

Zooarchaeological Analysis of Cultural Features from Four Early to Middle Holocene Fort Rock Basin Sites

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The four sites reported here were excavated by the University of Oregon Archaeological Field School during the 1993 through 2000 field seasons. The Bowling Dune (35LK2736), DJ Ranch (35LK2758), Locality III (35LK3035), and Bergen (35LK3175) sites are all located on the floor of the Fort Rock Basin and radiocarbon dates suggest that each site had occupations occurring at similar times during the Middle Holocene. However, differences in site features and artifact assemblages indicate that activities may have varied from site to site (see Jenkins, this volume; Jenkins, Droz, and Connolly, this volume; Moessner, this volume; Singer, this volume; and Helzer 2001). This paper focuses on analyses of faunal remains recovered at the four sites, primarily from radiocarbon-dated cultural features such as storage pits, living floors, and hearths. The data from the analyses are used to make comparisons between sites and selected features within each site, to discuss their possible environmental settings at the times of occupation, and to determine if there is evidence for seasonality in site use.

The four sites seem to express two types of cultural usage: at Bowling Dune and the East Locus of Locality III, constructed features are layered over each other, indicating that a variety of activities were conducted at the location over time (Jenkins 2000, Jenkins, this volume). The Bergen site and DJ Ranch also revealed episodes of ephemeral site use, but these events were underlain by living floors yielding abundant and diverse artifacts, suggesting more intensive habitations there (Moessner, this volume; Helzer 2001). To study the layered features found at Bowling Dune and Locality III, zooarchaeological samples were drawn from particular excavation units and levels associated most closely with each feature. The Bergen and DJ Ranch living floors required a different analytical strategy. A full accounting of the faunal remains from each feature would be a substantial undertaking, well outside of the scope of this study. It was decided that strategically located

surface to floor columns would be the most effective way to sample these floors.

Before continuing, several considerations must be noted. First, this project incorporates data utilized by several researchers seeking to answer different kinds of questions with their analyses. The analyses of the Bowling Dune, DJ Ranch and Locality III fauna were conducted by the author, but the reader will also note that Singer (this volume) drew her sample from the same three faunal assemblages, and in some cases, from the same features. Singer (this volume) incorporated larger sample sizes to create a broad-brush picture of the variety of taxa present at each site. For some features, her pool of specimens was larger than mine, resulting in the identification of species absent from this study, such as the mountain lion and raccoon she identified at the Bowling Dune site. Personnel from the National Fish and Wildlife Forensics Laboratory analyzed the column sample from the Bergen site as a training exercise and their analysis did not include size-grading of faunal remains. This information was added by the author at a later time.

Second, the East Block of Locality III was analyzed well before the other three sites, and size classed/unidentifiable bone fragments (Table 1) are an

Table 1. Animal bone size classifications (after Thomas 1969, and Schmitt 1988).

Class	Weight	Mammalian examples
I	<100 grams	mice, shrews
II	100-700 grams	squirrels, chipmunks, gophers
III	700 gm-5 kg	leporids, muskrats, skunks
IV	5-25 kg	coyotes, bobcats, badgers
V	25-225 kg	deer, sheep, antelope
VI	>225 kg	elk, bison
X		unidentifiable

unaddressed portion of the analysis. Consequently, the results for each site vary by different degrees, but more notably between Locality III and the others.

Finally, conditions of preservation and the unique characteristics of prehistoric site use at each location had differing taphonomic effects on the archaeofaunas. Unidentifiable remains compose a large portion of the faunal material from each site and the composition of taxa and classified/unclassified bone fragments are discussed for each site in turn. However, for the purpose of contrasting intrasite variability, the "Unidentified Bone" category has been eliminated from the visual representations (pie charts) so that minimally represented taxonomic categories may be more visible.

Bowling Dune (35LK2736)

A total of 3873 specimens was analyzed from seven features which included three storage pits, two living floors, and two hearths (Figure 1). Aside from the highly fragmented condition of many bones, preservation was generally good and those fragments exhibiting diagnostic characteristics could often be used to make identifications at least to the taxonomic level of Order. Pieces of eggshell and delicate fish bones were frequently recovered, providing some indication of the quality of preservation.

The Bowling Dune site is located on a low sand/silt dune approximately half a kilometer from the nearest known hydrologic feature; part of the distributary system that drained overflow from Silver Lake during periods of increased moisture (Jenkins, Droz, and Connolly, this volume). It is unusual that the site is located so far from water. Other nearby sites exhibit clearer ties to the drainage system, being situated along channels or on small playas. The fill surrounding the site on the west, south, and east was removed during diatomite strip mining operations. The dune now appears as a high, brushy promontory, but at one time it would have blended into a series of low relief features covering the landscape.

The Bowling Dune site is reported in greater detail elsewhere (Jenkins, this volume), but brief descriptions of the pertinent features are provided below along with descriptions of the fauna recovered from each.

Feature 8

This storage pit has been radiocarbon dated to 5040 cal. BP (4460±160 RCYBP, Beta-67523). The sharply defined feature originated at a surface now

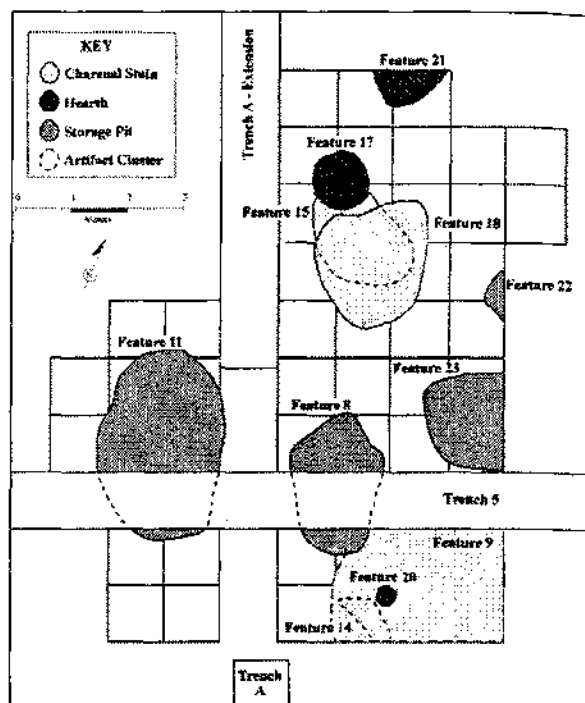


Figure 1. The Bowling Dune site features included in the analysis.

buried under 45 cm of fill and it measured 180 cm (N-S) in length by 140 cm (E-W) in width, attaining a depth of 60 cm. Botanical remains within the feature consisted of sagebrush charcoal, processed edible tissues (PET), and a *Chenopodium* (spp.) seed (Prouty 1995b). One edge-modified flake was recovered from the feature.

The 796 faunal specimens (Table 2) analyzed from Unit 5-2, (which partially contained Feature 8; see Figure 1) included three calcined, 34 burned (4%), and 369 stained fragments (46%), and 392 specimens that showed no signs of discoloration (49%). The faunal remains were quite varied, including specimens from amphibians, fish, birds (including eggshell), and large (Class 5) and small (Classes 1-3) mammals. A distal left humerus of an American Coot (*Fulica americana*) was the only bird specimen identifiable to species. Other bird remains were limited to four phalanges and a single piece of eggshell. The most commonly identified remains were those of hares, possibly including both Black-tailed and White-tailed jackrabbits. They were represented by elements from many portions of the body, including teeth (3), maxillas (2), scapula (1), humerus (1), radius (1), rib (1), femurs (2), patella (1), metatarsal (1), and phalanx (1). It is possible that all of these specimens may have originated from a single individual, but the high

Table 2. Faunal remains from the Bowling Dune site; selected features.

Level	F-8	F-15	F-17	F-18	F-21	F-22	F-23	Total
Aves								
carpometacarpus	-	1	-	-	-	-	-	1
coracoid	-	1	4	1	-	-	-	6
diaphysis	-	-	1	-	-	-	-	1
epiphysis	-	-	1	-	-	-	-	1
humerus	-	-	4	-	-	-	-	4
furculum	-	-	2	-	-	-	-	2
phalanx	4	-	1	-	-	-	-	5
podial	-	-	1	-	-	-	-	1
sternum	-	-	5	-	-	-	-	5
tarsometatarsus	-	-	-	1	-	-	-	1
tibiotarsus	-	-	1	-	-	-	-	1
ulna	-	-	6	1	-	-	-	7
unidentified	1	3	-	-	-	-	-	4
vertebra	1	1	-	1	-	-	-	3
<i>Branta canadensis</i>	-	-	1 cut	-	-	-	-	1
<i>Podilymbus podiceps</i>	-	-	1	-	-	-	-	1
<i>Fulica americana</i>	1	-	-	-	-	-	-	1
Lagomorpha								
astragalus	-	-	-	1	-	-	-	1
bullae	-	-	-	1	-	-	-	1
calcaneus	1	-	-	-	-	-	-	1
cranial	-	-	-	1	-	-	-	1
diaphysis	-	-	1*	-	-	-	-	1
femur	2	1	-	-	-	-	-	3
humerus	1	-	-	1	1	-	-	3
mandible	-	1	1	8	-	-	-	10
maxilla	1	-	1	1	-	3	-	6
metapodial	1	-	-	-	-	-	-	1
patella	1	-	-	1	-	-	-	2
pelvis	-	-	1	-	-	-	-	1
phalanx	1	-	-	-	-	-	-	1
premaxilla	1	-	-	-	-	-	-	1
radius	1	-	-	1	-	-	-	2
rib	1	-	-	-	-	-	-	1
scapula	1	-	-	-	-	1	-	2
tibia	1	1*	1*	3(1*)	-	-	-	6
tooth	3	1	1	5	1	7	-	18
ulna	-	-	1	-	-	-	-	1
Sylvilagus sp.								
maxilla	1	-	-	-	-	-	-	1
mandible	-	-	-	1	-	-	-	1
podial	-	-	1	-	-	-	-	1
radius	-	-	-	1	-	-	-	1
rib	1	-	-	-	-	-	-	1
Artiodactyla								
tooth	1	2	-	-	-	-	-	3
Odocoileus hemionus								
femur	-	1	-	-	-	-	-	1

Table 2 continued. Faunal remains from the Bowling Dune site; selected features.

