**Spring Lake Data Recovery Project**
**Spring Lake Site (41HY160)**
**Faunal Analysis**

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The Center for Archaeological Studies (CAS) 2014 excavations at the Spring Lake Site (41HY160) recovered over 6,700 fragments of animal bone. Detailed analysis of the bone, often termed faunal analysis, began in the summer of 2016. Faunal analysis is part of zooarchaeology, an archaeological specialty, which studies animal remains from archaeological sites from an anthropological standpoint (Reitz and Wing 2008). Zooarchaeological studies are used to investigate site formation, biological processes, and cultural processes which are reflected in the site being studied. The anthropological perspective addresses the consequences of complex interactions between humans and the environment in which they live. Animal bone fragments are analyzed to identify the animals and eco-niches represented. Any human modification from subsistence or bone technology activities are also identified and analyzed.

The current analyses began with sorting bone fragments into groups based on size of animal, signs of burning, or obvious evidence of butchering, skinning, or technological modification. Almost 6,700 animal bone fragments from specific analytical units at the Spring Lake Site were analyzed to identify the animals represented and any human modification from subsistence or bone technology activities. Of those fragments, nearly 58% were from Late Archaic contexts. Fragments from Middle Archaic (13.96%) and Early Archaic (14.64%) were the next most common. Fragments from Late Prehistoric and PaleoIndian contexts were the least common, 6.75% and 6.71%, respectively.

The faunal analysis used standard zooarchaeological techniques. Microscopic examination was conducted using a 12x-60x binocular microscope. Specialized lighting was used an overhead light and a low-angle sidelight to increase contrast. The sidelight reveals changes to the bone surface, including carnivore damage, root-etching, and cultural processes. Carnivore damage and root-etching are natural processes that modify the bone surface. Human butchering damage and technological modifications made during tool or ornament manufacture and use are cultural processes that each leave distinctive traces on the surface of bone.

Many small fragments were identifiable as skeletal elements from specific animals. In many cases, accurate taxonomic identification was possible to genera or species. Skeletal materials from reference specimens of fish, birds, and mammals were used to identify the faunal material. Range maps were used (Davis and Schmidly 1997) in some cases, as were historical records of fish collected in the San Marcos River by Kenneth Jurgens (1951). Published anatomical references were also used to increase accuracy of element identification. Assignment of bone fragments to the most appropriate taxonomic group was based on analysis of bone structure and skeletal anatomy from all potential animal groups, from fish and reptiles to birds and mammals. Some of the bones are easy to identify, based on their structure and morphology. Distinctive features allow identification of bone fragments to specific animal form and skeletal element.

Fragments of animal bone recovered from the Spring Lake Site are small and in poor physical condition. Based on taxonomic assignment, the following observations were made of the site's faunal data, based on the Number of Identified Specimens (NISP) measure (see Tables 1 – 5):

1. In Late Prehistoric contexts, fragments of large mammals (deer, bison, and other artiodactyls) comprised a significant amount of the identified faunal materials (about 30%). Medium mammals and turtles each contributed about 3% of the identified faunal remains. About 60% of the Late Prehistoric faunal remains were identifiable only to the Class Mammalia. No fish remains were present in Late Prehistoric contexts.
2. In Late Archaic contexts, fragments of large mammals (deer, bison, and other artiodactyls) comprised a significant amount of the faunal materials (about 33%). Medium – large mammals also added another 5%. Rodents and other small mammals were about 6% of the Late Archaic bone fragments. About 8% of Late Archaic bone fragments were identifiable only to the Class Mammalia. Approximately 9% of the Late Archaic fragments could be identified as turtle shell fragments. While rare, bobcat, foxes, and otters were identified in Late Archaic materials. Fish remains were also rare, but present. Bird remains were rare, but significant. Fragments of a bald eagle were identified, as were remains of a great-horned owl and large hawk.
3. Middle Archaic contexts had common fragments from large mammals (primarily deer, and other artiodactyls), although bison was present. About 19% of the Middle Archaic bone fragments were from large mammals. Medium – large mammals also added another almost 10%. About 43% of the fragments originated from medium or small - medium mammals, including rabbits. Small mammals were present but not numerous. About 15% of the Middle Archaic fragments were from turtles, snakes, or birds. Fish remains were also rare, but present. Bird remains were rare, but included fragments of a great-horned owl.
4. Early Archaic contexts produced similar patterns. About 24% of fragments from this context were from large mammals (primarily deer, and other artiodactyls), although bison was present. Medium – large mammals, including coyote-sized members of the dog family added another 10%. Rabbit fragments were numerous, making up almost 30% of the Early Archaic materials. About 11% of Early Archaic bone fragments were identifiable only to the Class Mammalia. Fish remains were also rare, but present. About 9% of the Early Archaic fragments were turtle shell fragments or snake vertebrae.
5. In PaleoIndian contexts, large mammal fragments (deer-sized artiodactyls) made up about 15%. No bison were identified in this context. Medium – large mammals also added another almost 12%. While rare, mountain lion, raccoon, and coyote-sized canids were identified in PaleoIndian materials. Medium mammals, including rabbits, were about 44% of the fragments in PaleoIndian contexts. About 5% of the PaleoIndian faunal materials were small mammal, including cotton rats. About 15% of PaleoIndian bone fragments were identifiable only to the Class Mammalia. About 5.5% of the PaleoIndian fragments were turtle shell fragments or snake vertebrae.

