 1500 B.C.

Technological System:

Projectile Points: Bitterroot Side Notched and Salmon River Side Notched characteristic. Oxbow, McKean, Besant, Pass Creek Valley Corner Notched, Pelican Lake Corner Notched, Ground Argillite, Irregular Stemmed and preforms also present.

Bifaces: Symmetric ovate, asymmetric ovate-convex base, asymmetric ovate-straight base, and oval

End Scrapers: Types 02, 05, 08, 11, 12, 16, and 19 cryptocrystalline forms and Types 20 to 22 microcrystalline forms. Dorsally retouched forms relatively frequent. Produced on rectangular or triangular blanks. Convex lateral edge forms are infrequent.

Side Scrapers: Types 03, 05, 07, 09. Green argillite rectangular, notched, flake and concave end.

Drills/Perforators: Types 03, 06, and 07. Side notched drill, triangular and irregular flake butt perforators.

Burins: N=4

Pieces Esquillees: Core, Type 21

Marginal Retouch: Variety of forms present. Retouching well controlled and tends to leave larger flake scars than later phases.

Large Cutting and Scraping Tools: Cobble choppers, decortication and block flake tools are very common. Flake choppers and cortex scrapers present.

Ground Stone Tools: Hammerstones, anvil stones, anvil stone edge ground cobble, slab abraders, rubbing stones, sawed stone, and a galena fragment

Bone Tools: Flakers

Flake/Core Technology: Both soft and hard hammer productive modes are used to remove parallel sided or expanding triangular flakes with faceted or unfaceted platforms from polymorphic, acute angle bifacial block cores. One particular triangular flake form is phase-exclusive. Unidirectional conical cores may have also been used.

Lithic Utilization Patterns: The subphase contains a large variety of cryptocrystalline materials. Avon Chert and yellow dendritic chert is common. A brown chert is phase-exclusive. Blue chert and obsidian are infrequent.

Microcrystalline materials are extensively utilized for the fabrication of a wide variety of large and small tools, and I propose the nomin, the Grinnell Technology, for this pattern. Large tools, cobble choppers, decortication flakes, flakes, etc., are fabricated by soft hammer percussion from large argillite cobbles. The small tools - projectile points, bifaces, and scrapers, side scrapers, etc., manufactured on prepared flakes derived from small polymorphic block cores by
either soft or hard hammer percussion. Other microcrystalline materials, quartzites and dolomites, are also used, and one may expect that in other geographic areas these lithic types, or others such as basalt, would be characteristic of the Grinnell Technology.

The Red Rock Canyon Subphase is also characterized by a high utilization frequency of microcrystalline materials for the production of small tools. However, the productive technology seems to be different; once larger samples are available it may be included within the Grinnell Technology.

**Internal Settlement Patterns:** Floors are characterized by scattered large rocks, and contain very little firebroken rock. The latter range ca. 10 cm. in diameter. Stone platform hearths may associate.

**Resource and Land Utilization Patterns:** Late-fall to early-winter kill camps [DgPl-1 (?)], spring-fall hunting camps (DgPm-1), and small camps (DgPl-85) in lower Pass Creek Valley. Utilization of the high life zones in summer months is indicated from other sites in Waterton. Basic prehistoric land and resource utilization patterns probably established by this time. Bison and sheep are exploited.

**Environment:** Atlantic II – IV, Sub Boreal I. Atlantic II – IV sees changes in precipitation patterns and mean temperature towards the xerothermic maximum reached during Atlantic III, with return to present day conditions in Atlantic IV and to colder, higher precipitation values evidenced by the first of the Neoglacial advances, Twin Creek Advance, ca. 3000 B.C. Sub Boreal I sees return towards present day conditions.

**BLAKISTON BROOK SUBPHASE** (Fig. 4, 30)

**Component Sample:** N=1

**Temporal Duration:** 1500 – 1000 B.C.
Technological System:

**Projectile Points:** Side notched obtuse shouldered forms, flake atlatl, Hanna Corner Notched and Hanna Stemmed

**Bifaces:** Corner notched

**End Scrapers:** Types 12, 17. Rectangular, partially dorsally retouched forms.

**Side Scrapers:** Absent in sample

**Drills/Perforators:** Absent in sample

**Graver/Cutters:** Natural point form

**Pieces Esquillees:** Absent in sample

**Marginal Retouch:** Inadequate sample

**Large Cutting and Scraping Tools:** Cobble choppers and block flake tools

**Ground Stone:** Absent in sample

**Bone Tools:** Absent in sample

**Flake/Core Technology:** Insufficient sample

**Lithic Utilization Patterns:** Very small sample, represented by 11 varieties in a sample of 17. Avon Chert is most frequent.

**Internal Settlement Pattern:** Insufficient sample

**Resource and Land Utilization Patterns:** Generally unknown. Probably same as in other subphases.

**Environment:** Sub Boreal II. Beginning of climatic deterioration which culminates in the following Sub Atlantic episode.

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**BLUE SLATE CANYON SUBPHASE (Fig. 4, 30)**

**Component Sample:** N=4

**Temporal Duration:** 1000 B.C. - A.D. 400

**Technological System:**

**Projectile Points:** Pelican Lake Corner Notched are characteristic.
A variety of obtuse shouldered side notched forms also associate, as does Hanna Corner Notched and Nubin Stemmed.

**Bifaces:** Corner Notched, rectangular bifaces made on flat pebbles, triangular bifaces, asymmetric ovate and oval bifaces.

**End Scrapers:** Types 01, 04, 08, 09, 14. Dorsally unretouched forms most common. Scraper blanks are generally rectangular or triangular in form.

**Side Scrapers:** Pointed unifaces. Rectangular, domed, oval and concave end side scrapers. Former two types most common.

**Drills/Perforators:** Reworked projectile points (Type 01, 02) and side notched (Type 03).

**Pieces Esquillees:** Core types

**Marginal Retouched:** A variety of forms present. Retouch pattern often produces a serrated edge. Pointed unifacial flakes characteristic.

**Flake/Core Technology:** A lateral core rejuvenation flake suggests one core type utilized was a polymorphic acute angles "conical" core. The external striking angles on the secondary soft hammer flakes suggest that acute angle polymorphic bifacial cores were also utilized (cf. Mulloy and Steige 1967: 191-192 for the description of a Pelican Lake Phase assemblage which contains both bifacial and polyhedral cores). The use of unidirectional conical cores and perhaps the punch technique is suggested by flake type 09.

There seems to be no particular preference for producing parallel sided or expanding triangular flake forms. A considerable size range is exhibited, possibly reflecting a bifacial core technique in which the cores were reduced to a very small size before being considered exhausted. Plain platforms and hard hammer flakes are very uncommon. While not associatable with the Blue Slate Canyon Subphase, the DgPl-26
specimen may be representative of the type of flakes brought from the Avon quarry and subsequently used as cores. The DgPl-76 hard hammer flakes may represent Blue Slate Canyon - Avon Chert quarry blanks.

**Lithic Utilization Patterns:** The lithic assemblage is characterized by the extensive use of Avon Chert and related varieties. A suite of varieties found associated occurs only in this subphase. White, grey, black, brown and yellow cherts, particularly the pebble varieties, are very infrequent. Obsidian is rare but more frequent than in the earlier Bellevue Hill Subphase. Microcrystalline argillites are uncommon and relate to the production of heavy duty or spall tools. Non local quartzites are absent.

**Internal Settlement Pattern:** Activity areas distinguishable in DgPl-42. Firebroken rock more frequent than earlier phases. It is larger than in the later phases, ca. 10 cm. diameter. Rockfilled surface hearths ca. one meter diameter, surface hearths ca. 50-60 cm. diameter, rock ringed surface hearth, and excavated saucer-shaped slab-lined, rockfilled hearth, 1.3 m. diameter, are characteristic.

**Resource and Land Utilization Patterns:** Fall/early-winter kill/camps, and late winter-early spring, (DgPl-42) and spring-fall hunting camps (DgPm-1) occur. Higher life zones probably exploited, although sites in cirque basins could not be occupied during part of this subphase. Bison, deer, and sheep exploited.

**Environment:** Sub Boreal III - Sub Atlantic and early part of Scandic. Continuation of climatic deterioration beginning in Sub Boreal II culminates in the regeneration of the Alpine cirque glaciers in the Sub Atlantic Twin Lake Advance. Early Scandic sees return to modern conditions.
CRANDELL MOUNTAIN SUBPHASE (Fig. 4, 31)

Component Sample: N=5

Temporal Duration: A.D. 400 - A.D. 1200

Technological System:


Bifaces: Asymmetric ovate

End Scrapers: Two types associate, Type 10 and 13, produced on square or triangular flake blanks. Dorsally finished forms absent.

Side Scrapers: Type 01, pointed uniface

Drills/Perforators: Absent in sample

Graver/Cutters: Types 17, 18, and 19

Pieces Esquillees: Absent in sample

Marginal Retouch: Limited number of forms present. Distal end retouching and utilization common. Retouching is very minute.

Ground Stone: Shaft smoother

Bone Tools: Biface handles, splinter awls, spatulas and flakers

Ceramics: Absent in sample

Flake/Core Technology: Technology characterized by the removal of parallel sided prismatic lamellar flakes by hard hammer or punch from unidirectional 90° angle, "conical" blake-like cores. These are reduced to a very small size with result that the flake assemblages range into the microlithic. Truncated blades are lacking and the technology, therefore, cannot be characterized as a microblade technology. Hard and soft hammer percussion was also utilized, although infrequently. Expanding triangular flakes are present but uncommon. The presence of a large secondary Avon Chert flake blank in DgPL-86/Level 4 is sugges-
tive of the technique employed at the quarries to obtain large "blades" for later working.

**Lithic Utilization Patterns:** A distinctive group of cryptocrystalline materials occur - blue cherts and chalcedonies and translucent grey chalcedony. Avon Chert, Knife River Flint and obsidian are relatively frequent. Black chert is uncommon. Microcrystalline lithics are infrequent and primarily associate with heavy duty butchering tools. Non local quartzites are absent.

**Internal Settlement Pattern:** Firebroken rock of a small size, ca. five cm. diameter, is abundant. No definite hearths were found. Areas of concentration of firebroken rock and bone (burned and calcined) suggest some type of rockfilled surface hearth was utilized, ca. 60 cm. diameter.

**Resource and Land Utilization Patterns:** Fall/winter kill camps and associated communal bison drives (DgPl-42, 68, 86) in the lower valley, summer alpine hunting camps (DgPm-17) in the cirque basins.

**Environment:** End of Scandic, beginning of Neo-Atlantic. Scandic slightly drier than today, Neo-Atlantic sees regeneration of Alpine glaciers in the second (Lost Lake I) to the last of the Neoglacial advances.

**PASS CREEK VALLEY SUBPHASE** (Fig. 4, 32)

**Component Sample:** N=8

**Temporal Duration:** A.D. 1200 - A.D. 1800

**Technological System:**

**Projectile Points:** Plains Triangular and Plains Side Notched characteristic. Catan, Prairie Side Notched and Flake Arrow Points are also present.

**Bifaces:** Characteristic biface form is asymmetrical triangular. Also present are asymmetric ovate bipoint and asymmetric ovate-straight base.
End Scrapers: Types 06, 07, 09, 10, 15, 17, 18, 19. Both dorsally retouched and dorsally unretouched forms present. Tendency for forms to be more convex than parallel sided in formal outline. Split chert pebbles are frequently used as the flake blank.

Side Scrapers: Split pebble side scrapers

Drills: Oval butt

Graver/Cutters: A variety of naturally pointed (Types 12, 14, 17), worked gravers (Types 16, 18) and snapped flakes (Type 19, 20).

Pieces Esquillees: Core (Type 21) and split pebble types (Type 22).

Marginal Retouch: Low frequency of a limited variety of forms.

Large Cutting and Scraping Tools: Low frequency of cobble choppers and decortication, spall, and block flake tools.

Ground Stone: Steatite pipe fragments and drilled dolomite bead.

Bone Tools: A variety of forms, bone side scrapers, knives, cut bone, biface handles, splinter awls, spinal awls, spatulas, and flakers. A shell bead or pendant blank from DgPl-55.

Ceramics: Cord and Check Stamped

Flake/Core Technology: The Bundle Technology is formally proposed herein as the nomina for the characteristic technology found in the Pass Creek Valley Subphase and in other age equivalent Late Late Prehistoric components on the adjacent plains. It is characterized by, 1) the extensive use of small chert pebbles of a variety of lithic types, particularly black chert, for the production of a wide variety of tool types - projectile points, end scrapers, split pebble end scrapers, bifaces, side scrapers, drills, and pieces esquillees, and 2) the production of parallel sided, straight edged microlithic flakes from high angle unidirectional cores by the bipolar technique utilizing solid pebble anvils and hard hammer percussion. Expanding triangular
hard and soft hammer flakes are also present. The latter technique is very infrequent. Prepared unidirectional cores and the punch technique also occur.

**Lithic Utilization Pattern:** The lithic assemblage is characterized by the use of a limited number of varieties of cryptocrystalline silicates, primarily black, brown, white, grey, yellow, white opaque, and HC type materials derived from small chert and chalcedony pebbles. The white varieties are the most common. Avon Chert occurs in low frequencies, obsidian is common and petrified wood occurs only in this subphase. Microcrystalline materials are infrequent and associate with the production of heavy duty butchering tools. Non local quartzites are absent.

**Internal Settlement Pattern:** Firebroken rock (small size) is very uncommon in campsites. Hearth types include surface hearths ca. 40 cm. to one meter in diameter, a rock filled surface hearth with ca. 90 cm. diameter, and rock ringed hearths ca. 50-100 cm. in diameter.

**Resource and Land Utilization Patterns:** The general prehistoric pattern is best expressed in this subphase. Fall/early winter (DgP1-55), fall/early and late winter/early spring kill/camps (DgP1-42), spring to fall hunting camps, (DgPm-1), transitory camps and summer hunting alpine camps. Bison, deer and sheep are hunted.

**Environment:** Terminal Neo Atlantic, Pacific I and II, and Neo Boreal. Lost Lake I cirque advance occurs in Neo Atlantic and Lost Lake II in the Neo Boreal. Climate essentially modern with minor fluctuations.

**ABORIGINAL HISTORIC COMPLEX (Fig. 4, 33)**

**Component Sample:** N=3

**Temporal Duration:** A.D. 1840 - A.D. 1870
Technological System:

A. Aboriginal

1. Chipped Stone: No positive associations can be established.

2. Bone and Shell Tools: Bone knives, cut bone, and a shell disk bead.

B. Caucasian: Items of Caucasian origin consist of glass trade beads, barrell hooping (presumably used for manufacturing metal arrow points), a bracelet and possibly some tin can fragments.

Resource and Land Utilization Patterns: Small transitory occupations in the valley, some relating to travel (DgPm-4) over the pass, others to subsistence and fur hunting (DgPl-51). Loss of bison herds, collapse of native subsistence/settlement systems occurs in this interval.

Environment: Modern

PHASE COMPARISONS

External comparisons may be profitably made to excavated data from two adjacent areas - the Rocky Mountains and the Plains. Data is generally lacking for the intermontane valley areas of Montana and the Rocky Mountain Trench to the west. In the Alberta Rockies very little excavated data is available north of Waterton. To the south the closest sites are in the Big Horn Basin - Mummy Cave (Wedel, Husted and Moss 1968), Big Horn (Husted 1969), and Upper Yellowstone Valley (Arthur 1966, Lahren 1971). Only the Big Horn Canyon sites have been extensively published on to date.

West of the Continental Divide in Idaho, considerable comparative data is available from sites excavated by Swanson and his co-workers -- Shoup Rock-shelter on the Salmon River (Swanson and Sneed 1966), the Wasden Bison Kill on the Snake River Plain (Butler 1968), and the Birch Creek excavations
(Swanson, Bonnichson and Butler 1964). The latter have yet to be fully pub-
lished.

In the Plains area comparisons are primarily restricted to select sites
in the Northern Plains.

Most comparative attention is focused on the Late Early Prehistoric and
the Early Middle Prehistoric periods, as these have not really been summarized
in the literature. The cultural dynamics of the Late Middle Prehistoric and
the Early Late Prehistoric in the Plains and eastern slope of the Rocky Moun-
tains have been summarized elsewhere (Reeves 1969b, 1970a, 1970d). By this time
obvious cultural differences between the east slope and the Idaho area are
evident; comparisons need not be made with the latter area. These cultural
differences are also evident in the Wyoming Basin by the Early Late Prehistor-
ic and continue on into the Late Late Prehistoric, at which time a number of
assemblages may also be differentiated in the Northwestern Plains area. Be-
cause of the relatively prolific data base for that time, comparisons may be
made with the immediately adjacent sites in the southwestern Alberta plains.
The radiocarbon dates of the Early Middle Prehistoric components referred to
in the following test are listed in Table 4.

Red Rock Canyon Subphase

Mountains

1. Big Horn Canyon (Husted 1969): Seven dated (Table 4) components from
three rockshelters date within the Early Prehistoric Period in the Big Horn
Canyon. Of these Sorenson I; Mangus I; and Bottleneck I, II and III are direct-
ly comparable. Sorenson II and III are later occupations, comparable to the
Valley Entrance Subphase.

Both lanceolate and stemmed projectile points were recovered from these
components: Agate Basin, Lusk, Alberta or Scotsbluff, Lovell Constricted and
Pryor Stemmed. The latter two types are considered associated in Waterton with the Valley Entrance Subphase.

The Agate Basin (Husted 1969: Fig. 14) and Lusk forms, characterized by convex or straight bases, are quite comparable to Waterton specimens, and some of Husted’s Lovell Constricted broken base forms (Husted 1969: Fig. 20) are very like Lusk points from Waterton. The Alberta-like form (Husted 1969: Fig. 8) compares favorably with the Scotsbluff point from DgPm-1.

Other comparable artifacts include: 1) asymmetric ovate bifaces; 2) ovate endscrapers (Husted 1968: Fig. 15f); 3) notched, distal notched (Husted 1968: Fig. 7d), corner notched (Husted 1968: Fig. 7j), and side notched gravers; 4) blades, which appear occasionally in the Big Horn assemblage (Husted 1968: Fig. 15f); 5) edge ground cobbles; 6) hearths (generally oval to circular excavated, charcoal and dirt filled basins 1 – 2 feet in diameter); and 7) the lack of firebroken rock. There is a wider range of end and side scrapers in the Big Horn samples, which probably reflects the smaller sample size from Waterton.

2. Mummy Cave (Wedel, Husted and Moss 1968): The excavations have not been fully reported on, and comparisons must consequently be confined to schematically illustrated projectile point and hearth types. The points illustrated (Wedel, Husted and Moss 1968: Fig. 1) for the Early Prehistoric dated (Table 4) and undated components consist of Agate Basin and Lusk-like forms with parallel, transverse or oblique flaking. They are quite comparable to the Waterton specimens, as are the hearth types.

3. Upper Yellowstone Valley: Comparable Lusk specimens have been excavated from disturbed contexts at the Eagle Creek and Carbella sites (Arthur 1966: Fig. 17b and 18f ). Agate Basin, Lusk and stemmed forms were found in a dated component (Table 4) at the Myers-Hindman site (Lahren 1971). Data is not yet available on the other material from this component.
4. **MacHaffie Site** (Forbis and Sperry 1952, Forbis n.d.): One level of this site, located near Helena, Montana, is a Scotsbluff occupation dating 6139 ± 300 B.C. (I-578A). This occurrence is anomolous in comparison to Early Prehistoric Mountain assemblages. Perhaps it represents an intrusive plains population unit.

5. **Wasden Bison Kill** (Butler 1968): The kill, bracketed by radiocarbon dates (Table 4), is characterized by lanceolate points, most of which are quite similar to the Lusk specimens from DgPl-l and DgPm-1 (Butler 1968: Fig. 17d, e, m and n). Agate Basin, both the convex (Butler 1968: Fig. 17o) and straight (Butler 1968: Fig. 17b) based varieties, is also represented.

6. **Shoup Rockshelter - Beta Shelter** (Swanson and Sneed 1966): Lanceolate collaterally flaked Lusk-like points (Swanson and Sneed 1966: Fig. 20i and j) were recovered from level 6c and the dated level 6d (Table 4). Various other tools were also recovered; however, the nature of the descriptions and classifications in the report make it almost impossible to use these in comparative studies.

7. **Other Idaho Sites**: Lanceolate-Agate Basin and Lusk-like forms appear in Wilson Butte II (Gruhn 1961), Birch Creek of the Birch Creek Phase (Swanson, Butler and Bonnichson 1964) and the early part of the Craig Mountain Phase (Butler 1962) at the Weis Rockshelter in northwestern Idaho. At the latter site they occur as a minor type associated with Cascade points and other elements of Butler's Old Cordilleran Culture - blades and edge ground cobbles. While infrequent, the latter tool types occur in the Red Rock Canyon Subphase.

8. **Alberta Rockies**: One dated component (Table 4), Level 1 from the Gap Site on the Oldman River, some 50 miles north of Waterton, produced a broken obliquely parallel flaked Lusk-like form (Reeves n.d.).

Published data on comparable Late Early Prehistoric assemblages from ex-
cavated contexts is only summary in nature (Irwin 1967). The dates for the DgPm-1 and other mountain components are later than those generally assigned to Plains Agate Basin components; e.g., 8040 ± 225 B.C. (M-1131) and 7400 ± 450 B.C. (0-1252) at Agate Basin, 7430 ± 500 B.C. (M-370) at Ray Long, and 8250 ± 500 B.C. (A-502) at Hell Gap (Irwin 1967).

Aside from specific projectile point types - Agate Basin, Lusk and Scots-bluff - other similarities between the areas include gravers or spurs (Irwin and Wormington 1970), common in some of the assemblages, and large end scrapers (Irwin and Wormington 1970: Fig. 2, 18, 19).

Valley Entrance Subphase

Comparison of the characteristic Lusk points have been made in the previous section.

Bellevue Hill Subphase

Mountains

1. Big Horn Canyon (Husted 1969): Comparative materials were found in the dated (Table 4) Sorenson IV occupation. The assemblage contains unnotched points characterized by convex lateral edges, straight bases, and side notched atlatl forms typable as Bitterroot and Salmon River Side Notched. There are very similar to the specimens from DgPl-1/Level 1. The narrow base variation is also present (Husted 1969: Plate 9n). One specimen (Husted 1969: Plate 9p) is very similar to the type Pass Creek Valley Corner Notched.

Ovate symmetric and asymmetric bifaces with convex (most frequent) or straight bases are common. These are very similar in form and size to the Bellevue Hill Subphase specimens. Lanceolate forms are also present in Sorenson IV.

Endscrapers consist of a variety of types, some of this are quite similar. For example, Type 20 resembles Husted's Group 3, Type 21 corresponds to Group
12, Type 16 matches Group 14, and Type 2 is similar to the specimen illustrated in Husted's Plate 10e. One group of Husted's, characterized by concave lateral edges, is absent in the DgPl-1 sample. Further, dorsally finished and unfinished forms made on small triangular blanks are more frequent at DgPl-1 than in Sorenson IV. Tool types missing at Sorenson IV include decortication spall tools, side scrapers, burins, pieces esquillees, broken artifact gravers and Pelican Lake Corner Notched points.

A slightly later (Table 4) component is Sorenson V. Bitterroot Side Notched are present, as is an Oxbow-like form (Husted 1969: Plate 11, 1) and stemmed forms (Plate 11k); the latter is not represented in the DgPl-1 sample.

Another comparable component is Mangus II. While represented by a very small sample, a Bitterroot Side Notched (Husted 1968: Plate 11: 18a) and a Salmon River Side Notched (Plate 18b) are present. The latter is very similar to the Bellevue Hill narrow base variant.

2. Mummy Cave (Wedel, Husted and Moss 1968): Nine components dating in the interval 5500 - 3000 B.C. (Table 4) are present. Illustrated point forms are quite comparable; Bitterroot Side Notched, Salmon River Side Notched, Pelican Lake Corner Notched, Pass Creek Valley Corner Notched and Oxbow are represented. A later component dated 2470 ± 150 B.C. contains McKean in association with Bitterroot Side Notched, Salmon River Side Notched, Oxbow and Duncan/Hanna forms.

3. Myers-Hindman (Lahren 1971): Bitterroot Side Notched and Salmon River Side Notched are present, along with a large assemblage of as yet undescribed artifacts from dated components (Table 4).

4. Idaho: The Idaho area is the "type locality" for the characteristic point types - Bitterroot and Salmon River Side Notched. Components of the Bitterroot Phase characterized by these points have been excavated from many locales. However, the major sites, Bison and Veratic (Swanson, Butler and
Bonnichson 1964), located in the Birch Creek Valley, have yet to be fully published.

Dates for the Bitterroot Phase range from 5200 to 2700 B.C. at Shoup (Swanson and Sneed 1966), and from 4000 to 1500 B.C. at Birch Creek (Table 4). Swanson, Butler, and Bonnichson (1964: 116) date phase termination at 1000 B.C. in the latter area.

At Shoup the notched projectile point types consist of Bitterroot Side Notched, Salmon River Side Notched, sharply barbed corner notched and Elko Eared. Some of the former type resemble Pass Creek Valley Corner Notched, and some of the latter would be subsumed under Salmon River Side Notched concave base variant as defined in this study. In addition there are lanceolate, triangular, squat triangular, broad lanceolate, narrow lanceolate forms and Beaverhead points. Swanson and Sneed do not have a category for bifaces or preforms. Probably both of these tool types have been subsumed under the lanceolate point category, which also includes unnotched atlatl points.

From their descriptions it is difficult to make comparisons of other tool types. Some of Swanson's and Sneed's variety 'A' end scrapers are like my argillite type groupings, and 'C' is like Types 5 and 11. Pieces esquillees may be present (wedge shaped scrapers). Core types include blade, wedge, and conical forms, some of which may be bifacial block cores. Blades are relatively frequent. Large pebble tools are common and include, besides unifacial choppers, pebble fleshers (N=51) of three types: cortical spall tools (N=15), slice (N=18) and wedges (N=8). Apparently these tools are relatively common in Birch Creek (Butler 1966). They are quite similar to the decortication flake tools in the Bellevue Hill Subphase.

5. Alberta Rockies: Two time equivalent components have been excavated; both are from the Gap Site dating ca. 4800 - 4100 B.C. (Table 4). Aside from two Bitterroot Side Notched Points, practically no other artifacts were
recovered during the excavations at this site (Reeves n.d.).

Plains

1. **Long Creek** (Wettlaufer 1960): Two dated Oxbow components, ca. 2700 B.C. (Table 4), were found at this site. The associated Oxbow points are similar but not identical to those in the Bellevue Hill Subphase. At Long Creek a shallow concave base variant with rounded basal edges (Wettlaufer 1960: Plate 18, 8) is quite similar to the Salmon River Side Notched type. Other Oxbows (Wettlaufer 1960: Plate 18, 1) are similar to Bitterroot Side Notched. Forms with low basal edges and acute shoulders are also present, and are not represented in the DgPl-1 sample. Also associated is a very distinctive un-notched 'V' shaped base form.

Bifaces, oval or elongate in form, are quite different. End scrapers are small, rectangular to triangular forms with angular or truncated cross sections. Dorsal surface retouching is common. They are quite comparable to the Bellevue Hill Types 5, 11, and 16.

2. **Oxbow Dam** (Nero and McCorquodale 1958): One level dated at ca. 3200 B.C. (Table 4) produced a small sample of artifacts. The scrapers, three in number, are small and well made, and are similar to the Bellevue Hill types. The points include Oxbow forms with concave bases very similar to Bellevue Hill Type 18, and a narrow base form similar to Type 17.

3. **Moon Lake and Harder** (Dyck 1970): Moon Lake, a small Oxbow occupation, dates ca. 2100 B.C., and Harder is put at ca. 1400 B.C. (Table 4). The Oxbow points are generally similar in form, as are the bifaces to the Bellevue Hill specimens. However, the end scrapers (cf. Dyck 1970: Fig. 10, 12a-12e; Fig. 18, 12a-12c) are quite distinct, characterized by short triangular forms with a high frequency of convex lateral edges and dorsally retouched surfaces. The distinctive concave based unnotched point also occurs at Harder.
4. **Swan River, Manitoba** (Gryba 1968): Swan River point forms include Bitterroot Side Notched and a specimen typable as Pass Creek Valley Corner Notched (Gryba 1968: Plate 2j). Also present is the unnotched concave base variant found in later Oxbow sites. Bifaces are symmetrical in form and very comparable to Bellevue Hill specimens (Gryba 1968: Plate 3e and f). End scrapers made on rectangular flakes are prismatic or straight in cross section. Dorsal retouching is infrequent (N=1). The specimens are similar to the Bellevue Hill types. The flake industry is characterized by parallel sided or expanding forms, possibly struck from block cores.

5. **Castor Creek** (Wormington and Forbis 1965): Castor Creek, an Oxbow site in central Alberta, is dated at 2525 ± 1000 B.C. The collection, characterized by Oxbow points, shows few similarities in tool types. The scrapers are similar to those illustrated by Dyck for Moon Lake and Harder.

In summary, comparisons to Oxbow and other sites in the northern plains show little relationship (other than in point morphometry) between the Oxbow-age sites - such as Moon Lake, Harder, Castor Creek - and the Bellevue Hill Subphase. Long Creek has a few similarities in the end scrapers, points and specific projectile point variation. In contrast, Swan River in Manitoba, which is earlier in time, is much closer in all assemblage elements.

**The Problem of the McKean Complex**

In Pass Creek Valley McKean points occur in stratigraphic association with the latest component of the Bellevue Hill Subphase. However, in the adjacent plains-mountains they are usually included in a complex termed McKean, which is usually thought to be unrelated to earlier cultural manifestations (Husted 1969).

In the southern Montana area, at Mummy Cave (Wedel, Husted and Moss 1968), McKean points occur in Layer 30, 2470 ± 150 B.C., associated with Bitterroot
Side Notched, Oxbow and other types, including Duncan. In the Big Horn Canyon McKean occurs in Bottleneck IV, dating 1870 ± 200 B.C. Duncan and other forms, but not Bitterroot Side Notched, are associated. Husted (1969) suggests that Sorenson V, dating ca. 3000 B.C. (Table 4), is a McKean component on the basis of a McKean point he recovered in Sorenson VI, which he considered to be intrusive from the earlier component - a rather tenuous assumption at best.

Dated Plains (Table 4) occurrences of McKean include the Gant Site (Gant and Hurt 1965), which has Oxbow, Duncan and Hanna points in association; the Kolterman Site (Wheeler 1958: Part I) with Oxbows associated; Signal Butte I with Oxbow, Hanna, Duncan and other types in association; and Sitting Crow (Neuman 1964) with Oxbow and Bitterroot Side Notched in association.

Superficially the data would suggest continuity from early components characterized by Bitterroot and Oxbow, to components characterized by McKean, Bitterroot and Oxbow, to later components characterized by McKean, Duncan and Hanna. However, other assemblage elements seem to exhibit a sharp break in continuity between the early components and the later components, and, I think, represent a major change in cultural traditions. The McKean and Duncan cultural tradition as characterized at the McKean site (Mulloy 1954), Signal Butte, Gant, and Bottleneck, is not, I would suspect, represented in the Rocky Mountain area. The mountain occurrences of McKean points in association with Bitterroot Side Notched and other types at sites such as DgPl-1 and Mummy Cave represent innovation of the point style by the indigenous populations. The plains tradition may, however, replace the mountain tradition ca. 1800 - 1500 B.C.

**Blakiston Brook Subphase**

This subphase is considered as a local representative of the Hanna Phase of the Northern Plains-Rocky Mountains. The latter is a serial phase of the TUNAXA cultural tradition (Reeves 1970a).
Blue Slate Canyon Subphase

Blue Slate Canyon is considered to be a local expression of the Pelican Lake Phase (Reeves 1970a). It represents a regionally adapted society operating in the foothills and mountains of southern Alberta and northern Montana. The Pelican Lake Phase is a serial phase of a cultural tradition — TUNAXA — which lasted some two and one-half millennia in the Northern Plains/Rocky Mountains (Reeves 1970a).

Significant differences do exist (for example, in the lithic utilization patterns) between the Blue Slate Canyon and the adjacent Pelican Lake Subphase, termed Mortlach. Avon Chert and its related varieties, which characterize the Blue Slate Canyon assemblage, are represented by less than 2% of the Pelican Lake sample at the Head-Smashed-In Bison Jump (Reeves 1970a), located only some 48 miles from Waterton Park, west of Fort MacLeod, Alberta. Conversely, other lithic types found associated at Head-Smashed-In have very low frequencies in the Blue Slate Canyon Subphase.

Crandell Mountain Subphase

The Crandell Mountain Subphase is considered to be a local manifestation of the Avonlea Phase (Reeves 1970a). The latter is a serial phase of the TUNAXA cultural tradition. Avonlea is found in the Northern Plains and Rocky Mountains. Its assemblage has not been particularly well defined to date, as the vast majority of samples have been obtained from buffalo traps and jumps. While the assemblage elements from Pass Creek Valley, other than points, cannot be readily compared, bifaces are identical, as is the basic technology and lithic utilization pattern. Avonlea is absent in the Big Horn Basin of Wyoming.

Besant and Waterton River Complexes

These complexes are represented by a few points from DgPl-1/Level 2. Radiocarbon dates from the Plains indicate that these complexes overlap with
the TUNAXA Pelican Lake and Avonlea phases (Reeves 1970a). While Besant Side Notched occasionally appears in Pelican Lake Phase components, it is considered representative of a discrete phase — the Besant Phase — and discrete cultural tradition — NAPIKWAN. Although Besant has been recovered from a number of sites in Waterton, its phase status is unclear; certainly it is not a major component in local prehistory. The Waterton River materials, named after DgPl-10, a major site in the Waterton Valley (Reeves 1970b), is characterized by Samantha points, the Besant Arrow point (Reeves 1970a). It's status is similar to Besant and must await further clarification.