Level	F-8	F-15	F-17	F-18	F-21	F-22	F-23	Total
Pisces								
basioccipital	-	-	-	-	-	-	2	2
ceratohyal	-	-	-	-	-	-	6	6
cleithrum	-	-	-	1	-	-	-	1
hyomandibular	-	-	-	-	-	-	1	1
maxillary	-	-	-	-	-	-	1	1
opercle	-	-	-	2	-	-	1	3
pharyngeal	2	-	-	-	-	-	7	9
quadrate	-	-	-	-	-	-	1	1
scapula	-	-	-	-	-	-	5	5
unidentified	-	-	-	5	-	-	606	611
urohyal	-	-	-	-	-	-	1	1
vertebra	1	-	-	-	-	-	66	67
Carnivora								
<i>Canis latrans</i>	-	-	1	-	-	-	-	1
Large Mammal								
	3	2	1	-	-	-	-	6
Medium Mammal								
	4	4	-	2	-	-	-	10
Small Mammal								
Class 3	21	80	8	11	1	16	-	137
Class 2	-	17	-	3	-	-	-	20
Class X	737	527	687	784	52	63	1	2851
Rodentia								
	-	2	-	1	2	-	-	5
Amphibia								
	1	3	-	-	-	-	-	
Serpentes								
	-	-	-	1	-	-	-	1
Eggshell								
	1	2	-	-	-	-	1	4
Tools								
	-	2	-	-	-	-	-	2
Modified								
	-	-	1 cut	-	1 cut, 2 striated	-	-	3
Total	796	652	733	839	60	90	703	3873

* =immature

degree of fragmentation and the resultant inability to "side" most elements leaves this determination in question. A proximal rib and a maxilla fragment from a *Syvilagus sp.* (cottontail) were also recovered. Fish bones included two Tui chub pharyngeals (from two specimens) and an unidentified vertebra. Large mammals are represented through an artiodactyl tooth fragment and a Class 5 scapula fragment. The small mammal remains include six Class 3 fragments from rabbits or hares that could not be identified with

certainty, and an ulna fragment from a Class 2 rodent. An ilium fragment from an amphibian (probably a Great Basin Spadefoot toad) was also recovered, which is believed to be the result of a burrow death or predator kill.

The variety of animal classes in the sample from Feature 8 suggests that there may be at least nine individuals represented there (one coot, one egg, one hare, one rabbit, two fish, one artiodactyl, one rodent, and one amphibian) and possibly more if the rabbit

are remains are from more than one individual. However, some of these animals like the amphibian and possibly the Class 2 rodent may not be directly related to the cultural feature.

Feature 15

Identified by Jenkins (this volume) as pre-Mazama camp debris, Feature 15 has a radiocarbon date of 5360 cal. BP (4710±60 RCYBP, Beta-75081) which is clearly at odds with the anticipated time range of 7600 cal. BP or earlier for pre-Mazama sites. Jenkins (this volume) feels the late date is the result of an intrusion of younger carbon from nearby post-Mazama occupations. The feature is 200 cm in length (N-S) by 150 cm in width (E-W), and the lens of charcoal stained sediments ranges between 10 and 30 cm in thickness, beginning approximately 1 meter below the modern surface. Artifacts associated with Feature 15 include a Cascade point manufactured from Horse Mountain obsidian, six bifaces, eight edge-modified flakes, an abrader, two metate fragments and one mano fragment. Paleobotanical remains included sagebrush charcoal and knotweed seeds (Prouty 1995b). Grass starch granules and an increase in cheno-ams were reported from the pollen analysis (Scott-Cummings 1995).

The 652 faunal remains (Table 2) associated with Feature 15 consisted of 13 calcined (2%), 26 burned (4%), 473 discolored (73%), and 140 unaltered specimens (21%) recovered from Units A-6 (Quads A and B), and A-9 (Quads A and C). Most of the bones were extremely fragmented and identifications were more challenging than at other Bowling Dune features, perhaps due to the greater antiquity of Feature 15.

Although limited in quantities, the range of animal classes represented at Feature 15 was rather broad. The remains of birds and their eggs, rodents, amphibians, leporids, medium-sized mammals, and artiodactyls were all found on the early living floor. Artiodactyl remains included a burned right femur head and two tooth fragments. Leporid remains consisted of a burned distal femur and an unfused right tibia. There were just three bird bones (two shaft fragments and a vertebral fragment) collected from Feature 15 along with two eggshell fragments. Specimens assigned to size classes included 17 Class 2 bones, ten of which were identifiable to the genus *Microtus* (vole). Two of the vole specimens (a mandible and a maxillary fragment) were burned. A total of 75 Class 3 and three Class 4 bones were also recovered. The anuran remains (an ilium and two tibia/fibulas) are probably those of a Great Basin

Spadefoot toad and not believed to be culturally deposited.

Feature 17

This basin-shaped hearth, radiocarbon dated to 7280 cal. BP (6420±230 RCYBP, Beta-75082), originated at a depth of 60 cm below the surface, overlying Feature 15 and underlying Feature 18 a little to the north (Figure 1). The 15-20 cm thick feature was 120 cm in length (N-S) by 90 cm in width (E-W). Paleobotanical remains included sagebrush and saltbush charcoal and saltbush and knotweed seeds (Prouty 1995). The pollens had a high arboreal and sagebrush content, along with some modern specimens (Scott-Cummings 1995).

The 733 faunal specimens (Table 2) included five calcined (<1%), seven burned (<1%), 577 discolored (79%), and 144 unaltered fragments (20%) recovered from Unit A-4, and Unit A-5 (Quads A and C). Birds accounted for the largest group of identified remains and many unidentifiable bone fragments were also believed to be those of birds. Four coracoids were recovered, one that was identified as mallard (*Anas platyrhynchos*) and three others that were the equivalent in size. The mallard and another coracoid were burned, the others were discolored. Six ulna fragments were identified, including a mid-shaft, three distal fragments (one belonging to a medium-sized duck was burned), a left ulna from a small duck, and the right ulna of a Pied-billed Grebe (*Podilymbus podiceps*). Five sternums were also recovered, including one from a medium-sized duck, one from a large duck, one from an unidentified goose, and two that were not classifiable to size. One of two humeri was that of a mallard (*Anas platyrhynchos*); the other was unidentifiable. Other remains included a burned right tibiotarsus from a medium-sized duck, two burned furculae from separate species, a burned phalanx, a shaft fragment, and an epiphyseal fragment.

Lagomorphs, lagging by a considerable quantity, composed the second largest group of identifiable specimens. The few *Lepus* sp. elements included a burned mandible fragment, a maxilla fragment, one tooth, a proximal ulna, an unfused right tibia that was burned, and a shaft fragment. One *Sylvilagus* sp. podial fragment was also noted.

The range of other types of animal remains was limited. One large mammal bone fragment was recovered, but offered no clues as to its origin. A coyote (*Canis latrans*) third incisor was collected in Unit A-4. Eight Class 3 fragments were collected.

Feature 17 is striking because of the limited range of its faunal remains. Primarily, the hearth was

utilized in the preparation of at least five waterfowl and possibly two lagomorphs. The emphasis on waterfowl may also be reflected by the limited quantity of size-graded bone fragments that were recovered - the more delicate portions of the avian skeleton probably deteriorated into small, unidentifiable fragments.

Feature 18

This living floor (Figure 1), dated to 6190 cal. BP (5380±70 RCYBP, Beta-75076), is described by Jenkins (this volume) as an "exceptionally black lens of sediment" which originated 30-40 cm below the surface, was 150 cm in diameter, 10 cm thick, and dissipated outward from a darker central area. The abundant paleobotanical remains included sagebrush charcoal and bark, two charred wada seeds, and one saltbush seed (Prouty 1995b). Scott-Cummings (1995) noted that pollens from Feature 18 were suggestive of grass processing. Lithic artifacts included three hammer stones, a mano, and a metate fragment.

The faunal assemblage consisted of 885 specimens (Table 2), including ten calcined (1%), 51 burned (6%), 465 discolored (52%), and 359 unaltered pieces (41%) from Units A-5 (Quads A and C), A-7 (Quads B and D), A-8 (Quads A and C), and A-10 (Quads C and D). The Feature 18 living floor yielded the culturally deposited remains of at least three lagomorphs, three birds, one fish, one medium-sized mammal and possibly one Class 2 rodent.

Leporid bones were the most commonly identified specimens. They included a cranial fragment; eight mandible fragments, one of which was burned; one burned maxilla fragment; five teeth; one distal humerus; one distal radius; one burned patella; one unfused left tibia; two right distal tibias, one of which was burned; and an astragalus. The two specimens of *Syvilagus* sp. included a mandible fragment and a distal radius.

Bird remains represented several waterfowl, ranging in size from large ducks to teal. Included were a coracoid from a small duck or rail (possibly a coot), the proximal ulna from a medium-sized duck, a small vertebra, and a mallard-sized tarsometatarsus. None of the specimens showed signs of heat alteration.

A variety of other animals were represented at Feature 18 through both taxonomic classes and size-graded bone fragments. Fish remains included a Tui chub cleithrum, two opercles, and five specimens whose fragmentary state rendered them unidentifiable. One Class 4 mammal (in the coyote to badger size range), eight Class 3, and three Class 2 bone

fragments were also recovered including one rodent tooth that was burned. Non-cultural remains included an unidentifiable snake vertebra, and 46 specimens from an immature Long-tailed weasel (*Mustela frenata*).

Feature 21

This undated hearth is located one meter northeast of Feature 17 (Figure 1). Originating at a depth of 60 cm, the 40 cm thick feature contained multiple lenses of charcoal suggesting repeated uses (Jenkins, this volume). It measured 100 cm from east to west, and 55 cm from north to south, but the feature was not completely excavated and a portion remains in the northern side wall of the unit. No paleobotanical remains were identified, but pollen analysis revealed hollow starch granules that were consistent with grass seed processing (Scott-Cummings 1995).

Sixty animal bone fragments (Table 2) were recovered from the feature including 19 burned specimens (32%), 33 that were discolored (55%), and eight that were not altered (13%) all came from Unit A-14, Quads A and B. Two bones were identified as *Lepus* sp., including a left distal humerus and a premolar. Class 2 rodent bones included a maxilla fragment and a tooth fragment, and two bones were categorized as Class 3. Three small, unidentifiable bone fragments displayed evidence of cultural alterations. One exhibited cut marks and two had striations consistent with wear from use as tools. The feature appears similar in size to the bone-rich Feature 17, but the limited quantities of animal bones and the thick, layered lenses of charcoal seem to indicate that the Feature 21 hearth was used for a different purpose.

