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Taphonomy and significance of Jefferson's ground sloth (Xenarthra: Megalonychidae) from Utah

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Records of the sloths *Megalonyx jeffersonii*, *Paramylodon harlani*, and *Nothrotheriops shastensis* in the Great Basin are rare. All currently known records for sloths are located around the region’s periphery. This scant record is also reflected in Utah, which has a very limited representation of Pleistocene ground sloths. The first reporting of a sloth, the mylodont *Paramylodon*, from Utah was based on 2 teeth and a partial vertebra (Miller 1976), presumably from the same individual, in the Silver Creek local fauna. The site yielding this fauna is about 48 km northeast and 568 m higher in elevation than the sloth from Point-of-the-Mountain (hereafter referred to as PM).

*Nothrotheriops*, the smallest of the 3 ground sloths, has been identified from cave sites in the southwestern part of Utah based solely on dung samples (Mead et al. 1984, Mead and Agenbroad 1992). The first Utah discovery of *Megalonyx* was only recently made (Gillette et al. 1999) and was based on several bones of a single individual found near the city of Orem, about 26 km southeast of PM. The material described here represents a substantial amount of a single, very large individual and is only the 2nd known record of *Megalonyx* from the entire Great Basin. It seems appropriate to provide as much information as possible about this specimen and the depositional setting from which it was recovered and the inferences that can be made regarding the ecology of this extinct species.

The partial *Megalonyx* skeleton described here was recovered from Lake Bonneville shoreline sediments in the southernmost part of Salt Lake County. Equipment operator Joe Miller, who works for Geneva Rock Products Company, made its discovery in the summer of 1996. With the kind permission of that company’s management, he presented the fossil material to the Earth Science Museum at Brigham Young University, Provo, Utah, where it has been accessioned.

The ground sloth bone-bearing unit lies within Pleistocene-age Lake Bonneville shoreline deposits in the Jordan River cut of the Traverse Range (Fig. 1). A Trimble TDC1 GPS unit was used to calculate the elevation of the bone-bearing unit at 1381.7 m (Fig. 2). The bone-bearing unit lies approximately 10 m below the present land surface. Machette (1992) mapped the surface sediments of the study area as upper Pleistocene lacustrine gravels that were deposited during the Provo regressive phase of the Bonneville lake cycle. These data broadly bracket the time of bone deposition from the maximum transgressive phase of the Stansbury Level at approximately 22 ka (thousands of years before present) to the Provo regression at approximately 13 ka (Currey et al. 1984, Currey 1990).

Research has shown that pre-Bonneville lakes occupied the lower parts of the northeastern portion of the Great Basin back to a
Fig. 1. Index map of the north central portion of Utah where *Megalonyx jeffersonii* fossils were collected.

Fig. 2. Topographic profile and location of key beds and lake levels at Point-of-the-Mountain. Elevations of the Bonneville and Provo Benches are taken from the Jordan Narrows 7.5-minute topographic map. Elevations of the Stansbury Level and of all ages are from Currey et al. (1984).
date of possibly 200 ka (Scott et al. 1983, McCoy 1987). Lake Bonneville, as generally understood, appears to have had its beginning sometime between 26.5 and 30.0 ka (Oviatt et al. 1992, Oviatt et al. 1994, Lemons et al. 1996). Maximum lake depth, as viewed elsewhere in the Great Basin, reportedly was 320 m about 14.5–15.0 ka (Jarrett and Malde 1987, Oviatt et al. 1992) when the Bonneville Level developed at 1554 m above mean sea level. A well-documented flood of gigantic proportions then occurred, quickly lowering the lake to the Provo Level. Interstate Highway 15, which runs immediately east of the fossil site, is situated on the resulting wave-built bench in this area (Fig. 2).

The Megalonyx skeleton reported here was recovered at 1381.7 m elevation, approximately 10 m above the Stansbury Level. According to Currey et al. (1984), this places the unit between the Stansbury (approximately 1371.6 m) and Provo Level (1463 m) at PM. The Stansbury Level probably formed before any other levels between 20 and 23 ka (Currey et al. 1984). The lowest Bonneville shoreline is the Gilbert Level at 1310 m, and it is significantly lower than the fossil occurrence. This shoreline developed during the latest part of the Pleistocene, probably 10–11 ka.