Pass Creek Valley Subphase

This subphase may be compared to sites on the adjacent plains of southern Alberta. Sampled components are lacking in the mountains to the north, and in the southern Montana-Wyoming area the time equivalent components are quite distinctive (cf. Husted 1969).

The Kenny Site (Reeves 1966b) is a winter campsite located some 35 miles northeast of Waterton near Brocket, Alberta. The comparable occupation, layer 4, dates A.D. 1545 + 60 (S-270). It is characterized by a variety of tool types, including Plains Side Notched projectile points. These generally resemble those of the Pass Creek Valley Subphase, although there are some minute stylistic differences [the Pass Creek Valley forms seem closer to the Boarding School Bison Drive variants (Kehoe 1967)].

Bifaces are distinctively different; a rectangular form is present at the Kenny Site. Scrapers are, however, quite similar, both in the use of split pebble blanks and in general form. Pieces esquillees are also present. The Rundle Technology characterizes both sites. Lithic suites do show some differences. Petrified wood and black chert are common in both; however, the high frequency of obsidian and white chert in Pass Creek Valley differs markedly to
the Kenny Site, where quartzites and other cherts predominate.

Other Plains sites such as Ross (Forbis 1960), Head-Smashed-In (Reeves 1970a) and Trout Creek (Byrne n.d.) show a similar set of relationships to the Pass Creek Valley Subphase in Waterton. The former sites belong to the Old Womens Phase (Reeves 1969b) the Pass Creek Valley Subphase may be considered its local representative in Waterton.
CONCLUSIONS AND SPECULATIONS

LAND AND RESOURCE UTILIZATION PATTERNS

Land and resource utilization patterns in Pass Creek Valley relate to
1) the use of the valley system trails and camping areas as a route of travel
between the Intermontane West, the east slope of the Rocky Mountains and ad­
jacent plains and foothills, and 2) the utilization of the resources and land
of the valley as seasonal components of a larger, integrated utilization pat­
tern for the Waterton area.

Transmontane Travel

Movements of peoples across the Pass could occur for at least two reasons:
1) the seasonal transhumance of a culture which seasonally exploited resources
on both sides of the Rocky Mountains, as in the historic Flathead and Kootenai
pattern, and 2) for trading/exchange expeditions to other areas to obtain
specific resources not available in a group's home territory, as in the case
of the historic journeys made by the Nez Perce and other western tribes to the
plains to obtain bison meat and hides.

Tribal seasonal transhumance was the historic pattern. The ethnohistorical
literature suggests that it was a consequence of the historic displacement of
the Flathead and Kootenai by the Blackfoot from the western fringes of the
plains. Archaeological data tends to corroborate this conclusion, as both
winter and summer campsites are represented in the Late Prehistoric sites in
Waterton, indicating that groups resided on the east side of the mountains
year round. There is abundant evidence that the route of travel was used in
prehistoric times by people traveling through the pass for one reason or another,
and it is quite possible that related peoples belonging to the same culture, who
resided in the intermontane west, seasonally traveled eastward over the pass
to hunt bison with kin resident on the eastern slope.
Lithic utilization patterns throughout the occupational history of the valley indicate that a large percentage of the cryptocrystalline materials found there were obtained from quarry areas in the central Montana Rockies. To obtain these materials one must travel across one of the passes in the southern Alberta/northern Montana Rockies. For example, access to the Avon Chert quarries is gained either by traveling down the east flank of the Rockies to the Rogers Pass in Montana, or via the South Kootenai or Flathead Pass to the Flathead Valley and thence up the Swan River to the Avon Valley.

Groups traveling through the South Kootenai Pass would probably overnight in small temporary camps, in favored locales such as Red Rock Canyon, a favorite camping spot in Historic times. Few remains would be left, and only limited hunting (if any at all) would be undertaken. These groups would, therefore, have had little effect on the landscape.

The cairns on the summit of the South Pootenai Pass relate to its utilization, and were perhaps erected as trail markers or for ceremonial purposes. Similarly, the activities reflected in the burials and killed vessels found in the DgPl-27 and 148 site areas, the eastern entrance of the pass, probably reflect the significance attached to the pass by its prehistoric users.

Seasonal Exploitation

Seasonal utilization of the valley may be divided into two patterns: 1) utilization of the lower valley from the Valley Entrance to Coppermine Creek, and 2) utilization of the upper valley, including the tributary valleys and cirques. The utilization patterns reflect the seasonal movements and ranges of the ungulates exploited. Bison were the primary ungulate utilized by prehistoric man, and it has been suggested in a previous section that they ranged in small cow/calf and bull groups between the high montane/subalpine zones in the summer and the lower valleys and flood plains in the winter, moving into
the former areas as the winter snows melted and into the latter with the onset of the late-fall/early-winter storms.

Sites such as DgPm-1, where both bison and sheep were hunted for at least the last 2000 years, would be utilized in the spring and fall when both species would range in the immediate area. The sites in the cirque basins would represent summer hunting camps occupied by small groups, perhaps hunters or nuclear families. The bison and other ungulates, such as sheep, would be hunted by individual or small group methods, utilizing the atlatl and later the bow and arrow.

This pattern of spring-summer exploitation of the higher life zones is probably characteristic of all phase occupancies in the valley, extending back some 8000 years. Early and Middle Prehistoric occupancy of the cirque basins has been obliterated by the Neoglacial episodes.

Land and resource utilization patterns in the lower valley exhibit a different configuration to those described above. This area, which contains the major valley grasslands, was probably inhabited by the bison herds as part of their late-fall/winter to early-spring range. It would, therefore, be exploited by man during these seasons of the year.

The sites, which are much larger than those in the higher life zones, include bison pounds, kill/campsites, and winter campsites. These cluster at and immediately above the Valley Entrance, suggesting that the Coppermine Creek area served as a game reservoir for hunting parties from sites down valley. The bison were exploited primarily by communal hunting techniques, and the faunal analysis suggests that the sites were occupied in late-fall to early-winter, and late winter to early spring. The analysis also suggests that the structure and size of the bison herds exploited, approximated that postulated for the Waterton area.
This seasonal pattern exploitation of the lower valley by the use of communal bison drives probably extends back to at least the beginning of the Bellevue Hill Supphase, although firm evidence for the use of pounds only dates ca. 600 B.C. (DgPl-42).

In addition to bison, deer and sheep were also hunted, and canids were trapped at the bison kills. Other ungulates (elk, moose) are represented by tools. This data indicates a very selective utilization of the total fauna available, which in part reflects the selective aspects of the total subsistence pattern as seen from sites in Pass Creek Valley. In direct opposition to the prehistoric pattern is that found at DgPl-51, an Aboriginal Historic component, occupied in the late-fall to early-winter. Here a wide range of fauna -- deer, elk, sheep, bison, badger, beaver and bird -- were exploited. This pattern probably reflects two factors: the change in the ungulate populations (i.e., the decimation of the bison herds), and the entry of the native into the fur trade network.

The major Holocene climatic fluctuations would affect the prehistoric utilization patterns in the valley. The distribution of the valley grasslands and the alpine tree line are largely controlled by local factors rather than general climatic trends, and probably have remained relatively stable since 6000 B.C.

The climatic episodes represented by the regenerated alpine and valley glaciations, particularly the latter, would be ones of lower mean temperatures, increased precipitation values, and lengthened winters. These factors would presumably affect the composition, seasonal distribution, and absolute size of the ungulate populations. For example, the presence of larger perennial snow fields and cirque glaciers would affect their summer ranges. As a consequence the nature, size and density of the human populations exploiting them should also change. If so, this change is not observable in the present data.
base. Even during the Lone Creek Advance, the last valley glaciation, man was living and hunting at Red Rock Canyon, only five miles from the ice fronts in the Upper Pass Creek and Bauerman valleys.

In sum, the resource and land utilization patterns as they appeared in different parts of the valley, characterized by seasonal utilization of the principle ungulate, bison, have remained essentially stable for the last 8500 years. This pattern is, however, only one aspect of the total yearly subsistence round for the Waterton Valley System, which would also include fishing at sites such as DgPl-4 (Milne-Brumley 1971), berrying and plant gathering (for which there is no direct evidence to date), and occupancy, perhaps for a major part of the winter, at sites such as DgPl-2, 3, 7, and 18, in the Waterton Valley (Fig. 2). The latter are much larger than any of the sites located in Pass Creek Valley.

VALLEY PREHISTORY

Although earlier occupations of the valley most certainly occurred, the first evidence comes from DgPm-1/Level 1, which dates to 8500 years ago, during the time of the last valley glaciations, the Lone Creek Advance. The assemblage (Red Rock Canyon Subphase) is very similar to those found in other Late Early Prehistoric components in the Montana and Idaho Rocky Mountains. While showing some similarities to the plains they are sufficiently different from the time-equivalent Cody Complex materials to be considered representative of a discrete cultural tradition [Swanson's (1962)Mountain-Plains culture], a mountain-foothills culture adapted to exploiting bison and other ungulates in the mountain valleys, uplands and adjacent foothills.

This adaptation probably extends back considerably farther in time, and may be represented in the Waterton area by the Lake Linnet I complex, which
contains assemblage elements very similar to the Windust Phase in the Snake River Valley (Leonardy and Rice 1970). How this earlier complex relates to the Red Rock Canyon Subphase is, however, unknown. The following subphase, Valley Entrance (6000-5500 B.C.), is considered to be a sequent phase in the cultural tradition represented in the earlier Red Rock Canyon Subphase.

The relationship of this early cultural tradition to that represented in the following Bellevue Hill Subphase (5500-1500 B.C.) is not entirely clear. In the Idaho area Swanson (1962) (see also Swanson, Butler and Bonnichson 1964, and Butler 1968) postulates cultural continuity, primarily on the basis of overlapping projectile point type distributions, from the earlier Mountain Plains culture to the Bitterroot Culture; the latter is characterized by Bitterroot Side Notched points. While this may be the case, without publication of the documentation from the major excavations in Birch Creek Valley this postulated continuity cannot be evaluated [Swanson's and Sneed's (1966) stratigraphic manipulations at the Shoup Rockshelter, designed to get Bitterroot points in association with the lanceolate points, are entirely unacceptable].

East of the divide in Mummy Cave, where the stratigraphy is clearly outlined, there is no overlap in projectile point types, either within the site or between the earliest Bitterroot Side Notched component at Mummy Cave and the latest Early Prehistoric components in the Big Horn Canyon rockshelters.

The data from Waterton indicates that there is a decided change in productive technology and many formal artifact types -- such as end scrapers, bifaces, cobble choppers, decortication flake tools and cryptocrystalline lithic suites -- between the two subphases. I feel these major changes are indicative of a replacement of the cultural traditions on the east slope of the Rocky Mountains. Further, the new tradition may, on the basis of the projectile point types (Husted 1969), represent an intrusive culture from the eastern plains-woodlands.
Since there is a degree of assemblage homogeniety between the east slope of the Rockies and the Idaho area, which may be taken as indicative of spatial cultural continuity, I would suggest that the same cultural tradition exists in both areas. Consequently, the supposed continuity in the Idaho area is more apparent than real.

Swanson proposed the nomina "Bitterroot Culture" for the cultural tradition in the Idaho area, which, he postulates, extends from the Bitterroot Phase to the ethnohistoric present. Because of its explicit linguistic and ethnic associations it is inappropriate to apply this nomina to other areas. Consequently the Early Middle Prehistoric cultural tradition on the east slope of the Rockies is termed (Reeves 1969) the Mummy Cave Complex.

This cultural tradition also extends across the plains on a Pre to Early Oxbow time level, ca. 3000 B.C. By late Oxbow times, however, ca. 2500 B.C., the plains area is diverging in assemblage characteristics from the earlier cultural base, in comparison to equivalent levels in the Rocky Mountains.

This divergence continues and becomes more complex in the interval 2500-1500 B.C. with the appearance of McKean, Duncan and Hanna points ca. 2500 B.C., and the development of different traditions in the Saskatchewan and Missouri Basins. In the mountains -- Waterton, the Upper Yellowstone and west of the divide in Idaho, for example -- the earlier cultural tradition persists, while new projectile point types, McKean, Elko Eared, Oxbow, etc., appear; Bitterroot Side Notched and Salmon River Side Notched persist, as do other technological and assemblage characteristics, to ca. 1500 B.C. on the east side of the divide, and perhaps as late as ca. 1000 B.C. in the Idaho area (Swanson, Butler and Bonnichson 1964).

The local relationship of the subsequent Blakiston Brook (1500-1000 B.C.) (Hanna Phase) and Blue Slate Canyon (1000 B.C. - A.D. 500) subphases (Pelican Lake Phase) of the TUNAXA cultural tradition to the earlier tradition is not
entirely clear. The assemblage characteristics of the Blue Slate Canyon Subphase indicate that the two cultural traditions are distinctively different, suggesting the replacement in Waterton of the earlier tradition by the TUNAXA tradition, which has its origins in the McKean Phase in the Missouri Basin (Reeves 1970a).

The Blue Slate Canyon Subphase is one of the best documented subphases in Pass Creek Valley. It is considered (Reeves 1970a) to be a local subphase of the Pelican Lake Phase of the Northern Plains - Rocky Mountains. At this time numerous subphases representing locally adapted populations may be differentiated in the general plains - mountain area. These are quite unrelated to the time equivalent assemblages in the Idaho area.

Blue Slate Canyon is followed by Crandell Mountain (A.D. 500 - A.D. 1200), a local subphase of the Avonlea Phase (Reeves 1970a) of the Northern Plains/Mountains, considered to be a sequent phase of the TUNAXA cultural tradition. The Avonlea Phase, characterized by a distinctive cultural configuration, is absent in the Wyoming mountains -- where a time equivalent phase, Todd (Reeves 1970a), characterized by Columbia Valley Corner Notched -- is present. The latter is quite similar to the Blue Dome Phase in Idaho (Swanson, Butler and Bonnichson 1964). Timber Ridge Side Notched occasionally appears in components of these two phases, as does Columbia Valley Corner Notched in Crandell Mountain, indicating that some interaction occurred between the various cultural groups in the Rocky Mountains.

Many new technological systems appear in the Avonlea Phase and its local representative, Crandell Mountain. These represent a major technological break with the preceding Blue Slate Canyon Subphase, suggesting a replacement of cultural traditions. However, until additional data is obtained from the Alberta Plains and northern Rocky Mountains, I do not propose that Avonlea be removed from the TUNAXA cultural tradition at this time.
The final phase of the prehistoric continuum, Pass Creek Valley (A.D. 1200-1840), is characterized by a distinctive technology which shows some continuity with the preceding Crandell Mountain Subphase, and may, therefore, be considered as a sequent phase in the earlier cultural tradition. Comparison with the immediately adjacent plains suggest that it is a local expression of the Old Woman's Phase (Reeves 1969b), the last of the Late Prehistoric Alberta Plains phases.

The Historic Aboriginal complexes (A.D. 1840-1870) cannot be related to the prehistoric continuum, and could represent brief transitory occupations by any of the known historic groups which frequented the area. While the ethnic identity of these historic occupants is indicated by the historical literature, the identity of the Pass Creek Valley Subphase populations can only be speculated on. The territory was Kootenai by A.D. 1790 but previously it may have been Flathead, if the extension of the Kootenai range occurred in Protohistoric times.

In conclusion, the prehistory of Pass Creek Valley is characterized throughout by successive cultures of nomadic communal bison hunting peoples adapted to the seasonal exploitation of small herds of bison in a mountain grassland environment. The archaeological cultures which represent these populations have changed through time; sometimes they are quite distinctive from those on the adjacent plains, while at other times they are very closely related. While significant technological changes, which no doubt effected the extractive efficiency and other cultural systems, have occurred over the past 8500 years, the basic overall utilization pattern persisted in Pass Creek Valley until the disintegration of aboriginal culture and the depletion of the principle resource base in the mid-19th century.
The environment itself has seen large scale climatic changes from the last of the valley glaciations, some 8000 years ago, through the warmer and dryer Atlantic III episode, and the Neoglacial cirque advances. Yet throughout time aboriginal man and bison have remained a constant factor in the landscape. While both are now forever buried in the dust, Pass Creek Valley remains essentially as it was in the Buffalo Days, a part of a larger valley system -- preserved in perpetuity as Waterton Lakes National Park -- unique in its ecosystem configuration and resource potentiality for prehistoric man in the northern Rocky Mountains -- Mistokis -- the Backbone of the World -- the home of Napi, the creator of the world and all living things.
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APPENDIX I
NON-CERAMIC ARTIFACTS

INTRODUCTION AND METHODOLOGICAL NOTE

The following description and classification is based on a number of assumptions concerning the nature and behavior of artifactual data. Artifacts, which may be simply defined as any objects manufactured or utilized by man, are physical manifestations of past cultural behavior; i.e., they are natural objects which have been modified by a set of culturally imposed attributes. Artifacts contain cultural information in the form of attributes which are logically irreducible characters of two or more states (Clarke 1968).

Following Rouse (1960), attributes are considered to be of three types: contextual, conceptual and procedural. Contextual attributes refer to the spatial temporal relationships of the artifact to other artifacts, cultural features, detritus, etc. They are important in determining associations and activity patterns within a site, but not in constructing typologies.

Procedural and conceptual attributes are used for the typological and descriptive studies. Conceptual attributes—form, style, and material—are subjected to selection during fabrication of the artifact. They usually reflect culturally conditioned individual behavior, and are observable. However, the procedural attributes, which relate to productive modes and utilitarian functions, must be inferred from the object.

Conceptual attributes, primarily those of form, show the greatest differential frequency distributions in time-space and culture and are therefore the most representative indicators of change in cultural behavior patterns; consequently, they are most useful for studying cultural change, defining archaeological units, and constructing cultural types. Types are considered by the writer to be real forms, exhibiting one or more diagnostic attributes
which show differential distributions in time, space, and culture. Other
descriptive attributes of form and modification may or may not change accord­
ingly.

While a minimum of one attribute is required for group membership, a type
should not be considered as either monothetic or polythetic in the sense that
these terms are used by numerical taxonomists. A type is a "system", composed
of a complex, interacting group of formal attributes which are not necessarily
shared by all members of the group. The majority of types in this study are
based upon attribute clusters which the writer considers from other studies
(Reeves 1966b, 1970a) to be culturally significant, and probably statistically
verifiable.

Procedural attributes are of varying usefulness. Specific functional
inferences require detailed microscopic inspection, and while of considerable
importance (Milne-Brumley 1971), they require both a great deal of time to
undertake as well as an evaluation of the many variables involved in the pro­
duction of wear patterns (Elliott and Anderson 1971). Functional studies are
not undertaken in this monograph. Gross productive processes are somewhat
more easily inferred and are discussed in some detail for chipped stone tools
in Appendix II.

A descriptive/analytic approach, based on the use of explicitly formulated
attribute lists, was employed in the analysis of all chipped stone artifacts.
The samples from the other artifact classes (bone/shell, historic White and
ground stone tools) were not suitable for manipulation by this approach.
Extensive attribute lists were formulated beforehand for the major tool types -
projectile points, bifaces, endscrapers, side scrapers, cobbled choppers, flakes
and marginally retouched flakes (Reeves 1970c). For other tool types - cores,
drills, perforators, Piece Esquillees, gravers, burins, and various large
chopping and cutting tools - lists were formulated during analysis utilizing the observed variability in the sample. The lists were designed to: 1) account for the formal, and to a certain degree the technological and functional, variation in the sample; 2) provide an adequate description of the individual item; 3) provide a meaningful communication of raw data and summarized tabulations between analysts; and 4) have cultural meaning for the culture under study. The only major data category which was not adequately controlled for in the attribute analysis was flaking and retouch patterns, as the writer at the moment is not able to quantify this information to his complete satisfaction.

The attribute lists, formulated for use in a data storage and retrieval system, vary in their total data content. For example, 60 non-metric and 23 metric observational categories were utilized for projectile points, while only eight non-metric and four metric categories were utilized for Piece Esquillees. Raw nonparametric and parametric data is not presented in this study, nor are descriptive and inferential statistics. The former is stored on key punch cards and is available for any interested users.

The operative procedure was essentially as follows: The site samples were first lumped together and broken down into the basic categories (industries) on the basis of material; i.e., chipped stone (01-09) (Binary Numeric Codes are used to designate artifact classes and types proposed herein. It is not a numerical listing of a number of trial types within any one class.), ground stone (10), bone/shell (11), and historically manufactured White artifacts (12-13). Chipped stone tools were then broken down into lower order classes (01-09) on the basis of functional and technological groupings; i.e., projectile points (01); drills, perforators, Piece Esquillees and gravers (02); bifaces (03); end scrapers (04); cores and core fragments (05); cobble choppers and other large tools (06); cryptocrystalline flakes (07); microcrystalline
flakes (08); and side scrapers (09).

The artifacts within each class were next examined for formal variations within and between sites, and provisional type systems established. A binary numeric code was then assigned to the trial types and all broken unclassifiable specimens placed in "groups" (90-99) within each class. The individual specimens were then studied, and their nonparametric and parametric attributes recorded on data sheets which were subsequently converted to IBM keypunch cards for generation of output listings by IBM 360 Model 50 computer facility. These lists were proofed for errors and studied along with the actual specimens to prepare summary type descriptions. Alterations were made of the preliminary typology as necessary. Selected metric attributes were then drawn from the lists for summary descriptive purposes.

The final typology arrived at varies within and between classes, and the types should not be considered of equivalent taxonomic status. For example, within the projectile points the type Plains Side Notched is broken into four trial types for descriptive and analytical purposes, while the trial type Timber Ridge Side Notched, which has equivalent taxonomic status to Plains Side Notched, is not broken down into smaller groupings.

Formal binomial nomination is restricted to projectile point types and has, with two exceptions (Pass Creek Valley Corner Notched and Hanna Stemmed), been drawn from nomina already in use in the literature. The nomina for other tool types is based on their significant formal attributes.

The following appendix is divided into sections corresponding to the artifact classes. Distributional data are provided in table form (Tables 6-9) and lithic terminology in Tables 10 & 11.
PROJECTILE POINTS

UNNOTCHED ARROW POINTS

Trial Type 01

Nomin: Plains Triangular

Sample: N=13

Form: Symmetric to asymmetric triangular (N=10) or ovate (N=2) body outlines. Straight (N=11), slightly sub-convex (N=1) or sub-concave (N=1) bases.

Metric Range:

Length: 18-22 mm. (N=5)
Width: 11-21 mm. (N=12)
Thickness: 2-4 mm. (N=12)
Weight: 0.7 - 2.3 gms. (N=6)

Modification: Oblique proximal (oriented obliquely towards the proximal end, which is the base of the point) bifacial pressure retouch. Flake scar widths range 3-7 mm. Bases thinned, generally unground (N=11 of 12).

Lithic Types: AC (N=1), BC (N=1), HC (N=11)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: A common type on the Plains (Reeves 1966b). Asymmetric forms have not been previously described for the area. This variation is similar to that of the Trial Type 12 biface found associated.

Trial Type 02

Nomin: Catan

Sample: N=3

Form: Ovate body outline. Convex base.
Metric Range:

Length: 20-21 mm. (N=3)

Width: 13-15 mm. (N=3)

Thickness: 3-4 mm. (N=3)

Weight: 0.8 - 1.2 gms. (N=3)

Modification: Oblique distal (oriented obliquely towards distal end or tip of the point) or proximal incomplete bifacial pressure retouch. Flake scar widths range 3-5 mm. Bases thinned.

Lithic Types: GQ (N=1), QL (N=1), VA (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: Catan points (MacNeish 1964: 407; Suhm and Jelks 1962) occur widely in North America. The closest reported occurrence is at Lake Pend d'Orielle (Miller 1959) in Idaho.

Trial Type 03  Pl. 17: 6-8

Nomin: Avonlea Triangular

Sample: N=5

Form: Triangular (N=3) to lanceolate (N=1) body outlines. Straight (N=3) or concave (N=2) bases.

Metric Range:

Length: 16-25 mm. (N=2)

Width: 12-15 mm. (N=4)

Thickness: 2-4 mm. (N=5)

Weight: 1.5 gms. (N=1)

Modification: Very well controlled oblique proximal parallel bifacial pressure retouch. Flake scar widths 1-3 mm. Bases bifacially thinned, unground.
Lithic Types: AC(N=2), VA (N=1), VB (N=1), QB (N=1)

Distribution: Table 6

Phase Association: Crandell Mountain

Discussion: Avonlea Triangular points are found associated with the Avonlea Phase in the adjacent Plains (Reeves 1970a). The type includes a number of formally distinct variants - concave, straight or convex lateral edges, with straight or concave bases. The concave lateral edge variant (N=1) (Pl. 17: 8), infrequent in the Plains, is represented in samples from the Big Horn Canyon (Husted 1969: Plate 18j and k).

SIDE NOTCHED ARROW POINTS

Trial Types 04-07

Pl. 17: 9-21

Nomin: Plains Side Notched

Sample: N=26

Form: Triangular body outline. Straight to convex lateral body edges. Acute, right angle or barbed shoulders. Small notches. Relatively high basal edges characterized by an overall rectanguloid configuration. Straight or concave bases.

Trial Type 04 (N=5) Pl. 17: 9-12

Acute or right angle shoulders. Straight basal edges, set parallel to or oblique to the longitudinal axis. Straight bases.

Trial Type 05 (N=13) Pl. 17: 13-16

Obtuse shoulders. Straight or convex basal edges, set oblique to the longitudinal axis. Point of maximum width of basal edge at base-notch juncture. Concave bases.

Trial Type 06 (N=2) Pl. 17: 17

Barbed shoulders. Straight basal edges set parallel to longitud-
inal axis. Straight bases.

**Trial Type 07 (N=6) Pl. 17: 18-21**

Obtuse shoulders. Straight basal edges, set oblique to the longitudinal axis. Point of maximum width of basal edge at basal edge-base juncture. Concave bases.

**Metric Range:**
- **Length:** 14-25 mm. (N=8)
- **Width:** 10-16 mm. (N=15)
- **Thickness:** 3-4 mm. (N=16)
- **Weight:** 0.5 - 1.6 gms. (N=11)

**Modification:** Well controlled perpendicular (flake scars are perpendicular to longitudinal axis of point) or proximal oblique bifacial pressure retouch. Flake scar widths range 2-5 mm., $\bar{x}$ 3 mm. Bases bifacially thinned (23 of 25). Occasionally ground (7 of 25).

**Lithic Types:** AC (N=1), BC (N=1), BG (N=2), BS (N=1), GC (N=1), GQ (N=1), HC (N=3), OB (N=6), PP (N=1), PY (N=2), QG (N=1), RS (N=1), TG (N=4), VA (N=1)

**Distribution:** Table 6

**Phase Association:** Pass Creek Valley and Crandell Mountain (DgPl-86: 24)

**Discussion:** Plains Side Notched points (Kehoe 1966, 1967), a common form on the Plains, have been classified by workers in a variety of ways (Forbis 1960, 1962; Kehoe 1966; Reeves 1966b). The Trial Type division utilized here is similar to Reeves (1966b). The basal edges in Trial Type 07 tend to be quite high (1/3 of the total length of the point). This attribute is similar to that found on arrow points from the mountainous west and plateau (cf. Sanger 1967: Fig. 5f and g). It may be an uncommon trait in the Plains area.
**Trial Type 08**

**Nomin:** Prairie Side Notched  
**Sample:** N=3  

**Metric Range:**
- Length: 16-22 mm. (N=2)  
- Width Body: 12-16 mm. (N=3)  
- Thickness: 3-4 mm. (N=3)  
- Weight: 0.7 - 1.4 gms. (N=3)

**Modification:** Well controlled oblique proximal parallel bifacial retouch (DgPl-86: 1) (Pl. 17: 22), or crude perpendicular random bifacial retouch. Flake scar widths range 2-5 mm. Bases are generally ground (2 of 3).

**Lithic Types:** BC (N=1), BH (N=1), GS (N=1)  
**Distribution:** Table 6  
**Phase Association:** Pass Creek Valley and Crandell Mountain  
**Discussion:** Prairie Side Notched (Kehoe 1966, 1967) is a common form on the Plains. DgPl-55: 358 (Pl. 17: 23) is intermediate in form between Prairie Side Notched and Plains Side Notched; i.e., the basal edges are more angular.

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**Trial Type 09**

**Nomin:** Flake Arrow Points  
**Sample:** N=4  
**Form:** Ovate to triangular body outlines. Obtuse shoulders. Broad shallow notches. Rounded basal edges. Straight or convex bases.

**Metric Range:**
- Length: 15-23 mm. (N=4)
Width Body: 9-14 mm. (N=4)
Thickness: 2-3 mm. (N=4)
Weight: 0.3 - 0.8 gms. (N=4)

Modification: Retouching of flake blank is restricted to the lateral edges. Bases unthinned and unground.

Lithic Types: BC (N=1), OB (N=1), RB (N=1), TB (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: Flake Arrow Points were first proposed as a trial type by the writer (Reeves 1970a) for Besant Phase assemblages. The type has generally been subsumed by other workers under the Prairie Side Notched type.

Trial Type 10 Pl. 17: 31-39

Nomin: Timber Ridge Side Notched

Sample: N=14

Form: Triangular to ovate body outlines. Straight to contracting ovate lateral body edges. Sharp, obtuse to acute shoulders. Small notches. Low, well defined rectangular basal edges. Subconcave to concave bases.

Metric Range:

Length: 14-34 mm. (N=10)
Width Body: 10-14 mm. (N=14)
Thickness: 2-3 mm. (N=14)
Weight: 0.2 - 1.2 gms. (N=9)

Modification: Extremely fine, parallel, oblique proximal bifacial pressure retouch. Flake scar widths range 1-3 mm., 2 mm. Bases bifacially thinned, rarely ground (3 of 14).

Lithic Types: AC (N=4), HC (N=1), QY (N=1), TG (N=2), VA (N=4), WO (N=2)
Distribution: Table 6

Phase Association: Crandell Mountain

Discussion: Timber Ridge Side Notched (Reeves 1970a) is one of the principle Avonlea Phase point types in the Northwestern Plains. The type may be broken down into a number of variants on the basis of body edge, shoulder, base, and basal edge configuration.

Trial Type 11

Pl. 17: 27

Nomin: Samantha Side Notched

Sample: N=1


Metric Range:

Length: 15 mm.

Width Body: 13 mm.

Thickness: 3 mm.

Weight: 0.7 gms.

Modification: Well controlled oblique proximal bifacial pressure re-touch. Flake scar widths average 2 mm. Base bifacially thinned and ground.

Lithic Type: QY

Distribution: DgPl-1/Level 2

Phase Association: No definite association with any of the valley sub-phases. Type has been found associated with a distinctive assemblage - the Waterton River Complex - at the Waterton River Cabin Site (DgPl-10) (Reeves 1970b).

Discussion: Samantha Side Notched points (Reeves 1970a) (Kehoe and Kehoe 1968) are associated with Besant Side Notched atlatl points in some Besant
Phase components in the adjacent Plains (Reeves 1970a). The type has also been subsumed by other workers under various types; e.g., Kehoe (1966) assigns it to the Prairie Side Notch System, in such forms as Swift Current Fishtail, Shaunanan Truncated Base, High River, Tompkins and Lewis. The form is also similar to Forbis' "High River" type (Forbis 1962: Fig. 13i and j) and certain "Nanton" forms.

Incomplete/Unclassifiable Side Notched Arrow Points (Group 91)

Sample: N=8

Lithic Types: BC (N=2), HC (N=1), OB (N=2), QB (N=1), TG (N=1), VA (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: This group consists of point fragments, usually broken at the neck, from various components. The quality of flaking on specimens from DgPl-55 (Nos. 226, 370, 417, and 386) and DgPm-4 suggests that they were Plains Side Notched types. The DgPl-68: 20 and DgPl-55: 349 specimens are poorly flaked, and may have been Prairie Side Notched. The specimen DgPl-148: 193 may be a Timber Ridge Side Notched point.

CORNER NOTCHED ARROW POINTS

Trial Type 12

Pl. 17: 28

Nomin: Scallorn

Sample: N=1

Metric Range:

Length: 30 mm.
Width: 25 mm.
Thickness: 7 mm.
Weight: 13 gms.

Modification: Well controlled oblique proximal bifacial pressure retouch.

Flake scar widths average 2-3 mm. Base thinned, unground.

Lithic Type: QY
Distribution: DgPl-l48
Phase Association: Unknown

Discussion: Scallorn, defined by Suhm and Jelks (1962) for the southern Plains area, appears in the Central Plains Keith Phase, a horticultural phase, and in age-equivalent hunting/gathering phases in the Wyoming-Powder River and North Platte Basins (Reeves 1970a). It has not previously been recovered from excavated contexts in the Northern Plains or Rocky Mountains.

Trial Type 13  Pl. 17: 29-30

Nomin: Columbia Valley Corner Notched
Sample: N=5
Form: Triangular to ovate body outline. Straight (N=2) or ovate lateral body edges (N=1). Acute or slightly barbed shoulders. Deep notches. Very low basal edges. Narrow bases.

Metric Range:

Length: 25 mm. (N=1)
Width: 13-15 mm. (N=5)
Thickness: 3-4 mm. (N=4)
Weight: 1.2 gms. (N=1)
Modification: Well-controlled perpendicular or oblique proximal bifacial pressure retouch. Flake scar widths 2-3 mm.

Lithic Types: KR (N=2), OR (N=2), WP (N=1)

Distribution: Table 6

Phase Association: DgP1-68: 57 (Pl. 17: 30) and DgP1-86: 45 associate with Crandell Mountain. Phase associations of others are not demonstrable.

Discussion: This Columbia Plateau type (Caldwell and Mallory 1967: 49-53) appears also in the Big Horn Basin in the Todd Phase (Reeves 1970a). Comparable forms also appear at the Head-Smashed-In site of southwestern Alberta in the earliest Avonlea Phase components (Reeves 1970a).