Feature 22

This undated storage pit was not fully excavated (Figure 1). Feature 22 originates approximately 60 cm beneath the modern surface and had been dug through a band of Mazama ash, indicating that the storage pit was in use after 7600 cal. BP. The pit was probably about 90 cm in diameter and shallow, attaining a depth of only 25-30 cm. The paleobotanical remains from Feature 22 suggest that both upland and lowland resources were being utilized at the location (Jenkins 1995). They included sagebrush and charred knotweed and saltbush seeds from the lowlands, and fruity tissue and biscuit root from the uplands (Prouty 1995b).

Only three faunal specimens were recovered in Unit A-12 that could be associated with Feature 22. They included two burned fragments and one that was

discolored, all of which were unidentifiable. The lack of faunal remains suggests that Feature 22 may have been wholly devoted to the storage of floral resources.

Feature 23

Carbon from a charcoal lens adjacent to the floor of this storage pit has been radiocarbon dated to 5460 cal. BP (4730±120 RCYBP, Beta-75084). Originating approximately 50 cm below the modern surface, Feature 23 was 190 cm in width, over 240 cm in length (it was not fully excavated), 50 cm deep, and 75 cm from Feature 18 (Figure 1). Like Feature 22, Feature 23 was excavated through Mazama tephra deposits. No macrobotanical analysis was carried out, but pollen analysis yielded high quantities of *Pinus*, low quantities of grasses, and an absence of sagebrush.

A small (50 ml/120.1 g) bulk soil sample (932-C1-A15-D-3-5) from the interior of the feature was found to contain an abundance of tiny fish bones (Table 2). The sample was passed through three nested screens with apertures of 1.0, 0.5, and 0.25 mm, but only the faunal material trapped in the 1.0 mm screen was analyzed. A total of 703 specimens (0.75 g) was recovered, including 700 fish bones, one unidentified burned bone fragment, a freshwater snail shell, and a piece of eggshell. The remains appear to be from small, first year Tui chubs and elements included basioccipitals, ceratohyals, cleithrums, hyomandibulars, opercles, pharyngeals, quadrates, scapulae, urohyals and vertebrae. Most appear to be unaltered by heat. Extrapolating from the sample size, fish remains could exceed 14,000 specimens per liter of fill in at least one portion of Feature 23. There were numerous remains captured in the 0.5 mm screen, but they were so small and in such great quantities that recovery would have been overly time consuming, and, because of their highly fragmented state, little information regarding frequency of elements or species of fish would have been yielded by the effort. Aside from the high numbers of fish bones, Feature 23 was also noteworthy because of its distance from a known hydrologic feature and its distinctiveness in relation to other cultural features at Bowling Dune. Fish were not as abundant in other features at the site and the implication may be that small fish were harvested elsewhere, transported to the site, and cached for later use. Ethnographic data show that, among other methods, small fish were scooped out of the water with winnowing trays (Fowler 1986) and dried whole, or collected from the edges of drying lakes and ponds.

Locality III (35LK3035)

The Locality III site extends several hundred meters along the windward southern slope of a slightly curved lunette. The lunette developed along the north and northeast shore of a playa that has been referred to as Lunette Lake (Jenkins 1995). The dune reaches a height of almost 1317 meters (4320 ft.), while Lunette Lake is approximately 1311 meters (4300 ft.) in elevation. The cultural deposits at Locality III are more apparent at the west end of the site than elsewhere. Erosion due primarily to slope wash has exposed bone, debitage, fire-cracked rock, ground stone, and chipped stone tools across a broad front in this area of the site.

Excavations were conducted at two loci (defined as the East Locus and the West Locus) in 1995 and 1996. The 1995 work at the East Locus centered around the reopening and expansion of explorations initiated by Mehringer and Cannon (1994:310-313) while preliminary work at the West Locus led to the identification of a probable house floor. The 1996 excavations focused on both loci. Seven 2x2 meter units and three 1x2 meter units were excavated to the north, west, and east of the 1995 East Locus excavations, and a variety of features were encountered (Figure 2). In the following narrative, excavation units are designated with the prefix "B", and cultural features with the prefix "EB". Radiocarbon dates on six hearths ranged in age from 7000 cal. BP (6120±180 RCYBP, WSU-4861) in Unit B-3, to 8180 cal. BP (7445±190 RCYBP, WSU-4863) in Unit B-2. Chronologically sensitive artifacts included four foliate points, two Northern Side-notched points, two Elko points, and a rectangular stemmed point (Jenkins 2000:81-82).

The East Locus was chosen as the source for this faunal analysis for several reasons. First, the deposits at this locus contain nine features that are clustered within six meters of each other, the majority of which occupy a relatively narrow band of stratigraphy (< 30 cm thick) which has been identified as Cultural Component 2 (Jenkins 2000:82). The features include a possible cache pit, six hearths, a metate recovered *in situ* and a complete egg that was also recovered *in situ*. Second, six of the features at this location were stratigraphically located within 25 cm in elevation, suggesting a relatively narrow time range of occupations. Radiocarbon dates from these features span a time period of approximately 1000 years. Finally, Cultural Component 2, from which the faunal samples were drawn, appears to almost be sealed by sterile deposits above and below it. This is an unusual

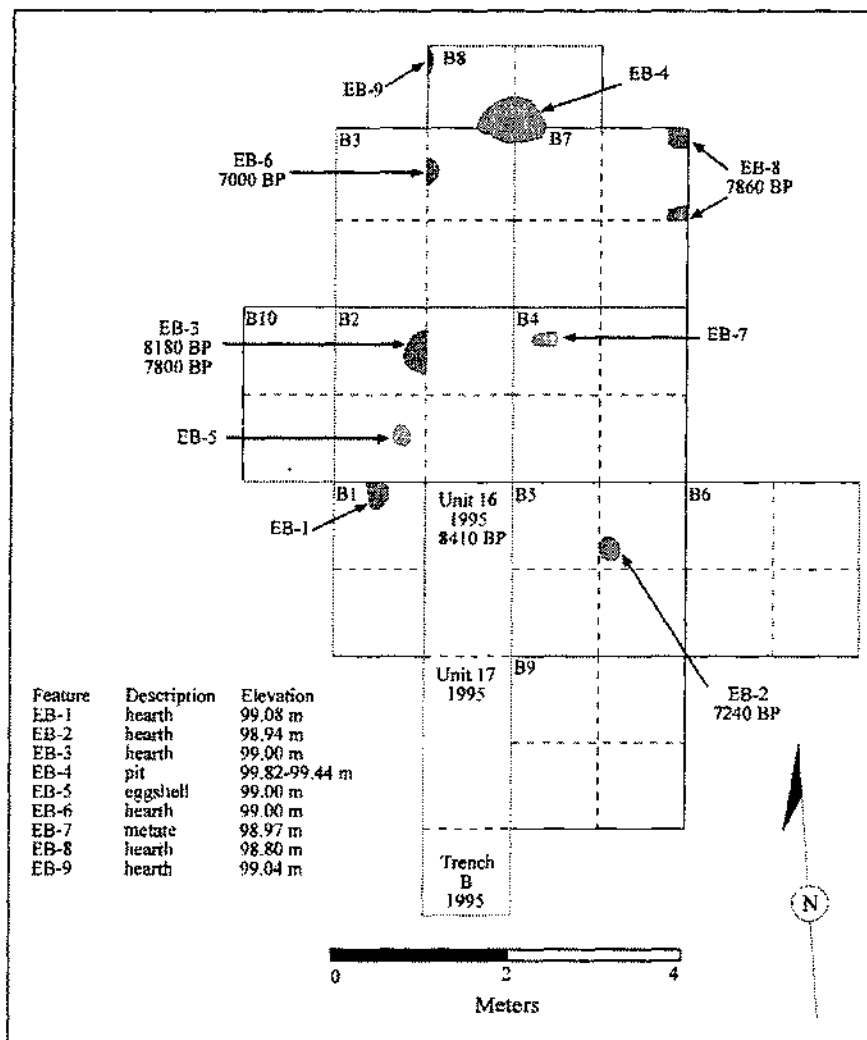


Figure 2. Map of the East Locus, Locality III. Units are designated with "B" prefix, features with "EB."

occurrence at Locality III, where chronologically sensitive artifacts that span thousands of years of occupation can be found in close stratigraphic association. Cultural Component 2 was the principal artifact-bearing stratigraphic layer at the East Locus. It was overlain by Cultural Component 3; approximately 30 cm of lakebed sediments mixed with reworked Mazama pumice that contained limited amounts of cultural material (Jenkins 2000). Cultural Component 2 was underlain by Cultural Component 1, approximately 30 cm in thickness and also containing limited quantities of cultural debris (Jenkins 2000). Thin sterile layers separated the three cultural layers.

Of the faunal remains examined from the East Locus at Locality III, 94.7% were determined to be unidentifiable (Table 3). Much of this material could

have been assigned to arbitrary size grades but not with any certainty to proper taxonomic class or family groups, so the remains were left ungraded. An additional 1.5% of the remains were determined to be of non-cultural deposition. This left a potentially diagnostic sample of 3.8% of the fauna. What follows is a unit by unit examination of the identified remains and associated features:

Unit B-2. This unit contained the hearth feature EB-3 and the eggshell feature EB-5 (Figure 2). Feature EB-3 was found in Level 7 of Unit B-2 at an elevation of 99.0 meters. The hearth was roughly 60 cm in diameter and had a dense layer of charcoal in the interior, which was underlain by reddish-tan bisque. Feature EB-3 has two radiocarbon dates of 8180 and 7800 cal. BP (7445±190 RCYBP, WSU-486300 and 7010±90 RCYBP, Beta 990020). Feature EB-5 was a cluster of 320 eggshell fragments that probably came from one egg. The small eggshell fragments were neither distinctly colored nor marked, rendering them unidentifiable. The feature was located in Quad C of Unit B-2, which may be associated with EB-1 and EB-3, because of its close proximity in terms of both

elevation and spatial location (at an elevation of 99.0 meters, less than one meter from EB-3 to the north, and EB-1 to the south). The eggshell feature has been considered separately from the other remains because of the enormous number of fragments, and for the potential that it may represent a unique incident that occurred around 7000 years ago. Fowler (1986:87) noted the general ethnographic practice of burying eggs in cold sand to preserve them, which may be applicable in this situation due to the fact that another, less well defined cluster of eggshell was located deeper in the Quad C deposits, 60 cm below EB-5.