Paleoenvironmental reconstruction of econiches is possible based on the fragments recovered during the 2014 excavations at the Spring Lake Site. Upland prairies and the edges of the Texas Hill Country were home to the deer, bison, and other artiodactyl hunted for meat, fat, hides, and bone used as raw materials. The same areas were the source for remains from medium to large

carnivores that likely included foxes, raccoons, coyotes, wolves, bobcats, and mountain lions. Were these animals sought for practical (hides for clothing, etc.) or ritual purposes (hides for shamanistic costumes and other paraphernalia)? Upland and streamside habitats were used to hunt or trap medium to small mammals that provided hides and meat, including rabbits, muskrats, squirrels and ground squirrels. Animals which probably lived alongside the prehistoric residents, included the small rodents (gophers, cotton rats, rice rats, woodrats, pocket mice, etc.) and snakes. The San Marcos River, at its headwaters, provided habitat for many types of fish, many of which are still present in Spring Lake. The local streams also provided homes for the turtles which are abundant in the Spring Lake Site's faunal collection.

Many fragments showed signs of butchering or cooking by the site's inhabitants. Skinning and butchering left distinctive cutmarks, especially from filleting and dismemberment activities. Several feet of large rabbits (jackrabbit or swamp rabbits) have remnant cut/snap fractures from skinning activities. Further activities, including scraping and then smashing, broke large mammal long bones to remove marrow from leg bones of deer, bison, or other artiodactyls. Occasionally, the bone smashing produced distinctive bone flakes. Direct heat cooking, such as grilling or roasting, left distinctive discoloration of bone fragments, often termed a roasting pattern. An occasional turtle shell fragment showed this pattern, suggesting roasting turtles in the shell prior to human consumption. Some fragments were completely discolored by heat from after being discarded and included in the soil surrounding earth ovens used to bake plants. Other fragments were incinerated by heat over 850$^{o}$ F that removed most organic material from the bone. Heating at this temperature produces calcination which leaves a distinctive bluish-white color.

Many fragments retained signs of specific modification made when they were included in the prehistoric inhabitants' technology. Several steps remain evident on many of the fragments from technological modification and use:

1. scraping to remove a fibrous membrane (termed the periosteum layer) on the outer layer of long bones,
2. cutting of distinctive grooves to allow removal of unwanted portions of the bone through controlled snapping of the bone into segments,
3. scraping and grinding of edges to shape bone tools and ornaments during their manufacture
4. Wear left by contact with plant materials, hides, or other substances when used by the site's inhabitants.

Tools were made from elements of small to large mammals, with most being made using artiodactyl lower leg bones known as metapodials. Tool fragments present in the Spring Lake Site faunal collection were typically from formal tools. Informal tools made from large mammal long bone fragments left after marrow removal were also present, suggesting use of 'properly shaped' fragments as butchering tools. At least one tool fragment from Early Archaic context had a hole drilled, possibly to suspend it from a cord. Bone beads were also present in the Spring Lake faunal collection. Manufacturing debris from technological modification of bone was recognizable, usually taking the form of ends of bones which had been cut/snapped off during the manufacturing process. The resulting ends were often identifiable to a great degree.