Incomplete/Unclassifiable Arrow Points (Group 92)

Lithic Types: AC (N=4), HC (N=3), OB (N=3), RS (N=1), SP (N=1), TG (N=2), WG (N=1), WT (N=2)

Distribution: Table 6

Discussion: These forms are either unnotched or notched arrow points, and probably represent broken fragments of the characteristic types in the components in which they occur; i.e., DgP1-86: 19 is Timber Ridge; DgP1-55: 83, 305, 379 are Plains Triangular or Plains Side Notched.

UNNOTCHED ATLATL POINTS

Trial Type 14

Nomin: Unnotched Atlatl

Sample: N=1

Form: Triangular body outline. Straight base.

Metric Range:

Width: 22 mm.
Thickness: 8 mm.

Weight: 1.5 gms.

Modification: Perpendicular bifacial pressure retouch.

Lithic Type: QZ

Distribution: DgPl-l/Level 1

Phase Association: Bellevue Hill

Discussion: Unnotched atlatl points occasionally appear in the Pelican Lake, Besant and Oxbow phases in the Northern Plains. In the mountainous area similar forms are found associated with Bitterroot Side Notched points in the Shoup Rockshelter in Idaho (Swanson and Sneed 1966).

SIDE NOTCHED ATLATL POINTS

Trial Types 15 and 16  Pl. 18: 1-8

Nomin: Bitterroot Side Notched

Sample: N=13

Form: Ovate (N=7) to triangular (N=3) body outlines. Straight to contracting ovate lateral body edges. Obtuse to acute shoulders. Well-defined rectangular straight basal edges. Straight (Trial Type 15: N=5) or concave (Trial Type 16: N=8) bases, which may be as wide as, or narrower than, the body.

Metric Range:

Length: 20-58 mm. (N=11)

Width Body: 13-25 mm. (N=13)

Thickness: 3-7 mm. (N=14)

Weight: 1.2 - 6.3 gms. (N=11)

Modification: Perpendicular to oblique proximal, complete to incomplete, bifacial pressure retouch. Flake scar widths range 2-5 mm., X 3 mm. Bases
bifacially thinned and may be ground (4 of 11).

**Lithic Types**: AC (N=1), CB (N=2), GG (N=2), GQ (N=1), GC (N=3), KR (N=1), NF (N=1), PB (N=1), PW (N=1)

**Distribution**: Table 6

**Phase Association**: Bellevue Hill

**Discussion**: The nomin Bitterroot Side Notched, proposed by Swanson for formally similar points found in the intermontane west - Idaho (Swanson 1962; Swanson and Sneed 1966) - is formally adopted herein for the northern Rocky Mountains and adjacent Plains. Similar forms also appear in rock shelters in the Big Horn Canyon (Husted 1969), in Mummy Cave (Wedel, Husted and Moss 1968), at the Gap Site (DlPo-20) on the Oldman River (Reeves n.d.), and at Swan River, Manitoba (Gryba 1968).

**Trial Types** 17 and 18  
**Pl. 18: 9-17**

**Nomin**: Salmon River Side Notched

**Sample**: N=15

**Form**: Triangular, ovate or lanceolate body outlines. Straight to convex lateral body edges. Obtuse to right angle shoulders. Rounded basal edges. Straight (Trial Type 17: N=8), concave or U-shaped (Trial Type 18: N=7) bases, which may be as wide as or narrower than the body.

**Metric Range**:

- **Length**: 15-33 mm. (N=7)
- **Width Body**: 11-22 mm. (N=11)
- **Thickness**: 3-6 mm. (N=10)
- **Weight**: 0.3 - 4.6 gms. (N=10)

**Modification**: Perpendicular to or oblique proximal bifacial retouch. Scar widths run 3-5 mm., X 3 mm. Bases thinned, generally ground (11 of 13).
Lithic Types: AC (N=1), BG (N=1), CB (N=4), GA (N=1), GG (N=3), RB (N=1), SP (N=2), UQ (N=1), WP (N=1)

Distribution: Table

Phase Association: Bellevue Hill

Discussion: Salmon River Side Notched, the nomin proposed by Swanson and Sneed (1966) for similar forms characterized by low rounded basal edges in the Idaho area, is herein expanded to include V-shaped concave base forms.

Trial Type 19

Nomin: Oxbow

Sample: N=7

Form: Triangular to lanceolate body outlines. Obtuse shoulders. Broad notches. Well defined straight basal edges, squared in appearance. Base or basal notch is U to V-shaped, resulting in an overall eared appearance of the basal edge stem configuration.

Metric Range:

Length: 25-44 mm. (N=3)
Width: 7-12 mm. (N=5)
Thickness: 5-6 mm. (N=2)
Weight: 3.4 - 6.0 gms. (N=2)

Modification: Proximal oblique bifacial pressure retouch. Flake scar widths average 2-5 mm. Bases thinned, rarely ground.

Lithic Types: AC (N=1), BA (N=1), CB (N=1), GG (N=2), QZ (N=1), RB (N=1)

Distribution: Table 6. Specimen found at DgPl-42 (Pl. 18: 6) represents reuse. It is manufactured from a brown chert found only in Bellevue Hill components.

Phase Association: Bellevue Hill
Discussion: Oxbow points (Wettlaufer 1960) are a characteristic form in the Northern Plains/Rocky Mountains. They are morphometrically related to the Bitterroot-Salmon River side notched systems.

**Trial Types** 20 - 22  
Pl. 18: 25-30

**Nomin:** Obtuse Shouldered Side Notched

**Sample:** N=7

**Form:** Triangular to lanceolate body outlines. Convex to recurvate (Trial Type 21: N=1) (Pl. 18: 29) body edges. Obtuse rounded shoulders. Broad shallow notches. Poorly defined convex basal edges. Convex (Trial Type 20: N=4) (Pl. 18: 25-28), and concave (Trial Type 22: N=22) (Pl. 18: 30) bases.

**Metric Range:**

- Length: 22-31 mm. (N=5)
- Width: 14-22 mm. (N=5)
- Thickness: 4-7 mm. (N=5)
- Weight: 3.0 - 4.9 gms. (N=5)

**Modification:** Distal to proximal oblique bifacial retouch. Flake scar widths range 2-5 mm., X 4-5 mm. Bases thinned, occasionally ground (2 of 6).

**Lithic Types:** AB (N=1), BC (N=1), DA (N=1), NF (N=1), PL (N=1), QY (N=1), TB (N=1)

**Distribution:** Table 6

**Phase Associations:** Blakiston Brook and Blue Slate Canyon

Discussion: These types are found in a variety of sites in the central Rockies; e.g., Durango, Colorado (Morris and Burgh 1954: Fig. 1a, b, c, m, n), Hells Midden (Lister 1951: Fig. 6 - left specimen), Deluge Shelter, Colorado (Leach 1967 - types 3d and 3e) and Willowbrook in the Colorado foothills (Leach 1967: Fig. 3j). The form also appears in the Plains Pelican Lake and Hanna phases (Reeves 1970a).
Nomin: Besant Side Notched

Sample: N=5


Metric Range:
- Length: 24-39 mm. (N=2)
- Width: 15-29 mm. (N=2)
- Thickness: 6-7 mm. (N=4)
- Weight: 2.4 - 7.1 gms. (N=2)

Modification: Perpendicular bifacial pressure retouch. Flake scar widths average 2-4 mm. Bases are bifacially thinned by removing flakes parallel to longitudinal axis, then ground.

Lithic Types: HC (N=1), KR (N=1), NF (N=1), QY (N=1), VQ (N=1)

Distribution: Table 6

Phase Associations: Bellevue Hill and the Besant Complex

Discussion: On the adjacent plains Besant Side Notched points are characteristic of the Besant Phase (Reeves 1970a), dating ca. A.D. 200 - 700. The type has also been found in components of the Pelican Lake Phase at Head-Smashed-In (Reeves 1970a). The form is morphometrically similar to the Bitterroot and Salmon River side notched systems, and to certain forms found associated with Oxbow points at Long Creek (Wettlaufer 1960: Plate 18: 4, 7), suggesting a considerable time depth for the type. The contextual association of the DgPl-68: 34 (Pl. 18: 24) specimen with a Salmon River Side Notched (Pl. 18: 9) specimen lends support to this assertion.
Trial Type 24

Nomin: Flake Atlatl

Sample: N=1


Metric Range:
- Length: 23 mm.
- Width: 16 mm.
- Thickness: 4 mm.
- Weight: 1.5 gms.

Modification: Proximal oblique bifacial retouch confined to lateral edges. Base thinned and ground.

Lithic Type: Avon Chert - AC

Distribution: DgPl-86/Level 3

Phase Association: Blakiston Brook

Discussion: Flake points (Reeves 1970a) are occasionally found in the Besant, Pelican Lake and Hanna phases in the Northern Plains/Rocky Mountains.

Incomplete/Unclassifiable Side Notched Atlatl Points (Group 93)

Sample: N=7

Modification: Oblique proximal bifacial retouch. Flake scar widths 2-4 mm. wide.

Lithic Types: AC (N=1), AV (N=1), GG (N=1), KA (N=1), QG (N=1), RB (N=1)

Distribution: Table 6

Phase Associations: Bellevue Hill and Besant Complex

Discussion: The shoulder configurations of the body (N=4) and base (N=3) fragments, and associations, indicate that they are broken specimens of the
Bitterroot (DgPl-1: 253, DgPl-68: 13), Salmon River (DgPl-86: 28) and Besant
(DgPl-1: 83, DgPl-148: 206) types.

CORNER NOTCHED ATLATL POINTS

Trial Types 25-29, Group 94  Pl. 19: 1-13

Nomin: Pelican Lake Corner Notched

Sample: N=31

Form: Triangular (N=12), lanceolate (N=10) or ovate (N=6) body outlines. Straight to contracting ovate lateral body edges. Right angle, acute, or barbed shoulders. Broad to narrow corner notches. Rounded basal edges. Convex (N=14), straight (N=8), and concave (N=1) bases.

Metric Ranges: Five trial types based on metrics and body edge configurations are proposed:

Trial Type 25 (N=2) (Pl. 19: 1-2): Small triangular forms. Length 18-19 mm., width 16 mm., thickness 3-4 mm., weight 9-10 gms.

Trial Type 26 (N=5) (Pl. 19: 3-4): Medium sized triangular forms. Length 24-27 mm. (N=4), width 18-21 mm. (N=5), thickness 4-5 mm. (N=4), weight 1.6 - 2.5 gms. (N=4).

Trial Type 27 (N=6) (Pl. 19: 11-13): Large triangular forms. Length 36-37 mm. (N=3), width 24-26 mm. (N=6), thickness 6-7 mm. (N=5), weight 3.8 - 5.7 gms. (N=4).

Trial Type 28 (N=3) (Pl. 19: 5-6): Medium sized ovate forms with relatively long stems. Length 25-31 mm. (N=3), width 19-20 mm. (N=3), thickness 3-5 mm. (N=3), weight 2.3 - 3.4 gms. (N=3).

Trial Type 29 (N=11) (Pl. 19: 7-10): Medium to large, lanceolate forms with relatively short stems and acute to heavily barbed shoulders. Length 34-45 mm. (N=3) (one body, DgPl-47: 17 has a length of 53 mm.), width 19-26 mm. (N=6), thickness 4-7 mm. (N=11), weight 3.0 - 5.3 gms. (N=3).
Group 94 (N=4): Broken unclassifiable Pelican Lake Corner Notched points.

Modification: Proximal oblique complete (19 of 31) bifacial pressure retouch. Flake scar widths range 2-6 mm., \( \bar{x} 4 \) mm. Bases bifacially thinned and ground (14 of 24).

Lithic Types: AB (N=1), AC (N=13), BT (N=1), CB (N=1), KR (N=1), PY (N=1), QB (N=2), QD (N=3), RB (N=2), RS (N=1), TG (N=2), UQ (N=1), VA (N=1), VQ (N=1).

High frequency of Avon Chert and related varieties at DgP1-42.

Distribution: Table 6

Phase Association: Bellevue Hill (DgP1-1: 153, 254) (Pl. 19: 5, 9) and Blue Slate Canyon.

Discussion: Pelican Lake Corner Notched (Reeves 1970a) is the diagnostic point type found in regional subphases of the Pelican Lake Phase (ca. 1000 B.C. - A.D. 200-500) of the Northern Plains/Rocky Mountains. Minute differences exist between the points associated with each subphase. The forms in Waterton tend towards triangular outline with relatively wide bodies, while those in the adjacent Plains tend to have narrow bodies and a high frequency of ovate to lanceolate body outlines.

While primarily confined to the Late Middle Prehistoric, they also appear in the Early Middle Prehistoric; e.g., Mummy Cave (Wedel, Husted and Moss 1968), layer 16 (5680 B.C. \( \pm 170 \) (I-1588), layer 29 (3305 \( \pm 140 \) B.C.) and layer 25, and in the Shoup Rockshelter in Idaho both above and below Mazama Ash (Swanson and Sneed 1966).

Trial Type 30 Pl. 19: 20, 22

Nomin: Hanna Corner Notched

Sample: N=3
**Form**: Triangular to lanceolate body outlines. Contracting ovate lateral body edges. Obtuse to acute shoulders. Broad corner notches. Long stems. Low rounded basal edges. Straight or concave bases, narrower in width than the body.

**Metric Range**:
- Length: 23-52 mm. (N=2)
- Width: 10-11 mm. (N=2)
- Thickness: 6 mm. (N=2)
- Weight: 2.2 - 4.8 gms. (N=2)

**Modification**: Proximal oblique bifacial pressure retouch. Flake scar widths 3-5 mm. Bases thinned, may be ground.

**Lithic Types**: BA (N=1), CB (N=1), QY (N=1)

**Distribution**: Table 6

**Phase Association**: Blakiston Brook and Blue Slate Canyon

**Discussion**: Hanna points (Wheeler 1954), diagnostic of the Hanna Phase (Reeves 1970a), proceed and are contemporaneous with early Pelican Lake Phase components on the adjacent Plains.

**Trial Type** 31

**Nomin**: Pass Creek Corner Notched

**Sample**: N=3


**Metric Range**:
- Length: 31-33 mm. (N=2)
- Width: 15-16 mm. (N=3)
- Thickness: 4-6 mm. (N=3)
- Weight: 1.3 - 1.8 gms. (N=3)
Modification: Perpendicular to oblique proximal bifacial pressure retouch. Flake scar widths run 2-5 mm. Bifacially thinned and unground.

Lithic Types: BP (N=1), GG (N=1), RS (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill

Discussion: This trial type differs in its metric configuration from Pelican Lake Corner Notched. Similar forms are found associated with the Bitterroot and Salmon River types in Idaho (Swanson and Sneed 1966).

STEMMED ATLATL POINTS

Trial Type 32 Pl. 19: 21

Nomin: Hanna Stemmed

Sample: N=1


Metric Range:

Length: 35 mm.

Width: 21 mm.

Thickness: 5 mm.

Weight: 3.4 gms.

Modification: Proximal oblique bifacial pressure retouch. Flake scar widths average 3-4 mm. Base bifacially thinned and ground.

Lithic Types: AC (N=1)

Distribution: DgPl-86/Level 3

Phase Association: Blakiston Brook

Discussion: Hanna Stemmed is a new type proposed herein for the stemmed form found associated with Hanna Corner Notched. Although the form falls with-
in the range of the Duncan type (Wheeler 1954: Fig. 1d), it should be removed from this type as the former includes other distinctive variants within the original type description. Duncan should be restricted to stemmed lanceolate forms with deeply indented or concave bases (Wheeler 1954: Fig. 1a, b, c, and e). Although represented by only one point in the Pass Creek sample, it is relatively common in the adjacent Waterton Valley.

Trial Type 33

Nomin: Nubin Stemmed
Sample: N=1
Form: Triangular body outline. Acute shoulders. Narrow slightly expanding stem.

Metric Range:
Length: 26 mm.
Width: 23 mm.
Thickness: 7 mm.

Modification: Oblique proximal bifacial pressure retouch. Flake scar widths range 2-3 mm. Base unfinished.

Lithic Type: CC
Distribution: DgPl-42/Level 1
Phase Association: Blue Slate Canyon

Discussion: Nubin Stemmed forms are found in the central Rocky Mountains in association with obtuse shouldered types (Reeves 1970a). They also occasionally appear in the Northern Plains in Pelican Lake Phase components (e.g., Mulloy and Steege 1967: Fig. 17/3).
Trial Type 3^  Pl. 19: 29

Nomin: Irregular Stemmed
Sample: N=1
Form: Lanceolate body outline. Rounded obtuse shoulders. Irregular contracting stem.

Metric Range:
Length: 30 mm.
Width: 8 mm.
Thickness: 5 mm.
Weight: 2.5 gms.

Modification: Proximal oblique incomplete bifacial pressure retouch. Flake scar widths are 2-5 mm. Unfinished base.

Lithic Type: GG
Distribution: DgPl-1/Level 1
Phase Association: Bellevue Hill
Discussion: Stemmed forms do not normally occur with Bitterroot or Salmon River points. Consequently, the type probably represents a side notched specimen broken during flaking.

BASAL NOTCHED ATLATL POINTS

Trial Type 35  Pl. 19: 14-17, 23

Nomin: McKean Lanceolate
Sample: N=7
Form: Lanceolate body outline. Ovate to parallel ovate lateral body edges. Basal notches. One or both lateral edges may be slightly indented.

Metric Range:
Length: 21-38 mm. (N=5)
Width: 16-18 mm. (N=5)

Thickness: 5-6 mm. (N=5)

Weight: 24-51 gms. (N=5)

Modification: Distal to proximal oblique bifacial retouch. Flake scar widths run 3-6 mm. Basal notch unground. One specimen (DgPl-148: 19) (Pl. 19: 15) has been resharpened.

Lithic Types: AC (N=1), BA (N=1), CB (N=1), HC (N=1), OY (N=1), RB (N=1), WH (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill

Discussion: McKean Lanceolate, first described by Wheeler (1952) is widely distributed in the Northern Plains and Rocky Mountains.

Incomplete/Unclassifiable Broken Atlatl Points (Group 95)

Sample: N=14

Lithic Types: AC (N=2), BA (N=2), BT (N=2), CF (N=2), GG (N=1), GQ (N=1), KR (N=1), QB (N=1), QG (N=1), RQ (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill and Blue Slate Canyon

Discussion: This group consists of atlatl mid-sections and tips which cannot be classified. Phase associations and lithic types suggest that the DgPl-1 forms are broken Bitterroot or Salmon River side notched types, and the DgPl-42 specimens broken Pelican Lake Corner Notched.

INCOMPLETE/UNCLASSIFIABLE ARROW OR ATLATL POINTS (Group 96)

Atlatl or arrow tips. Distributions (Table 6) and distal tip angles suggest that specimens DgPl-148: 233, 234, 237, and 258, and DgPl-149: 6 are
atlatl tips, and DgPl-148: 219, 220, 225 and DgPl-1: 9 are arrow tips. Lithic types are AC (N=4), GD (N=1), GQ (N=1), GS (N=1), PC (N=1), QY (N=1).

**PREFORMS**

**Group** 90  
**Pl. 19: 24-26**

**Nomin:** Preforms  
**Sample:** N=11  
**Metric Range:**  
- Length: 23-40 mm. (N=5)  
- Width: 15-22 mm. (N=9)  
- Thickness: 3-6 mm. (N=10)  
- Weight: 4.4 gms. (N=1)  
**Modification:** Oblique proximal bifacial pressure retouch. Flake scar widths range 2-6 mm.  
**Lithic Types:** AC (N=3), CA (N=1), GG (N=3), RA (N=1), RB (N=3)  
**Distribution:** Table 6  
**Phase Association:** Bellevue Hill, Crandell Mountain and Besant Complex  
**Discussion:** With the exception of DgPl-76: 242 and DgPl-86: 55 (Pl. 19: 26), which are arrow preforms, the specimens are atlatl preforms broken during manufacture. Four DgPl-1 specimens associate stratigraphically and lithically with the Bellevue Hill Subphase, and one with the Besant Complex.

**GROUND ARGILLITE POINTS**

**Trial Type** 36  
**Pl. 19: 31-33**

**Nomin:** Ground Argillite Points  
**Sample:** N=3
Form: Side notched (N=1), corner notched (N=1) and stemmed (N=1) body outlines.

Metric Range:
- Length: 26-29 mm. (N=2)
- Width: 17-22 mm. (N=3)
- Thickness: 3-4 mm. (N=3)
- Weight: 1.7 - 2.6 gms. (N=2)

Modification: Marginally chipped argillite flakes with ground lateral edges, notches and base.

Lithic Type: GD (N=3)
Distribution: Table 6
Phase Association: Bellevue Hill
Discussion: The forms vary in their configurations, but likely are variants on the Bitterroot and Salmon River types.

LANCEOLATE SPEAR POINTS

Trial Type 37  Pl. 19: 40-43
Nomin: Lusk
Sample: N=4

Form: Lanceolate body outline. Expanding ovate (N=3) or excurbate (N=1) lateral body edges. Straight (N=3) or slightly concave (N=2) bases.

Metric Range:
- Length: 32-48 mm. (N=3)
- Width: 20-27 mm. (N=3)
- Thickness: 6-7 mm. (N=3)
- Weight: 5.5 - 6.0 gms. (N=3)

Modification: Subparallel, oblique proximal or perpendicular bifacial
pressure retouch. Flake scar widths run 3-5 mm. Base thinned but rarely ground (N=1). DgPl-1: 194, 348 (Pl. 19: 41, 43) specimens are reworked, and DgPl-1: 348 and DgPm-1: 87 specimens (Pl. 19: 43, 40) have a rounded blunted tip. Lateral edges are ground on DgPl-1: 358, 194 and DgPm-1: 71 (Pl. 19: 42), on the former to the point where reworking begins.

Lithic Types: AC (N=1), GG (N=2), WB (N=1)

Distribution: Table 6

Phase Association: Red Rock Canyon and Valley Entrance

Discussion: Lusk points were proposed by Irwin (1967) as a replacement for the Angostura type designation, as the latter type description included both Lusk and Agate Basin forms. The Waterton specimens do not exhibit the well controlled oblique flaking found on Lusk forms in the type area of the Plains. Similar forms occur in the mountainous area to the south.

Trial Type 38 Pl. 19: 45-46

Nomin: Agate Basin

Sample: N=2

Form: Lanceolate body outline, broken at or near maximum width. Excurvate body edges (one asymmetric) expand away from a straight or slightly convex base.

Metric Range:

Length (broken specimens): 35-40 mm. (original length ca. 70 mm.)

Width (at break): 22-24 mm.

Thickness: 7-8 mm.

Modification: Subparallel, perpendicular to distal oblique bifacial pressure retouch. Flake scar widths range 4-9 mm., X 6 mm. Base and lateral edges ground to point of break. Bases bifacially thinned. One specimen,
DgPm-1: 23 (Pl. 19: 46) has small channel flake removed from base, parallel to longitudinal axis.

**Lithic Type:** BA (N=1), GG (N=1)

**Distribution:** DgPm-1/Level 1

**Phase Association:** Red Rock Canyon

**Discussion:** Agate Basin is an Early Prehistoric point type found in the adjacent Plains (cf. Wormington 1957, Irwin 1967, Irwin and Wormington 1970). The DgPm-1 specimens correspond to Irwin's two basic styles - convex and straight base. The latter form quite often has a small channel flake removed. Asymmetric variants of the convex base form are evidently also present (cf. Wormington 1957: Fig. 46). Similar forms occur in the Big Horn Canyon, Mummy Cave and Idaho.

**Trial Type 39**

**Nomin:** Lerma

**Sample:** N=1

**Form:** Ovate body outline. Excurvate body edges.

**Metric Range:**
- **Length:** 53 mm.
- **Width:** 28 mm.
- **Thickness:** 8 mm.
- **Weight:** 10.5 gms.

**Modification:** Oblique proximal to perpendicular coarse bifacial percussion retouch. Base thinned by removal of a single flake. Platform remnant present on ventral surface.

**Lithic Type:** CB (N=1)

**Distribution:** DgPm-1/Level 1
Phase Association: Red Rock Canyon

Discussion: This form is similar to that termed "Broad Oval points" by Butler (1962: Fig. 10gg). The form would be considered Lerma by MacNeish (1964: 395). While some workers dislike the application of this nomen outside its original area, the writer sees no reason why it should not be applied in this or any other instance. A more "classic" form has been found in excavation at DgPm-18 (Reeves 1969: Fig. 5, No. 5); the latter is very comparable to a specimen illustrated by Suhm and Jelkes (1962: Plate 104c).

Trial Type 40

Pl. 19: 44

Nomin: Scotsbluff (Alberta)

Sample: N=1


Metric Range:

Length: 30 mm.

Width: 20 mm.

Thickness: 5 mm.

Weight: 3.2 gms.

Modification: Proximal oblique bifacial pressure retouch on body, distal oblique retouch on stem. Flake scar width averages 5 mm. Stem and base ground. Base unthinned.

Lithic Type: BA (N=1)

Distribution: DgPm-1/Level 1

Phase Association: Red Rock Canyon

Discussion: The form compares favorably in size with the smaller Scotsbluff or Alberta forms illustrated by Forbis (1968: Fig. b and m).
BIFACES

Bifaces consist of those bifacially modified flake or core tools which appear to have functioned primarily as cutting implements. The following classification is based on: 1) the formal edge configurations, 2) the symmetry or asymmetry of the form relative to the longitudinal and transverse axis, and 3) the presence or absence of hafting modifications.

BIFACES WITH MODIFIED HAFTING ELEMENTS

**Trial Type 01**

**Nomin:** Corner Notched

**Sample:** N=5

**Form:** Asymmetric ovate to triangular outline. Convex to concave lateral edges. Acute or barbed shoulders. Broad corner notches. Narrow, slightly expanding stems. Rounded basal edges. Convex bases.

**Metric Range:**

- Length: 32-65 mm. (N=3)
- Width: 20-44 mm. (N=3)
- Thickness: 5-7 mm. (N=4)
- Weight: 0.3 - 3.2 gms. (N=2)

**Modification:** Perpendicular to oblique proximal bifacial pressure retouch. Flake scar widths 2-4 mm. Bases bifacially thinned, one ground (DgPl-42: 216) (Pl. 20: 1). Beveled left lateral edges on DgPl-1: 2 and DgPl-42: 216.

**Lithic Types:** AC (N=1), BC (N=1), BT (N=1), QD (N=1), RB (N=1)

**Distribution:** Table 6

**Phase Association:** Blue Slate Canyon and Blakiston Brook. Specimen DgPl-
148: 2 from surface on slope above site.

Discussion: Size range of DgPl-42: 216 and DgPl-86: 15 suggest they were projectile points reutilized as bifacial knives. The type is occasionally found in Pelican Lake Phase components on the Northern Plains (Reeves 1970a).

**Trial Type 02**

**Nomin:** Stemmed Biface

**Sample:** N=2

**Form:** Large and small lanceolate forms. Excurvate body edges. Obtuse rounded shoulders. Straight to slightly contracting stems. Convex bases.

**Metric Range:**
- **Length:** 22-89 mm. (N=2)
- **Width:** 14-43 mm. (N=2)
- **Thickness:** 5-12 mm. (N=2)
- **Weight:** 3.1 gms. (N=1)

**Modification:** DgPm-1: 73 exhibits incomplete perpendicular bifacial percussion retouch. Flake scar widths range 4-7 mm. Base partially thinned. Manufactured by flaking down an argillite pebble. DgPl-148: 39 shows perpendicular to oblique proximal bifacial pressure retouch. Flake scar widths run 2-3 mm. Base thinned. May have been ground.

**Lithic Types:** KR (N=1), GY (N=1)

**Distribution:** DgPm-1/Level 1 and DgPl-148

**Phase Association:** Red Rock Canyon (DgPm-1 specimen only).

**Discussion:** Stemming of the DgPm-1 specimen is probably fortuitous, resulting from the flaking properties of the coarse grained argillite.
BIFACES WITHOUT MODIFIED HAFTING ELEMENTS

Trial Type 03

Pl. 20: 4-5

Nomin: Rectangular Pebble Biface

Sample: N=3

Form: Rectangular outline. Straight lateral edges. Slightly convex ends.

Metric Range:

Length: 47-59 mm. (N=3)

Width: 33-38 mm. (N=3)

Thickness: 7-10 mm. (N=3)

Weight: 7.2 gms. (N=1)

Modification: Manufactured by bifacial percussion flaking of flat, rectangular pebbles. Flaking is restricted to lateral edges on DgPl-42: 260 and 270; also present on the ends of 245.

Lithic Types: Green argillite stream pebbles. GA (N=3).

Distribution: DgPl-42/Level 1

Phase Association: Blue Slate Canyon

Discussion: The type has not been found in other sites in the Park, nor has it been reported for Pelican Lake Phase components in the adjacent Plains.

Trial Type 04

Pl. 20: 6-7

Nomin: Triangular Biface

Sample: N=5

Form: Triangular outline. Straight to slightly excurvate lateral edges. Slightly convex base.

Metric Range:

Length: 25-49 mm. (N=2)
Width: 20–37 mm. (N=3)
Thickness: 5–9 mm. (N=3)
Weight: 3.2 – 7.1 gms. (N=3)

Modification: Bifacial pressure (?) retouch covers both surfaces. Un-thinned bases. Manufactured on prepared flake blanks produced by direct percussion.

Lithic Types: AB (N=1), AC (N=1), BC (N=1), BT (N=1), DA (N=1)
Distribution: DgPl-42/Level 1
Phase Association: Blue Slate Canyon
Discussion: The form is a typical type found in Pelican Lake Phase components in the Northern Plains/Rocky Mountains (Reeves 1970a).

Trial Type 05 Pl. 20: 8-9, 12-13

Nomin: Symmetric Ovate – Convex Base Biface
Sample: N=9
Form: Ovate outline. Excurvate lateral edges. Point of maximum width located on proximal half of the form. Convex base.

Metric Range:
Length: 30–59 mm. (N=5)
Width: 23–43 mm. (N=6)
Thickness: 7–14 mm. (N=6)
Weight: 4.5 – 30.0 gms. (N=5)

Modification: Complete bifacial percussion retouch. Flake scar widths run 5–12 mm. Bases thinned, may be ground. Manufactured on prepared flakes produced by hard hammer percussion. Edges bifacially beveled on specimen DgPl-1: 362 (Pl. 20: 12).

Lithic Types: BA (N=1), GA (N=3), GG (N=1), GQ (N=2), HC (N=1), QR (N=1)
Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: Type relates technologically and formally to asymmetric biface types 06 and 08.

Trial Type 06 Pl. 20: 10

Nomin: Symmetric Ovate Bipoint

Sample: N=1


Metric Range:

Length: 100 mm.
Width: 47 mm.
Thickness: 8 mm.
Weight: 56.3 gms.

Modification: Bifacially percussion retouched. Flake scar widths range 4-10 mm. Base thinned and ground.

Lithic Type: UQ

Distribution: DgPl-85/Level 1

Phase Association: Red Rock Canyon (?)

Discussion: Type is technically identical to forms called Willow Leaf Bipoint or Lerma Point by many workers. However, edge wear on the specimen indicates that it was used as a knife.

Trial Type 07 Pl. 21: 1-6; Pl. 31: 13

Nomin: Asymmetric Ovate - Convex Base Biface

Sample: N=13
Form: Asymmetric ovate outline. Excurvate lateral edges. Convex base. Point of maximum width in the proximal half of form.

Metric Range:

Length: 25-77 mm. (N=7)
Width: 21-42 mm. (N=7)
Thickness: 8-12 mm. (N=9)
Weight: 5.4 - 31.1 gms. (N=6)

Modification: Complete to incomplete bifacial percussion or pressure retouch. Flake scar widths run 4-12 mm. Bases may or may not be thinned or ground. Manufactured on prepared flakes by hard hammer percussion except specimen DgPl-1: 32, which is made on a core. Dorsal surface edge bevelling on DgPl-1: 32, DgPl-148: 15, and DgPl-1: 96.

Lithic Types: BT (N=1), GA (N=4), GG (N=1), GQ (N=1), HC (N=2), QD (N=2), VQ (N=2)

Distribution: Table 6

Phase Association: Red Rock Canyon, Bellevue Hill and Blue Slate Canyon

Discussion: A common biface form in Late Early Prehistoric and Middle Prehistoric periods. DgPl-1 specimens similar to Type 06.

Trial Type 08

Nomin: Asymmetric Ovate - Straight Base Biface

Sample: N=4

Form: Asymmetric ovate outline. Excurvate lateral edges. Straight base. Point of maximum width in proximal half of form.

Metric Range:

Length: 39-58 mm. (N=3)
Width: 28-34 mm. (N=4)
Thickness: 8-10 mm. (N=3)
Weight: 3.2 - 8.1 gms. (N=2)

Modification: Complete to incomplete bifacial percussion retouch. Flake scar widths average 5-8 mm. Bases usually thinned, may be ground. Manufactured on prepared hard-hammer percussion flakes.

Lithic Types: GQ (N=1), HC (N=1), PA (N=1), QG (N=1)
Distribution: DgPl-1/Level 1
Phase Association: Bellevue Hill
Discussion: Form morphometrically related to Type 07 and 05 specimens from DgPl-1.

Trial Type 09
Pl. 21: 16-17

Nomin: Asymmetric Ovate - Convex Base Biface
Sample: N=3

Metric Range:
Length: 42-59 mm. (N=2)
Width: 20-29 mm. (N=2)
Thickness: 8-12 mm. (N=2)
Weight: 5.8 - 23 gms. (N=2)

Modification: Complete bifacial retouch. Flake scar widths range 3-7 mm. Bases thinned but unground. Manufactured on prepared flakes produced by hard-hammer percussion.

Lithic Types: DA (N=1), WO (N=1), WQ (N=1)
Distribution: Table 6
Phase Association: Bellevue Hill, Crandell Mountain and Pass Creek Valley
Discussion: Characteristic form found associated with the Avonlea Phase on adjacent Plains (Reeves 1970a). Broken specimens (Group 91), DgPl-68: 25 and 32, probably belong to this type.