The hearth feature EB-1 was adjacent to the south, and the metate feature EB-7 was less than half a meter to the east (Figure 2). Feature EB-1 is located

Table 3. Faunal remains recovered from the Locality III site.

Group	Common Name	B-2	B-5	B-7	B-10
Mammalia					
Mammals	Class 1, mice, etc.	-	-	-	-
	Class 2, squirrels etc.	-	-	1	1
	Class 3, rabbits, etc.	1	-	4	-
	Class 4, coyotes, etc.	7	1	5	1
	Class 5, deer, etc.	2	-	-	-
	Class X, unidentified	9	5	24	3
Rodentia					
<i>Spermophilus sp.</i>	Ground Squirrel	-	-	1	-
Rodentia	Class 2 and 3	1	4	9	2
Lagomorpha					
<i>Lepus sp.</i>	Hares (Jackrabbits)	3	4	5	11
Leporidae	Rabbits and Hares	8	16	14	8
Aves					
Podicipiformes	Grebes				
<i>Podiceps sp.</i>		-	1	-	-
Anseriformes					
<i>Anas sp.</i> (small)					
<i>A. carolinensis</i>	Green-w. Teal	-	1	-	1
<i>Anas sp.</i> (Large)		-	1	-	-
<i>A. platyrhynchos</i>	Mallard	-	1	1	-
Gruiformes					
<i>Fulica americana</i>	Coot	-	-	-	1
Aves	Unidentified	2	-	1	-
Eggshell ¹		320	-	2	7
Pisces					
Cypriniformes					
<i>Gila bicolor</i>	Tui chub	-	1	-	-
Amphibia					
Salentia	Frogs/Toads	-	-	1	-
Total		353	34	68	36

¹The 320 pieces of eggshell in Unit B-2 have been treated as a separate feature, EB-5.

in Unit B-1 at an elevation of 99.08 meters. A large utilized obsidian flake was associated with the feature, and a large fragment of burned bone, possibly artiodactyl, was found in the hearth deposits. Because of its close proximity it is possible that EB-1 is related to Feature 4, a clay-lined hearth that was excavated in 1995 at a reported elevation of 99.0 meters. EB-1 has not been dated, but the 1995 Feature 4 was dated to

8410 cal. BP (7670±230 RCYBP, Beta-85686). Feature EB-7 is a metate, measuring 25 cm by 30 cm, with the grinding surface facing upward. The feature was found in Unit B-4 at an elevation of 98.97 meters. Smaller pieces of fragmented ground stone that were found in association with this feature are probably fire-cracked rock. The features are vertically oriented within 13 cm of each other.

Two 10 cm excavation levels are represented in the B-2 sample, levels 6 and 7, and they account for 87% of the faunal remains collected from the entire unit. Rabbits and hares make up almost half of the identified remains from Unit B-2. The Lagomorph remains consist primarily of long bone fragments, which account for 55% of the total. They include five forelimb fragments and one hindlimb fragment, and represent at least two individuals. Four of the pieces were identified as *Lepus sp.* (Hares) and of these, one, a distal tibia epiphysis, was an unfused juvenile element. Of the remaining Lagomorph bones, 36% were "foot bones" consisting of metacarpals, metatarsals, and phalanges.

The other significant group from this unit was Aves, which consisted of three bone fragments that were unidentifiable to family or species. Two were wing bones, and one was a leg bone. The bones were too fragmented to make determinations on whether they came from the same individual.

Rodents were represented by a single fragmented tooth, probably an incisor. The remaining specimens were unidentifiable except to the class mammalia. Unidentified mammals composed the second largest group from this unit, at 39.3% of the total. The unit had the highest quantities of large mammal bone for any of those sampled. One bone identified as Class 3 could not be matched to any element in the comparative collections. There were seven pieces assignable to Class 4 (coyote-sized) and two that were Class 5 (large mammal). Unfortunately, the pieces were too fragmented for further identification.

Unit B-5. A single hearth feature, EB-2 was located in Quad B of this unit (Figure 2), and all of the other features in the excavation block are at least two meters distant. Feature EB-2 was a circular hearth approximately 35 cm. in diameter and filled with charcoal stained soil. It was found in Level 9 of Unit B-5, at an elevation of 98.94 meters. EB-2 has been radiocarbon dated to 7240 cal. BP (6370±190 RCYBP, WSU-4864).

Three excavation levels are represented by this sample; levels 8, 9, and 11, amounting to 91% of the total faunal assemblage from the unit. What would have been level 10 was a transition zone, from a contour excavation technique to a level floor excavation technique prompted by the discovery of EB-2. The result was a level that was as thick as 16 cm in the north portion, but was already lower than the desired elevation in the south portion of the unit. Because of this, the south end was not excavated during the transition.

The greatest percentage of Lagomorph bone in relation to other taxa was produced by this unit

(58.9%, of which 20% was identified to *Lepus sp.*). This figure is somewhat misleading with regard to the actual numbers of rabbits and hares (MNI) that may be represented within the unit by the NISP. Three distal humerus fragments show that at least two individuals are represented by the sample, but the remaining bone (85%) could easily be attributed to just one animal. Fore and hindlimb footbones make up 35% of the Lagomorph sample, and longbone fragments account for 25%. Forelimbs are represented by three bones, hindlimbs by two. Again, a juvenile is represented by an unfused distal tibia epiphysis (Table 3).

The unit is unique in its representation of avian remains. Four bones were identified as Aves, and were further identified as belonging to two families representing at least three species. They include *Podiceps* (grebes) and *Anatidae* (surface feeding ducks), including *Anas platyrhynchos* (Mallard), *Anas carolinensis* (Green Winged Teal), and *Anas sp.* The avian remains are attributable to a minimum of three individuals, all of which are known ethnographically to have been included in the regional diet (Fowler 1986). All of the species, especially the *Anatidae*, are known to inhabit shallow ponds. Grebes will make their home in either shallow or deep water environments, and need some open water to affect a takeoff. The avian remains were found only in Quads A and B of the unit, closest to the hearth feature.

Rodents compose the next largest identified group, but are represented by only four teeth that are too fragmented to be analyzed.

The only fish bone in the entire East Locus sample was found in Unit B-5. It is a small, scorched Tui chub vertebra excavated in Quad B, which also produced Feature EB-2.

Only 14.8% of the remains were classified as unidentifiable mammal, again for the reasons described in the Unit B-2 summary. Only one fragment was found to be Class 4 in the B-5 sample.

Unit B-7. Feature EB-8 (a hearth) was located in this unit, as was the southeast portion of Feature EB-4, a mud-capped cache pit (Figure 2). The faunal sample from this unit was drawn well below the bottom of the cache pit, however, and EB-4 is not considered to be part of Component 2. Feature EB-8 was a possible hearth feature. EB-8 consists of two separate loci located in the northeast and southeast corners of Unit B-7, Quad B, at an elevation of 98.8 meters. The hearth(s) consist of an area of darkly stained, charcoal laden sediments that were underlain with bisque in the northeast locus. The feature has been radiocarbon dated to 7860 cal. BP (7040±135 RCYBP, WSU-4866). The metate, EB-7, is less than half a meter to

south of the unit, and the hearth, Feature EB-6 is approximately one meter west. Feature EB-6 was approximately 20 cm by 25 cm west to east, and located in Unit B-3 at an elevation of 99.0 meters. The contents of the feature included fire cracked rock, charcoal, and burnt bone. A utilized flake was found nearby. Feature EB-6 was radiocarbon dated to 7000 BP (6120±180 RCYBP, WSU-4861). Faunal remains were examined from levels 11, 12, 13, and 14, representing 83% of all faunal remains from the unit. The greatest number of identifiable fragments and elements at Locality III were derived from this unit, producing the widest taxonomic diversity.

Lagomorphs account for less than a third of the fauna identified in the unit (32.7%, with *Lepus sp.* comprising 8.6%). Bones of the lower leg and foot account for 55% of this total, and the longbones of the forelimbs and hindlimbs make up 30% of the lagomorph remains (Table 3). The longbones are equally represented by three specimens from the forelimbs and three from the hindlimbs, and once more the presence of three distal humerus fragments indicates that at least two animals are represented.

Aves are represented by two specimens. The most diagnostic fragment is a proximal humerus that closely resembles *Anas platyrhynchos* (Mallard). Also, a sternum fragment was collected that can only be identified to Aves.

Rodents are represented primarily by the ubiquitous teeth, which account for 80% of the total sample. Several of these resembled rabbit or hare specimens, but could not be identified with certainty. Others were too fragmented to be analyzed. The only complete rodent element from the unit was an ulna that was identified as *Spermophilus sp.* (Ground squirrel), and was clearly intrusive. The absence of other intrusive bones in association with the ulna may be due to the small size of squirrel remains, which permits many to pass through 1/8 inch mesh screen.

An Amphibian tibia/fibula fragment, from either a frog or a toad, was excavated in Quad B, level 13. It was the only bone representative of that group in the East Locus sample. The fragment is charred and seems to be associated with the other cultural materials from the site.

There were two small fragments of eggshell excavated from Unit B-7, both of which were found in Quad B, Level 14, at an elevation of 98.8 meters. The pieces were small, and lacked distinctive markings that might have permitted further identification.

Unidentified mammal bone accounted for 41.2% of the unit sample (34 pieces). Of this total, five pieces were Class 4 (coyote sized), four pieces were Class 3, and one piece was Class 2.

Unit B-10. This unit contained no distinct features, but it was located within one meter of EB-1, EB-3, and EB-5. The unit was opened shortly before the end of the field season, and the excavators found it necessary to shovel off the first 60 - 65 cm of overburden to get to the obvious cultural deposits before time ran out. The beginning elevation was 99.0 meters, and the team excavated three levels. Only Quads B and D were excavated. The faunal remains sampled in this study represent 100% of the excavated material.

Lagomorph remains were the dominant category in the unit (57.5%) (Table 3). Interestingly, these consisted almost entirely of bones from the front end of the animals, with a single calcaneus representative of the body beyond the forelimbs and scapulas. Quad D of the first level (99.0-98.9) produced a cluster of *Lepus sp.* bones that appeared to be from the same animal. A left and right mandible, a left and right scapula, a metacarpal, and 10 pieces of unidentifiable Class 3 bone were found in a 30 cm area of Quad D, at 99.01 meters of elevation. All of the elements were relatively complete, and all of the bone from the cluster had a similar coloration that seemed to be the product of scorching. Quad B produced four distal humerus fragments and two proximal radius fragments, also from *Lepus sp.*, but the orientation of these remains to the large cluster is not clear. In all, the remains represent at least four animals. Less than half of the remains from this category are identifiable, and only to Leporidae. Foot bones account for 21% of the total, and forelimb bones make up 63% of this sample.