Based on the current Spring Lake Data Recovery Project analysis, much of the Spring Lake fauna is similar to fauna from sites in the Lower Pecos region of West Texas (Castaneda, et al. 2016; Jurgens 2005a, 2005b, 2006, 2008, 2014a, 2014b, 2015; Jurgens and Rush 2015; Koenig, et al., 2018). During the current faunal analysis, many similarities to the Lower Pecos study results were noted in remains of animals present and in cultural modifications. Bone tool or ornament fragments, and evidence for their manufacture, have rarely been documented in Central Texas. The Spring Lake Site faunal analysis shows that the same cultural processes documented in West Texas were used in Central Texas by the Early Archaic.

Sites such as Spring Lake help archaeologists open the doors to the past. With those open doors, we better understand the details of widespread prehistoric cultural processes, such as subsistence and bone technology. We also better understand the environmental contexts in which those processes were practiced.

Table 1: Late Prehistoric Faunal Remains

| **Taxon** | **NISP** | **%** |
|---|---|---|
| Bison | 2 | |
| Deer | 6 | 1.36 |
| Artiodactyla | 14 | 3.18 |
| Large mammal | 113 | 25.68 |
| Canidae (coyote-sized) | 1 | <1 |
| Canidae (fox-sized) | 1 | <1 |
| Carnivora | 1 | <1 |
| Medium mammal | 12 | 2.73 |
| Jackrabbit or swamp rabbit | 3 | <1 |
| Cottontail rabbit | 4 | <1 |
| Small - medium mammal | 2 | <1 |
| Squirrel or ground squirrel | 1 | <1 |
| Gopher | 1 | <1 |
| Rodentia (small) | 3 | <1 |
| Mammalia | 261 | 59.32 |
| Aves (small) | 1 | <1 |
| Snake | 2 | <1 |
| Turtle | 12 | 2.73 |

Table 2: Late Archaic Faunal Remains

| **Taxon** | **NISP** | **%** |
|---|---|---|
| Bison | 11 | <1 |
| White-tailed deer | 92 | 2.8 |
| Artiodactyla | 197 | 6 |
| Large mammal | 806 | 24.55 |
| Medium – large mammal | 168 | 5.12 |
| Canidae (large dog or wolf) | 3 | <1 |
| Canidae (coyote-sized) | 9 | <1 |
| Canidae (fox-size) | 3 | <1 |
| Canidae | 2 | <1 |
| Bobcat | 1 | <1 |
| Otter | 1 | <1 |
| Raccoon | 2 | <1 |
| Carnivora | 9 | <1 |
| Medium mammal | 762 | 23.21 |
| Jackrabbit or swamp rabbit | 52 | 1.58 |
| Cottontail rabbit | 74 | 2.25 |
| Rabbit | 9 | <1 |
| Muskrat | 3 | <1 |
| Large rodent | 1 | <1 |
| Small – medium mammal | 162 | 4.93 |
| Squirrel or ground squirrel | 12 | <1 |
| Woodrat | 3 | <1 |

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|---|---|---|
| Rice rat | 1 | <1 |
| Cotton rat | 7 | <1 |
| Gopher | 4 | <1 |
| Small rodent | 41 | 1.25 |
| Rodent | 13 | <1 |
| Small mammal | 148 | 4.51 |
| Mammal | 271 | 8.25 |
| Bald eagle | 10 | <1 |
| Accipitridae (large) | 2 | <1 |
| Great-horned owl | 1 | <1 |
| Aves (large) | 14 | <1 |
| Aves (medium – large) | 2 | <1 |
| Aves (medium) | 15 | <1 |
| Aves (small) | 5 | <1 |
| Aves | 10 | <1 |
| Snake | 94 | 2.86 |
| Turtle | 214 | 6.52 |
| Softshell turtle | 9 | <1 |
| Reptile | 1 | <1 |
| Catfish | 14 | <1 |
| Sunfish or bass | 4 | <1 |
| Freshwater drumfish | 1 | <1 |
| Suckerfish | 1 | <1 |
| Fish | 18 | <1 |
| Mollusc | 1 | <1 |