**Trial Type 10**

Pl. 21: 10; Pl. 30: 5

**Nomin:** Oval Biface

**Sample:** N=3

**Form:** Oval outline. Excurvate lateral edges and proximal and distal ends.

**Metric Range:**
- **Length:** 48-105 mm. (N=3)
- **Width:** 35-97 mm. (N=3)
- **Thickness:** 11-22 mm. (N=3)
- **Weight:** 19.3 - 31.3 gms. (N=3)

**Modification:** Relatively complete bifacial percussion retouch. Flake scar widths run 2-15 mm. Specimen DgPl-1: 331 (Pl. 30: 5) manufactured on a large argillite core or flake.

**Lithic Types:** GG (N=2), GA (N=1)

**Distribution:** Table 6

**Phase Association:** Bellevue Hill and Blue Slate Canyon

**Discussion:** DgPl-1 specimen completely unrelated morphometrically to DgPl-42 specimens.

**Trial Type 11**

**Nomin:** Subcircular Biface

**Sample:** N=1

**Form:** Subcircular outline. No points of juncture separate lateral edges from proximal and distal ends.
Metric Range:

Length: 73 mm.
Width: 56 mm.
Thickness: 1\(\frac{1}{4}\) mm.
Weight: 62 gms.

Modification: Bifacial percussion retouch. Flake scar widths range 7-12 mm. Manufactured on prepared flake produced by hard-hammer percussion.

Lithic Type: WH
Distribution: DgPl-148
Phase Association: Unknown
Discussion: While the form bears a general morphological similarity to Type 10, it exhibits better controlled and more regular retouch.

Trial Type 12
Pl. 12: 12-15

Nomin: Asymmetric Triangular
Sample: N=12
Form: Triangular outline. One lateral edge straight or concave, other lateral edge excursive. Point of maximum width in proximal half of form, at or adjacent to the base.

Metric Range:

Length: 28-48 mm. (N=4)
Width: 15-24 mm. (N=4)
Thickness: 3-7 mm. (N=3)
Weight: 1.1-7.7 gms. (N=3)

Modification: Bifacial pressure retouch. Flake scar width average 2-5 mm. Bases thinned, occasionally ground. Manufactured on prepared flakes. Straight or slightly concave edge often backed (3 of 6) or bifacially beveled
Lithic Types: AC (N=4), BW (N=1), GS (N=1), HC (N=1), OB (N=1), PC (N=1), PY (N=1), QG (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: Form exhibits a distinct configuration morphometrically unrelated to other biface types. Small, thin forms such as DgPl-l: 135 and 351 (Pl. 21: 15) could have served as 01 type points.

Unclassifiable Broken Specimens - Group 91

Sample: N=23

Form and Modification: Biface tips which cannot be definitely assigned to any of the preceding trial types. Eleven specimens probably correspond to Trial Types 01, 05, or 07: DgPl-l: 106, 151, 220, 251, 330, 624, 625, 626, are either 05 or 07; DgPl-l: 10, DgPl-l: 21: 197, 240 either 01 or 07; DgPm-l: 76 either 05 or 07. Specimen DgPl-l: 52 and 25 probably correspond to Trial Type 09, and DgPl-l: 56 to Type 12.

Lithic Types: AC (N=5), CC (N=1), CP (N=1), GA (N=1), GW (N=1), HC (N=3), QD (N=3), QG (N=1), RA (N=1), RM (N=1), VA (N=2), VQ (N=2), WO (N=1). DgPl-l: 10 thermofractured.

Distribution: Table 6

Phase Association: All subphases
End scrapers are those tools whose primary working edge is located on the distal end; the lateral edges may or may not also be utilized.

The following classification is based on a number of criteria, including shape of the flake blank as reflected in the transverse and longitudinal sections, the formal outline, the extent of lateral edge and dorsal surface retouching, and the type of material utilized.

CRYPTOCRYSSTALLINE DORSALLY FINISHED ENDSNAPERS

**Trial Type 01**

**Sample:** N=5

**Form:** Rectangular (N=4) or square (N=1) body outline. Straight lateral edges. Convex transverse section. Straight longitudinal section.

**Metric Range:**
- **Length:** 18-29 mm. (N=2)
- **Width:** 17-23 mm. (N=5)
- **Thickness:** 4-8 mm. (N=5)
- **Weight:** 2.4 - 3.7 gms. (N=3)

**Modification:** Dorsal surface completely pressure retouched. Flake scar widths average 2-5 mm. Hafting area on DgPl-42: 5 (Pl. 20: 4) thinned by longitudinal removal of flakes from dorsal surface. DgPl-42: 250 (Pl. 20: 1) retouched on ventral surface distal end. Manufactured on lamellar flakes. DgPl-42: 209 (Pl. 20: 2) flake produced by hard-hammer percussion or punch.

**Lithic Types:** BT (N=1), GH (N=1), KR (N=1), RA (N=1), RB (N=1)

**Distribution:** DgPl-42/Level 1
Phase Association: Blue Slate Canyon

Discussion: DgPl-42: 250 ventral surface retouch is similar to that on Trial Type 09 specimen DgPm-1: 14. Trial Type 01 is formally closest to Trial Type 09, differing only in the presence or absence of retouched dorsal surface.

Trial Type 02

Sample: N=2

Form: Rectangular body outline. Straight lateral edges. Truncated convex transverse section. Straight longitudinal section. Distal left lateral corner is spurred.

Metric Range:
- Length: 18-29 mm. (N=2)
- Width: 17-23 mm. (N=5)
- Thickness: 4-8 mm. (N=5)
- Weight: 2.4 - 3.7 gms. (N=3)


Lithic Types: RA (N=1), WH (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill

Discussion: None.
Trial Type 03

Sample: N=1

Form: Small, square body outline. Straight lateral edges. Convex transverse section. Angular longitudinal section.

Metric Range:

Length: 18 mm.
Width: 17 mm.
Thickness: 7 mm.
Weight: 2.8 gms.

Modification: Dorsal surface completely pressure retouched. Flake scar widths average 1-2 mm. Flakes removed from proximal end parallel to the longitudinal axis. Ventral surface retouch at proximal end and along left lateral edge. Heavy use retouch on lateral edges.

Lithic Type: RH
Distribution: DgPl-75
Phase Association: Unknown
Discussion: Method of dorsal surface retouching is unique in the sample.

Trial Type 04

Sample: N=5


Metric Range:

Length: 19-37 mm. (N=5)
Width: 13-28 mm. (N=5)
Thickness: 4-7 mm. (N=5)
Weight: 1.0 - 5.6 gms. (N=5)
Modification: Dorsal surface completely retouched. Flake scar widths range 2-6 mm., X 4 mm. Ventral surface in striking platform area and adjacent lateral edges retouched. Relic platform area on DgPl-1: 337 (Pl. 22: 9) specimen. Lateral edges may show use retouch.

Lithic Types: AC (N=1), BB (N=1), BT (N=2), KR (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon

Discussion: DgPl-42: 249 and 252 (Pl. 22: 8) specimens, manufactured of the same lithic type, are identical in form, complete to a projecting spur on the right lateral edge, and were probably made by the same artisan. DgPm-1: 44 (Pl. 22: 11) differs slightly from the rest, as the dorsal surface retouching has been directed to produce a "domed" effect at the point of maximum thickness. DgPl-42: 111 (Pl. 22: 10) is the smallest end scraper in the sample.

Trial Type 05 Pl. 22: 12-14

Sample: N=7

Form: Triangular body outline. Straight lateral edges. Angular transverse and longitudinal sections.

Metric Range:

Length: 22 mm (N=2)

Width: 19-24 mm. (N=2)

Thickness: 7-8 mm. (N=3)

Weight: 3.2 - 3.6 gms. (N=3)

Modification: Completely retouched dorsal surface. Flake scar widths average 2-5 mm. DgPl-1: 82 (Pl. 22: 13) specimen completely flaked on ventral surface. Manufactured on slightly expanding triangular flakes, produced by
hard-hammer percussion.

**Lithic Types:** BA (N=1), KS (N=3), OY (N=1), RM (N=1), WO (N=1)

**Distribution:** Table 6

**Phase Association:** Bellevue Hill

**Discussion:** This type is similar to Trial Type 04, differing mainly in more markedly angular cross and longitudinal sections. DgPl-1: 270 and 281 are fragmentary mid-sections and may not belong in this type.

**Trial Type** 06  
**Pl. 22: 15**

**Sample:** N=2

**Form:** Short triangular body outline. Straight to slightly convex lateral edges. Convex transverse section. Angular longitudinal section.

**Metric Range:**

- **Length:** 16-19 mm. (N=2)
- **Width:** 16 mm.
- **Thickness:** 5-6 mm. (N=2)
- **Weight:** 1.4 gms. (N=1)

**Modification:** Pressure retouched dorsal surfaces. Flake scar widths run 2-4 mm. Original cortex present on DgPl-42: 172. Manufactured on split pebbles. DgPl-1: 76 (Pl. 22: 15) has cortical striking platform.

**Lithic Type:** GB (N=2)

**Distribution:** Table 6

**Phase Association:** Pass Creek Valley

**Discussion:** This type is related to Trial Types 07, 17, and 20, all products of the Rundle Technology. Form is more equilateral triangular in shape than other forms described above.
Trial Type 07

Sample: N=1


Metric Range:

- Length: 24 mm.
- Width: 22 mm.
- Thickness: 9 mm.
- Weight: 4.6 gms.

Modification: Pressure retouched dorsal surface. Flake scar widths average 4-6 mm. Cortex remnant on proximal end adjacent to striking platform area. Manufactured from split pebble blank.

Lithic Type: BP

Distribution: DgPl-55

Phase Association: Pass Creek Valley

Discussion: This type is similar in configuration to Trial Type 08; however, the blank is product of different technology. Technologically the type is related to Trial Types 07, 17, and 20.

Trial Type 08

Sample: N=4


Metric Range:

- Length: 21-46 mm. (N=3)
- Width: 19-32 mm.
- Thickness: 7 mm.
- Weight: 3.7 - 15.8 gms.
Modification: Completely retouched dorsal surfaces. Flake scar widths average 3-5 mm. Specimen DgPl-42: 229 (Pl. 22: 28) has been resharpened by removing a flake the width of the form from the ventral surface at the distal end. Ventral surface retouch in striking platform area and adjacent lateral edges. Manufactured on triangular expanding or oval (?) flakes, produced at least in one instance by soft-hammer percussion (DgPl-42: 11).

Lithic Types: BH (N=1), BT (N=2), QB (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon and Bellevue Hill

Discussion: DgPl-42 forms are morphometrically related to Trial Types 01 and 04.

CRYPTOCRystALLINE DORSALLY UNFINISHED END SCRAPERS

Trial Type 09

Pl. 22: 18-20, 29

Sample: N=7

Form: Rectangular body outline. Straight lateral edges. Straight, truncated, transverse section. Straight longitudinal section.

Metric Range:

- Length: 18-36 mm. (N=3)
- Width: 21-30 mm. (N=5)
- Thickness: 2-6 mm. (N=4)
- Weight: 2.1 - 8.2 gms. (N=4)

Modification: Dorsal surface unretouched. One or both lateral edges usually retouched. Manufactured on truncated lamellar flakes. DgPm-1: 14 (Pl. 22: 29) specimen has flake removed from ventral surface at distal end in similar fashion to that found on Trial Type 01 specimen (DgPl-42: 230).
Lithic Types: QD (N=1), QG (N=1), QW (N=1), QY (N=1), RC (N=1), RH (N=1), TG (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon (N=6) and Pass Creek Valley (N=1)

Discussion: The type is closest to dorsally finished Trial Type 01. The latter was probably produced on a prismatic lamellar flake.

Trial Type 10 Pl. 23: 30-32

Sample: N=4

Form: Square outline. Straight to convex lateral edges. Straight, truncated, transverse and longitudinal sections.

Metric Range:
   Length: 22-32 mm. (N=4)
   Width: 17-26 mm. (N=4)
   Thickness: 6-12 mm. (N=4)
   Weight: 3.7 - 11.5 gms. (N=4)

Modification: Retouch confined to lateral edges and distal ends. DgPl-68: 2 and 23 (Pl. 22: 31) also retouched on proximal end. Manufactured on prismatic and truncated flakes produced by hard-hammer percussion. Ventral surface retouching present on one end of DgPl-68: 23.

Lithic Types: BG (N=1), KR (N=1), QY (N=2)

Distribution: Table 6

Phase Association: Pass Creek Valley and Crandell Mountain

Discussion: Formal configuration generally unrelated to other types. Closest overall relationship to specimens is dorsally retouched types 08 (DgPl-1: 206) (Pl. 22: 17) and 01 (DgPl-42: 209) (Pl. 22: 2).
Trial Type 11

Sample: N=2

Form: Expanding rectangular outline. Straight lateral edges. Angular transverse and longitudinal sections.

Metric Range:
- Length: 30-31 mm. (N=2)
- Width: 19-20 mm. (N=2)
- Thickness: 8-9 mm. (N=2)
- Weight: 4.4 - 5.0 gms. (N=2)

Modification: Retouching confined to distal ends. Manufactured from prismatic flakes produced by hard-hammer percussion. DgPl-1: 108 (Pl. 22: 21) had platform snapped off prior to hafting.

Lithic Types: AC (N=1), OY (N=1)

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: The type is similar to types 05 and 12, which are made on the same basic flake type.

Trial Type 12

Sample: N=3

Form: Expanding rectangular outline. Straight lateral edges. Angular transverse and longitudinal sections.

Metric Range:
- Length: 23-25 mm. (N=3)
- Width: 16-20 mm. (N=3)
- Thickness: 5-7 mm. (N=3)
- Weight: 4.3 - 6.2 gms. (N=3)
Modification: Retouch confined to lateral edges and distal end, except on DgPl-86: 26 (Pl. 22: 23), which has the left half dorsal surface retouched. Manufactured on prismatic flakes. Striking platforms snapped off. Use retouch on the proximal end indicates forms were hafted after snapping.

Lithic Types: RA (N=3). DgPl-86: 30 (Pl. 22: 24) is potlidded, indicating subsequent burning.

Distribution: Table 6

Phase Association: Bellevue Hill and Blakiston Brook

Discussion: Specimens are morphometrically intermediate between types 11 and 13. Specimen DgPl-86: 26 is the only specimen with the dorsal surface half retouched. Comparison of facet edge angles of types 11, 12 and 13:

Type 11, $\bar{x} 39^\circ (R 30-45^\circ) N=4$; Type 12, $\bar{x} 36^\circ (R 32-40^\circ) N=3$; Type 13, $\bar{x} 34^\circ (R 28-40^\circ)$ - suggests that Type 12 flake blank is intermediate between Types 11 and 13.

Trial Type 13

Sample: N=4


Metric Range:

- Length: 18-29 mm. (N=3)
- Width: 19-20 mm. (N=2)
- Thickness: 5-6 mm. (N=3)
- Weight: 3.0 gms. (N=1)

Modification: Retouch confined to lateral edges and distal end. Platforms thinned by removal of long, narrow (1-2 mm. wide), parallel flakes on dorsal surface at proximal end. Manufactured on long, narrow, truncated and
prismatic punched blade-like flakes.

**Lithic Types:** KR (N=3), RA (N=1). Two specimens are thermofractured.

**Distribution:** DgPl-68/Level 2

**Phase Association:** Crandell Mountain

**Discussion:** This type differs in many characteristics from the other types in productive technology, blank type, and dorsal thinning technique.

**Trial Type 14**

**Sample:** N=1

**Form:** Equilateral triangular outline. Convex and irregular lateral edges. Angular transverse section. Truncated longitudinal section.

**Metric Range:**
- Length: 24 mm.
- Width: 20 mm.
- Thickness: 9 mm.
- Weight: 3.2 gms.

**Modification:** Retouch confined to lateral edges and distal end. Manufactured on triangular blank.

**Lithic Type:** QY

**Distribution:** DgPl-42/Level 1

**Phase Association:** Blue Slate Canyon

**Discussion:** The Trial Type is unlike others from DgPl-42 which are made on rectangular lamellar blanks of one form or another.

**Trial Type 15**

**Sample:** N=3

**Form:** Expanding rectangular-triangular outline. Straight lateral edges.
Angular cross section. Straight longitudinal section.

**Metric Range:**
- Length: 20 mm. (N=1)
- Width: 20 mm. (N=1)
- Thickness: 7 mm. (N=1)
- Weight: 3.5 gms. (N=1)

**Modification:** Retouch confined to distal end. Manufactured on low facet angle ($\bar{X} 30^\circ$) triangular flakes. DgPl-1: 23 (Pl. 23: 2) has been snapped but rehafted subsequently.

**Lithic Types:** DG (N=1), QL (N=1), RA (N=1). DgPl-1: 326 thermofractured.

**Distribution:** Table 6

**Phase Association:** Pass Creek Valley

**Discussion:** Type 15 is intermediate in facet angle between 13 and 16. Former are produced on different flake blanks.

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**Trial Type 16**

**Pl. 23: 3-6**

**Sample:** N=4

**Form:** Triangular outline. Straight to slightly convex lateral edges. Angular cross section, apex skewed to the right. Straight longitudinal section.

**Metric Range:**
- Length: 15-24 mm. (N=4)
- Width: 16-21 mm. (N=4)
- Thickness: 4-6 mm. (N=4)
- Weight: 0.9 - 2.2 gms. (N=4)

**Modification:** Retouch confined to distal end and lateral edges. Manufactured on a thin triangular flake, whose arris lies along the right lateral edge resulting in a low left facet angle (22-23°), and a high right facet angle (30-50°). Blank produced by hard-hammer percussion.
Lithic Types: AC (N=2), GQ (N=1), NT (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill

Discussion: Flake type on which type is manufactured differs from all preceding types.

Trial Type 17

Sample: N=3


Metric Range:

- Length: 18-34 mm. (N=3)
- Width: 18-25 mm. (N=3)
- Thickness: 9-10 mm. (N=3)
- Weight: 1.3 - 9.9 gms. (N=3)


Lithic Types: BR (N=1), HC (N=1), PG (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley

Discussion: This form is technologically related to Types 6, 7, and 18 in the use of split chert pebbles for modification into end scrapers.

Trial Type 18

Sample: N=3

Form: Oval to discoidal outline. Convex transverse and longitudinal
sections.

**Metric Range:**

Length: 20–32 mm. (N=3)  
Width: 15 mm. (N=1)  
Thickness: 4–8 mm. (N=3)  
Weight: 1.2 gms. (N=1)

**Modification:** Unretouched cortical dorsal surface. Retouch confined to distal end and lateral edges. DgPl-148: 56 (Pl. 23: 12) is a split pebble with only use retouch on the distal end.

**Lithic Type:** BC (N=3)  
**Distribution:** Table 6  
**Phase Association:** Pass Creek Valley

**Discussion:** This Trial Type is technologically related to types 6, 7, and 17.

**Trial Type 19**

**Pl. 23: 13-15**

**Sample:** N=4  
**Form:** Ovate outline. Angular transverse section. Convex longitudinal section.

**Metric Range:**

Length: 31-66 mm. (N=4)  
Width: 22-35 mm. (N=3)  
Thickness: 7-13 mm. (N=4)  
Weight: 4.2 – 30.5 gms. (N=3)

**Modification:** Dorsal surfaces may be partially retouched. Retouch may be present along the lateral edges. Manufactured on oval (?) flakes produced by hard-hammer percussion and punch (DgPl-68: 58) (Pl. 23: 15).
Lithic Types: AC (N=2), BQ (N=1), WT (N=1)

Distribution: Table 6

Phase Association: Red Rock Canyon, Valley Entrance and Pass Creek Valley

Discussion: Specimens of this type vary greatly in size. The DgPm-1 and DgPl-1 forms are very similar to ones found in other Early Prehistoric contexts (cf. Irwin 1967) where they are associated with Agate Basin or Lusk points (Husted 1969: Plate 7f).

Unclassifiable Broken Cryptocrystalline Endscrapers - Group 91, 92

Sample: N=2

Form: Two broken end scrapers, a butt (91) and a mid-section (92).

Lithic Types: AC (N=1), RA (N=1)

Distribution: Table

Phase Association: Crandell Mountain

MICROCRYSTALLINE END SCRAPERS

Trial Types 20-22 P1. 23: 16-20

Sample: N=8

Form: Ovate (Trial Type 20) to rectanguloid (Trial Types 21 and 22) outline. Convex or straight lateral edges. Convex (Trial Type 20), angular (Trial Type 21) or truncated (Trial Type 22) transverse sections. Straight (Trial Type 20), truncated (Trial Type 21), or angular (Trial Type 22) longitudinal sections.

Metric Range:

Length: 30-80 mm. (N=8)

Width: 30-45 mm. (N=8)

Thickness: 12-19 mm. (N=8)
Weight: 19.6 - 72.0 gms. (N=8)

Modification: Retouch primarily confined to distal ends and lateral edges. Dorsal surface may be partially or completely modified. Manufactured on large, thick, tabular, triangular or oval flakes. Cortical platforms present on DgPl-1: 47, 57, and 245. "Prepared" ground platforms on DgPl-1: 70 and 71. Cortical surface is present on dorsal surface of DgPl-1: 365 and on the left lateral edge of 47. Flakes were produced by hard (?) hammer percussion on cobble cores, resulting in the removal of a tabular, triangular decortication or prepared flake, using either a natural cortical surface as the striking platform or prepared platform.

Lithic Type: GA (N=8)

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: The Trial Types are part of the "Grinnell Technology". Type 22 approaches Type 16; in form Type 19 and Type 23; and is similar to Types 2, 5, and 11. One might interpret these similarities as representing an attempt by the fabricators to replicate the cryptocrystalline blank forms.
SIDE SCRAPERS

Side scrapers consist of those unifacially modified tools whose primary working edges, characterized by steep retouching, are located along the lateral edges of the form. The following classification is based upon differences in morphology, modification and lithic type.

Trial Type 01

Pl. 24: 1-2

Nomin: Pointed Uniface

Sample: N=2

Form: Ovate to triangular body outline. Slightly excurvate lateral edges. Pointed distal end. Straight proximal end. Plano-convex transverse section.

Metric Range:

Length: 48 mm. (N=1)
Width: 34 mm. (N=1)
Thickness: 9-11 mm. (N=2)
Weight: 14.1 gms. (N=1)

Modification: Complete to incomplete dorsal surface pressure retouch. Flake scar widths range 4-10 mm. DgPl-85: 2 (Pl. 24: 1) is also completely flaked on the ventral surface. Ventral surface retouching confined to distal end on DgPl-42: 217 (Pl. 24: 2).

Lithic Types: BT (N=1), HC (N=1)

Distribution: DgPl-42/Level 1; DgPl-85/Level 3

Phase Association: Blue Slate Canyon and Crandell Mountain

Discussion: The form is a characteristic type found in various phases of the TUNAXA cultural tradition (Reeves 1970a) in the adjacent Plains and Rocky
Mountains.

**Trial Type 02**  
Pl. 24: 18

**Nomin:** Green Argillite Pointed Uniface  
**Sample:** N=2  
**Form:** Ovate outline. Pointed distal end. Convex lateral body edges.  
**Metric Range:**  
 Thickness: 10-15 mm. (N=2)

**Modification:** Percussion retouched dorsal surface. Flake scar widths run 6-12 mm. Manufactured on decortication flakes produced by hard-hammer percussion. DgPl-1: 239 retouched along right lateral edge on ventral surface.

**Lithic Type:** GA (N=2)  
**Distribution:** DgPl-1/Level 1  
**Phase Association:** Bellevue Hill  
**Discussion:** This type is a product of the Grinnell Technology

**Trial Type 03**  
Pl. 24: 6-9

**Nomin:** Rectangular Side Scraper  
**Sample:** N=7  
**Form:** Rectangular outline. Relatively straight lateral edges. Straight to convex proximal and distal ends. Plano-convex transverse section.  
**Metric Range:**  
 Length: 35-50 mm. (N=4)  
 Width: 22-30 mm. (N=5)  
 Thickness: 6-13 mm. (N=7)  
 Weight: 10-20 gms. (N=4)
Modification: Completely pressure retouched dorsal surface (6 of 7 specimens). Flake scar widths range 2-6 mm. Ventral surfaces also completely flaked on two specimens. Use retouching generally present on all edges and ends. Manufactured on prepared flakes. In one instance (DgPl-42: 121) flake removed by hard-hammer percussion.

Lithic Types: AC (N=1), BT (N=1), GS (N=1), PP (N=1), QB (N=1), QY (N=1), RA (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon and Pass Creek Valley

Discussion: This type is a typical form found in Pelican Lake Phase components in the adjacent Plains (Reeves 1970a). The DgPm-U specimen is morphometrically similar to but technologically distinct from the DgPl-42 specimens.

Trial Type 04

Pl. 24: 17

Nomin: Green Argillite Rectangular Side Scraper

Sample: N=2

Form: Rectangular outline. Straight to excursive lateral edges. Convex distal end. Straight proximal end.

Metric Range:

Length: 32-62 mm. (N=2)

Width: 38 mm. (N=2)

Thickness: 15 mm. (N=2)

Weight: 37.2 - 41.1 gms. (N=2)

Modification: Dorsal surfaces completely percussion retouched. Flake scar widths run 4-10 mm. Extensive use retouch on edges. Manufactured on decortication flakes produced by hard-hammer percussion.
Lithic Type: GA (N=2)
Distribution: DgPl-1/Level 1
Phase Association: Bellevue Hill
Discussion: This type is a product of the Grinnell Technology.

Trial Type 05
Nomin: Notched Rectangular Side Scraper
Sample: N=1
Form: Broken rectangular outline. Straight lateral edges. Convex distal end. Notches placed along the sides (20 mm.) behind distal end to facilitate hafting (?).

Metric Range:
Thickness: 9 mm.
Modification: Dorsal surface completely pressure retouched. Flake scar widths average 5 mm. Ventral surface retouched along lateral edges.

Lithic Type: AC
Distribution: DgPl-1/Level 1
Phase Association: Bellevue Hill
Discussion: Notching may be fortuitous rather than intended.

Trial Type 06
Nomin: Domed Side Scraper
Sample: N=2

Metric Range:
Length: 47-50 mm.
Thickness: 22-25 mm.
Modification: Retouch confined to lateral edges. Specimen DgPl-42: 243 (Pl. 24: 4) ventral surface has lateral edge retouch.

Lithic Types: AC (N=1), GS (N=1)

Distribution: DgPl-42/Level 1

Phase Association: Blue Slate Canyon

Discussion: While the specimens are fragmentary, their general configuration suggests that they belong to the Domed Side Scraper type, a common Pelican Lake Phase form (Reeves 1970a).

Trial Type 07 Pl. 24: 12-14

Nomin: Rectangular Flake Side Scraper

Sample: N=3

Form: Small rectangular outline.

Metric Range:

Length: 28-32 mm.

Width: 12-14 mm.

Thickness: 4-7 mm.

Weight: 18-19 gms.

Modification: Steep marginal dorsal surface retouch confined to lateral edges and ends. Made on small decortication or lamellar flakes, produced by hard-hammer percussion.

Lithic Types: BA (N=1), GG (N=1), RY (N=1)

Distribution: Table 6

Phase Association: Red Rock Canyon, Bellevue Hill, Blue Slate Canyon

Discussion: This form is essentially a flake which has been retouched to produce a definite form.
Trial Type 08

Nomin: Oval Flake Side Scraper
Sample: N=1
Form: Large oval outline. Convex working edge and distal end. Relatively straight base and holding edge.

Metric Range:
   Length: 75 mm.
   Width: 57 mm.
   Thickness: 11 mm.
   Weight: 54.6 gms.

Modification: Base and holding edge retouched on the ventral flake surface. Dorsal surface originally percussion flaked, then pressure retouched around lateral edges, except in the palmar region.

Lithic Type: DA
Distribution: DgPl-42/Level 1
Phase Association: Blue Slate Canyon
Discussion: Form modified for right handed grip.

Trial Type 09

Nomin: Concave End Side Scraper
Sample: N=2
Form: Broken rectangular outline. Relatively straight lateral edges. Concave distal (?) end.

Metric Range:
   Width Distal End: 11 mm.
   Depth concavity: 2 mm.
   Thickness: 4-11 mm.
Modification: Retouch restricted to lateral edges and distal end.

Lithic Types: AC (N=1), QD (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon and Bellevue Hill

Discussion: These two specimens are unique in the sample. Microscopic examination suggests the concave edges functioned as spokeshaves or gouges.

Trial Type 10

Pl. 24: 15

Nominal: Split Pebble Side Scraper

Sample: N=2

Form: One triangular and one broken form

Metric Range:

Length: 30 mm. (N=1)

Width: 23 mm. (N=1)

Thickness: 10 mm. (N=1)

Weight: 7.2 gms. (N=1)

Modification: Manufactured on split pebbles. Edge retouch confined to straight lateral edge and end on complete form. Cortex covers most of the dorsal surface.

Lithic Type: BC (N=2)

Distribution: DgPl-1/Level 2B, DgPl-55

Phase Association: Pass Creek Valley

Discussion: This type is a product of the Rundle Technology.

Unclassifiable Side Scraper Fragments - Group 91

Sample: N=7

Form and Modification: Broken fragments with steep marginal retouch,
four of which have completely flaked dorsal surfaces (DgP1-42: 41, 113, 151, 256).

**Lithic Types:** AC (N=2), BT (N=1), OB (N=1), PC (N=2), QW (N=1)

**Distribution:** Table 6

**Phase Association:** Red Rock Canyon, Blue Slate Canyon, Pass Creek Valley

**Discussion:** Forms from DgP1-42 with completely retouched dorsal surfaces are probably Trial Type 03 fragments.
Division within these groups is based on observable formal and functional
differences.

BIFACIAL DRILLS AND PERFORATORS

**Trial Type 01**

**Pl. 25: 1**

**Nomin:** Reworked Corner Notched Point

**Sample:** N=1

**Form and Modification:** Barbed, Pelican Lake Corner Notched point, whose
tip has been reworked into a perforating/graving tool. Microscopic striations
run oblique and parallel to the longitudinal axis. Tip is four mm. long.

**Metric Range:**
- Length: 30 mm.
- Width: 26 mm.
- Thickness: 5 mm.
- Weight: 3.3 gms.

**Lithic Type:** BT

**Distribution:** DgP1-42/Level 1

**Phase Association:** Blue Slate Canyon

**Discussion:** Form corresponds to Pelican Lake Corner Notched - Trial Type 26.

**Trial Type 02**

**Pl. 25: 2**

**Nomin:** Side Notched Perforator/Graver

**Sample:** N=1
Form and Modification: Side notched form, probably originally a projectile point, whose tip has been reworked to a sharp perforating or graving point. Bifacial retouch on left lateral edge from notch to tip. Unifacial ventral surface retouch on distal half of right lateral edge. The alternate retouch produces a beveled diamond shaped cross section. Tip, six mm. long, has oblique and longitudinal, parallel striations on it.

Metric Range:
Length: 24 mm.
Width: 15 mm.
Thickness: .6 mm.
Weight: 2.1 gms.

Lithic Type: GQ
Distribution: DgPl-42/Level 1
Phase Association: Blue Slate Canyon

Discussion: This specimen was probably once a Pelican Lake Corner Notched point.

Trial Type 03 Pl. 25: 3-5

Nomin: Side Notched Perforator/Drill
Sample: N=3


Metric Range:
Length: 28-32 mm.
Width: 10-17 mm.
Thickness: 4-6 mm.
Weight: .9 - 2.6 gms.

Lithic Types: AC (N=2), QY (N=1)

Distribution: DgPl-42/Level 1 (N=2), DgPl-1/Level 1

Phase Association: Blue Slate Canyon and Bellevue Hill

Discussion: Configurations of the three specimens suggest that they are not reworked projectile points. DgPl-42 specimens are probably perforating tools, and the DgPl-1 specimen a drill.

Trial Type 04

 NomIn: Oval Butt Drill/Graver
 Sample: N=1

 Form and Modification: Oval butt. Short blunted tip, exhibiting crushed edges and perpendicular and oblique striations.

 Metric Range:
 Length: 21 mm.
 Width: 20 mm.
 Thickness: 8 mm.
 Weight: 2.1 gms.

 Lithic Type: Obsidian
 Distribution: DgPl-55
 Phase Association: Pass Creek Valley
 Discussion: May have had another bit projecting from the butt, which was snapped off at its base.
Trial Type  05

Nomin:  T-Butt Drill

Sample:  N=1

Form and Modification:  Proximal shaft and adjacent butt area of a broken bifacially modified T-butt drill.

Lithic Type:  Pink Chert

Distribution:  DgPl-148

Phase Association:  Unknown

Discussion:  None

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Trial Type  06  Pl. 25: 7

Nomin:  Triangular Perforator/Graver

Sample:  N=2

Form and Modification:  Triangular outline. Marginally retouched flake. Bifacially retouched along the right lateral edge. Unifacially retouched on the dorsal surface of the left lateral edge. Wear striations parallel and oblique to the tip.

Metric Range:

Length:  22-32 mm.  (N=2)

Width:  12-21 mm.  (N=2)

Thickness:  5-6 mm.  (N=2)

Weight:  1.0 - 3.6 gms.  (N=2)

Lithic Types:  QY  (N=1),  GG  (N=1)

Distribution:  DgPl-149,  DgPl-1/Level 1

Phase Association:  Bellevue Hill

Discussion:  None
Trial Type 07

Nomin: Flake Butt Perforator/Graver

Sample: N=1

Form and Modification: Flake with distal end unifacially retouched to produce a pointed bit (10 mm. long) set perpendicular to flake percussion axis. Oblique and perpendicular striations on tip.