Avian remains from B-10 consisted of two elements that were identifiable to two species. A carpometacarpus was found to be that of a *Fulica americana* (American Coot). In addition, a tarsometatarsus was identified from an *Anas carolinensis* (Green-Winged Teal). Both were excavated in Quad D, with the coot having been found in Level 1, the teal in Level 2.

Two rodent teeth were excavated in close association to the cluster of jackrabbit bones. Of these, one can be identified as Leporidae, and the other is too fragmented to identify. One piece of Class 2 bone, one piece of Class 4 bone, and three unidentified mammal bones were recovered from the component as well.

Seven pieces of eggshell were recovered from levels 1 and 2 of Quad B. Once again, the fragments were too small and indistinct to identify further. They were found within two meters of EB-5, the eggshell feature, at about the same general elevation.

Locality III Summary

The East Locus of Locality III produced zooarchaeological evidence that small mammals and birds (and their eggs) were the primary resources utilized at the location between ca. 8500-6000 years ago. Fish may have been used to a lesser extent (also see Mehringer and Cannon 1994) and medium-sized mammals appeared to be more common than large mammals in Cultural Component 2. The waterfowl species that were identified included teals, mallards, grebes, and coots. The latter two varieties require an open water environment for acceleration into flight, but mallards and teals favor shallow water.

Of course, the East Locus of Locality III is representative of only a small but early portion of what the site had to offer in terms of zooarchaeological research. Singer (this volume) discusses both the West and East Loci in her analysis and an analysis of the West Locus house floor has recently been conducted by Mueller (2001). In aggregate, the three analyses portray the Locality III site in considerable detail over the course of the Middle Holocene.

DJ Ranch (35LK2758)

The DJ Ranch site is located on the edge of a small pond linked to the distributary system originating from Silver Lake. The portion of the site of concern for this analysis is a probable house floor that was situated near the crest of a lunette dune that curved around the pond's northeast edge (Moessner, this volume). A channel leading to the pond from Lunette Lake is believed to have charged it with water during periods of increased precipitation, perhaps creating a shallow pond in the midst of a dune and slough marshland environment teeming with floral and faunal resources.

This analysis included 11,648 specimens (Table 5) derived from Unit F, a 2x2 meter square that was excavated to the deepest portion of the cultural deposits (Figure 3). A radiocarbon age of 5630 cal. BP (4900±80 RCYBP Beta-67527) was assayed on sediments from the base of the cultural component (Moessner, this volume). The excavations reached Level 10 in Quads C and D (10 cm levels to 97.8 m), and Level 11 in Quads A and B (97.7 m). The faunal remains from Level 7 of Quad A are missing.

Fish constitute the greatest portion of identifiable remains; 2433 specimens, or 21% of the total (Table 5). They are followed at a considerable distance by lagomorphs (including *Sylvilagus*) at 2.8%, and birds

at 0.05%. Eggshell accounts for 0.09% of the total. Unidentifiable animal remains composed the greatest percentage of the faunal sample (63.5%), and size-classed bones included 0.05% large mammal, 0.02% medium mammal, 10% Class 3, 0.04% Class 2, and 0.01% Class 1. Rodent remains made up 0.04% of the total, but many of the Class 1 and 2 remains are also believed to be rodent. In combination, the three groups that are most likely attributable to the rodent category account for 1% of the sample.

Evidence for cultural alteration is reflected through calcining, burning, and discoloration. Calcined bone composed 2.5% of the faunal sample (296 specimens) and did not appear until the fourth level of excavation (from the surface). Two peaks for calcined bone were noted; one in Level 6 and again in Level 8. Charred bone was less prevalent than the calcined material, accounting for 0.07% of the total (79 specimens). The greatest amount of charred bone occurred in Level 4 and declined sharply thereafter, with five or fewer pieces noted in the levels that followed. The majority of the animal bone (71.5%, or 8706 specimens) was discolored perhaps by staining from prolonged contact with anthropic sediments, smoking via nearness to a heat source (Buikstra and Swegle 1989), or by currently unidentified agents in the surrounding sediments. The latter seems less likely because the discolored bone frequencies rise and fall in a pattern similar to that of the calcined material, suggesting there may be a relationship between the two. Peaks in the discolored specimens occurred in Levels 6 and 8, which may correlate to Moessner's Period 3 and Period 1 cultural components. It should be remembered that Level 7 of Quad A is missing and what now appears as two peaks could very well be an artificial construct created by the missing artifact bag, misrepresenting the true cultural layering (or possible mixing) between Levels 6 through 8. Other bone fragments did not appear to be altered by any means and they may be indicative of naturally occurring events such as rodent burrow deaths, food preparation at some distance from the hearth, or deposition at a later time than the majority of the faunal remains. These unaltered specimens make up 25.3% (2942 pieces) of the sample with peaks occurring in Levels 4 and 9, just above and below the levels in which the majority of the calcined and discolored bones occur.

There is no question that the deposits were affected to some degree through bioturbation caused by rodents, badgers, and possibly insects. Rodent burrowing was frequently noted on the excavation maps and rodent remains infiltrated all levels of the site. Most of the rodent remains examined during this

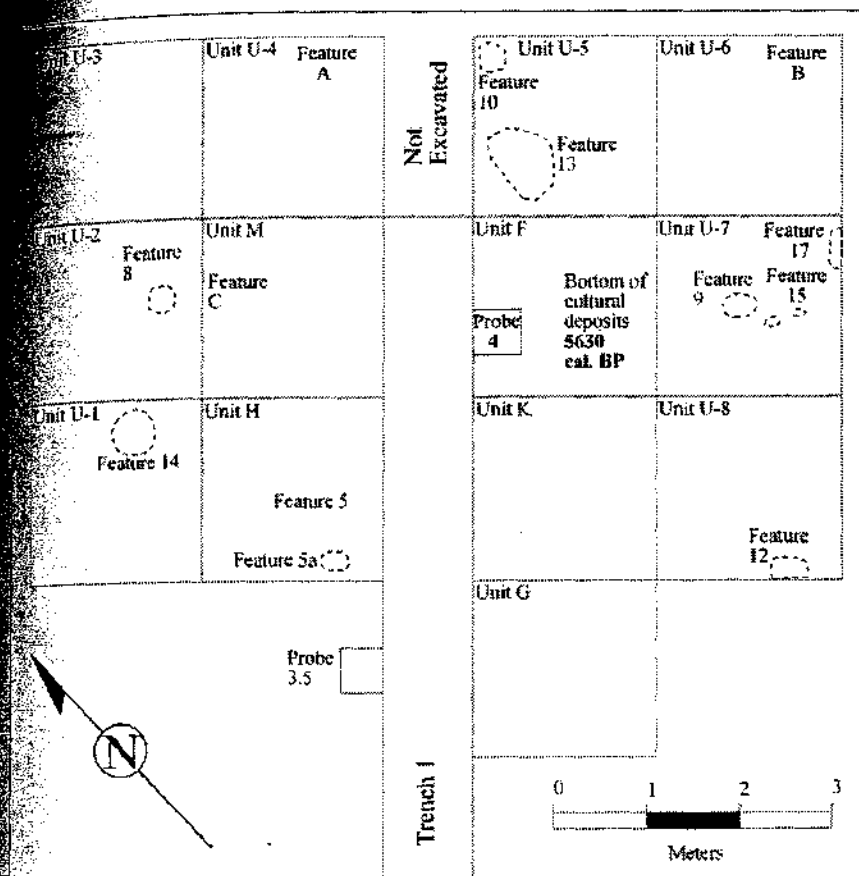


Figure 3. DJ Ranch, plan view of main excavation block and cultural features.

study were found to be unaltered cranial, teeth, and longbone fragments; primarily from *Peromyscus* (mouse), *Spermophilus* (ground squirrel), *Microtus* (vole), and a small number of *Eutamias* (chipmunk). A few of the *Spermophilus* and Class 1 bone fragments were charred. One unaltered *Scapanus* (mole) mandible was also recovered. The remains of their pursuers, which included coyotes and badgers, were also found at DJ Ranch and the badgers occasionally gouged deep tunnels through the deposits in search of ground squirrels and other prey. The degree of mixing that occurred at DJ Ranch might be more apparent with a broader sampling of the faunal remains, but that is beyond the scope of this project.

The majority of the archaeofaunas were found between levels 4 through 8 including most of the avian, lagomorph, eggshell, and size-classed bone fragments. The prevalence of animal bones in levels 4 through 8 (98.5-98.0 m elevation) ties in with Moessner's ca. 3700 cal. BP (3430 RCYBP) Period 3

and ca. 5500 cal. BP (4820 RCYBP) Period 1 (98.2-98.0 m) designations for the Trench 1 Upper Block. Fish remains reach their greatest concentrations in levels 8 and 9 (98.10-97.90 m), where 1860 pieces, or 76% of the total were recovered. Based on the Unit F sample, fish appear to have been a more significant component of the earlier, Period 1 diet. There are two peaks in the large mammal remains from Unit F; one in Level 5 and another in Level 8. Neither of the peaks result from an abundance of tooth enamel fragments in the deposits, which, when recorded individually, can lead to a misrepresentation of large mammal remains in a site. Other differences are more subtle, but it is worth noting that avian and *Syvilagus* remains are more concentrated in levels 4 through 6, as are Class 3 and medium-sized mammals.

Some of the possible differences in the faunal representations from the two components may be influenced by the absence of the Quad A Level 7 material,

particularly with regard to taxa that are represented through low frequencies of identified elements such as avian and medium to large mammal remains. Despite that, what appears to be a bimodal distribution of animal remains with peaks between levels 4-6 and 8-9 is supported by similar peaks in the debitage and formed tools reported for Unit F by Babcock (1995).

Avian remains were largely those of waterfowl of various kinds, including Canada Goose (*Branta canadensis*), American Coot (*Fulica americana*), Pied-billed Grebe (*Podilymbus podiceps*), and a variety of small, medium, and large ducks that were unidentifiable to species. Bones of the forelimbs were the most commonly preserved elements at DJ Ranch, accounting for 29% of the total.