Table 3: Middle Archaic Faunal Remains

| **Taxon** | **NISP** | **%** |
|---|---|---|
| Bison | 1 | <1 |
| Deer | 20 | 2.37 |
| Artiodactyla | 28 | 3.32 |
| Large mammal | 110 | 13.05 |
| Medium - large mammal | 82 | 9.73 |
| Canidae (coyote-sized) | 1 | <1 |
| Canidae (fox-sized) | 1 | <1 |
| Canidae | 1 | <1 |
| Carnivora | 3 | <1 |
| Medium mammal | 275 | 32.62 |
| Small - medium mammal | 30 | 3.56 |
| Jackrabbit or swamp rabbit | 25 | 2.97 |
| Cottontail rabbit | 36 | 4.27 |
| Large rodent | 1 | <1 |
| Medium rodent | 1 | <1 |
| Pocket mouse | 3 | <1 |
| Small rodent | 9 | 1.07 |
| Small mammal | 15 | 1.78 |
| Mammal | 56 | 6.64 |
| Great-horned owl | 1 | <1 |
| Aves (large) | 4 | <1 |
| Aves (medium - large) | 1 | <1 |
| Aves (medium) | 12 | 1.42 |
| Aves (small - medium) | 1 | <1 |
| Snake | 29 | 3.44 |
| Turtle | 82 | 9.73 |
| Catfish | 2 | <1 |
| Sunfish or bass | 1 | <1 |
| Suckerfish | 2 | <1 |
| Garfish | 3 | <1 |
| Fish | 4 | <1 |
| Snail | 2 | <1 |
| Mollusc | 1 | <1 |

Table 4: Early Archaic Faunal Remains

| Taxon | NISP | % |
|---|---|---|
| Bison | 3 | <1 |
| Deer | 45 | 4.88 |
| Artiodactyla | 35 | 3.79 |
| Large Mammal | 140 | 15.17 |
| Medium - large mammal | 76 | 8.23 |
| Canidae (medium) | 20 | 2.17 |
| Canidae (small) | 6 | <1 |
| Raccoon | 1 | <1 |
| Carnivora | 5 | <1 |
| Large rabbit | 7 | <1 |
| Cottontail rabbit | 38 | 4.12 |
| Medium mammal | 234 | 25.35 |
| Small - medium mammal | 34 | 3.68 |
| Medium rodent | 1 | <1 |
| Squirrel or ground squirrel | 5 | <1 |
| Cotton rat | 9 | <1 |
| Rodentia | 5 | <1 |
| Small rodent | 4 | <1 |
| Small mammal | 54 | 5.85 |
| Mammalia | 100 | 10.83 |
| Hawk | 1 | <1 |
| Duck | 1 | <1 |
| Aves | 6 | <1 |
| Aves (large) | 4 | <1 |
| Turtle | 43 | 4.66 |
| Softshell turtle | 4 | <1 |
| Snake | 22 | 2.38 |
| Gar fish | 5 | <1 |
| Catfish | 4 | <1 |
| Sunfish or bass | 2 | <1 |
| Freshwater drumfish | 1 | <1 |
| Indeterminate fish | 4 | <1 |
| Mollusc | 4 | <1 |

Table 5: PaleoIndian Faunal Remains

| Taxon | NISP | % |
|---|---|---|
| Artiodactyla | 10 | 2.44 |
| Deer | 22 | 5.37 |
| Large mammal | 30 | 7.32 |
| Medium - large mammal | 49 | 11.95 |
| Mountain lion | 1 | <1 |
| Canidae (coyote-size) | 2 | <1 |
| Raccoon | 1 | <1 |
| Medium mammal | 155 | 37.8 |
| Large rabbit | 6 | 1.46 |
| Cottontail rabbit | 13 | 3.17 |
| Squirrel or ground squirrel | 3 | <1 |
| Cotton rat | 11 | 2.68 |
| Rodentia | 3 | <1 |
| Small mammal | 11 | 2.68 |
| Mammalia | 63 | 15.37 |
| Aves (large) | 1 | <1 |
| Aves (small) | 1 | <1 |
| Snake | 6 | 1.46 |
| Turtle | 16 | 3.9 |
| Softshell turtle | 2 | <1 |
| Gar fish | 1 | <1 |
| Freshwater drumfish | 1 | <1 |
| Sunfish or bass | 1 | <1 |
| Fish | 1 | <1 |

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