Lithic Type: CC

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: None

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Trial Type 08

Nomin: Burins

Sample: N=4

Burins are those artifacts which have been purposefully modified by a burin blow to produce a cutting, engraving edge. They are described individually in the following section.

Type: Single-Faceted Single-Ended Burin Pl. 25: 11

Form and Manufacture: Flat oval pebble quartered by flexion to produce two adjacent flat surfaces. A burin blow directed parallel to the longitudinal fracture removed a single burin spall, two mm. long and four mm. wide, at the proximal end, producing a squared, sharp cutting edge at the intersection of the transverse fracture and longitudinal edge.

Metric Range:

Width of Burin: 28 mm.
Length of Burin: 36 mm.
Width of Cutting Edge: 8 mm.
Cutting Angle: 90°

Weight: 11.5 gms.

**Lithic Type:** BC

**Distribution:** DgPl-1/Level 1

**Phase Association:** Bellevue Hill

**Discussion:** A comparable specimen was not encountered in the literature searched.

**Type:** Single-Faceted Double-Ended Burin Pl. 25: 9

**Form and Manufacture:** Manufactured on a thick flake which was initially prepared by bifacial flaking of the edges. The blank was then broken transversely, producing a smooth flat fracture. A burin spall was either removed at this stage from the transverse surface, or subsequent to the removal of a spall longitudinally by a blow delivered perpendicular to the lateral edge of the blank. This spall, 31 mm. long, width eight mm., extended the complete length of the form. Subsequently a blow was directed at the base of the burin, removed a spall seven mm. long and three mm. wide, creating a "beak" at the base of the form. The lateral edges were further bifacially retouched subsequent to the initial spalling. The burin was resharpened at least three times, with the removal of three spalls (lengths ten, six and five mm.) from the originally trimmed proximal end. The form was discarded when still square and sharp.

**Metric Range:**

Length: 33 mm.

Width at Base of 2nd Scar: 22 mm.

Width at Base of 4th Scar: 17 mm.

Thickness at Top of 4th Scar: 8 mm.

Cutting Angle Proximal: 85°
Cutting Angle Distal: 85°

Weight: 7.2 gms.

**Lithic Type:** CC

**Distribution:** DgPm-1/Level 1

**Phase Association:** Red Rock Canyon

**Discussion:** This specimen resembles some of Alexander's (1963) type three, which are made on bifacial tools, and is not unlike some illustrated by Giddings (1964) for Cape Denbeigh.

**Type:** Single-Faceted Single-Ended Burin and Spall  Pl. 25: 12-13

**Form and Manufacture:** Made on an oval chert pebble. One surface was first flaked, then the edge chosen to receive the burin blow was prepared by battering. A blow was subsequently directed nine mm. in from the lateral edge, removing a spall the whole length of the pebble (38 mm.). The lateral edges and ends of the burin were subsequently flaked, producing a form 30 mm. long. The proximal end of the form and the adjacent burin facet were bifacially trimmed to produce a sharp cutting point at the intersection of the edge and the burin facet.

**Metric Range:**

- Length: 30 mm.
- Width: 18 mm.
- Width Proximal End: 12 mm.
- Width Cutting Edge: 2 mm. at intersection
- Width Facet: 9 mm.
- Cutting Angle: 75°
- Weight: 4.9 gms.

**Distribution:** DgPl-1/Level 1

**Lithic Type:** CB
Phase Association: Bellevue Hill

Type: Double-Ended Flake Burin

Form and Manufacture: Made on a thick secondary decortication flake. Burin spalls (28 mm. long, four mm. wide) have been removed from both the striking platform and the distal end, resulting in a double faceted working edge, a perpendicular cutting edge at both edges of the facets, and a "beak" at the proximal end. The latter is very worn.

Metric Range:

- Width Distal End: 22 mm.
- Length: 44 mm.
- Width Cutting Edge: 5 mm.
- Cutting Angle: 95°
- Weight: 9.9 gms.

Distribution: DgPl-1/Level 1

Lithic Type: HC

Phase Association: Bellevue Hill

Trial Type 09

Nomin: Broken Artifact Scraper/Graver

Sample: N=26

Form and Modification: Biface and scraper fragments which have been broken transversely by flexion or rotation, subsequently utilized as graver/scrapers. Eleven of the artifacts are biface tips, four biface bases, one a medial biface fragment, one an end scraper bit, and nine flakes.

Examination of the broken edges reveals polish and striating, usually along one or both edges of the vertical fracture, suggesting use as scrapers. Usually there is wear at the point of juncture(s) of fracture with the lateral
edges of the biface. These junctures are generally pointed and sharp, suggesting they were used as graver points; often (N=5) both junctures will exhibit wear. Five specimens have oblique fractures removing a portion of the lateral edge which produced acute angle (60-85°) squared, pseudo-burin cutting edges (6-10 mm. wide) at the intersection of the transverse end oblique fractures.

The distal biface fragments seem to be primarily asymmetric ovate forms, which present a general triangular appearance when the transverse fracture is oriented perpendicular with the acute angle tip at the distal end and a rectangular broader square tip at the proximal end. Segments with oblique fractures present a similar appearance. The three basal fragments, in contrast, present a semi-circular configuration with right angular intersections between the lateral body edges and the transverse fracture.

**Metric Range:**

- **Length:** 21-47 mm. (N=26)
- **Width:** 12-28 mm.
- **Thickness:** 5-12 mm.
- **Angle Cutting Edges:** 60-100°
- **Weight:** 1.2 - 11.6 gms.

**Lithic Types:** AC (N=5), BC (N=1), BH (N=1), CC (N=1), GA (N=1), GG (N=4), GQ (N=1), GW (N=1), HC (N=2), KS (N=1), QR (N=2), QY (N=1), VQ (N=2), WO (N=2)

**Distribution:** DgPl-1/Level 1

**Phase Association:** Bellevue Hill

**Discussion:** None
Sample: N=19

Form and Modification: Cores and core fragments whose fortuitous or manufactured sharp projections have been used as graver tips. Adjacent sharp lateral edges may also be utilized as scraping or cutting edges. Number of points showing retouch or use retouch may vary from one to five.

Distribution: Table 6

Phase Association: Bellevue Hill, Crandell Mountain, Pass Creek Valley

GRAVER/CUTTERS (Trial Type 10-20)

This group includes a variety of flakes with modified or naturally sharp projections or corners which probably served a variety of different functions —i.e., perforating, incising/engraving, and cutting a variety of materials such as hide, wood, bone, tendons, ligaments, tissue, etc. While the flake samples from each site were carefully examined, the frequency of the forms in many of the following categories is probably underrepresented.

Formal metric and lithic data is not included in the following description.

Trial Types 10-11

Pl. 26: 1-5

Nominal: Rectangular Distal End Flake Gravers

Sample: N=5, Trial Type 10 (N=1), Trial Type 11 (N=4)

Form and Modification: Parallel-sided flakes with a graver "spur" set on the distal end. Type 10, manufactured on a type 04 blade (DgPm-1: 69) (Pl. 26: 1) is produced by double notching the distal end, resulting in an intermediate sharp point. Lateral edges are very lightly use-retouched.

Type 11 graver tips are produced by bilateral oblique unifacial retouching which formed a sharp point. Produced on parallel sided or expanding soft
hammer and punch flakes. Lateral edges and distal end are unifacially re-touched on the dorsal surface of specimens DgPm-1: 69 (Pl. 26: 5) and DgP-42: 31 (Pl. 26: 2), and on ventral surface of DgPl-1: 271 (Pl. 26: 4). Lateral edges are not retouched on DgPl-1: 65 (Pl. 26: 3).

**Distribution:** Table 6

**Phase Association:** Red Rock Canyon, Bellevue Hill, Blue Slate Canyon, Pass Creek Valley

**Trial Type 12**

**Nomin:** Natural Pointed Distal Flake Gravers

**Sample:** N=3

**Form and Modification:** Parallel sided flakes with pointed distal ends used as graving points. Some use retouch may be present along the lateral edges.

**Distribution:** Table 6

**Phase Association:** Bellevue Hill, Pass Creek Valley

**Trial Type 13**

**Nomin:** Notched Lateral Edge Gravers

**Sample:** N=7

**Form and Modification:** Parallel sided or expanding triangular flakes with multiple graver tips produced by insetting double notches on the lateral edges. Number of tips present varies from two to three. Adjacent lateral edge areas may or may not be retouched. Retouching on three specimens (e.g., Pl. 26: 8-9) produces a denticulated/serrated appearance to the edges.

**Distribution:** Table 6

**Phase Association:** Red Rock Canyon, Blue Slate Canyon
Trial Type \textsuperscript{14} Pl. 26: 10-11

Nomin: Lateral Edge Flake Gravers

Sample: \(N=2\)

Form and Modification: Expanding triangular and other flake types, with one or more sharp lateral edge projections which have been used as graver tips. These may be lightly retouched unifacially to produce a sharper point. Adjacent edges may have slight unifacial dorsal use retouch.

Distribution: Table 6

Phase Association: All subphases

Trial Type \textsuperscript{15} Pl. 26: 12-15

Nomin: Corner Notched Flake Gravers

Sample: \(N=4\)

Form and Modification: Flakes with graver points produced by double notching the left distal lateral flake corner. Specimen DgPm-1: 94 has spurs at both lateral corners (Pl. 26: 12). Adjacent lateral edges may be slightly retouched.

Distribution: Table 6

Phase Association: Red Rock Canyon, Bellevue Hill

Trial Type \textsuperscript{16} Pl. 26: 16-18

Nomin: Corner Retouched Flake Gravers

Sample: \(N=7\)

Form and Modification: Parallel side or expanding triangular flakes on which one distal lateral corner has been modified to a sharp point by unifacial edge retouch of the adjacent portions of the lateral edge and distal end. Adjacent edges may or may not show use retouch.
**Distribution:** Table

**Phase Association:** Bellevue Hill, Blue Slate Canyon, Crandell Mountain

**Trial Type 17**

*Nomin:* Natural Pointed Corner Flake Gravers

*Sample:* N=15

**Form and Modification:** A variety of flake types having a naturally sharp distal lateral corner which has been used or slightly modified to make a graver tip. Adjacent edges may have some slight use retouching.

**Distribution:** Table 6

**Phase Association:** Bellevue Hill, Blue Slate Canyon, Pass Creek Valley

**Trial Type 18**

*Nomin:* Snapped Flake Corner Retouched Gravers

*Sample:* N=5

**Form and Modification:** Flakes of a variety of types whose distal ends have been snapped. The resultant sharp lateral edge junctures have been used or retouched to form a sharp graving point. Often the point is produced by retouching the lateral edge on the dorsal or ventral surface, immediately anterior of the break, resulting in a sharp point projecting obliquely from the corner. Spurs occur on right lateral edges (N=7), left lateral edges (N=3), and both (N=5). Adjacent lateral edges may or may not be use retouched.

**Distribution:** Table 6

**Phase Association:** Bellevue Hill, Blue Slate Canyon, Pass Creek Valley

**Trial Type 19 and 20**

*Nomin:* Snapped Flake Corner Gravers
Sample: N=15, Trial Type 19 (N=7), Trial Type 20 (N=8)

Form and Modification: Produced on parallel sided or expanding triangular flakes which have been snapped by flexion; the lateral edge corners of the resultant transverse fracture have been utilized or slightly retouched to form an obliquely-set sharp convex cutting edge. Type 20 has both lateral edges retouched; Type 19 has one. Use retouch is usually absent from the adjacent edges, suggesting that the tool was used as a cutting instrument, held corner-on.

Distribution: Table 6

Phase Association: Bellevue Hill, Blue Slate Canyon, Crandell Mountain, Pass Creek Valley

PIECE ESQUILLEES

Trial Type 21 Pl. 25: 14-16

Nomin: Core Piece Esquillees

Sample: N=14

Form and Modification: Square to rectangular core fragments, exhibiting bipolar flaking of opposed, crushed and battered edges. The primary edge is bifacially modified while the secondary edge may be unifacially modified. Two specimens (DgPl-1: 201, 275) have additional working edges set perpendicular to the main edge. The DgPl-1 and DgPl-86: 4 specimens are most closely comparable to the type description (MacDonald 1968). They resemble each other more than the DgPl-42, 47 and 55 specimens. The latter are smaller and tend to have very light use on the secondary end. One specimen (DgPl-1: 627) (Pl. 25: 15) has a longitudinal spall removed from both lateral edges, producing a pseudo-burin (cf. MacDonald 1968: 88). DgPl-86: 4 has a retouched thin lateral edge.
Metric Range:

Length: 17-37 mm. (N=10)
Width: 13-35 mm. (N=11)
Thickness: 7-12 mm. (N=10)
Weight: 2.2 - 19.2 gms. (N=10)

Lithic Types: GG (N=1), GQ (N=2), CH (N=1), KR (N=1), OB (N=1), QY (N=3),
RY (N=2), VA (N=1), WO (N=1)

Distribution: Table 6

Phase Association: Bellevue Hill, Blue Slate Canyon and Pass Creek Valley

Trial Type 22

Pl. 25: 17-19

Nomin: Split Pebble Piece Esquillees
Sample: N=3

Form and Modification: Rectangular to square pebbles which are partially
or completely split, with bipolar battered, crushed and flaked opposite edges.
Primary edge is bifacial; secondary edge may be unifacial.

Metric Range:

Length: 26-36 mm.
Width: 23-25 mm.
Thickness: 6-8 mm.
Weight: 5.1 - 8.8 gms.

Lithic Types: BC (N=1), BP (N=1), PY (N=1)

Distribution: Table 6

Phase Association: Pass Creek Valley
Cryptocrystalline

Three types of flake patterns are distinguished: 1) utilized flakes which show nicks, stria, and step flaking along edges—presumably the result of use; 2) localized retouched flakes which may be intentionally retouched to straighten or sharpen an edge, or the result of intensive utilization; and 3) patterned retouch flakes, exhibiting areas of continuous retouch along the edge(s).

Flakes may be utilized without prior edge preparation. The length of time that such a flake is utilized, and the type of utilization, will affect the degree to which features characteristic of utilization are produced on the flake. Further, many of these features may be produced in manufacture and transport (Elliott and Anderson 1971), and it is therefore extremely difficult to separate unutilized from utilized flakes, even with microscopic study.

Localized retouch, regardless of its mode of origin, grades into patterned retouch. Here again it is difficult to separate the former from the latter. Patterned retouch forms are relatively infrequent in the sample (N=114) suggesting that flakes tended to be used or slightly modified rather than extensively retouched. They are classified into 18 groups on the basis of surface, edges, and end combinations:

01 Left Lateral Edge Retouch - Dorsal Surface (N=29) (Pl. 27: 1; Pl 28: 13)
02 Right Lateral Edge Retouch - Dorsal Surface (N=18) (Pl. 27: 8, 29)
03 Left and Right Lateral Edge Retouch - Dorsal Surface (N=23) (Pl. 28: 27-29)
04 Left Lateral Edge Retouch - Ventral Surface (N=5) (Pl. 28: 6)
05 Right Lateral Edge Retouch - Ventral Surface (N=5) (Pl. 28: 12)
06 Left and Right Lateral Edge Retouch - Ventral Surface (N=3) (Pl. 28: 5)
07 Left Lateral Edge Dorsal Surface Retouch/Right Lateral Edge Ventral Surface Retouch (N=4)
08 Left Lateral Edge Ventral Surface Retouch/Right Lateral Edge Dorsal Surface Retouch (N=1)
09 Right Lateral Edge and Distal End Dorsal Surface Retouch (N=3)
10 Left Lateral Edge and Distal End Dorsal Surface Retouch (N=2)
11 Distal End Ventral Surface Retouch (N=2)
12 Proximal End Ventral Surface Retouch (N=1)
13 Right Lateral Distal End Ventral Surface Retouch (N=1)
14 Distal End Dorsal Surface Retouch (N=3) (Pl. 27: 16)
15 Left and Right Lateral Edges and Distal End Dorsal Surface Retouch (N=1)
16 Left and Right Lateral Edges and Distal End Ventral Surface Retouch (N=1)
17 Pointed Unifacial Flakes (N=6) (Pl. 28: 2, 8)
18 Microcrystalline Lateral Edge Retouch (N=5) (Pl. 31: 7, 8)

There is no statistical significance to the distributional patterns, except for the exclusive association of pointed unifacial flakes (N=16) (Pl. 28: 2, 8) with the Blue Slate Canyon Subphase. End retouched or utilized forms seem more common in DgPl-68/Level 2. Bifacial patterned retouch is absent in all phases.

Edge shapes vary from straight to slightly convex in configuration. Concave edges, produced by retouching, are extremely rare, represented by two specimens from DgPl-42/Level 1 (Pl. 28: 12). Edge angles range from 50-80°. Step flaking of some of the edges suggests that they functioned as scrapers,
while others with lower angles, ca. 50-60°, were used as cutting tools.

Flaking patterns are difficult to quantify. DgPl-68/Level 2 scars are very minute, averaging one mm. in width, and set on a very thin edge. DgPl-42/Level 1 flake scars are slightly larger and often result in a serrated edge produced by placing the flaker at wider intervals along the lateral flake edge during manufacture, thereby leaving the interflake spurs projecting laterally from the retouched edge. DgPl-1/Level 1 and DgPl-1/Level 1 patterns exhibit well controlled flaking which tends to be slightly larger than that in the later components. Patterned retouch in DgPl-55 and DgPl-1/Level 2B resembles that of DgPl-68/Level 2, but occurs considerably less frequently.

Microcrystalline

The microcrystalline flakes exhibit the same range of variation and localized retouch forms as the cryptocrystalline. Patterned retouch forms are very infrequent, represented by five quartzite flakes (Group 18), with a retouched stepped flaked edge, 60-70° in angle, suggesting that they functioned as scraping tools (Pl. 31: 7, 8).
LARGE CUTTING AND SCRAPING TOOLS

This group of artifacts, consisting of a number of forms manufactured from microcrystalline rock types, served a variety of cutting and scraping functions. The following classification is based on the flake/core type, morphology, modification and function.

**Trial Type 01-03**

**Nomin:** Cobble Choppers

**Sample:** N=78

**Form and Modification:** Generally oval-triangular in outline with a single unifacially flaked or utilized end or edge. Manufactured from stream cobbles or cores.

**Trial Type 01 (N=39)(Pl. 30: 1-3, 5, 6, 12):** Cobbles with only ends or edges modified. The dorsal, and usually the ventral, surfaces are original cobble cortex.

**Trial Type 02 (N=32)(Pl. 30: 6, 8, 9):** Cobbles or cores whose dorsal surface is a flat fracture plane rather than the original cortical surface. The ventral surface may also be a fracture plane.

**Trial Type 03 (N=5)(Pl. 30: 4):** Cobbles which exhibit a naturally fractured utilized edge.

The choppers vary considerably in outline. Type 01 specimens are oval, ovate or roughly triangular in outline, and quadrilateral in transverse and longitudinal section. The form largely represents the original shape of the cobble. Often the proximal end is naturally beveled, facilitating palming. Retouch on Trial Type 01 is almost exclusively restricted to the distal end (38 out of 39).
Trial Type 02 specimens are manufactured on cobbles which have been split along one or more parallel bedding planes. They tend to be rectangular and rhomboid in outline with quadrilateral cross sections. The lateral edges and proximal end on these forms may be retouched and utilized. The unmodified 03 forms are variable in outline, but generally quadrilateral in section.

The choppers are divisible into two groups on the basis of weight; one (N=46) of one kg. or less (range .2 - 1.0 kg.), and the other (N=17) of one kg. and over (range 1.3 - 4.5 kg.). The larger forms may be "two-handed" choppers, since their weight and size is in excess of what might comfortably be used with one hand.

**Metric Range:**

- Length: 60-173 mm. (N=78)
- Width: 33-103 mm. (N=78)
- Thickness: 15-108 mm. (N=69)
- Weight: 85-3910 gms. (N=78)

**Lithic Types:** DO (N=12), GA (N=55), GB (N=1), IT (N=1), LS (N=1), RQ (N=6), SQ (N=2)

**Distribution:** Table 6

**Phase Association:** All phases, but predominately Bellevue Hill.

**Discussion:** Of note is the absence of bifacial working edges. The cobble choppers were probably used in butchering and bone breaking activities for marrow removal and bone grease preparation.

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**Trial Type 04**

**Pl. 31: 1-4**

**Nomin:** Decortication Flake Tools

**Sample:** N=101

**Form and Modification:** Variable in outline, but tending towards a semi-
rectangular form. The flake blanks are usually secondary decortication flakes removed from the edge of a flat, roughly rectangular cobble by directing a blow to the edge of the cobble in such a manner that the cobble edge is removed along with a portion of the adjacent surfaces, producing a large, roughly rectangular form with one sharp straight-convex edge opposite to a naturally backed edge suitable for palming. The sharp edge may or may not be retouched on the ventral flake surface, which is the dorsal tool surface.

**Metric Range:**
- **Length:** 24-117 mm. (N=101)
- **Width:** 12-180 mm. (N=101)
- ** Thickness:** 10-45 mm. (N=101)
- **Weight:** 9-457 gms. (N=101)

**Lithic Types:** BA (N=2), DO (N=8), GA (N=75), GQ (N=1), LQ (N=1), PQ (N=6), QU (N=1), QW (N=1), RQ (N=1), WQ (N=2), YQ (N=1)

**Distribution:** Table 6

**Phase Association:** All phases, except Blakiston Brook. Predominately Bellevue Hill.

**Discussion:** The flake type is one which could be easily produced. However, the high frequency of the form in DgPl-1/Level 1 (i.e., 99%) suggests that it was a type selected-for in the productive technology.

The type is quite comparable to specimens described by Swanson and Sneed (1966: 31-33) as spall fleshers, slice fleshers and wedge-shaped fleshers. Functionally the tools would be exceedingly versatile, useful for meat and cartilage cutting, sawing, bone breaking, and hide fleshing and scraping.

**Trial Type** 05

**Nomin:** Cortical Spall Tools
Sample: N=4

Form and Modification: Elliptical to oval, thin primary decortication flakes manufactured by a single blow directed at the thin edge of a cobble. The sharp convex edge may be blunted or intentionally retouched. Two specimens, DgPl-42: 55 and 183 had a platform prepared on the cobble edge prior to flake removal.

Metric Range:
- Length: 61-84 mm. (percussion axis)
- Width: 80-104 mm.
- Thickness: 13-15 mm.
- Weight: 6.7 - 10.6 gms.

Lithic Types: GA (N=3), RA (N=1)

Distribution: Table 6

Phase Association: Blue Slate Canyon, Pass Creek Valley

Discussion: The two specimens from DgPl-42 are very consistent in form, use and manufacture. The DgPl-55 and 68 specimens are more irregular, and possibly do not belong in the same technological tradition. It is a versatile tool, and could have served a similar range of functions as Trial Type 04.

Trial Type 06

Nomin: Block/Core Tools

Sample: N=48

Form and Modification: Rectangular, triangular and irregular core, cobble and block fragments with one or more sharp, straight to irregular utilized edges. Only one specimen (DgPl-1: 299) has been retouched prior to use. Cortex is usually present on one or more surfaces and edges, quite often the dorsal surface, suggesting that some of these were derived from longitudinally split stream cobbles.
Metric Range:
Length: 20-11\frac{1}{4} mm.
Width: 24-1\frac{1}{4} mm.
Thickness: 7-\frac{1}{2} mm.
Weight: 5-606 gms.

Lithic Types: BA (N=2), GA (N=46)

Distribution: Table 6. Primarily from DgPl-1/Level 1.

Phase Association: Bellevue Hill, Blue Slate Canyon, Pass Creek Valley.
Predominantly Bellevue Hill.

Discussion: This rather "amorphous" formal group represents utilized microcrystalline debitage.

Trial Type 07

Nomin: Flake Choppers
Sample: N=4

Form and Modification: Large circular to subrectangular, convex-edged spalls or split cobbles, with unifacially or bifacially utilized or retouched edges. The convex "ventral" surface is usually covered with cortex. Retouch and/or utilization is confined to three quarters or less of the circumference. The proximal end (holding edge) is unretouched, presumably to facilitate palm- ing.

Metric Range:
Length: 106-17\frac{1}{4} mm.
Width: 137-162 mm.
Thickness: 27-30 mm.
Weight: 425-1012 gms.

Lithic Type: GA (N=4)
Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: This is a generalized form which could serve a variety of cutting, scraping and chopping functions, however, its low frequency suggests that these functions were better served by other argillite tool types.

Trial Type 08

Pl. 31: 10-11

Nomin: Quartzite Cortex Scraper

Sample: N=2

Form and Modification: Oval (DgPl-1: 334) and rectangular (DgPl-1: 116) forms, with a general biconvex section, a convex cortical ventral surface, and a completely flaked dorsal surface. The forms are manufactured from split quartzite cobbles. The blank was subsequently flaked unifacially away from the cortical surface on all edges to produce the steep angled working faces.

Metric Range:

Length: 55-108 mm.
Width: 43-63 mm.
Thickness: 23-34 mm.
Weight: 58-263 gms.
Edge Angle: 67°-75°

Lithic Types: PQ (N=1), YQ (N=1)

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: Step flaking and striating, perpendicular to working edges, suggest that these forms were hand-held and used for scraping and fleshing. The two specimens are unique in the excavated and surface collections in the Park.
This group includes a variety of pecked, ground, polished, sawed, and drilled stone objects made out of a limited variety of coarse grained igneous and sedimentary rock types.

**Edge Ground Cobble**

*Sample: N=1*

*Form and Modification:* Flattened, biconvex, oval Purcell basalt cobble, with grinding, abraiding, battering and crushing along the lateral edges.

**Metric Range:**
- Length: 13.5 cm.
- Width: 12.1 cm.
- Thickness: 5.1 cm.
- Weight: 1.112 kg.

*Distribution:* DgPm-1/Level 1

*Phase Association:* Red Rock Canyon

*Discussion:* Form resembles those described by Crabtree and Swanson (1968). May have been used in blade production.

**Unshaped Hammer Stones**

*Sample: N=4*

*Form and Modification:* Egg-shaped Purcell basalt cobbles and pebbles with pecked/crushed ends.

**Metric Range:**
- Length: 6.0 - 11.1 cm.
Width: 4.0 - 9.6 cm.
Thickn: 3.2 - 6.0 cm.
Weight: 100-675 gms.

**Distribution:** Table

**Phase Association:** Bellevue Hill, Blue Slate Canyon

**Discussion:** These hammerstones were probably used both for flint knapping and bone breaking. The sample is probably grossly underrepresentative of the number of specimens present.

Conical Hammer Stone

Sample: N=1

**Form and Modification:** Large conical hammerstone manufactured from a cobble which has been pecked and ground to form a tapering cylindrical form. The distal end is crushed and pecked, particularly along the edges and adjacent area of the lateral surface. There is also a small amount of pecking on the proximal end.

**Metric Range:**
- Length: 20 cm.
- Diameter, Distal: 8.5 cm.
- Diameter, Proximal: 4.0 cm.
- Weight: 1.75 kg.

**Lithic Type:** Gabbro

**Phase Association:** Unknown

**Discussion:** The presence of extensive damage on the edge of the distal end and its association with a large number of flakes (produced by hard-hammer percussion) suggest that it was used as a hammerstone.
Anvil Stones

Sample: N=4

Form and Modification: Large gabbro (DgPl-68: 31), quartzite (DgPl-86: 58, DgPl-1: 261) or sandstone (DgPl-1: 272), flat or angular boulders which have constricted areas of pitting or crushing on a flat or angular surface.

Metric Range:

Length: 11.0 - 19.1 cm.
Width: 10.5 - 18.5 cm.
 Thickness: 3.1 - 5.2 cm.
Weight: 1.1 - 3.65 kg.

Distribution: Table 7

Phase Association: Bellevue Hill

Discussion: The boulders were probably used as anvil stones either for flint knapping or bone breaking.

Anvil/Edge-Ground Cobble

Pl. 32: 5

Sample: N=1

Form and Modification: Oval, flattened, biconvex, red argillite/quartzite cobble, with pitting on one surface and grinding on the other to form flat, striated and polished facets on the two opposite lateral edges.

Metric Range:

Length: 10.0 cm.
Width: 7.1 cm.
 Thickness: 4.5 cm.
Weight: 0.5 kg.

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill
Discussion: Pitting indicates that stone has been used as an anvil. The presence of ground, striated, polished facets on the lateral edges suggests it has also been used in abrading—perhaps hide working.

**Anvil Stone/Abrader**  
**Pl. 32: 2**

**Sample:** N=1

**Form and Modification:** Rectangular artifact made of biotite gneiss which has flat, ground surfaces and edges, exhibiting longitudinal striations and extensive pitting (lateral edges only).

**Metric Range:**
- Length: 14.4 cm.
- Width: 6.5 cm.
- Thickness: 3.3 cm.
- Weight: 619 gms.

**Distribution:** DgPl-42/Level 1

**Phase Association:** Blue Slate Canyon

**Discussion:** The striating and polishing of the flat surfaces suggest that they were used as abrading surfaces—perhaps in hide working. The pitted lateral edges suggest that the tool had also been used edge-on as an anvil stone—possibly for bone breaking.

**Sandstone Slab Abraders**

**Sample:** N=3

**Form and Modification:** Two complete and one fragmentary flat, oval/rectangular, friable sandstone slabs with smoothed, striated areas on one surface.

**Metric Range:**
- Length: 10.6 - 17.7 cm.
Width: 14.0 - 3.6 cm.
Thickness: 3.4 cm.
Weight: 1.5 - 3.3 kgs.

Distribution: Table 7

Phase Association: Bellevue Hill, Blue Slate Canyon

Discussion: These tools may have been used as abraders in working ground stone tools or hides. The DgPl-1: 250 specimen may have been hand-held and slanted against the roughout, while the DgPl-42: 230 specimen probably served as a solid sanding block with the roughout sanded against it.

Dolomite Rubbing Stones

Sample: N=4

Form and Modification: Two large and two small pieces of soft, buff colored, weathered dolomite, exhibiting flattened, striated and smoothed areas.

Metric Range:
Length: 3.2 - 12.2 cm.
Width: 1.7 - 3.8 cm.
Thickness: 0.6 - 1.4 cm.
Weight: 1.1 - 67.5 gms.

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: The striations and rounded edges suggest they were probably used in rubbing and burnishing hides.

Sawn Stone

Sample: N=1

Form and Modification: An eroded piece (4.4 x 3.9 x 2.1 cm., 14.6 gms.)
of cross laminated dolomite limestone breccia which has been sawn transversely.

Length of cut is 3.4 cm.; width, 1.6 cm.

Distribution: DgPl-1/Level 1
Phase Association: Bellevue Hill
Discussion: None

Stone Ball

Pl. 32: 3

Sample: N=1
Form and Modification: Small, naturally spherical polished stone ball (2.6 cm. diameter; 25.6 gms.) manufactured of non-local pink quartzite. It may have been a curiosity or part of a medicine bundle.

Distribution: DgPl-148
Phase Association: Unknown
Discussion: None

Incised Pebble

Sample: N=1
Form and Modification: Stream-rolled, Purcell basalt pebble, with five sub-parallel incisions two and a half cm. long by one half mm. wide on one surface.

Distribution: DgPm-1/Level 1
Phase Association: Red Rock Canyon
Discussion: None

Sandstone Shaft Smoother

Pl. 32: 4

Sample: N=1
Form and Modification: Incomplete, single groove, rectangular "boat-
shaped" shaft smoother (5.4 x 3.2 x 2.1 cm.). Groove width 9 mm., depth 4.5 mm. Both lateral edges have two narrow, poorly-formed grooves, terminating 10-15 mm. from the complete end.

Distribution: DgPl-47/Level 2 or 3

Phase Association: Crandell Mountain or Pass Creek Valley

Discussion: None

Steatite Pipe Fragments

Sample: N=2 (from the same item)

Form and Modification: Two longitudinal fragments (2.2 cm.) of the shaft of a black steatite pipe. Wall thickness five mm., channel diameter seven mm., stem diameter 13-15 mm. The outside is polished to a semi-gloss. Longitudinal striations are visible on the channel walls.

Distribution: DgPm-1/Level 3

Phase Association: Pass Creek Valley

Discussion: None

Dolomite Bead

Sample: N=1

Form and Modification: Small, pyramidal, yellow dolomite bead, one cm. length, seven mm. thick. Drill hole three mm. in diameter, four mm. in length at the proximal end.

Distribution: DgPm-1/Level 3

Phase Association: Pass Creek Valley

Discussion: None
Striated Galena Fragment

Sample: N=1

Form and Modification: Tabular galena fragment (3.2 x 1.0 cm.; 16.5 gms.) exhibiting a smooth striated surface and rounded edges.

Distribution: DgPl-1/Level 1

Phase Association: Bellevue Hill

Discussion: None

Quart Crystal

Sample: N=1

Form and Modification: Opaque quartz crystal (3.2 x 2.2 cm.; 7.5 gms.).

Distribution: DgPm-1/Level 1

Phase Association: Red Rock Canyon

Discussion: None
BONE AND SHELL ARTIFACTS

The following classification is largely based on Kehoe's (1967) study, wherein he established a number of functional categories—awls, scrapers, knives, spatulas, etc. While the implied functions may be correct, detailed functional analysis will be required for verification.

BONE TOOLS

Mammal Leg Bone End Scraper

Sample: N=1

Form and Modification: Medapodial proximal shaft section (9.5 cm. x 3.0 cm.). Jagged, hacked proximal end. Rounded, beveled distal end. Latter exhibits wear polish on the edge and adjacent cortical surface.

Distribution: DgPl-47/Level ?

Phase Association: Unknown

Mammal Leg Bone Side Scraper

Sample: N=2

Form and Modification: Proximal sections of longitudinally split radial shafts and proximal head (8.5 cm. and 18 cm. long). Hacked distal end. Cut walls. One wall is rounded and smoothed.