Lagomorphs consisted primarily of *Lepus* sp., possibly including both Black-tailed and White-tailed jackrabbits. However, there were also a few lagomorph remains (<5%) included in the category

Table 5 continued. Faunal remains from the 1993 DJ Ranch excavations: Unit F, Quad A-D; Levels 1-11.

Level	1	2	3	4	5	6	7	8	9	10	11	Total
Fishes												
basioccipital	-	-	-	-	5	6	6	43	40	6	1	107
basipterygium	-	-	-	-	-	-	-	-	1	-	-	1
ceratohyal	-	-	-	4	2	5	7	5	13	3	-	39
cleithrum	-	-	-	-	-	3	2	58	31	7	1	102
hyomandibular	-	-	-	1	1	-	-	15	10	-	-	27
maxillary	-	-	-	-	1	-	-	-	-	-	-	1
opercle	-	-	-	-	-	2	-	25	28	12	-	67
parietal	-	-	-	-	-	-	-	-	-	2	-	2
pharyngeal	2	-	6	11	18	18	24	111	128	17	2	337
premaxilla	-	-	-	-	-	1	-	-	-	-	-	1
quadrate	-	-	-	-	2	1	1	3	7	-	-	14
rib	-	-	-	2	1	-	6	12	5	2	-	28
scapula	-	-	-	-	-	1	-	8	2	-	-	11
unidentified	4	-	1	2	64	32	15	592	470	70	5	1255
urohyal	-	-	-	-	-	-	-	-	1	1	-	2
vertebra	1	-	4	26	29	48	55	122	128	23	1	437
vomer	-	-	-	-	-	-	-	2	-	-	-	2
												2433
Large Mammal												
Artiodactyla	3	-	3	3	15	5	1	20	1	1	-	52
	-	-	-	-	-	-	-	1	-	-	-	1
Medium Mammal												
	-	-	1	2	4	11	-	2	1	1	-	22
Small Mammal												
Class 3	29	14	23	58	434	120	76	246	61	47(1*)	2	1110
Class 2	2	2	1	2	2	12	3	17(2*)	4	1	1*	47
Class 1	-	-	1	1	3	2	3	3	2	-	-	15
Class X	337	226	607	790	1089	1126	1218	974	801	188	54	7410
												8657
Rodentia												
	2	2	-	10	3	13	9	3	4	3	-	49
Scapanus												
	-	-	-	-	-	-	1	-	-	-	-	1
Amphibia												
	-	1	1	3	6	1	1	3	1	-	-	17
Serpentes												
	-	1	-	1	1	-	-	-	-	1	-	4
Taxidea taxus												
	-	-	-	-	-	-	-	-	-	1	-	1
												72
Total	384	266	674	984	1756	1502	1484	2366	1764	394	74	11,648

*--immature

that were unassignable as either immature jackrabbits or cottontails (the epiphyses were fused on these considerably smaller specimens). They were most likely the remains of Pygmy rabbits (*Brachylagus idahoensis*). *Syvilagus* were categorized separately whenever possible.

Fish remains were distinct, even when identifiable elements were not present. Most of the specimens had a waxy, translucent quality about them that set them apart from the mammal and bird bone. Over 52% of

the fish bones were not identifiable to element. The fragmentary nature of most bones would have made minimum number of individual (MNI) estimations difficult, were it not for the basioccipital fragments which preserved well and each of which is indicative of one individual. At least 107 individuals are represented through basioccipitals in Unit F. Most, if not all of the bones are believed to originate from Tui chub. All intact diagnostic elements were those of Tui chub, and the size range was considerable; some of the

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ceratohyal	-	-	-	4	2	5	7	5	13	3	-	39
cleithrum	-	-	-	-	-	3	2	58	31	7	1	102
hyomandibular	-	-	-	1	1	-	-	15	10	-	-	27
maxillary	-	-	-	-	1	-	-	-	-	-	-	1
opercle	-	-	-	-	-	2	-	25	28	12	-	67
parietal	-	-	-	-	-	-	-	-	-	2	-	2
pharyngeal	2	-	6	11	18	18	24	111	128	17	2	337
premaxilla	-	-	-	-	-	1	-	-	-	-	-	1
quadrate	-	-	-	-	2	1	1	3	7	-	-	14
rib	-	-	-	2	1	-	6	12	5	2	-	28
scapula	-	-	-	-	-	1	-	8	2	-	-	11
unidentified	4	-	1	2	64	32	15	592	470	70	5	1255
urohyal	-	-	-	-	-	-	-	-	1	1	-	2
vertebra	1	-	4	26	29	48	55	122	128	23	1	437
vomer	-	-	-	-	-	-	-	2	-	-	-	2
												2433
Large Mammal												
Artiodactyla	3	-	3	3	15	5	1	20	1	1	-	52
	-	-	-	-	-	-	-	1	-	-	-	1
Medium Mammal												
	-	-	1	2	4	11	-	2	1	1	-	22
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												8657
Rodentia												
	2	2	-	10	3	13	9	3	4	3	-	49
Scapanus												
	-	-	-	-	-	-	1	-	-	-	-	1
Amphibia												
	-	1	1	3	6	1	1	3	1	-	-	17
Serpentes												
	-	1	-	1	1	-	-	-	-	1	-	4
Taxidea taxus												
	-	-	-	-	-	-	-	-	-	1	-	1
												72
Total	384	266	674	984	1756	1502	1484	2366	1764	394	74	11,648

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pharyngeals were among the largest I have encountered from Northern Great Basin sites. The fish remains were generally discolored, although some in all size ranges were burned. The presence of all size ranges at DJ Ranch may indicate that fish were being procured through a non-selective means; precluding the use of gill nets at least some of the time.

Size-classed bone falls into four basic categories of large, medium, small, and unidentifiable. If a bone is considered unidentifiable, it is probably Class 3 or smaller, since the thickness and curvature of some bone fragments can be used to assign them into larger categories. It would be less time consuming and quite reasonable to assign the remainder to a single "small mammal" category, but distinctions between different types of animals (rodents and lagomorphs in particular) would be lost as a result. By grouping the categories together, the percentage of small mammal bone in Unit F is found to be 74% of the total. Separation into size classes reveals that 10% is Class 3, 0.4% is Class 2, 0.1% is Class 1 and 64% is unidentifiable.

Other remains included a *Scapanus* (mole) mandible and a phalanx from a badger (*Taxidea taxus*), neither of which appear to be related to the cultural deposits. Likewise, 17 anuran fragments (believed to be those of Great Basin spadefoot toads) and four snake vertebrae were probably deposited naturally.

The Bergen Site (35LK3175)

The Bergen site is located in the Fort Rock Valley approximately four miles southeast of Fort Rock and north of the Connley Hills. During the middle Holocene, the locality was the northernmost extension of the dune and channel distributary system originating from Silver Lake (Jenkins, Droz, and Connolly, this volume). The site is situated at the southeast end of a lunette 1600 meters long by 200 meters wide that developed on the northeast perimeter of paleo-Lake Beasley. Paleo-Lake Beasley is a dry lake which is believed to have reached depths of three to four meters (Jenkins, Droz, and Connolly, this volume).

Testing of the Bergen site occurred in July of 1998 as an activity of the University of Oregon Archaeological Field School. An L-shaped excavation block of four units was opened in a location where probing indicated concentrations of charcoal and cultural debris were present. The test excavations suggested that a possible house floor

existed there based on the presence of Feature 3, a hearth dating to 5930 cal. BP (5190±40 RCYBP, Beta-153979 [Helzer 2001:75]). It was bounded by a thick, basin-shaped lens laden with charcoal, large bone fragments, and formed lithic and bone tools. The cultural surface was underlain by sterile deposits.

Excavations of the house feature continued in 1999, when a six by six meter block revealed the floor in its entirety (Figure 4). Helzer (2001:146) commented that: "The general shape resembles a circular house structure that measures four to five meters in diameter with a hearth in the center." The hearth (Feature 3) was said to contain an abundance of charcoal and dark, greasy sediments that may have been permeated with animal fat (Helzer 2001:58). Both plant and animal remains were noted as being concentrated around the central hearth and decreasing away from the feature (Helzer 2001). Another feature just west of the hearth consisted of a shallow pit which contained a large biface, several elk antler flaking billets, *Olivella* shell beads and pieces of abalone shell (Helzer 2001). The doorway is believed to have faced eastward, and a concentration of plant remains on the ground surface nearby is suggestive of a plant processing activity area (Helzer 2001). The 2000 House, located five meters northeast, produced a hearth date of 5820 cal. BP (5090±100 RCYBP, Beta-148611 [Helzer 2001]). The similarity in dates suggests that a number of houses may have occupied the dune crest around the same time.

A total of 9,659 specimens were analyzed by personnel from the U.S. Fish and Wildlife National Forensics Laboratory as part of a cooperative training venture (Table 6). Additional analysis to identify size classes for the bone fragments was conducted by the author. The sample for this analysis was drawn from Quad A of Unit 3, just north of the hearth (Feature 3). There, as in other portions of the house feature, a mass of bones covered the floor. A total of 15 levels of fill were removed in ten centimeter increments, but the faunal sample from Level 14 is missing. An index of the bone concentrations in the Bergen house is provided through the fact that the quantities recovered from a single 1x1 meter quad approached those from the entire 2x2 meter Unit F at DJ Ranch (9,659 pieces versus 11,648, or 83% of the DJ Ranch total). The overall frequencies of burned and calcined bone are not available for this sample. The bones were almost uniformly discolored through long term burial in the house floor deposits. Burned and calcined bones were readily identified because of their alteration in color, but (lighter tinted) unaltered and discolored bone fragments were not as easily discerned because of the adhering dark sediments. Small mammal bones