Distribution: Table 7

Phase Association: Pass Creek Valley
Rib Side Scraper

Sample:  N=2
Form and Modification:  One complete (DgPl-68: 84) specimen (36 cm. long), severed below the head with medially tapering rounded edges. One fragment from DgPl-55 probably same tool type.
Distribution:  Table 7
Phase Association:  Pass Creek Valley

Bone Knives

Sample:  N=11
Form and Modification:  Long bone shaft sections (4.2 - 12.0 cm.) which have polished, flaked walls. Sharp or rounded tips.
Distribution:  Table 7
Phase Association:  Pass Creek Valley and Historic Aboriginal Complex

Cut Bone

Sample:  N=10
Form and Modification:  Miscellaneous fragments of cut bone. DgPl-1: 60 (rib); DgPl-47: 17, DgPl-55: 450, 449 (long bones) are small square to rectangular (1.9 x 1.9 to 2.4 x 2.6 cm.), thin (.4 - .7 cm.) pieces. DgPl-47: 1 is a notched longitudinally-split ulna shaft fragment (7.1 cm. long). DgPl-148: 323 (1.5 cm.) is the proximal end of a metapodial whose shaft has been cut and worked to a beveled sharp edge. DgPl-51: 32 is a sawed rib fragment (2.2 cm. long), and DgPl-51: 33 and 35 are broken rib fragments with steel knife cut marks on their surfaces. DgPl-51: 34 is a quadrilateral (2.2 x 2.1 cm.) percussion-flaked cortical bone shaft fragment.
Distribution:  Table 7
Phase Association: Pass Creek Valley and Historic Aboriginal Complex

Rib Biface Handles

Pl. 33: 12

Sample: N=2

Form and Modification: Fragmentary specimen (DgPl-86: 12) is fractured longitudinally, with only one wall and part of an edge remaining. DgPl-1: 13⁴ (Pl. 33: 12) is a complete medial rib shaft section (9.7 cm. long). One edge has been grooved, presumably for hafting a small biface. The distal end is beveled and the proximal jagged and hacked.

Distribution: Table 7

Phase Association: Crandell Mountain, Pass Creek Valley

Mammal Leg Bone Splinter Awl

Pl. 33: 13-14

Sample: N=4

Form and Modification: Manufactured on long bone medial shaft fragments (5.0 - 8.0 cm. long). DgPl-68 and 55 specimens have flat butts, tapered edges, and sharp distal ends. DgPl-148: 327 (Pl. 33: 14), worked down from both edges, has a medially centered shaft projecting from a rectangular shaped palming area. Cancellous tissue has been left on the interior of the wall to provide a firmer grip. All edges have been flaked and smoothed.

Distribution: Table 7

Phase Association: Crandell Mountain, Pass Creek Valley

Rib Splinter Awls

Pl. 33: 7-8

Sample: N=4

Form and Modification: Manufactured on the rib faces, with worked lateral edges and distal ends (4.5 - 6.5 cm. long; 1.0 - 1.2 cm. wide).
Distribution: Table 7
Phase Association: Pass Creek Valley

**Neural Spine Awls**

Pl. 33: 15

**Sample:** N=2

**Form and Modification:** Manufactured on the neural spine of the posterior half of a thoracic vertebrae. Spine and arch have been longitudinally split, with the centrum transversely broken at the base of the facets, and the posterior spinal portion modified into a tapering, sharply pointed awl (length 8.7 cm.).

**Distribution:** DgPl-1/Level 2B

**Phase Association:** Pass Creek Valley

**Leg Bone Spatulas**

Pl. 33: 11, 17-19

**Sample:** N=10

**Form and Modification:** Manufactured on metapodials or other long bone splinters and the fourth vestigial metapodial of *Alces americanus* (moose) (N=3) (length 5.1 - 12.3 cm., width 1-2 cm.). The lateral edges of the splinters consist of the cortical walls, which are often flaked, polished, and tapered to the distal end. The pointed to rounded beveled distal ends exhibit a flattened, thick (4-5 mm.) cross section. One of the *Alces* metapodials is the proximal half (Pl. 33: 17). The other two distal halves (Pl. 33: 10, 19) (6.5 and 7.0 cm. long) have lateral edges which naturally taper to a pointed flattened end.

**Distribution:** Table 7

**Phase Association:** Crandell Mountain and Pass Creek Valley
Rib Spatulas  
Pl. 33: 9, 16  
Sample:  N=12  
Form and Modification:  Manufactured on longitudinally split rib fragments. Rounded or unworked lateral edges and proximal ends. Rounded, beveled, or flat distal ends (length 2.8 - 8.7 cm., width 2.2 - 9.0 cm.).  
Distribution:  Table 7  
Phase Association:  Crandell Mountain, Pass Creek Valley

Flakers  
Pl. 33: 2-5  
Sample:  N=16  
Form and Modification:  Longitudinally split leg bone shaft fragments with fractured, unworked or rounded proximal ends, straight to tapering lateral edges, and rounded, slightly beveled, relatively blunt tips (lengths 12.8 - 4.2 cm., widths 3.0 - 1.5 cm.). Tip flaked from compression during flint knapping.  
Distribution:  Table 7  
Phase Association:  Pellevue Hill, Blue Slate Canyon, Crandell Mountain, Pass Creek Valley

SHELL ARTIFACTS

Shell Disk Bead  
Pl. 34: 8  
Sample:  N=1  
Form and Modification:  Circular shell disk bead, 12 mm. diameter, 1 mm. thick. Shaped by cutting and grinding.  
Distribution:  DgPm-4  
Phase Association:  Aboriginal Historic Complex
Bead or Pendant Blank

Pl. 34: 7

Sample: N=1

Form and Modification: Square piece of shell (1.6 cm. x 2 mm. thick), shaped by cutting and grinding of the lateral edges.

Distribution: DgPl-55

Phase Association: Pass Creek Valley
ARTIFACTS OF CAUCASIAN ORIGIN

These artifacts include a miscellaneous assortment of metal, wooden, leather and glass items recovered from a few of the sites in the valley. They are separated into two groups—those relating to White occupation of the Park, and those representing aboriginal White trade goods.

WHITE OCCUPATION (Table 7)

Tin Cans

Thirty six fragments of badly rusted tinned sheet iron (or steel) containers, all from DgPl-51. Three (DgPl-51: 6, 9, 10) have crimped end joints, and one a crimped side joint (DgPl-51: 17). The latter also has a soldered end joint and a slip-on lid. One end (DgPl-51: 4) has a legend —AD—; NORTON BROS. CHICAG-. Crimped end joints first appear commercially in America in 1898, and side joints in the 20th century.

Three other fragments (DgPl-51: 7, 18, 19) all from the same container, have joints produced by bending the edges, fitting the bent edges and soldering them together. It was probably a rectangular form.

Some other fragments have soldered side joints. Other fragments lack joints. Some of the latter have been cut (Pl. 34: 5, 6, 10), as has one end joint specimen (DgPl-51: 9). The cuts are relatively straight and clean.

The presence of crimping provides dating control for most of the pieces, suggesting that they are from the early 20th century use of the area. However, some of the cut and soldered pieces may relate to the historic aboriginal occupancy at the site.
Nails

Square Nails: Four cut nine penny (N=1) and 10 penny (N=3) nails from DgPl-55. Probably late 19th to early 20th century.

Round Nails: Common nails—six ¼", five ¾", and four 3", found in sod at DgPl-42.

Fence Staples

Three from DgPl-55.

Bailing Wire:

Two pieces (DgPl-51 and DgPl-42).

Nuts and Bolts

Two 3.4" round bolts with nuts from DgPl-55.

Brass Tacks

One from DgPl-55.

Spoon Handle

One broken handle from "tin" spoon (DgPl-55).

Canadian Penny

One 1954 Canadian Penny from DgPl-55.

Cartridge Cases and Heads

1. 250 Savage Expended Case, probably fired by a Model 99 Savage. Post A.D. 1915 date.
2. .22 Caliber Long Rifle Rim Fire Cases (N=2). Post A.D. 1918 date.
3. .30 Caliber Bullet Jacket (Flat Base type). Ca. A.D. 1900 date.

Leather

One piece leather sole from DgPl-51. One leather watch strap from DgPl-55.

Rubber

One piece elastic rubber from DgPl-51.

Buttons

One white four-holed shirt button from DgPl-55.

Wooden Bung

One specimen from DgPl-55.

WHITE TRADE GOODS (Table 7)

Barrel Hooping

Pl. 34: 1
One transversely cut hoop section (6.7 cm. long, width 2.3 cm., and 1.5 cm. thick) and eight cut pieces, originally 2.3 cm. wide and 1.5 cm. thick. The material has been crudely cut. Probably utilized in the production of metal arrow points.

Brass Bracelet

Pl. 34: 9
Made of heavy gauge (5 mm.) brass wire. Flattened circular cross section. Wire has been bent into an oval shape (inside diameter 5.6 x 4.0 cm.), with a
2.8 mm. gap left between the ends of the wire. Decorated with a notched design on the outer surface produced by filing notches perpendicular to the longitudinal axis of the wire.

This specimen, found on the talus slope of Bellevue Hill above DgPl-27, compares very closely with bracelets illustrated by Ray and Jelks (1964) for an historic burial dating from A.D. 1820-1840 in Texas. Apparently these were a common trade item in the Northwestern Plains, and have been found in burials of very recent age. It has been suggested that they originated as brass dresser handles.

Glass Trade Beads

The following is a brief description based on a report prepared by R. Sprague (University of Idaho) of the historic glass trade beads from sites in Pass Creek Valley.

Site DgPl-42:

Bead Type: Seed Beads (N=3)
Description: Opaque White (N9.5)
Approximate Age: A.D. 1860-1910

Site DgPm-4:

Bead Type: Seed Beads (N=65)
Description: Opaque White (N9.5) N=31 (2 very small)
Opaque Black (N1.5) N=23
Opaque Pink (2.5R5/6) N=1
Opaque Dark Robins Egg Blue (7.5B4/6) N=2
Opaque Light Robins Egg Blue (7.5B7/6) N=1
Approximate Age: A.D. 1860-1910
**Bead Type:** Pony Beads (N=18)

**Description:** Translucent White (56Y9/1) Over Opaque White (N9/5) Core

N=17

Opaque Black (N1.5) N=1

**Approximate Age:** A.D. 1840-1880

**Bead Type:** Faceted Tubular

**Description:** Transparent Clear Over Translucent White (5PB8/1) Core

N=1

Deep Purple (2.5R2/4) N=1

Dark Blue (7.5PB3/10) Over Light Blue (5PB8/1) Core N=1

Dark Blue (7.5PB3/8) (poorly faceted)

**Approximate Age:** A.D. 1860-1870
APPENDIX II
LITHIC TECHNOLOGY

The study of lithic technology involves consideration of many variables relating to the production and use of chipped stone tools. Many of these variables, such as kinesthetics, require a detailed first-hand knowledge of the art of flint knapping, an area of knowledge in which the writer has no experience; consequently, variables of this nature will not be considered herein. Rather, the following sections focus on the more obvious of the productive mechanisms; i.e., the types of cores, methods of flake detachment, types of flakes produced and types of material utilized.

Two basic raw material industries, the cryptocrystalline and the microcrystalline (Milne-Brumley 1971), are distinguished. Cryptocrystalline silicates—cherts and chalcedonies—are used for the production of flake blanks which are later modified into a variety of "small" tool types. In contrast, microcrystalline materials—quartzites and argillites, etc.—because of their coarser nature, are primarily used for the production of heavy duty butchering, chopping and scraping tools. Small tools may also, however, be produced from microcrystalline materials.

Microcrystalline cores which relate to small tool production are described with the cryptocrystalline flakage and cores, which are dealt with in some detail. Microcrystalline materials, in contrast, are only briefly described. General technological inferences and summaries are presented in the respective phase summaries in Chapter 5.

The appendix concludes with a brief summary of the lithic types, and utilization patterns of certain of these types through time.
CRYPTOCRYSSTALLINE FLAKAGE

In studying the flakage, three basic variables were considered: the manufacturing stage represented by a flake, its morphometric form, and its attributes relating to productive methods. Consideration of these variables allowed for inferences to be made on the range of flint working activities carried out at a site, the types of cores utilized, and the methods of flake detachment.

The sample from each site was first examined and classified on the basis of manufacturing stage into primary (20) or secondary (22) decortication flakes, secondary flake blanks (01-15), block fracture flakes (21), retouching/resharpening flakes (16-19), and core rejuvenation flakes (23). The secondary flake blanks and retouching/resharpening flakes were then broken down into types on the basis of platform configuration, with the secondary flakes further divided on the basis of formal outline and productive mechanisms.

SECONDARY FLAKES (01-15)

These flakes, purposefully produced for use or modification into various types of tools, exhibit the largest set of technological attributes and the highest degree of formal control. They are broken down into groups on the basis of two attribute sets:

A. Platform Type: The surface topography of the platform, which is a function of the type of core utilized and the preparation of the core platform prior to flake removal. Three types are distinguished:

1. Faceted: Small flake scars, "facets", present on the surface of the platform.

2. Plain: Smooth, unfaceted platform.
3. **Absent:** The platform is very thin, sharp, and usually irregular or concave in profile.

B. **Formal Outline:**

1. **Parallel Sided:** Lateral flake edges are relatively straight, oriented parallel to the axis of percussion; i.e., they are end struck.

2. **Expanding Triangular:** The lateral edges—which may be straight, slightly convex or concave—are set oblique to the axis of percussion, diverging away from the striking platform.

3. **Rectangular:** The lateral edges, which are relatively straight, are perpendicular to the axis of percussion; i.e., they are edge struck.

Eleven trial types were established on the basis of the above attribute sets. Broken secondary flakes were classified on the basis of their outlines, either as parallel sided (05), triangular (11), or unclassifiable (15). These are not discussed, only tabulated.

**Productive Modes**

The inference of the methods utilized in flake detachment is derived from the study of certain flake attributes: the extent and nature of proximal battering on the dorsal flake surface, platform shape, platform modification prior to and as a result of flake removal, platform ventral surface juncture configurations, distal end configuration, and ventral flake surface features—impact scars, bulbar configurations, bulbar scars, lateral and bulbar fissures, and compression waves.

Many variables control the form these attributes will exhibit on a flake. Structural and elastic properties of the material and the force, direction and type of blow are the principle factors. Most of these cannot, however, be effectively controlled for, and it is assumed that the attributes reflect the type of blow only; i.e., pressure, hard-hammer percussion, soft-hammer per-
cussion, and punch. Most specimens could be assigned with some degree of confidence to one of these productive modes, except in certain cases where the punch technique may have been employed concurrently with hard or soft hammer. The criteria used are summarized below:

1. **Pressure**: Relatively long, thin, flat flakes, with a deep bulbar scar and a small prominent bulb. Platforms may exhibit pressure pitting and semicircular fractures.

2. **Percussion**: Relatively wide in terms of the length. The bulbar scars are shallow and the bulbs larger and more diffuse than on pressure.
   
   A. **Hard Hammer**: If faceted, the facets are relatively large. Triangular platforms, internal lips absent, impact scars and bulbar scars are all present. Bulbs more prominent than on soft hammer. Lateral and bulbar fissures present. Compression waves are better developed and hinging more frequent than on soft hammer.

   B. **Soft Hammer**: Smaller facets, when present. Oval to plano-convex platforms, usually crushed on the dorsal edge, and internally lipped. Impact and bulbar scars are often absent, as are bulbar fissures. Bulbs less prominent, and compression waves are less well developed.

3. **Punch**: Punched flakes are difficult to separate from soft hammer flakes, as they share many attributes. Further, they have not yet been described in sufficient detail in the literature (Bordes and Crabtree 1968). While resembling soft hammer, their characteristics are less well developed. Platforms are oval or plano-convex, and may be faceted. Lips may be present but bulbar scars are absent, as are bulbar fissures. Bulbs themselves may be absent, as are compression waves. Lateral fissuring does, however, occur. Punch marks may be present on the platform and the flake form produced is usually relatively parallel sided.
In the following section the various flake types or groups are discussed by site and level where applicable. Formal configurations other than the identifying criteria is not discussed in any detail. Edge configurations on the flakes vary from straight to excursive to irregular. Concave edges are relatively infrequent. Distal ends may be pointed, rounded, hinged, or irregular. Cross sections are almost invariably triangular (i.e., prismatic). Truncated forms are virtually absent. Flake type frequencies are summarized in Table 8. Lithic type frequencies are not presented in this study.

**Flake Types 01-03, 06-08**

**Nomin:** Parallel Sided (01-03), or Expanding Triangular flakes with faceted (01, 06), plain (02, 07), or irregular (03, 08) platforms.

**Sample:** \( N=496 \)

**Distribution:** Table 8

**Phase Association:** All phases

**Discussion:**

**DgPl-1/Level 1:** Parallel sided (Pl. 26: 3-4; Pl. 28: 13-19, 29) or expanding triangular (Pl. 26: 20, 22-23; Pl. 28: 20-23) forms with faceted or plain platforms produced by hard or soft hammer modes occur in equal frequencies (Table 8), suggesting no preferential selection for flake type, platform type, or productive mode. Parallel sided forms are characterized by platforms as wide as the lateral edges. These are frequently abraded, as are those on the triangular forms. The triangular forms include one variant (\( N=8 \)) characterized by an acentrally located arris which produces unequal flake facet angles (Pl. 28: 21, 23). Lengths vary from 11-36 mm., and platform widths from 4-20 mm. The flakes were largely produced from polymorphic block cores.

**DgPl-1/Levels 2A and 2B:** The only forms readily assignable to Level
2A are soft hammer forms with faceted platforms, similar in their overall configuration to DgPl-U2/Level 1 specimens. The hard hammer, parallel or expanding triangular forms are very similar to the DgPl-55 specimens and are therefore assigned to Level 2B. Lengths vary from 10-25 mm., and platform widths from 4-10 mm. The Level 2B flakes were probably produced from small pebble cores.

**DgPl-U2/Level 1:** Flake production is characterized by soft hammer percussion (N=88). Hard hammer is represented on only four specimens. These are characterized by unfaceted platforms. The latter platform type is also very infrequent (N=10) as compared to faceted platforms. The faceted forms, characterized by laterally restricted platforms, exhibit a continuous range of variation from parallel sided (Pl. 26: 10; Pl. 28: 1-6) to expanding triangular forms (Pl. 26: 21; Pl. 28: 7-12). On the former form the lateral edges expand distally, then are redirected parallel to the longitudinal axis. Lengths range from 16-47 mm., platform widths from 3-17 mm. The flakes were probably produced from conical and bifacial polymorphic cores.

Pressure flakes are also present (N=2). No definite evidence of the punch technique was observed. The unfaceted hard hammer forms 02 and 06 are characterized by broad platforms (Pl. 26: 21).

**DgPl-42/Levels 2 and 3:** An insufficient sample was recovered from these levels.

**DgPl-47:** The limited sample (N=12) is identical to DgPl-U2/Level 1.

**DgPl-55:** Parallel sided forms (N=21) (Pl. 27: 19-24) predominate over expanding triangular (N=15) (Pl. 26: 19; Pl. 27: 25-28), and hard hammer (N=28) over soft (N=8). The latter technique associates exclusively with expanding triangular forms and faceted platforms. The parallel sided flakes, characterized by plain platforms which are as wide as the lateral edges, are small and
relatively thick. Two of the type 03 forms have small bulbs on the distal/ventral surface, and crushed distal ends, indicating the use of the bipolar technique. Lengths range from 17-32 mm., and platform widths 4-16 mm. They were probably produced from small unidirectional pebble cores.

DgPl-68/Level 1: Frequencies are very low (N=8). The triangular (Pl. 26: 16) or parallel sided (Pl. 26:7 ) forms, produced by hard hammer percussion, are very similar to the DgPl-1/Level 1 specimens.

DgPl-68/Level 2: Parallel sided forms, characterized by straight or slightly excursive lateral edges, are characteristic (N=21) (Pl. 26: 6, 17; Pl. 27: 7-8, 11-14, 16), in contrast to expanding triangular forms (N=2). Hard hammer (N=5) or punch (N=7) predominate over soft hammer (N=2), indicating a decided preference for the production of parallel sided flakes utilizing hard hammer or punch. An intermediate group, designated as percussion (N=6), are probably punch flakes. Lengths range from 11-36 mm., platform widths 6-11 mm. The flakes were produced from unidirectional blade-like cores.

DgPl-68/Level 3: Parallel sided (Pl. 27: 19) and expanding triangular flakes occur in equivalent frequencies (8 of each). Soft hammer is exclusively associated with the expanding triangular forms. Faceted parallel sided forms are absent. The intermediate percussion group also occurs in this level (N=7), as does one punch flake.

DgPl-85: The small sample is only well represented in Level 2. Hard hammer parallel sided forms and soft hammer triangular forms occur in equivalent frequencies. In general the forms are quite similar to DgPl-1/Level 1.

DgPl-86/Levels 1 and 2: Sample size is very small (N=6). Flake forms and techniques occur in roughly equivalent frequencies. The parallel sided forms are similar to those in DgPl-1/Level 1.

DgPl-86/Level 3: Insufficient sample size.
DgPl-86/Level 4: Parallel sided forms (Pl. 27: 9-10) predominate over triangular (Pl. 27: 15) (6 to 2). Soft hammer technique is associated with the latter. Punched, parallel sided forms occur. One specimen - A4596 - of Avon Chert is 88 cm. long. It is probably a quarry blank (Pl. 29: 8).

DgPm-l/Level 1: Soft hammer is characteristic (N=23). There seems to be no preference for parallel sided (Pl. 27: 1-3) or triangular forms (Pl. 26: 8-9, 12, 24-25; Pl. 27: 4-6), or between faceted and unfaceted platforms. Lengths range from 23-43 mm. Platforms are generally intermediate between the DgPl-42 and the DgPl-1 specimens in width, ranging from 8-35 mm. They were probably produced from unidirectional conical cores.

DgPm-l/Levels 2A and 2B: Flakage from Level 2 is difficult to assign. It is probable that the unfaceted forms produced by hard or soft hammer associate with Level 2A, and the 01, 07 faceted soft hammer forms with 2B. Some of the 01 types are similar in their configuration to the DgPl-42 01 forms.

DgPm-l/Level 3: (Pl. 26: 5; Pl. 27: 20) Frequency (N=3) is too low to make any inferences.

Flake Type 04 (Pl. 26: 1; Pl. 29: 7)

Nomin: Prismatic Blades

Sample: N=2

Form and Production: The dorsal surfaces are battered at the proximal end. Platforms are irregular, thin and faceted (2 mm. width facets), and crushed at dorsal edge. They are lightly striated, perhaps indicating platform abrasion prior to flake removal. Ventral surface characteristics indicate that the flakes were produced by hard hammer percussion from a unidirectional conical core, possibly by the use of an edge ground cobble hammerstone. Lengths range from 40-109 mm., and platform widths from 13-17 mm.
Distribution: DgPm-1/Level 1

Phase Association: Red Rock Canyon

Flake Type 09 (Pl. 26: 2; Pl. 28: 27-28)

Nomin: Narrow Angle Expanding Triangular Flakes

Sample: N=4

Form and Production: These expanding triangular forms are characterized by straight lateral edges and prismatic cross sections, with the lateral edges diverging at a relatively low angle from the striking platform. These features result in a more lamellar blade-like form then either types 01 or 06. The platforms are either faceted or plain. Lengths range from 27-44 mm., platform widths from 4-7 mm. Ventral platform characteristics suggest that they were produced by soft hammer percussion from unidirectional conical cores.

Distribution: DgPl-42/Level 1

Phase Association: Blue Slate Canyon

Flake Type 10 (Pl. 26: 18; Pl. 28: 25, 27)

Nomin: Constricted Platform Expanding Triangular Flakes

Sample: N=13

Form and Production: Identical to expanding triangular flakes in form, differing only in the presence of a constricted platform area. Produced by soft hammer percussion.

Distribution: Table 8

Phase Association: Blue Slate Canyon

Discussion: Probably a fortuitous variant of the 07 flake type.
Flake Types 13 and 14 (Pl. 28: 24)

Nomin: Rectangular flakes with faceted or plain platforms

Sample: N=7

Form and Production: Side-struck or rectangular flakes are very infrequent in the sample. Produced by soft hammer and hard hammer percussion. Platform widths range from 15-22 mm.

Distribution: Table 8

Phase Association: Red Rock Canyon, Bellevue Hill, Pass Creek Valley

Discussion: They are probably fortuitous variants.

Flake Type 23 (Pl. 29: 9)

Nomin: Lateral Core Rejuvenation Flake

Sample: N=1

Form and Production: Triangular shaped flake, containing a striking platform at the proximal end, and two parallel sided negative flake scars on the dorsal surface. The overhang and projecting spur between the facets has been removed. The primary platform is striated, battered, and polished, suggesting that the platform was lightly abraded prior to flake removal, which was accomplished by soft hammer percussion. One lateral core edge has subsequently been used as a platform. The fragment (length 53 mm., platform width 28 mm.) is from a polymorphic acute angles "conical" core.

Distribution: DgPl-42/Level 1

Phase Association: Blue Slate Canyon

PRIMARY, SECONDARY AND BLOCK FRACTURE FLAKES

Primary flakes (Types 20 and 21) are those produced during the initial flaking of a chert block or nodule to remove the cortex and prepare the core
edges and striking platforms. While they may not exhibit prepared striking platforms and other characteristics indicative of the productive modes involved, they are often the characteristic flake type present in assemblages characterized by the use of small pebble cores. Two types of flakes are distinguished: Primary Decortication (Type 20), flakes whose dorsal surface is completely covered with cortex; and Secondary Decortication (Type 21), flakes whose dorsal surface is only partially covered with cortex.

Block Flakes (Type 22), vary considerably in their form. They are usually thick and irregular, and often lack striking platforms and other flake characteristics. Block flakes are produced by a variety of processes—thermofracture, coarse trimming, frost action, hard hammer percussion and misdirected blows, generally as a result of the poor fracturing properties of the material being worked. They may occur at any stage in the primary or secondary flaking process. The study of these flakes, combined with the study of the lithic types, allows for inferences to be made on the extent of core reduction which occurred at a site. These are briefly noted below.

**Flake Types 20-22 (Pl. 26: 11, 14, 15; Pl. 27: 29-34)**

- **Nomin:** Primary and Secondary Decortication and Block Fracture Flakes
- **Sample:** N=130
- **Distribution:** Table 8
- **Phase Association:** All phases. Some types are infrequent in certain phases.

**Discussion:** The frequency of primary and secondary flakes is controlled by a number of interrelated variables: the extent to which core reduction from nodules was carried out at the site, the nature of the lithics being utilized, and whether the flakes produced in decortication were suitable for use as tools.
Block fracture frequencies relate to the above variables, to the nature of the material and to the extent of thermofracturing at a site. Thermofractured block flakes (Pl. 27: 33-34) occur in a number of site--DgPl-1/Level 2B; DgPl-42/Levels 1 and 2; DgPl-47; DgPl-68/Levels 1, 2, and 3; DgPl-86/Levels 1 and 4; and DgPm-1/Level 2B. Comparison of these with other flake types in these components which show evidence of thermofracturing suggest they were burned in post-occupational fires.

**DgPl-1**: In level 2B all three flake types are represented (Pl. 28: 30-32) and are relatively common (Table 8). These, derived from small pebble cores by hard hammer percussion using the bipolar technique, indicate that considerable core reduction occurred in this level. While less common in level 1, the decortication flakes (Pl. 26: 11, 15) represent pebble nodules which were reduced by both hard and soft hammer. Block fracture flakes in level 1 indicate that both Avon Chert and QY lithic cores were worked in this level. Decortication flakes of either of the latter are absent.

**DgPl-42**: The extremely low frequency of these flake types (Table 8) suggests that little reduction of the nodules occurred at the site, and that either prepared cores or flakes were brought in.

**DgPl-47**: A similar situation exists here as in DgPl-42. The one decortication flake present is not indicative of core reduction.

**DgPl-68**: The presence of core fragments, exhausted cores and flakes of matching lithic types in level 2 indicates that a number of cores were reduced. The general lack of decortication flakes suggests that the cores were transported in a prepared stage. A similar situation obtains for level 1. In level 3, one black chert pebble (Pl. 27: 29) decortication flake was removed from a pebble core by use of the bipolar technique.

**DgPl-85**: The sample, while very small, indicates that at least two
cores were reduced from nodules at the site in Level 2.

DgPl-86: Decortication flakes are absent. The block flakes are a result of thermofracture, suggesting a similar situation to DgPl-68 in core reduction.

DgPm-1: Primary decortication flakes are absent in Level 1. While secondary decortication flakes are present (Pl. 26: 14) they were not reduced from nodules at the site. However, the presence of block flake indicates some core reduction from prepared chert cores occurred in these levels. A similar situation obtains in Level 2. In Level 3 small chert pebbles (N=1 ?) were reduced by the bipolar technique.

DgPm-4: The only flakes found in DgPm-4 were three secondary decortication flakes.

RESHARPENING AND RETOUCHING FLAKES (16-19) (N=1811)

These flakes are a product of unifacial or bifacial retouching, core trimming, tool resharpening and reworking. No attempt is made herein to differentiate the groups relating to these technological stages. Most, however, are resharpening flakes. They are divided into four groups on the basis of platform topography:

1. Faceted Platforms (16)
2. Faceted, Overhung Platforms (17) - presumably the result of bifacial retouching and resharpening (Frisson 1968).
3. Plain Flat Platforms (18)
4. Irregular Platforms (19) - thin, sharp, irregular striking platforms.

The flakes vary in form from parallel sided to expanding triangular and spatulate shapes. Their size varies widely from specimens, two to three mm. in width and five mm. long, to some in excess of one cm. in width and three
cm. in length. (The lithic frequencies of these flakes are excluded from the
total counts.) The distribution (Table 8) is reflective of the activities
which occurred at these sites during their occupation, and the types of tools
being used for various purposes. It may be noted here that only resharpening
flakes were recovered (N=2) from DgPl-14.

MISCELLANEOUS SITES

The flakage from the two sites described below is not included in the
general analysis and tabulated summaries.

DgPl-27: Five flakes were recovered—one number four, a distal fragment
of a large Avon Chert quarry blank (12 mm. thick and 49 mm. in width at the
break). Number five is another Avon Chert distal end (35 mm. width at the
break, 8 mm. thick), and number eight is a parallel sided Avon Chert flake
(28 mm. x 22 mm. x 5 mm.) with a plain plano-convex lipped platform. It was
produced by soft hammer percussion from an 80° platform. Specimens number
four and five are probably hard hammer flakes.

Number three (Pl. 29: 10) is a large Avon Chert side struck quarry flake,
62 mm. in width, 40 mm. long and 12 mm. thick. It has been subsequently used
as a core to detach relatively parallel sided flakes from its dorsal surface
(core facet angles 50-79°), using the ventral flake surface as the striking
platform. Number six (Pl. 29: 10) is a matching parallel sided prismatic
flake, 50 mm. long, 14 mm. wide (below the platform), derived from a platform
on the core. The latter was removed by soft hammer percussion.

DgPl-76: The flakes (N=576) include secondary flake blanks and debitage
produced by hard hammer percussion from a core transported to the site. The
former are characterized by plain platforms and generally expanding triangular
forms. They range up to 10 cm. in length and five cm. in width, and are not
unlike some of the hard hammer forms from DgPl-42.
CRYPTOCRystALLINE CORES AND FRAGMENTS

The Pass Creek area is far removed from most quarry sources and, consequently, many materials were brought in as blanks or finished tools. In the following discussion, cores, which are essentially exhausted nuclei, are separated from core fragments. The latter are most abundant and are described collectively. Cores are described separately according to type.

Block Cores  
Pl. 29: 1-2, 4-6

Sample: N=12

Form and Modification: The block cores from DgPl-1 and 68 are essentially identical, characterized as polymorphic rectangular, double-ended forms with biconvex sections and slightly excurvate surfaces (DgPl-68: 12 is subcircular in form). Flakes have been driven both from the ends and adjacent edges, producing a multifaceted bifacial form with multiple acute angled platforms.

Core platforms are either previous flake scars located on the opposite face, or prepared fracture surfaces. Relic platform areas often exhibit striations suggesting some preparatory abrasion. Lateral edge spurs are usually removed. Platform angles range from 70 to 90°, scar widths from six to 20 mm., and scar lengths from 10 to 30 mm. Complete cores range from 53 to 85 mm. in length, 41 to 58 mm. in width, 16 to 19 mm. in thickness and 40.5 to 92.3 gms. in weight.

The flakes, removed by hard hammer percussion, were generally parallel-sided to occasionally expanding triangular in form, and terminated at previous flake scars.

Broken cores are fractured by transverse breaks in all except two instances.
A slightly different block core form was recovered from DgPl-148. Discoidal in shape, it has flakes struck both off the lateral edges and the flat dorsal surface.

**Distribution:** Table 8

**Lithic Types:** GA (N=1), GG (N=8), PQ (N=1), QY (N=1), RY (N=1)

**Phase Association:** Bellevue Hill

Conical Core

**Sample:** N=1

**Form and Modification:** A multifaceted Avon Chert nucleus was recovered from DgPl-148 (number 33). It may have originally been a unidirectional conical core, since earlier unidirectional scars have been partially obliterated by later flaking. These flake scars are parallel-sided to triangular in outline, and the flakes were removed by percussion from an 80-90° platform located at the top of the core.

Unidirectional Core

Pl. 29: 3

**Sample:** N=1

**Form and Modification:** Unidirectional core (32 mm. x 25 mm. x 22 mm., 22.7 gms.), broken transversely above the keel by thermofracture. It is roughly conical in outline and square in cross section. The fluted surface (17 mm. width) converges slightly towards the keel. Bladelets have been driven off this surface. The back of the core, 26 mm. wide, is flaked transversely from the left lateral edge. Lateral edges (15 mm. wide) contain single vertical relic flake scars removed from the striking platform prior to the transverse flaking of the back. These attributes suggest that these edges, and perhaps the back, were used for blade removal, and that the transverse
flaking represents an attempt to rejuvenate the core.

The striking platform (18 x 28 mm.) has been rejuvenated by the removal of a single flake from the left lateral edge. Occasional striations on the platform edge suggest it may have been lightly abraded prior to blade removal. The platform edge has been flaked to remove spurs and overhangs between the bladelet scars. Punch marks are occasionally present. The last two bladelets removed from the fluted surface were five mm. wide at the platform, and extended past the thermofracture break. Core edge angles range from 85 to 90°.

Lithic Type: VA
Distribution: DgPl-68/Level 2
Phase Association: Crandell Mountain

Core and Nodule Fragments
Sample: N=44
Form and Modification: Core fragments were recovered from a number of sites. At DgPl-1 they came from both Levels 1 and 2B. The five 2B specimens exhibit unidirectional to multidirectional parallel flake scars, and multiple platforms. They represent exhausted shattered nucleus of small pebble cores which were worked by bipolar percussion. The Level 1 specimens (N=12) are fragments of polymorphic block cores. Nodule fragments from Levels 1 and 2B represent small fractured chert pebbles.

At DgPl-68 one fragment of an obsidian core was recovered from Level 1, five core fragments from Level 2, and two from Level 3. Only the latter two groups had intact platform areas, and represent unidirectional parallel sided flake cores (edge angles 80-85°). Punch marks are present on the platforms in both levels.

Five fragments were recovered from DgPl-42/Level 2. Specimen number 272
is a thick angular piece with multidirectional flaking on its back. The other surfaces are fractured. The other specimens are small lateral edge fragments which contain unidirectional bladelet scars.

A unidirectional parallel sided flake pebble core fragment was found at DgPl-55. In DgPl-85/Level 2, a fragment of a broken polymorphic bidirectional block core was recovered, and in DgPl-86 an unidentifiable fragment came from Level 2 and a thermofractured distal portion of a conical parallel sided flake core was found in Level 3.

DgPl-148 (N=4) are probably unidirectional or bidirectional block cores. Three fragments of block cores were found at DgPl-149. No core fragments were found at DgPm-1. A nodule fragment from Level 1 of Plate Chalcedony has bidirectional flaking on the vertical edges.

**Lithic Types:** AC (N=7), BR (N=1), BH (N=1), CG (N=1), GA (N=1), GG (N=2), GQ (N=1), HC (N=6), OB (N=4), PC (N=2), QY (N=1), QG (N=1), RY (N=4), RW (N=1), RJ (N=3), TG (N=2), WO (N=2), WC (N=2)

**Distribution:** Table 8

**Phase Association:** Red Rock Canyon, Bellevue Hill, Crandell Mountain, Pass Creek Valley
Microcrystalline materials consist of local argillites, basalts, dolomite, and a variety of quartzites, both local and imported. Chert grade green argillite flakes and cores which were used for the fabrication of small chipped stone tools have been described in the previous section. The analytical procedure as outlined in the previous section on cryptocrystalline flakage was followed in the analysis of the microcrystalline materials, with each site sample being examined and segregated into decortication, secondary, block, or broken cobble core categories. (One additional platform category—cortical—was added for secondary flakes.)

During the sorting process it became evident that because of inherent structural properties—i.e., bedding planes and granular structure—the green argillite flakage varied widely. Because of this factor, it was felt that little data would be gained by intensive metrical description. However, a small sample which showed the least degree of formal variability was drawn from the prepared flake categories and analyzed using the cryptocrystalline metric format. The remainder of the sample was simply measured—length, width, thickness and weight—and typed as to lithic material. These data are not presented herein.

Because of the granular nature and structural properties of the material, the percussive methods utilized in flake detachment were more difficult to infer. The green argillite flakes have plano-convex or oval platforms and internal lips. They lack impact and bulbar scars and shatter lines on the bulb. These attributes suggest that the soft hammer percussion was used, probably the most effective means of flake production from green argillite.
materials. The quartzites, in contrast, show more use of hard hammer percussion. Distributions are given in Table 8.

DgPl-1

The majority of the flakage is from Level 1 (N=737). While 116 specimens are assigned to Level 2 a large number of these specimens probably belong in Level 1, as 92 specimens of the Level 2 sample were recovered in 1968 when adequate vertical controls were not maintained. The actual sample from Level 2A and 2B should be equivalent to the frequencies of the green argillite flakage at sites such as DgPl-42 and 55. Further, most of these flakes should be decortication, block, and core fragments. The Level 1 sample consists largely of argillite debitage relating to the fabrication of the characteristic cobble choppers and spall tools found associated.

Core fragments, often fractured along bedding planes, are angular to irregular in outline, exhibiting large randomly oriented negative flake scars. Relic platforms are rare; a group of six cores with cortical platforms had edge angles of 70-90°, \( \overline{\gamma} = 83° \). The flakes driven off these cores range from rectangular (Pl. 26: 15), 22-35 mm. wide and 22-37 mm. long, to triangular, 13-25 mm. wide and 58 mm. long.

Prepared flakes vary considerably in their form, ranging from irregular specimens to rectangular and triangular forms quite comparable to the cryptocrystalline flake types found in Level 1. In general it would seem that the fabricators were attempting to produce fairly regular forms for use as blanks or as flake tools. The initial cobble reduction produced a high percentage of relatively square flakes with cortical platforms. A variant of these parallel sided forms is characterized by a broad, thick, triangular platform.

Local and non-local quartzites represent the reduction of a minimum of 24 cobbles. Rectangular flakes like those noted above are produced, as is
another form characterized by rectangular outline and quadrilateral cross section. Bulbs and arris are lacking. This form (N=6) is invariably utilized.

DgPm-1

Occasional flakage occurs in Levels 2 and 3, and probably relates to the modification of large tools rather than flake blank production. In Level 1, in contrast, core reduction occurred for the production of flake blanks. Quartzite core reduction is more frequent than argillite. A minimum of eight quartzite cobbles are represented, only two of which are local. One flake concentration found in Level 1 represents the reduction of a quartzite core. Flakes may be typed into the prepared flake categories, with 16 parallel sided forms and 18 triangular forms present. Additional debitage is also present. This distribution of forms suggests that there was no particular selection on the part of the artisan for parallel sided as opposed to expanding triangular flakes. Examination of the arris patterns indicate that they were removed from a unidirectional, acute angle, conical core which had slightly tapering lateral edges. The original core height was ca. five cm.

Other Sites

Relatively little microcrystalline flakage was recovered from the other excavated sites. At DgPl-42 two local quartzites are represented. The small amount of green argillite flakage is generally unutilized; it probably accumulated as a result of the fabrication of heavy duty butchering tools. One unidirectional core fragment is present, edge angle 75°. Similarly, at DgPl-47 cryptocrystalline materials are represented by one decortication flake. At DgPl-55 quartzites are lacking and argillites (N=24) represent detritus from cobble chopper manufacture. At DgPl-68 one foreign quartzite is present in
Level 1. The argillite sample is very small (N=2). In Level 2 the eight microcrystalline flake spalls are derived from cobble choppers, as is the one specimen in Level 3. While virtually absent at DgPl-86, the three cores recovered from Level 2 indicate that core reduction was carried on. One of these cores has two adjacent cortical platforms (80–90° edge angles). Flakage is infrequent at DgPl-85; two non-local quartzites are represented. The other microcrystalline flakage is associated with chopper production. Two non-local quartzites are present at DgPl-148 and one at DgPl-149. Green argillite debitage is very infrequent in these two sites.
LITHIC TYPES AND UTILIZATION PATTERNS

The study of lithic types involves consideration of two variables: the types of lithics represented and their possible sources. Classification in the following section is based solely on hand specimen examination, and the color and structural properties of the specimens. A number of variables cannot be controlled for in this type of analysis, such as variation in color and structure within a single source, and alteration of physical characteristics as a result of heat treatment or post-occupational firing. Source areas are also difficult to control for, as visually similar lithics may be obtained from different sources, or visually dissimilar lithics from the same source. Little systematic study has been done on sources in the Northern Plains - Rocky Mountains, and consequently sources can only be located in a very few instances.

The following classification and discussion is of limited use, but hopefully it begins to indicate the range of types utilized and their changes through time. The varieties distinguished are designated by an alphabetic code, and a minimum of 100 varieties are represented (Tables 10, 11). These varieties are briefly described and the distribution of some of the more common types in the phase components in the valley discussed (Table 9).

CRYPTOCRYSTALLINES

Cherts

The term chert applies to fine grained opaque cryptocrystalline quartzites exhibiting a dull flat luster, if not altered by heat treatment.

Pebble Cherts: This group includes--besides black chert [BC, PC (pebble)],
banded black chert (BB)— a variety of fine grained, opaque, dull lustered cherts lacking inclusions. The latter vary in color: Brown (RW, RB), Green (RG), Blue (LP), Purple (PP), Red (RJ), and Yellow (PY). They primarily occur as small chert pebbles with black weathering rinds. These pebbles are common in the preglacial and postglacial gravels in the plains and mountain valleys to the north, whose source material includes Paleozoic sediments. The black cherts, and one brown variety, could have been quarried from in situ outcrops in the Paleozoic formations in the Rockies to the north. The brown chert (RW) variety seems also to have been quarried; however, the source area is unknown for this particular variety.

Black chert is absent in the Red Rock Canyon Subphase, which probably reflects sampling rather than cultural variables. While it is infrequent in later subphases, it seems to be slightly more frequent in the Pass Creek Valley Subphase.

A particular RW brown chert varient (N=18), characterized by a dense reddish brown color, is restricted to the Bellevue Hill Supphase; it occurs at DgPl-1, DgPl-68 and DgPm-1, and as the "reutilized" Oxbow point at DgP1-U2.

White, Grey, Cream and Blue Cherts: Six varieties of white chert are distinguished. Some of these contain weathered pebble cortex, indicating they were collected from gravels or tills. Of particular note is the HC variety, which is characterized by small microscopic spherical white inclusions in a clear silica matrix. This variety is relatively common and upon heat treatment turns pink. A positive source area is unknown for it. Specimens of the other chert varieties—grey (4 varieties), cream (2 varieties) and blue (1 variety)—lack weathering rinds, which may either reflect the sampling or the possibility that these materials were obtained from primary quarry sources, particularly in the case of the cream and blue chert varieties.
Only the HC and WO varieties in this group occur in any frequency. These types occur in all subphases, with the lowest relative frequency in Blue Slate Canyon and the highest in Pass Creek Valley. A Chi-square test run between DgPl-55 and DgPl-42 samples was significant at the 10% level, indicating a definite change in utilization patterns. The same test run between DgPl-55 and DgPl-68/Level 2 was only significant at the 30% level.

The cream chert, while infrequent, occurs only in the Early and Middle Prehistoric Period phases. It may, therefore, be culturally absent from the Late Prehistoric phases. The distinctive blue chert (VB) occurs only in DgPl-68/Level 2.

Brown-Yellow Cherts: Six varieties are distinguished. Some have greasy lusters and may be chalcedonies. Of particular note is the QY (yellow chert with dendrites) which alters to red upon heating (RY). A number of quarry sources are known for this variety in the central Montana Rockies near Helena, Montana.

The QY variety is most common, occurring in all phases. It may, however, be more common in the Late Prehistoric than in the Late Middle.

Avon Chert: Avon Chert is a fine grained, light brown sedimentary chert containing occasional gastropods and other inclusions. It may or may not patinate to a distinctive chalky white. The source area is the Avon quarry, southwest of Helena, Montana. Two varieties are found associated.

The chert is frequent in DgPm-l/Level 1 (N=6), DgPl-1/Level 1 (N=39), and DgPl-42/Level 1 (N=55), but less so in DgPl-68/Level 2 (N=5) and DgPl-55 (N=1). This distribution suggests a decline in its utilization in the Late Prehistoric Period. The Avon variant DA occurs only in the Blue Slate Canyon Subphase, and at DgPl-42 it and Avon Chert account for nearly 50% of the total lithic assemblage.
Avon Associated Suite: Five varieties of cherts, which could be placed in the Brown-Yellow Chert group, occur associated with Avon Chert in the Blue Slate Canyon Subphase. Like Avon Chert, these materials have been derived from primary quarry sources, and while their exact locations are unknown, they are probably located in the central Montana Rockies. At DgPl-42 they total 56 specimens.

Red Cherts: Four varieties, two of which, RA and RY, are heat treated Avon Chert and yellow dendritic chert (QY). While the unaltered forms are quite distinctive, the heat treated forms are not easy to tell apart.

Chalcedonies

Chalcedonies are translucent fibrous cryptocrystalline quartzes which exhibit a waxy lustre. Colors vary widely, and in the sample range from grey (N=5) to white (N=2), blue (N=6), brown (N=1), and red/grey (N=1).

Pebble cortexes are present on some of the specimens, indicating that they were obtained from secondary sources such as gravels or conglomerates. Characteristics of other specimens suggest that they were obtained from primary quarry sources, perhaps in the Montana area. Some of the blue and grey chalcedonies occur as pebbles in the Basal Kootenai Conglomerate, a quarry for which is located in the Crowsnest Pass.

Grey chalcedonies occur sporadically throughout the sequence. The blue chalcedonies, while occurring in most phases (except for DgPm-1/Level 1), are most characteristic in the Crandell Mountain Subphase (e.g., DgPl-68/N=15, 14 of which are of the same specific variety, VA, which is also represented by four specimens in DgPl-68-Level 4). Similarly, a BG chalcedony variety occurs only in the Pass Creek Valley Subphase in the DgPm-1 (N=2) and DgPl-68 (N=3) components.
Knife River Flint Suite

This group includes five varieties, only one of which is considered to be true Knife River Flint from the Dakota quarries. The other varieties differ structurally from it, and some may have been obtained from quarries in the central Montana Rockies.

Knife River Flint and its pseudo-forms is very infrequent in practically all the components, particularly in the Pass Creek Valley phase where it is represented by a single specimen from DgPl-1/Level 3; in the Crandell Mountain (N=7) and Blue Slate Canyon (N=11) phases it is slightly more popular. A Chi-square test between DgPl-55 and DgPl-68/Level 2 was significant at the 10% level, suggesting that its virtually absence in the latest phase is a function of cultural rather than sampling variables.

Siltstones

Siltstones are fine grained, chert-like sedimentary materials. The grey siltstone probably comes from the Fort Union Formation, which outcrops over a wide area of southern Montana and northern Wyoming.

The Nordegg Formation siltstone is a black silicious material obtained from the Nordegg Formation, which outcrops in the foothills north of Calgary. It is easily mistaken for basalt. Its occurrence is too low for comparisons to be made. The salt and pepper material, known as grey silicious siltstone is probably a welded tuff. Its source area is unknown.

Petrified Wood

Three varieties are distinguished. These are Cretaceous petrified woods which occur secondarily in gravels in the adjacent plains, and eroding out of primary sources in cretaceous sediments. The petrified woods are very common
in the Late Late Prehistoric components on the adjacent plains, suggesting that primary quarry sources were being utilized at this time. As in the plains, the use of petrified wood in Waterton is restricted to the Late Late Prehistoric; i.e., the Pass Creek Valley Subphase.

**Vein Quartz and Quartz**

These materials may be obtained locally along the gabbro dykes and sills, although particular specimens may have been imported.

**Obsidian**

The obsidian, varying from black opaque to translucent, may have been obtained from the Yellowstone Park quarries, or possibly other quarries in the Beaverhead Range of southwestern Montana.

Obsidian is most common in the Pass Creek Valley Subphase where it occurs as points, core fragments, and various flake types. In the earlier components it is represented by core fragments from DgPl-68/Level 2 and Level 1, and one tool from DgPl-42.

Resharpening flakes are more common in the Crandell Mountain Subphase than the preceding phases, and are virtually absent from the Bellevue Hill Subphase, except in the terminal component at DgPl-68. In contrast to the very low frequency of obsidian in the Bellevue Hill Subphase, it is, while only represented by resharpening flakes, more common in the Red Rock Canyon Subphase.

**MICROCRYSTALLINES**

**Basalt**

The basalt present is Tertiary basalt, probably obtained from quarries
in central Montana. Basalt is infrequent but occurs sporadically in most subphases, and is perhaps slightly more frequent in the Red Rock Canyon and Bellevue Hill subphases.

**Quartzites**

Eleven color varieties are distinguished. With the exception of the DR red variety and some of the specimens included in the white and grey varieties, they are probably Pre-cambrian quartzites obtained from Laurentide tills and post-glacial gravels on the adjacent plains. Some, however, could have come from quarries located in Montana or in the Rocky Mountains to the north.

**Dolomite**

Local Pre-Cambrian dolomite.

**Argillites**

Kootenai Argillite is a distinctive green argillite found in quarries on the west side of the Kootenai Lakes in British Columbia. It is represented by a single specimen in the sample. The other argillites—brown, purple, grey and green (the latter being the most frequent color)—come from local Pre-Cambrian Belt series formations. The green argillite seems to have been obtained in cobble form from the adjacent fluvial deposits. The chert grade green argillite occurs in localized bands within these formations. Purple argillite is rather fissile and not particularly suitable for tools.

**Utilization Patterns**

The utilization of quartzites varies through time. In DgPm-1/Level 1, eight individual specimens are represented, only two of which may be of local
origin. This trend continues in the subsequent Bellevue Hill Subphase, and at DgPl-1, where some 24 varieties are represented; at DgPl-68/Level 1, of six specimens at least two are non-local. At DgPm-1/Level 2A two non-local varieties are represented. Later phases, in comparison, show a decline in the use of quartzite, and contain only local varieties; DgPl-42 has six pieces, DgPl-68/Level 2 has four, DgPl-68/Level 3 but a single, and DgPm-1/Level 3 has three specimens. Quartzite is absent from DgPl-55.

Argillite frequencies parallel the trend described above. In DgPm-1.Level 1 there are 36 specimens plus 11 chert grade specimens, and in DgPm-1/Level 2A there are 19 specimens plus nine chert grade specimens. In DgPl-68/Level 1 there are eight specimens, and in DgPl-1, 768 specimens.

In the later phase components the argillite frequencies decrease markedly, being represented in DgPl-42 by 51 specimens, in DgPl-68/Level 2 by five specimens and in DgPl-86/Level 4 by eight specimens; in the very latest components DgPl-68/Level 3 yields three specimens plus two chert grade specimens and DgPl-55 has 24 specimens plus nine chert grade specimens.
APPENDIX III
CERAMIC ARTIFACTS

1
CERAMIC ANALYSIS
R. M. GETTY

INTRODUCTION

Ceramics recovered from four sites in Pass Creek Valley are described in
detail to facilitate future comparisons. A single sherd recovered from DgPm-1
is not included. Aside from the use of standard analytical techniques, consider­
able time was spent restoring the vessels in order to obtain more complete
profiles and more accurate measurements. While the irregularity in handmade
vessels makes exact measurement impossible, one may reasonably assume that the
results are comparable.

The descriptive terms wet, semi-wet, and dry are used to describe either
the paddling process or subsequent smoothing of the vessel. Wet, is used to
describe the smoothing process by which fine clays are brought to the surface
using water. This is usually done after the vessel has been paddled and before
it has dried. The term dry, is used when there is no indication that the fine
clays are brought to the surface.

DGPL-1 (PL. 30: 1)

The sample consists of 26 sherds representing the rim, neck, shoulder and
body of a single vessel.

Method of Manufacture:

Unknown.

Composition:

Texture: Granular, due to size and amount of added temper. Compaction
and adhesion is well developed.
Temper: Crushed granite. The feldspar and quartz grains range from 1 to 4 mm. in diameter.

Firing: The vessel is dark grey to black in colour indicating that it was fired in a slightly reducing atmosphere. While orange oxidization clouds are present on both the interior and exterior of the vessel, the firing rim is less than 1 mm. thick.

Surface Finish:

Exterior: The vessel was shaped with a cord wrapped paddle, then subsequently smoothed while in the wet state. The latter process has almost completely obliterated the cord impressions.

Interior: Smoothed after drying.

Rim and Lip: Smoothed. The exterior lip shows signs of having been smoothed in the wet state and the interior lip in the dry state. The presence of heavy horizontal striations on the exterior lip suggests that it was brushed.

Vessel Form:

Rim: The rim varies between 9 and 12 mm. in thickness, averaging 11 mm. It has a slightly everted, flowing profile with a slightly rounded exteriorly beveled lip. The external orifice diameter is 26 cm.

Neck and Body: Unknown. The curvature of the neck sherds suggests that a rounded shoulder was present. Neck sherds average 10 mm. ± 1 mm. in thickness. Body sherds (N=5) range from 5-8 mm. thick. Bowl diameter is undeterminable.

Decoration:

None other than surface finish. One small rim segment exhibits three thumb nail impressions, 1 mm. wide, .5-1 mm. deep, 6-8 mm. long and spaced 10 mm. apart. From the exterior of the vessel, these are oriented obliquely to the right. The other rim sherds exhibit no decoration.

Use:
Carbonaceous residue, adhering to the interior, indicates that it was used for cooking.

DGPL-27 (PL. 30: 10)

Five body sherds, from a single vessel, constitute the sample from this site.

Method of Manufacture:

Unknown.

Composition:

Texture: Compact, good adhesion, low friability and no tendency to laminate.

Temper: Crushed granite. The quartz and feldspar (Microcline [Bower, n.d.]) grains generally range between .5 and 1 mm., with some up to 5 mm. in diameter.

Firing: The presence of a 2 mm. thick firing rim indicates that the vessel was fired in an oxidizing atmosphere. The exterior is completely oxidized while the interior is unoxidized, indicating that direct firing was confined to the exterior.

Surface Finish:

Exterior: The vessel was molded and shaped by use of a check stamped paddle. Subsequently, the check stamping was largely obliterated by smoothing the surface while in a wet state. The presence of numerous, small striations suggests that a fine fiber, perhaps hair, was used in this final smoothing.

Interior: The presence of coarse striations and temper showing on the surface, suggests that the interior was smoothed when the clay was fairly dry.

Vessel Form:

Unknown. The body sherds range from 4.5 to 11 mm. in thickness. The bowl diameter is at least 23 cm.
Decoration:

None other than the surface treatment.

Use:

The presence of charred residue, adhering to the interior, suggests a cooking function.

DGPL-55 (PL. 30: 3-5, 7)

Several hundred sherds, restorable to several large pieces of a single vessel, were recovered from a 10 meter square area in the south excavation area (Fig. 24). Of these, only five small pieces are from the rim and neck.

Method of Manufacture:

The presence of well defined oblique breaks suggest that the vessel was coiled.

Composition:

Texture: Compact, adhesion well developed, low friability and no tendency to laminate.

Temper: Crushed sandstone. The quartz grains range from .5 to 3 mm. in diameter, with some up to 8 mm. in size. Pebbles, probably aplastic inclusions, are also present.

Firing: The presence of oxidation clouds on both surfaces indicates that the vessel was fired in an oxidizing atmosphere. The firing rim is ca. 2 mm. thick. Oxidation is less pronounced towards the rim, indicating that the vessel rested upon its base during firing. The base is also unoxidized suggesting that it rested in burning coals and/or ashes. The interior clouds suggests that a fire was placed within the vessel.

Surface Finish:

Exterior: Finished by use of a cord wrapped paddle whose strands were 3 mm. apart and 1 to 2 mm. in diameter. Subsequent to paddling, the surface was
lightly smoothed, producing a glossy appearance. Horizontal striations in the neck and shoulder region indicate the use of a fine fiber or a finger.

**Interior:** Finished by smoothing. Fine horizontal striations appear on the surface, suggesting that the fingers were used in this process.

**Rim and Lip:** The few rim sherds recovered indicate that paddling, although less pronounced, extended to the edge of the lip. The lip is plain, apparently smoothed while in the wet state.

**Vessel Form:**

Rim thickness could not be determined. The external orifice diameter is ca. 30 cm. and vessel height ca. 22 cm. Body sherd thickness ranges from 3 to 9 mm., with the majority between 5 and 7 mm. There is no noticeable thickening of the vessel walls toward the base. The vessel is globular shaped with a slightly flaring rim caused by a slight constriction of the neck. Shoulders are rounded.

**Decoration:**

None other than the surface finish.

**Use:**

Carbonaceous residue adheres to the interior surface suggesting the vessel was used in cooking.

**DGPL-148, VESSEL #1 (PL. 30: 8, 9, 11)**

Several hundred sherds from the body of a single vessel were recovered from the rock outcrop area of the site (Fig. 6). Some sherds are eroded and bleached indicating that they had been exposed some time in the past.

**Method of Manufacture:**

A few oblique breaks are present suggesting that the vessel was made by the coil technique.

**Composition:**
Texture: Coarse: the result of using large size temper. Adhesion of the clay to the temper grains is relatively good. Upon breakage, the clay separates from the grains leaving clean, well-exposed grains. The oxidized firing rims tend to cleave from the rest of the sherds.

Temper: Crushed granite. The angular temper grains (composed of feldspar, quartz and some pyrite) range in size from 1 to 3 mm. Grains up to 8 mm. in diameter are present.

Firing: The vessel was fired, while resting on its base, in an oxidizing atmosphere -- probably an open fire. The exterior firing rim varies from .5 to 6 mm. in thickness. On some areas of the vessel firing clouds are present, indicating a more intense firing of these areas since the carbonaceous material has been burned from the clay. The thickest oxidation rim appears on the bottom and sides of the bowl, while the thinnest appears in the neck and rim portion. Oxidation clouds are lacking on the interior, indicating that this surface was not fired directly.

Surface Finish:

Exterior: The vessel was molded and shaped by use of a cord wrapped paddle. The individual cords were 1 - 1.5 mm. in diameter and the distance between the cords was 1.5 to 3.5 mm. Close examination reveals the use of a single cord. In only one or two instances was a double twist cord suggested, which probably resulted from overlapping strikes. The cord wrapped impressions in the rim area are poorly defined, probably the result of less striking force being applied in this area, rather than the subsequent smoothing of the vessel.

While the cord wrapped paddling extends over the shoulder, the presence of smoothed body sherds indicates that the vessel was not completely paddled. No striations are apparent on these sherds, which also exhibit many exposed temper grains, suggesting that this smoothing occurred while the clay was semi-wet.
Interior: The interior was smoothed. The sherds exhibit numerous fine horizontal striations, suggesting the use of fingers or a very fine fiber when smoothing the vessel in a semi-wet state. The interior surface is quite irregular, probably due to the coarseness of the temper.

Lip: The lips were rounded and smoothed, while in a semi-wet state, following the application of a thumb nail decoration which is partially obliterated by this smoothing.

Vessel Form:

Rim: The lip varies in thickness from 8-10 mm., averaging 9 mm., and is approximately 1 mm. thicker than the rim. The lip forms a right angle with the rim. The internal rim diameter is approximately 27 cm.

Neck and Body: While not enough of the neck was restorable to obtain measurements, it appears to be the same diameter as the orifice. The body has a slightly greater diameter than the rim, measuring 33 cm. in diameter. Body sherd thickness is highly variable, ranging between 5 and 14 mm., with most sherds falling between 7 and 11 mm. The sherds thicken towards the base. The height of the vessel could not be determined. The base is presumed to be rounded since the sherds neither suggest a coconut shaped nor a flat bottomed vessel.

Decoration:

The rim and body exhibit no decoration other than the surface finish. The lip, however, has a series of oblique fingernail impressions, set about 5 mm. apart, which cut through the interior of the lip. From the exterior of the vessel, they are oriented obliquely to the right.

Use:

The presence of a 1-2 mm. thick carbon residue, adhering to portions of the vessel's interior, indicates that the vessel was used for cooking.
DGPL-148, VESSEL #2 (PL. 30: 2, 6)

Rim, neck and shoulder sherds, representing a single vessel, were found in a tight cluster between two large rocks (Test F [Fig. 6]).

Method of Manufacture:

While the exact technique is undeterminable, the vessel was probably either coiled or molded. The vessel has a rolled exterior rim which has not been completely obliterated by subsequent paddling.

Composition:

Texture: Low friability, compact, laminate with 4-6 laminae per sherd, and good adhesion of the clay to the temper.

Temper: Crushed granite. The grains (composed of mica, quartz and feldspar) are quite fine, ranging between .5 and 2 mm. in size. A few larger grains, up to 4 mm. in size, are present. The clay/temper ratio is the highest of all vessels examined in this study.

Firing: The vessel was fired in an oxidizing atmosphere sufficient to form a firing rim up to 2 mm. thick. The presence of both exterior and interior firing clouds, on the upper body, suggest that both surfaces were fired.

Surface Finish:

Exterior: The vessel was molded and shaped by the paddle and anvil technique utilizing a cord-wrapped paddle. A herring-bone pattern of the cord casts suggests that a braided cord was used. The cords are 1.5 to 2 mm. in width.

The cord-wrapped impressions are visible on the neck and rim of the vessel, but towards the shoulder of the vessel they are weakly expressed and have been partially obliterated by subsequent smoothing. Below the shoulder they are completely obliterated. Smoothing occurred in a semi-wet state as the fine clay has not been brought to the surface. Some fine horizontal striations (produced by a fine fiber, hair or finger whorls) are present.
**Interior:** The interior of the vessel is completely smoothed. The process was carried out while the vessel was in the wet state, since surface striations are few in number and very weakly expressed. The presence of a few coarse striations near the lip suggest that this area was wiped with a relatively heavy fiber.

**Lip:** The exterior area of the lip exhibits cord wrapped paddling which has been partially obliterated by subsequent smoothing. The interior lip was treated similar to the interior wall.

**Vessel Form:**

**Rim:** Rim thickness ranges from 7 to 12 mm., averaging 10 to 11 mm. thick. The rim profile is slightly concave, sloping outwards at ca. 30°. The lip is rounded with an irregular external border. The external orifice diameter is ca. 16 cm.

**Neck and Body:** The neck averages 1 to 2 mm. less in thickness than the rim, with a maximum diameter of 15 cm. The shoulder is angular or chevron shaped, with an exterior angle of 135 to 140 degrees and a diameter of 17 cm. The height of the vessel was probably 12-14 cm., providing that it was not a double-shouldered pot. The vessel was probably globular in shape.

**Decoration:**

None other than the surface finish.

**Use:**

Carbonaceous residue was not present on the inner surface of the vessel, suggesting that it may have been used for storage rather than cooking.

**INTERSITE COMPARISONS**

The vessels recovered from the four sites represent a minimum of four different technological traditions, with the DgPl-55 vessel being the most distinct. The latter vessel, primarily characterized by its distinctive
temper, exhibits distinctive paste characteristics including excellent adhesion, compaction, low friability and aplastic pebble inclusions. Further, the vessel form is distinctive in its thinness and uniformity of wall thickness. The vessel is also completely corded, and the cord impressions are different to those present on the other vessels.

The vessel from the rock outcrop at DgPl-148 (Vessel 1) represents another tradition on the basis of its temper. Although the temper is crushed granite, it is much coarser than that in the other DgPl-148 vessel or the DgPl-1 vessel. Consequently the clay/temper ratio is much lower. Other characteristics of the paste, which are partially a function of the temper, include poor adhesion and high friability. The vessel form and wall construction also differs — with a marked thinness in the neck and rim. While cord impressed like the DgPl-148, #2 vessel and DgPl-1 vessel, the cording is quite distinctive. The vessel's only real similarity is its lip decoration which is similar to one of the rim segments from DgPl-1.

A third tradition is represented by the vessels from DgPl-1 and DgPl-148, (Vessel #2). Shared traits are crushed granite temper and temper size. However, the DgPl-1 vessel has a higher temper/clay ratio and markedly poorer adhesion than the DgPl-148 #2 vessel. Firing characteristics are also similar, with both exhibiting interior and exterior oxidation clouds and comparable firing rim thicknesses. Vessel form and construction is similar in body sherd thickness, a slightly thicker rim, and a vertical to slightly everted rim. Surface finish is also similar — both are corded exteriorly with smoothed rims and interiors. Decoration is likewise similar — thumbnail.

The only aspects whereby they differ include the use of a plain cord wrapped paddle on the DgPl-1 vessel as opposed to a braided cord on the DgPl-148 vessel, and the more marked obliteration of the cords on the DgPl-1 vessel. The DgPl-1 vessel is also larger.
The DgPl-27 vessel represents the fourth tradition. It differs primarily from the others in its surface finish, characterized by check stamping. The temper is a crushed granite, rich in microcline, indicating a different source than that used in the other vessels. In addition the temper/clay ratio is lower and the temper has been more finely crushed. The vessel is similar in firing characteristics to the DgPl-148, Vessel #1, in that both lack interior firing clouds. Further both are characterized by an irregular surface and a marked variation in sherd thicknesses.
For the last two years I have been examining private and institutional pottery collections in an attempt to ascertain the nature of the southern Alberta ceramic pattern. To date the materials from approximately 125 sites have been investigated, most of it being derived from surface collections. However, the four Pass Creek Valley sites and 20 others which have been professionally excavated, provide the possibility for some accurate chronological assessments. Probably the most important of the excavated sites is the Morkin Site (D1Pk-2). At this site the 4,000 sherds recovered were not only so diverse as to encompass virtually the entire range of variation seen in the pottery of the province, but also the materials were distributed through four occupation levels whose radiocarbon dates range from about A.D. 700 to A.D. 1850. While the synthesis is far from complete, enough work has been done to permit some very tentative observations.