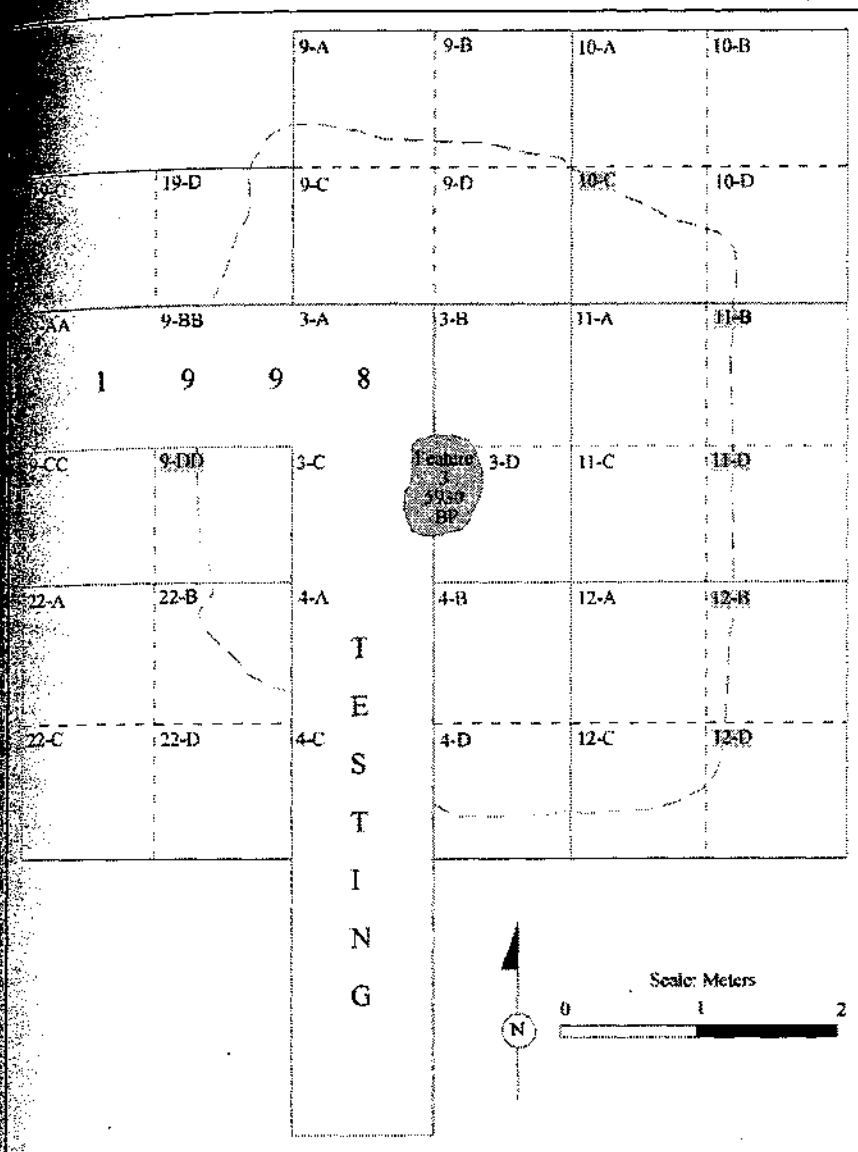


Figure 4. Bergen site, plan view of main excavation block and cultural features.

outnumbered by birds, and eggshell and identifiable rodent remains are almost nonexistent.

Faunal remains from this small portion of the Bergen site appear to be vertically partitioned into two cultural components, in keeping with, but somewhat different from Helzer's (2001) assessment. The majority of faunal remains appear in levels 9 through 13, but there is an intriguing spike in most types of remains in Level 7; particularly those of birds, large mammals (including artiodactyls), small mammals and unidentifiable remains. The Level 7 faunal increase is not dramatic, but it is noticeable and it may suggest that many of the animal species utilized during the earlier, more substantial occupation were also available during this later period. Helzer's (2001:63) graph of artifact frequencies for the two components indicates a greater accentuation for both projectile points and other artifacts between levels 4 through 7 (dating between 4860 and 3960 cal. BP [Helzer 2001:76]). Caution is in order here. The animal bone sample is representative only of a single 1x1 meter column through the deposits and the spatial associations observed through this column may be indicative of greater bone deposition near Feature 3, not the overall

distribution of faunal remains throughout the house feature.

Specimens identified to the level of species included a Pronghorn tibia and the radius from a Black-crowned Night Heron (Simms et al. 2000). One coracoid was identified as that of a grebe. An astragalus from either a Black-tailed or White-tailed jackrabbit was also noted. It is anticipated that many of the 136 unspecified lagomorph specimens belonged to *Lepus*, but there also may have been cottontail and pygmy rabbit remains. Sixteen canid teeth from either coyotes or dogs were also recovered from the house

composed the majority of the identifiable remains at 61%. They were followed by large mammal at 23%, bird (primarily waterfowl) at 7%, lagomorphs at 5%, fish at 2%, and carnivores and rodents at 1%. Medium-sized mammals and rodents each make up less than 1% of the identifiable remains. Here, we have a sample that is considerably different than the others analyzed in this paper, with large mammal remains recovered in greater numbers than all of the other identifiable remains (excluding the generic small mammal category) combined. Lagomorphs, which included very few immature specimens are

Table 6. Faunal remains from the Bergen site: Unit 3, Quad A, Levels 1-15.

Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Aves																
carpometacarpus	-	-	-	-	-	-	1	-	-	2	1	-	1	-	1	6
coracoid	-	-	1	2	1	2	7	-	1	2	4	5	1	-	-	26
cuneiform	-	-	-	1	-	-	-	-	-	1	-	-	2	-	-	4
humerus	-	-	-	-	-	-	2	-	1	2	1	1	1	-	2	10
femur	-	-	1	-	1	-	-	-	-	-	-	2	-	-	-	4
furculum	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
parasphenoid	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
phalanx	-	-	1	-	-	-	3	1	5	5	3	1	1	-	-	20
quadrate	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
radius	-	-	-	-	1	-	1	-	1	3	2	-	-	-	-	8
rib	-	-	-	-	-	1	1	1	1	6	-	4	1	-	-	15
sacrum	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
scapula	-	1	1	-	-	-	2	-	2	1	-	-	2	-	-	9
sternum	-	-	3	-	-	-	3	-	5	8	8	1	1	-	1	30
synsacrum	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
tarsometatarsus	-	-	1	-	-	-	-	-	2	6	2	1	1	-	-	13
tibiotarsus	-	-	1	-	1	-	-	-	1	4	3	-	-	-	-	10
ulna	-	-	-	-	-	-	-	1	3	2	5	-	3	-	-	14
vertebra	-	-	4	-	-	-	-	1	1	3	1	1	-	-	-	11
Total	0	1	13	3	4	3	21	4	23	46	30	18	15	0	4	185
Lagomorpha																
alveolar	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2
calcaneus	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
femur	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2
frontal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
humerus	-	-	2	-	-	-	1	-	-	2	3	-	1	-	1	10
mandible	-	-	-	-	1	-	-	-	2	2	-	-	1	-	-	6
maxilla	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
metapodial	-	-	1	-	1	-	-	-	2	2	2	3	-	-	-	11
palatine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
pateila	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
pelvis	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	2
petrosal	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
podial	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	2
phalanx	1	-	-	-	-	2	-	3	7	8	6	8	3	-	-	38
premaxilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
radius	-	-	2	-	-	-	-	-	-	-	-	3	-	-	-	5
rib	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	2
sacrum	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
scapula	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	3
tibia	1	-	-	-	1	-	-	-	2	-	2	-	1	-	-	7
tooth	-	-	-	-	2	-	-	-	2	2	-	-	4	-	13	23
ulna	-	-	1	-	-	-	-	-	1	1	1	1	-	-	-	5
vertebra	-	-	-	-	-	-	-	1	2	2	1	2	-	-	-	8
zygomatic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Total	2	0	6	1	5	2	1	6	23	23	19	18	10	0	20	136
Artiodactyla																
alveolar	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
astragalus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
pelvis	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-	3
rib	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
tibia	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
ulna	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	2
Total	0	0	0	0	0	4	0	0	0	0	1	0	3	0	1	9

Table 6 continued. Faunal remains from the Bergen site: Unit 3, Quad A, Levels 1-15.

Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Pisces																
Isthmum	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	3
mand/max	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	2
pharyngeal	-	-	-	-	-	-	-	-	5	1	-	5	-	-	2	13
unidentified	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	3
vertebra	4	-	-	2	2	-	4	1	6	8	6	-	-	-	-	33
Total	4	1	0	2	4	0	4	1	12	11	8	5	0	0	2	54
Carnivora																
tooth	-	-	-	1	-	-	-	-	-	-	-	-	14	-	1	16
Large Mammal	10	8	12	7	22	46	34	36	57	61	58	67	122	-	92	632
Medium Mammal	-	-	1	-	-	1	-	-	1	2	-	1	2	-	-	8
Small Mammal	69	20	76	55	96	118	123	119	243	210	182	191	122	-	65	1690
Unidentifiable	361	144	342	145	299	486	530	409	344	732	1102	1144	622	-	245	6905
Rodent	-	-	-	6	-	-	2	-	4	-	-	1	-	-	1	14
Amphibian	-	-	-	-	-	2	-	-	-	2	-	6	-	-	-	10
Total	446	174	450	220	430	662	715	575	707	1088	1400	1451	910	-	431	9659

IDs: *Antilocapra americanus* tibia, L6; Unidentified grebe coracoid, L9; Black-crowned Night Heron radius, L10; *Lepus* sp. astragalus, L11

floor. The teeth, mandibles, and maxillary fragments of both large game and carnivores were unusually common at the Bergen site, although of those types of head fragments, only teeth were recovered from this house sample.

The Bergen site: Evidence for Seasonality?

What might account for the differences between the frequencies of faunal remains at the Bergen site and the others here reported (Figure 5)? Perhaps seasonality is an issue. If people were occupying the Bergen site in the late fall and winter months, bird eggs would not be present and rodents would be settling into hibernation by late August and September. Today, wintering herds of deer and antelope converge on the flats between Fort Rock and the Connley Hills from November through March. Oregon Department of Fish and Wildlife studies indicate that modern herds fluctuate between 5,000 and 17,000 animals during the winter months, feeding out onto the open sagebrush flats during good weather

and taking cover in the ancient juniper stands blanketing the Connley Hills as winter storms move into the valley (Hedrick, pers. com., 1999). Very few deer inhabit the Fort Rock Valley during the summer. Most of the herd moves into the timber near La Pine to the northwest while smaller herds migrate to the Sycan Marsh and Williamson River areas to the southwest or to the Upper Deschutes west of La Pine (Zalunardo 1965). A similar situation occurs with pronghorns, which congregate during the winter on sagebrush flats associated with moist playa beds near the Bergen site. During the late spring, a majority of the herd migrates in a southwesterly direction toward Chiloquin. Only remnants of the herd stay in the Fort Rock area from April to October. Of course, the above observations are based on modern evidence for deer and antelope movements, and Middle Holocene behavior patterns may not have been the same. During that time, given a lower temperature regime and greater effective precipitation, the necessary food and cover conditions for browsing animals may have been more uniform, and there may not have been the

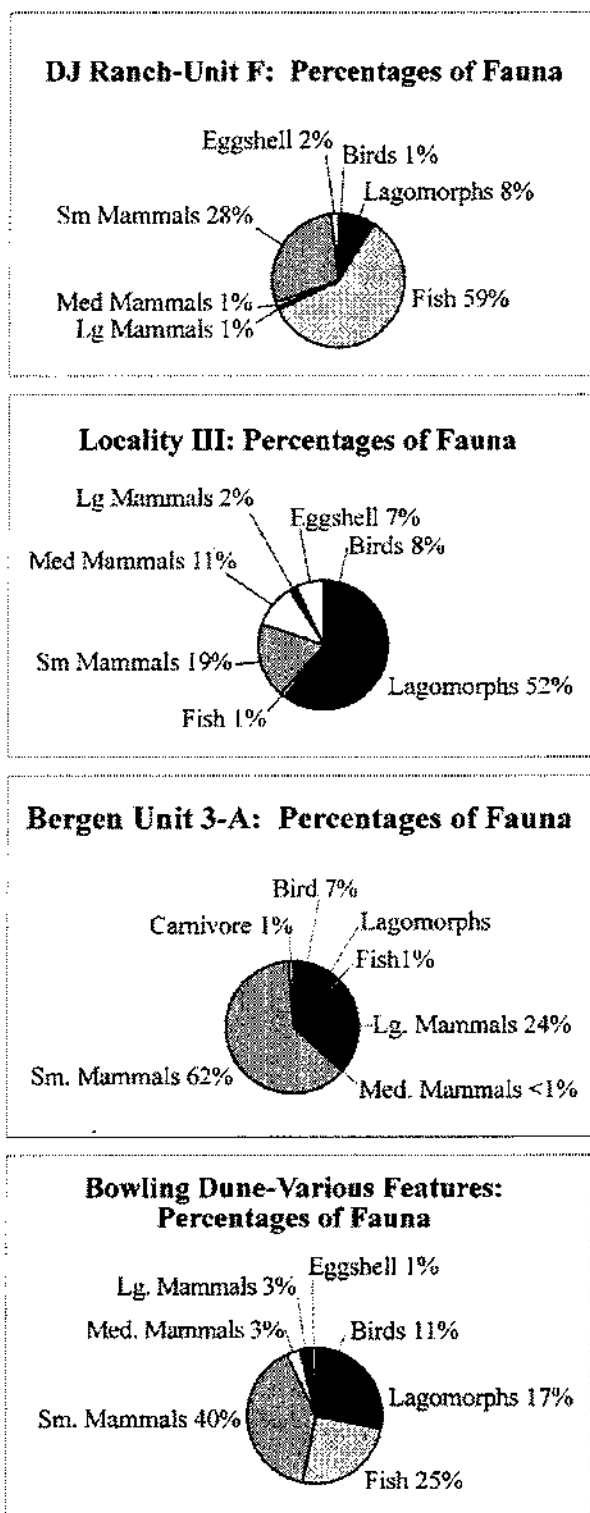


Figure 5. Frequencies of faunal remains from the four sites.

need to range as widely as today. However, wildlife biologists believe that deer and antelope migration patterns are conservative (related to altitudinal and other long-lived geographic patterns) and it is possible that their patterns of movement have been similar for thousands of years.

The abundance and variety of migratory bird remains may also be indicative of fall or early winter site use, particularly since immature bird remains were lacking and eggshell fragments were rare. Also, the sheer numbers of avian remains probably do not reflect resident populations found at relatively small ephemeral lakes during the summer months. Instead, the high densities may be more indicative of availability during the fall and early winter months when newly arriving flights could regularly replenish the population at paleo Lake Beasley as birds moved southward along the Pacific Flyway.

Fish remains compose 2% of the sample, but this figure may be misleading due to the fact that the results are based on recovery from 1/8 inch screens. In a satellite study of faunal remains recovered during Helzer's (2001) paleoethnobotanical research, high quantities of small fish bones were collected from the 1.0 mm and 0.50 mm screen samples. A one liter bulk sediment sample examined by the author yielded 215 fish bone fragments, indicating that large numbers of small fish may have been present in the house floor deposits. Identified elements included ceratohyals, vertebrae, rays, ribs, pharyngeals, cleithrums, basioccipitals, and scales, some of which had been burned. Only one of the bulk samples has been examined to date, but Helzer (pers. com. 2001) noted that similar remains were common in the other bulk samples she analyzed. The preliminary indication is that small fish played a significant dietary role at the Bergen site, perhaps having been dried and stored for use during the winter months.

Helzer (2001) provides additional evidence for seasonality in her botanical study. The presence of fall to winter-ripening goosefoot (*Chenopodiaceae*) and sedge (*Cyperaceae*) seeds, and the absence of spring roots and summer grasses suggests to her that the house was a fall/winter occupation.

The Bergen site is better known for the paleobotanical studies conducted by Helzer (2001), but a more thorough analysis of the archaeofaunal remains from the site will also contribute greatly to our understanding of Northern Great Basin settlement and subsistence patterns. The task is a daunting one, however. It is estimated that approximately 150,000 pieces of bone were recovered from the main block excavation, not counting the microfaunal remains collected during the soil flotation analysis.

The Bergen Site: A Historical Note

Dr. Harold G. (Hal) Bergen and his wife, Marjorie, may not have been the first artifact collectors to visit this site, but they were among the very few who kept detailed notes of their explorations in the Fort Rock and Christmas Valleys (from 1957 through 1974) and made them available for public use. Their notes and artifact collection were donated to the Burke Museum at the University of Washington, providing an impetus to examine the site.

The Bergens surface collected and dug at the site in 1972-73, referring to the lunette dune as Big Knife Ridge because of several large obsidian bifaces that were found there. Several quotes from Bergen's (1992) notes are of interest:

"Many fractured pieces of camp bone were seen. The majority appeared to be deer or antelope. Numerous lower jaw bones & often with teeth were seen, but rarely were pieces of the skull seen. The long bones were all broken for marrow extraction. An occasional larger bison vertebrae was found. There were also some bird and rodent bones. No fish bones were seen."

"There was also a much greater concentration of camp bone in this area. A majority of the lower jaws of deer and antelope were in this region."

"Deer and antelope bone was dominant with some bison bone. We have a report that big horn sheep bone was also found. Some rodent & a fair amount of bird bone was seen. No fish bone was found."

A brief examination of the bone fragments he recovered at the site affirmed his identifications of deer and antelope, but several larger fragments could not be identified as bison with certainty. Bergen also succinctly grasped patterns that emerged from the present analysis; a fair amount of bird bone and some rodent bone was found, and no fish bone (that would have been visible in 1/4 or 1/8 inch screen) was present. Bergen (pers. com., 1998) collected only a small sample of what he saw and subsequently described large clusters of deer and antelope mandibles in some subsurface deposits. His repeated visits to various portions of the site, and consistent descriptions of similar bone clusters encountered during each excavation, suggests that both large mammal procurement, and processing and discard

patterns for certain types of elements may be widespread across this large dune site. Numerous dentary elements are present in the Bergen housepit fauna, including those of deer, pronghorns, and canids, but patterned clustering of such elements has not been noted thus far.

Conclusions

The four sites reported here provide valuable insights into patterns of intra and inter-site usage in the Fort Rock Basin during the Middle Holocene. Zooarchaeologically speaking, two of the sites, Bowling Dune and Locality III, appear to be indicative of short term use events geared primarily towards the procurement of small game and waterfowl. The other two sites, DJ Ranch and Bergen, contained evidence of more substantial, longer term site use with fish heavily utilized at the former and large mammals at the latter. It is clear that all of the sites were utilized over thousands of years. As the body of work in faunal analysis becomes more detailed, our understanding of paleoenvironments, human behavior, and subsistence in the Fort Rock Valley should become richer. There is still considerable work to be done however, considering that the Bergen house may be the first evidence for a winter village occupation (Helzer 2001) to be excavated in 13 years of sustained research in the region. Among the findings of this study are the following:

Two of the sites provided evidence of pre-Mazama (pre-7600 years ago) occupations; Cultural Component 2 at Locality III and Feature 15 at Bowling Dune. Small mammals (especially hares) were the prevalent species at both sites, but the faunal diversity was broad and included birds, rodents and minimal evidence of medium to large mammals. Both sites were probably associated with a grassland/marshland ecotone, as indicated by the faunal samples.

It seems clear that substantial Middle Holocene cultural features, such as the house floors at DJ Ranch and the Bergen site, are tied closely to substantial hydrologic features. Although this should not be surprising, it is important to note that the DJ Ranch fauna indicate a possible emphasis on spring and summer resources, and the Bergen site fauna may emphasize late fall and winter resources. Consideration should be given to the implications of substantial spring and summer habitations in a region where ethnographic accounts favor wide-ranging family groups during those seasons.

The evidence from this analysis suggests sites which may have been used in the spring and summer months had a greater reliance on small and immature mammals and birds. In the fall and winter (a tentative finding by all means), large mammals, waterfowl, and perhaps small, stored fish were dietary staples. The relative lack of large mammal bones in spring/summer sites may indicate that the migratory behavior of artiodactyl herds has remained consistent over time since large mammals would have been distant from the Fort Rock Basin sites at these seasons.

The archaeological evidence for use of faunal resources suggests that storage strategies were utilized at Fort Rock lowland sites. A case in point would be Feature 23 at Bowling Dune where compelling evidence for the storage of small Tui chub exists, among other storage features and layers of hearths and camp debris dating to pre-Mazama times. Storage pits

were identified at Locality III and DJ Ranch as well, although none of those were so clearly tied to the storage of faunal remains.

The analysis of faunal remains captured in 1/8 inch screen may provide only part of the record. Analyses by Greenspan (1990), O'Grady (2000), and Helzer (2001) among others, indicate that valuable faunal information may reside in bulk soil samples, which should be collected as a matter of course during any archaeological excavation project. The systematic examination of various constituents in the bulk samples led to the identification of significant fish remains in sites where they would otherwise have been considered a subsistence item of minimal importance. Bulk sediment sample analysis greatly enhances our understanding of fish procurement and storage practices when it is employed regularly.

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