On the basis of the sherd distributions at the Morkin and other sites, it would appear that there are at least three major ceramic traditions represented in the Alberta collections. In the earliest of these, the pottery consists mainly of coconut shaped vessels with round bottoms and near vertical to slightly insloping rims. The exterior surfaces are noticeably dimpled, probably as the result of paddling with a net or coarse fabric-wrapped implement. The rims are unthickened, and may be wedge-shaped, with decoration confined to the occasional occurrence of narrow incisions or punctates on both the interior and exterior lip edges. Sometimes one or more rows of punctuation will be found running horizontally below the lip, as well as bands of finger pinching. These materials are usually associated with Avonlea projectile points and therefore may date somewhere around A.D. 700.
The second pottery tradition encompasses both the largest percentage of the materials recovered from Alberta sites, and reflects the greatest range of variation. Vessel forms usually include globular bodies but the bases range from well rounded to definitely flat, some of the latter even being flanged. Pronounced shoulders occur frequently and rims may be insloping, vertical or flaring. Lips are usually flattened horizontally but rounded and everted forms are also known. The pattern may be modified by internal and/or external thickening. The exterior surface finish is quite variable and may be vertically cord-marked, fabric impressed or plain. Even on vessels revealing the original surface texturing, the surface is still usually smoothed somewhat, and in the earlier periods it would seem that this was often accomplished by polishing while the vessel was in a partially hardened condition. Decoration consists of incisions or punctates on the lip, upper rim, and/or shoulders. Finger pinching is also known. This tradition is extremely long lived. It appears to originate immediately after the termination of the Avonlea Phase in southern Alberta, and continues into the Early Historic period.

The third and latest tradition is notable for its striking affiliations with ceramics from the Missouri River area of the Unites States. These materials feature globular bodies vessels with "S" shaped, braced, or direct vertical rims, and plain, brushed, or check-stamped surface finishes. Linear dentate stamp impressions are the most common form of decoration, and these may occur as oblique or horizontal lines across the lip, and/or on and below the rim. Finger pinching, punctating, and incising appear occasionally as minor features of decorative motifs. On the whole these materials are most similar to pottery found in North and South Dakota, and ultimately may be seen as a derivative of the ceramics characterizing the Extended Middle Missouri Tradition, dating sometime after A.D. 1700.
As can be seen from the foregoing descriptions, most of the Pass Creek Valley materials fall well within the range of variation of the second southern Alberta ceramic tradition. The partially obliterated cord marking seen on the sherds from DgPl-1, 55 and 148 is representative of the most common form of surface finish occurring in that tradition, and the oblique lip incisions constitute a decorative motif which is found in other collections from the province. The smoothing technique used on the original surface texturing, a procedure which produced polished bars interspersed by shallow, dull grooves with crisp edges, is indicative of a construction mode more common in the earlier phases of the tradition, and may therefore suggest a Prehistoric rather than Proto-Historic or Early Historic date for these materials. All of the rim forms can be duplicated in other southern Alberta collections, particularly from the sites in the Old Man River area.

The sherds from DgPl-27 appear to differ from the others primarily in surface finish. The occurrence of check-stamping affiliates these materials with the third and latest tradition, for this surface texturing technique would seem to have an ultimate Middle Missouri source. In all probability this would mean that these ceramics date from the Proto-Historic period.

On the basis of the materials examined there is no trace of the earliest, Avonlea-associated ceramic tradition in the Pass Creek Valley area. This is not surprising, for pottery appears to be only a minor element in the Avonlea Phase elsewhere in southern Alberta.

In summary, the ceramics recovered during the excavations of DgPl-1, 27, 55 and 148 in Pass Creek Valley seem to relate to indigenous southern Alberta pottery traditions which date from the Late Prehistoric Period, with some indication of a slight Middle Missouri Tradition influences at DgPl-27. The admittedly vague generalizations presented herein are all subject to revision.
in the near future when the syntheses of the Alberta ceramic pattern is completed (Byrne n. d.). Because of acquisition of additional ceramic data since the pioneering work of Wedel (1951) and Forbis (1960), it should be possible to deal with the place of the Pass Creek Valley ceramics at greater length.
APPENDIX IV

FAUNAL ANALYSIS AND BUTCHERING PATTERNS

R. M. GETTY

INTRODUCTION

The osteological materials recovered from the excavated sites in Pass Creek Valley were analysed during the winter of 1970-71. This analysis was undertaken to determine the seasonal and temporal aspects of the economic basis of the prehistoric populations resident in the valley, and their cultural preferences in species utilization, butchering techniques and secondary processing methods.

METHODOLOGY

Bone elements were identified as to species by using the University of Calgary's comparative collection or Olsen's (1964) text. Sexing was not attempted because the elements were fragmentary. Elk and deer aging was based on tooth erruption schedules and wear patterns, utilizing comparative sets from the Department of Archaeology. Bison age classes were established using Fuller's (1959) tooth erruption and wear pattern schedules, and Silver's (1963) epiphysial fusion tables. Inferences as to butchering technique were drawn from Dibble and Lorrain (1968), McCorquodale (1960), Reeves (1966b) and White (1952, 1953a, 1953b, 1954, 1955). Bone grease inferences were based on Leechman (1951) and Zierheut (1967), the basic assumption being that when bones were communuted beyond what I considered necessary for marrow extraction, bone grease was prepared.

In the following appendix the results of the analysis is given by site, with data presented on: species utilized, age classes, butchering patterns, site seasonality and site function. These data are summarized in Tables 12-14.
Isolated teeth and cranial components are not included in Tables 13 and 14 because of difficulty in accurately determining minimum numbers of individuals. It should be noted that the minimum number species given in Tables 12, 13 and 14 to not always agree, since age classes have been considered in constructing Table 12. Further, because of the small sample sizes available, left and right elements are not listed separately in Tables 13 and 14.

**DGPL-1**

The extensive excavations at this site produced a large sample of osteological material from Level 2b. Only a few burned and calcined rib and long bone fragments were preserved in the lower levels. These data are insufficient to indicate whether the earlier levels were camp or kill sites.

Level 2b produced identifiable bone representing a single species, *Bison bison sp.* (a few young deer bones recovered from the litter mat are considered intrusive) representing a minimum of four individuals: 6 month to 1 year in age (N=1), 2 to 3 years in age (N=1), 3 to 4 years in age (N=1) and greater than 6 years in age (N=1). Abundant molar scrap was recovered which showed little or no sign of wear, indicating that additional individuals in the 2-3 year age range were present. Robust elements were absent suggesting that the animals were cows rather than bulls. No fetal material was recovered.

The above data suggest that the site was occupied in the late fall or early winter. The site appears to be a camp rather than a kill since elements usually left at a kill were under-represented in the sample. However, the presence of some vertebrae, cranial fragments, maxillary teeth, and rib heads suggests that the kills were made in the vicinity of the camp.

The butchering technique used at this site is similar to that at DgPl-86. The presence of cranial fragments suggest that crania were removed at the kill and brought back to camp, where they were further processed. Mandibles were
shattered, suggesting removal of the tongue and, perhaps, the use of the corpus marrow (Zierheut 1967:34). The presence of a basi-occiput, along with unlocatable skull fragments and maxillary teeth, suggests that the brain was removed. The highly fragmented nature of the skulls may be due to removal of other portions such as the nasal cartilage. The forelimb was either severed whole or by chopping through the glenoid. The hind limb was removed by chopping through the acetabular region of the pelvis or the neck of the femur. The rib cage was removed by breaking the ribs just lateral to the caustal articulation with the vertebral transverse processes. Thoracic spines were lacking suggesting that the back fat was stripped from the animals at the kill.

The bones were further processed for the production of marrow and bone grease, presumably after the meat was stripped from the limbs. Central long bone shaft fragments vary from quite large specimens to ones small enough to pass through a 1/4" screen. The femur and all but the distal end of the humerus were completely crushed. Long bone heads were absent and tibiae were extensively crushed. Radii were also butchered for marrow but the proximal and distal ends were not fragmented. The olecranon of the ulna was apparently shattered in the process of cracking through the distal end of the humerus. Ulnar heads were missing, and the shafts show signs of having been bashed off. Metapodials were occasionally broken to obtain the marrow, but they were not crushed for bone grease recovery.

The wrist and ankle joints were discarded without further utilization; however phalanges were saved for the preparation of glue (Grinnell 1962:227). Some of the proximal and medial phalanges were broken. Distal ones were generally absent.

DGPL-42

Bone preservation was quite good in all levels of the site. This fact,
combined with a large sample, allowed for a detailed analysis.

Levels 2 and 3

Bone density per unit area was quite low in comparison to level 1. Three species were represented: (1) Canid sp. (N=1) a right mandibular fragment of a coyote size canid; (2) Odocoileus sp. (N=1) a right distal humerus fragment and long bone scrap; and (3) Bison bison sp. (N=9) representing six age classes: fetal (N=2), 1.5 to 2 years (N=2), 3 to 4 years (N=2), 2 to 3 years (N=2), 5 to 6 years (N=1) and greater than 10 years (N=2). In addition, isolated post cranial elements indicated the presence of a minimum of four additional bison. While sex of the individuals could not be determined, the presence of two very large metacarpals suggests a minimum of two bulls were represented (Butler et al. 1971). The preserved fetal bison indicates a late winter to spring occupation. This conclusion is supported by the absence of animals less than a year in age.

The recovered bone elements suggest that the excavation area was a primary butchering area of a kill since the elements usually left at a kill site, i.e., skull fragments, vertebrae and ribs, were common. These elements, though, tend to cluster towards the western portion of the excavation area. Most of the long bone fragments were quite large indicating that they were broken to extract marrow. Preparation of bone grease does not appear to have been a major activity in this area. In contrast, the eastern portion of the excavation area had a higher proportion of smaller, crushed bones and a lower frequency of large elements, indicating that it functioned as a secondary processing area.

Caudal vertebrae were absent indicating that they were left with the hide. Once skinned, the animals could have been cut into three portions for further processing (the head, fore-end and hind-end), possibly to facilitate division of the labour among several individuals.
The skull was removed by chopping through the atlas vertebrae. While evidence as to the means of removing the brains was lacking, small skull fragments were numerous, indicating that the brains were utilized. The tongue was removed by chopping through the ascending ramus of the mandible. Often the mandibular corpus was shattered, possibly indicating a food shortage at that time (McQuorquodale 1960:92-39). However, it may be that these mandibles were used as anvil stones or clubs, or perhaps, they were even preferred as a marrow source. Most of the thoracic vertebrae had broken spines indicating that the back fat was removed as a block. The missing portion of the spines were not found, suggesting that this cut was removed from the excavation area.

Forelimbs were separated whole, or by cutting through the scapular blade just above the glenoid fossa. Many blade fragments were noted in the detritus, indicating that the scapulae were not removed from the area. Carpal bones were lacking, suggesting that the lower foot was severed by chopping through this joint. Most of the metacarpals were intact, indicating that the lower foot was discarded without further processing. Several articulated lower limbs were present in the sample.

The rib cage was removed by breaking through the ribs near the vertebral articulation. Rib shaft fragments were infrequent, suggesting that the rib cage was transported elsewhere.

The hind quarters were severed from the rest of the body by chopping through the last few lumbar vertebrae. Some of these quarters may have been removed elsewhere as the percentage of these bones was well below that of other elements. Shattered pelvic fragments and femoral heads suggest that the hind limbs were removed from the pelvic girdle by chopping through the femoral necks. The tarsal bones were undamaged, indicating that the lower portion of the hind limb was removed either by breaking the tibial or metatarsal shaft.
Following this initial butchering, the limbs were stripped of their meat and further processed to recover both bone grease and marrow. The humerus and radius were both broken to retrieve marrow, and the proximal humeral head and distal radial head were used for the production of bone grease. The tibia and femur were also processed for marrow. The proximal ends of the femur and tibia and the distal femoral head were absent, indicating their use in bone grease production. Marrow may have been extracted from some of the broken metatarsals.

While the occurrence frequency of phalanges was well below the other elements, the three phalanges were equally common, suggesting that hoof glue was not prepared.

**Level 1**

Species represented consisted of an adult canid, in the coyote size range, represented by a right mandibular fragment and a minimum of 12 bison representing eight age classes: newly born or fetal (N=1), 6 months (N=1), about 1 year (N=1) and 1 1/2 to 2 years (N=1), 2 to 3 years (N=3+), 3 to 4 years (N=2+) and greater than 10 years (N=1). At least two bulls were represented in the sample while the rest were probably cows and immature bulls.

The presence of newly born or fetal bison, bison about 6 months in age and several around a year in age suggests that this site was used during two seasons of the year -- late winter to spring and late fall to early winter.

In contrast to Level 2-3, the large amount of bone refuse recovered indicates the excavation area functioned more as a campsite than in later levels. However, the presence of skulls, mandibles, vertebrae, pelves and lower limb elements indicate that primary kills were also made. The areal distribution of elements, once again, indicate that the larger discarded elements cluster towards the western end of the excavated area, while bone scrap is more prevalent in the eastern end (Figs. 21-22).
The animal was first skinned, leaving the caudal vertebrae attached to the hide. The animal was then divided into three segments for further processing. Atlas vertebrae were low in number, and occasionally damaged, indicating that the skull was removed by chopping through the atlas. While evidence as to how the brains were removed was lacking, the large number of small skull fragments indicate that they were utilized. The large number of maxillary portions and shattered horn cores suggest that the skulls of smaller individuals were extensively smashed in obtaining access to the brain. In the case of larger individuals access was obtained by smashing through the basi-occiput. The tongue was apparently removed by smashing through the ascending ramus and, as was the case in level 2-3, the mandibular corpus was often shattered. Half of the recovered thoracic vertebrae lacked spines, indicating that the back fat was often removed as a solid piece. The missing portion of these vertebrae were not recovered in the excavation area, suggesting that this cut was removed to another area of the campsite for further processing.

The hind quarters were first removed by chopping through the lumbar vertebrae, then further segmented by severing the limbs from the pelvic girdle by breaking the bone around the acetabulum. Acetabula were generally intact but the ischium and illium portions, along with the sacrum, were often missing. In a few instances femoral heads were found, indicating that an alternate way of severing the limb was by chopping through the femoral neck.

The front quarters were removed by smashing through the scapula blade above the glenoid fossa. Glenoids were relatively common while whole scapulae were represented by only three specimens. The rib cage was removed next by breaking through the ribs behind the cuastal -- transverse process. In some instances the vertebrae were damaged. Presumably they were removed elsewhere for further processing.
After stripping the flesh, the fore limbs underwent further preparation. Humeri were smashed to obtain marrow and to prepare bone grease, leaving only the distal end unutilized. The radius was also broken to obtain the marrow. Ulnae were under represented, probably as a result of breaking the distal humeri. Carpal bones showed no sign of damage but half of the metacarpals were broken, presumably for obtaining marrow. Phalanges, especially the third were under represented suggesting that hoof glue was prepared. Several of the phalanges were broken transversally, perhaps a result of glue making.

The hind limb was also extensively utilized after stripping the meat. The femur was crushed to obtain marrow and bone grease as was the tibia, excepting the distal ends. The tarsal bones were well accounted for but the metatarsals were generally broken.

**DGPL-47**

The bone from this site, which may represent three occupations, is considered a single unit for purposes of analysis.

Two species are represented, *Bison bison* sp. and a large adult canid. The latter, represented by a lower right fourth premolar and some long bone fragments, is either wolf (*Canis lupus*) or a large domestic dog (*Canis familiaris*). Identifiable bison bones, while few in number, represent a minimum of three and probably four individuals, two of which were 2-3.5 years in age and one greater than 4 years. Younger bison are not represented.

Seasonality of the kill cannot be inferred. The site functioned as both a camp and a kill, as elements often left at the kill, were also present, i.e., skull fragments, vertebrae, rib articular ends, and foot elements. Long bone cancellous tissue fragments were present, suggesting that both bone grease and marrow was extracted; however, marrow was not extracted from all elements since some were complete. While tarsal bones were over represented, carpals were
under represented suggesting some preferential processing of respective limb elements. The presence of two complete metacarpals indicates that the lower limbs were discarded without further use, perhaps an indication of light butchering and/or an abundance of game.

DGPL-51

The sample from DgPl-51, a late 19th century occupation, contains a greater variety of species than any other site in the Valley: 3 mule deer, representing 1 adult, ca. 6 years old, and 2 juveniles, 1/2 year old; 1 yearling elk; 3 sheep, representing 1 adult and 2 immature individuals; one bison, aged 2-3 years; a badger; a beaver; and one bird, possibly a spruce grouse.

Bison are under-represented in comparison to the 18th century occupations in the Valley, suggesting that the bison population had been largely decimated by the late 1800's. The presence of badger and beaver may relate either to the interaction of the site's occupants with the fur trade or to the utilization of less preferred species for food.

The ages of the individuals indicate that the site was occupied during the fall, since half of the animals killed were born during the spring of the same year. The lack of vertebrae and pelvic fragments from the small ungulates may indicate that the kills were made some distance from the camp.

Although the unidentifiable bone scrap was primarily from small ungulates, marrow and, probably, bone grease was obtained from all species. The bone scrap includes long bone shaft, rib shaft and head, vertebral, and skull fragments.

The butchering pattern is as follows:

1. The mandibles of both deer and sheep were broken below the ascending rami for removal of the tongue.

2. All long bones, and sometimes metapodials, were fractured to obtain
marrow and prepare bone grease. Heads of the long bones were either fragmented or missing.

3. Carpals, tarsals, and phalanges were all but absent, suggesting either that the lower limbs were discarded elsewhere or fed to the dogs. Hooves may have been used as glue since butchered first and second phalanges were recovered.

DGPL-55

North Excavation Area

Two species were represented, *Bison bison sp.* (N=2), 2-3 years and 4-6 years in age and *Odocoileus sp.* (N=2) older than 1.5 years. Both the deer and bison bones were highly fragmented, suggesting that marrow and bone grease was extracted from both species. Axial skeletal elements were absent indicating that the kills were made some distance away. Fetal or young animals were absent, perhaps, suggesting a fall to early winter occupation. The low frequency of elements does not permit butchering technique inferences. The absence of third phalanges may suggest that glue was manufactured.

South Excavation Area

Species represented were bison (N=1) aged 2-3 years, mule deer (N=1) aged 1-2 years and one large old carnivore. Both large and small ungulates were used in the preparation of bone grease and marrow. The presence of an unfused thoracic spine from a small ungulate suggests a spring to fall occupation.

Fragments in this area were predominantly from long bones and ribs. One vertebral articular rib end was found along with some teeth fragments. The presence of a bison acetabular fragment and a mandibular condyloid fragment suggests a possible difference in butchering between the North and South areas.

The large carnivore material consists of a few markedly worn incisors, which may represent either a black bear or a canid in the wolf size range.
DGPL-68

Level 3

The identifiable bison bones consisted of vertebrae and pelvic fragments, six phalanges, one metatarsal and three tarsals. These represent a minimum of two individuals, one a mature adult 4-6 years old. Long bone scrap was common. Other recovered fragments include a scapulae glenoid, ulna, vertebrae and skull scrap. The variety of elements, all crushed or broken, suggests that the site was a kill-camp. The heavy butchering may indicate a scarcity of food. A thoracic vertebrae of either a Lynx canadensis or Lynx rufus was recovered from the litter mat, but it does not associate with the prehistoric occupation.

Level 2

Most identifiable bone and scrap was Bison. Identifiable elements included one carpal bone, the distal end of a metacarpal, and four phalanges. Scrap, mainly crushed long bone, was plentiful. A few rib shaft, teeth, and skull fragments were also present. An elk (Cervus canadensis) was represented by a badly eroded antler base.

Level 1

This level produced a few bison teeth, some long bone scrap and a few rib shaft fragments. Much of this bone was calcined.

DGPL-75

A minimum of two bison, representing one young and one old adult, were recovered. Ungulate fetal, or newly born, bone (unidentifiable as to species) was present along with two elements of an adult deer. The presence of fetal bone suggests that the site was occupied in the late winter to early spring.

DGPL-85

Preserved faunal remains were found in the upper two levels. In Level 3,
a minimum of one bison, 1.5 years in age, was represented. Bison bone scrap included metapodial, ulna, rib shaft, second phalange, humerus, femur and skull fragments. These fragments were large, possibly indicating that only marrow was being extracted.

Level 2 produced no species identifiable bone. Large ungulate scrap included teeth, long bone shaft and a few rib fragments. Less scrap was present in this level than in level 3. Some of it was intrusive since the only identifiable bone from this level matched, in age and preservation, that of level 3. The presence of a small ungulate in the sheep, goat or deer size range was indicated by an acetabular fragment. Calcined bone fragments were recovered.

DGPL-86

Level 4

This component, 20 cm. in depth, produced the only significant amount of identifiable bone and bone scrap for the site. In fact, per unit area, it was the most dense bone level excavated in the Valley. Two species were represented. A minimum of 3 bison were recovered, representing at least one, 2-3 years in age, and one, 3-4 years in age. A fourth animal, probably a large bull, may also be present. The others were either young bulls or cows. The greater portion of a mature canid skeleton in the coyote size range, probably *Canis familiaris*, was also recovered. The lack of very young fetal bison suggests a fall kill.

The identifiable elements, and the amount of bone refuse recovered, suggest that the site was a campsite rather than a kill as the portions usually left at a kill were noticeably absent or very few in number. Camp activities were indicated by the prevalence of broken and crushed long bone and rib shaft fragments. Bone marrow was being extracted, and the presence of crushed long bone heads and finely crushed bone suggests that bone grease was also prepared.
The inferred butchering sequence is as follows:

1. The tongue was removed by chopping through the ascending ramus of the mandible.

2. The fore limb was severed either whole or through the scapula-humeral articulation.

3. The hind limbs were severed by chopping through the acetabular region of the pelvis.

4. The rib cage was separated from the vertebral column by chopping through the shafts just lateral to their articulation with the transverse processes of the vertebrae.

Thoracic spines were not identified in the refuse, indicating that the back fat was stripped off at the kill. Also, removal of the brains probably occurred at the kill since only a few maxillary teeth and cranial fragments were recovered.

Once stripped of meat, the bones were subjected to further treatment in the production of bone grease and marrow. The femur and tibia, and all but the distal end of the humerus, were completely crushed (the lack of distal tibia is probably a sampling error for little marrow or bone grease is obtainable from it and it would be difficult to crush). While the scapulae may have been crushed, the lack of glenoid fossae suggest that this element was not brought into camp. The radius was not crushed but the central portion of the shaft was broken for marrow extraction. Ulnar heads were absent suggesting that they were either smashed during the process of fragmenting the humerus or intentionally crushed.

Lower limb elements were either discarded whole or after the metapodials were broken to obtain the marrow. Distal phalanges were absent, suggesting that the remaining lower segment was used to prepare glue.
Levels 1-3

These levels produced very little material. Bison tooth enamel and three or four identifiable bones were recovered. The third level may possibly be a kill rather than a camp as maxillary teeth, vertebral fragments and rib articular heads were among the elements recovered.

DGPL-148

Species represented include single individuals of *Bison bison* sp., *Alces alces*, *Lynx canadensis* and *Citellus* sp. (either the Columbian or the Hollister ground squirrel.) Species-unidentifiable bone elements included tooth, rib, scapula and long bone fragments of large ungulates; a bird humerus; and, calcined bone scrap. Since the moose was represented by a single element, it does not necessarily indicate that this species was exploited as a food source.

DGPM-1

Soil conditions on the site were not conducive to bone preservation, and consequently, little identifiable bone was recovered from the excavation.

Level 3

Bison and sheep were represented by single individuals. In addition, a bison skull (a near adult 3-4 years in age) was partially exposed on the surface. A considerable amount of bone refuse, including long bone shaft and head fragments, rib shaft fragments, skull fragments and teeth, were recovered suggesting that both bone grease and marrow was extracted. Some of the long bone shaft fragments were from small ungulates, probably sheep. Rib articular ends, vertebrae and pelvic fragments were lacking in the sample, perhaps indicating that the kills were made some distance from camp. Because of the small sample size butchering techniques cannot be inferred. The lack of second and third phalanges suggests that hoof glue was prepared.
Level 2b

One adult bison and one sheep were represented. A small amount of long bone scrap was also recovered.

Level 2a

Bison and sheep were represented in this level. Scrap, which included a few long bone and tooth fragments, was scarce.

Level 1

Tooth enamel and occasional long bone scrap was present. These were from large ungulates, probably bison.

Test H

This test, isolated from the main excavation area, produced an articulated vertebral segment composed of the atlas, axis and four cervicals, all from a single mature bison. Other identifiable bones included the proximal end of a left metacarpal and the articulating carpal bones, a rib shaft fragment, a long bone shaft and head fragment and some pelvic fragments. The presence of the vertebral segment suggests that the animal had been killed at this loci.

CONCLUSIONS

Variability in the sample size from the various sites negates any definitive statements being made on changing patterns in butchering technique through time, with the possible exception of DgPl-42. At this site, in level 1, the tibia was usually utilized for marrow recovery and bone grease preparation, and the hoof for glue, while in level 3 the tibia was not utilized and the foot was discarded whole. In level 1, the lower front leg was severed above the carpals, but in level 3 it was severed through the carpals.

One interesting trait showing up in the Pass Creek Valley sites is the intensive utilization of the bison skull. In most instances the craniums were thoroughly smashed to obtain the brains, and the mandibular corpus was
broken to retrieve the marrow. While both marrow and brains would provide sustenance, the brains could in addition have been used in the tanning process to soften hides (Driver 1961:174; Ewers 1958:110).

The analysis established the economic basis of the cultures for the last 5000 years. With the exception of DgPl-51, a historic site, bison were the primary ungulate resource exploited in the Valley. The other species utilized for food were deer and sheep. While elk was utilized at DgPl-51, the antler recovered at DgPl-68 does not necessarily indicate that elk was a food source in prehistoric times, as it may have been used in tool manufacture. A similar case is the moose bone recovered from DgPl-148.

The faunal analysis has provided valuable data on the seasonal utilization by man of the Valley -- either during the fall to early winter, or the late winter to spring -- the time of year when, on ecological grounds, one would expect the ungulates to be present in the lower valley area.
APPENDIX V
ABSOLUTE AND RELATIVE DATING

The dating and chronological alignment (Table 5) of components and phases in Pass Creek Valley rests on the use of a number of standardized methods: radiocarbon dating, obsidian hydration dating, relative stratigraphic position, archaeological cross dating both between components in the valley and with site/phases located elsewhere in the Northern Plains/Rocky Mountains.

Ultimately all absolute chronological techniques rest on the validity of the radiocarbon method, for which there are a number of potential and real sources of error (Polach and Golson 1966). Of these the most important source of error is the deVries effect — the variation in the natural concentration of radioactive CO₂ with time. This variation affects the relationship between the radiocarbon age and true age (Stuiver and Suess 1966). For example, in the 1st millennium A.D. radiocarbon dates are 50 to 100 years older than the calendrical dates for the first 500 years and last 200 years of the millennium. Prior to 1000 B.C. radiocarbon years are increasingly younger than calendrical dates, e.g., a radiocarbon date of 4300 B.C. corresponds to a calendrical date of 3500 B.C. This source of error is not controlled for in the evaluation and dating of the phases, whose dates should be considered radiocarbon and not calendrical.

Dates have been obtained on eight samples (Table 5) from a variety of materials: charcoal, bone collagen and bone apatite. Of these charred wood and charcoal yield the most reliable determinations. Collagen dates are considered by some workers to be unsatisfactory; however, the writer (Reeves 1970a) considers them quite acceptable, although they yield slightly younger determinations than charcoal. Bone apatite dating is a relatively new technique, but seems to yield determinations essentially in agreement with collagen.
Of dates obtained, six dates require special comment. GX2046 (Blakiston Brook Subphase) is unacceptable. It is considered a mixed sample, the result of the extensive rodent disturbance at the site. Four samples (GX2053, GX2052, GX2015, and GX2045) yielded modern determinations. The modern determination for GX2053 is of no particular concern, since the site is one of the latest Pass Creek Valley components. The date probably reflects the slightly younger results obtained on bone collagen. Three modern determinations and one very late determination (GX2269) were obtained on Crandell Mountain Subphase components. Re-examination of the undated portion of the charcoal sample from DgPl-85 indicates that a carbonized tree root was dated. The two other modern determinations and GX2269 indicate that the samples may have been contaminated by the extensive recent burning of the bone layers at both of these sites.

Red Rock Canyon Subphase

Only one date is available for this phase. It cross checks with the obsidian hydration dates, the associated paleo-environmental conditions and typological comparisons to other radiocarbon dated archaeological sites of a similar age (Table 4).

Since only one component is presented, the dating of the temporal interval occupied by this subphase must be based on external comparisons to dated complexes in the adjacent Rocky Mountains (Table 4). The dates for these range between 7000 and 6000 B.C. The only dated materials which relate to a possibly earlier complex are those from Mummy Cave, Layer 4, which dates pre-7000 B.C. A date of 7000 B.C. is therefore suggested for the Red Rock Canyon Subphase.

Valley Entrance Subphase

The Valley Entrance Subphase as represented in Pass Creek Valley and at
other sites in Waterton can be dated only on the basis of archaeological comparisons. The dates from the Big Horn Canyon, I-612 and I-689, plus the dates for the following subphase suggest an occupational interval from 6000 to 5500 B.C.

Bellevue Hill Subphase

Internal chronological control is available only on terminal components: DgPl-1/Level 1C, 1695 ± 210 B.C. (GX1460); DgPl-86/Level 2, 1810 B.C. obsidian hydration years (O.H.Y.); and DgPl-68/Level 1, 2000 B.C. (O.H.Y.). In the Waterton Valley, dates of 2440 ± 220 B.C. (GX2012) and 2980 ± 160 B.C. (GX1459) have been obtained on collagen extracts from Bellevue Hill Subphase components at DgPl-4.

In order to determine phase initiation, dated components in the adjacent mountain areas (Table 4) must be used. These suggest a date of 5600 to 5400 B.C., or ca. 5500 B.C. for the initial appearance of the complexes characterized by Bitterroot Side Notched points.

Phase termination is a complex problem involving consideration of the dating of Oxbow and McKeen points on the adjacent plains (Table 4). The dates suggest an initial date of ca. 3200 B.C. for Oxbow, and 2500 B.C. for McKeen. In both instances Bitterroot Side Notched points are associated. The sequence becomes complex after 2500 B.C.: on the U.S. plains Bitterroot Side Notched disappears while Oxbow continues on to ca. 2000 B.C. in association with McKeen, Hanna and Duncan, and McKeen continues until ca. 1800 - 1500 B.C. In the Saskatchewan Basin it seems that Oxbow continues until ca. 2000 B.C., but not in association with the other forms.

In Idaho, in contrast to the situation on the plains, Bitterroot Side Notched continues until ca. 1500 to 1000 B.C., even though new point types — Elko Eared and McKeen — appear at ca. 2500 B.C. A similar situation exists
in Waterton, where Bitterroot Side Notched points persist in association with Oxbows, "Elko Eared" forms, and McKean points. The terminus of the subphase, marked by a date of 1695±210 B.C. (GX1460), is placed at ca. 1500 B.C.

**Blakiston Brook Subphase**

Internal dating control for the subphase component is not available. Elsewhere (Reeves 1969b, 1970a) I have assigned the Hanna Phase, which the Blakiston Brook Subphase represents, a range from ca. 1500 to 1000 B.C., although the point type, Hanna Corner Notched, ranges from ca. 2500 B.C. to ca. 700 B.C. in age.

**Blue Slate Canyon Subphase**

Four radiocarbon dates have been obtained from DgPl-42 (Table 3). These indicate that the earliest component dates ca. 700 B.C. (GX1196). However, data from the adjacent plains and mountains (Reeves 1970a) suggest an initial date of ca. 1000 B.C. for the Pelican Lake Subphase, which Blue Slate Canyon represents. Radiocarbon dates for the terminal Blue Slate Canyon Subphase components at DgPl-42 suggest a terminal date of ca. A.D. 500.

**Crandell Mountain Subphase**

Acceptable radiocarbon determinations within the 1 sigma error range have not been obtained on Crandell Mountain components in Pass Creek Valley; GX2194 from DgPl-85 is accepted at 2 sigma. Obsidian hydration determinations are available for three components: DgPl-68/Level 2, A.D. 495; DgPl-86/Level 4, A.D. 772; and DgPl-42, A.D. 1214.

On the adjacent plains (Reeves 1970a) phase initiation of the Avonlea Phase, which Crandell Mountain Subphase represents, is placed at A.D. 150-250. Early point types are absent in the Crandell Mountain sample, suggesting that it begins slightly later, as does the local representative of the Avonlea Phase.
in the southern Montana area (Reeves 1970a). The Blue Slate Canyon determinations suggest a date of ca. A.D. 500 for phase initiation.

Subphase termination is a problem as the radiocarbon determinations for the subsequent subphase have all yielded very recent dates. Elsewhere (Reeves 1970a) I have suggested a terminal date of ca. A.D. 700 for the Alberta plains and ca. A.D. 900 - 1000 for the Montana area. However, recent data from southwestern Alberta suggests that the Avonlea Phase does not terminate at ca. A.D. 700, but continued at least 300 years longer, a situation similar to that in Montana. The DgPl-42 obsidian hydration determination and the DgPl-85 radiocarbon date suggest a late termination in the Waterton area, ca. A.D. 1200.

Pass Creek Valley Subphase

Six radiocarbon determinations ranging from ca. A.D. 1450 to 1840 have been obtained on subphase components. Obsidian hydration dates are also available: DgPl-1/Level 2B, A.D. 1588; DgPl-55, A.D. 1532; DgPm-1, A.D. 1688. The absence of earlier dated components is either a function of sampling, dating errors, or the operation of other factors -- perhaps cultural preference. However, the obsidian hydration dates tend to corroborate the late radiocarbon determinations, suggesting that earlier components are truly absent.

Phase initiation is tentatively placed at A.D. 1200, and terminated at A.D. 1840. It should be noted, however, that the Crandell Mountain Supphase, or some other complex such as Waterton River, may occupy the first 500 year interval.

Besant and Waterton River Complexes

Dating of the appearance of these "complexes" in Pass Creek Valley rests on cross dating to other dated sites. At DgPl-10, a representation of the Waterton River complex, obsidian dates tend to cluster in two major groups. A.D. 640 and A.D. 1343. In adjacent plains Besant dates range from A.D. 150 -
250 to A.D. 750 (Reeves 1970a).

**Historical Aboriginal Complex**

This complex is datable by the associated trade beads to A.D. 1840 - 1870.