LOCALITY DESCRIPTION

The sand and gravel quarry owned by Geneva Rock Products Company in which the sloth was found is in SW1/4, NE1/4, Sec. 23, T4S, R1W, Jordan Narrows 7.5′ Quadrangle, Salt Lake County, Utah, at 111°55′W longitude, 40°27′30″N latitude. This is BYU locality number 802. Sediments from which the sloth was recovered were deposited on the north flank of the Traverse Mountains of the Wasatch Range that forms PM. This range marks the easternmost boundary of late Pleistocene Lake Bonneville.

SEDIMENTOLOGY AND DEPOSITIONAL HISTORY

Sedimentology

Bone was found on and within an oxidized, poorly sorted, sandy siltstone bed. Thickness and lateral extent of this ferruginous bed are unknown. Detailed study of the bone-bearing bed is incomplete because shortly after recovery of the sloth, excavation by the gravel pit operator resulted in the bed being completely covered. The currently exposed (1999) stratal unit above the bone-bearing bed is composed of sand and gravel. The stratal unit below the bed is primarily composed of sand as viewed elsewhere in the pit.

The ferruginous bone-bearing bed is overlain by high-angled (31°), NW dipping foresets of large-scale, sigmoidal, cross-stratified beds (Fig. 3). The unit containing the bone-bearing beds is approximately 10 m thick and is composed of sand and gravel. Foreset beds can be traced laterally and upward into gravel-rich topset beds, which are largely low-angle (12°) to planar beds. Measurements taken from bedforms laterally to the south of topset beds indicate an azimuth direction of approximately 260°. Grain-size distribution of 5 samples from the base to top of the unit indicates a coarsening upward trend (Fig. 4). Gravel and pebble-sized lithoclasts are subangular to subrounded and are composed of limestone, quartzite, and granite. Mica is a common component of the sand. The unit is extremely friable to nearly unlithified, as grains can be disaggregated by rubbing. A thin (0.6 m) soil horizon is presently developing on the top of the unit in the study area.

The bone-bearing unit is underlain by an 11.6-m-thick, sand-dominated unit that displays low-angle planar to undulating beds as seen in more deeply excavated pit areas. This unit is also extremely friable. The lower portion of the unit displays soft sediment deformation in the form of convolute bedding. The scale of convolute bedding is on the order of 2 m.

There is a sharp contact at the base of this lower sand with a relatively thick (1 m) gray-green clay. Within the excavated pits, this clay layer acts as a permeability barrier and locally ponds water (Fig. 5). Elevation of this clay layer (1370 m) is within 1.5 m of the Stansbury Level elevation (Currey et al. 1984) and is approximately 12.2 m above the elevation of the Jordan River.

The stratal unit overlying the bone-bearing bed is interpreted to represent progradation of a large spit developing at the PM on the northern flank of the Traverse Range. Perennial winds from the west and northwest working on the extensive fetch of Lake Bonneville would have produced strong southwest-oriented longshore currents. Similar spits at Rocky Ridge and Little
Mountain near the town of Payson to the south and Stockton Bar to the west have been identified elsewhere in Lake Bonneville deposits (Bissell 1968). Longshore currents were able to entrain large gravel-sized clasts and push a large quantity of sediment toward and around PM, which projected into Lake Bonneville at that time. Sediments here were shed from the nearby Wasatch Front as indicated by granite and limestone lithoclasts that match the lithology there. This spit built a relatively shallow terrace where the strong currents were concentrated. Sediments were pushed along the top of this terrace until they avalanched into

Fig. 3. Topset and foreset sand and gravel beds in the stratal unit directly above the sloth bone-bearing unit. These beds are interpreted to have been deposited by a prograding spit during the Provo regressive phase of the Bonneville lake cycle.

Fig. 4. 3-D histogram displaying grain-size distributions of 5 beds within the sigmoidal cross-stratified unit above the ground sloth bone-bearing unit. Bed 1 is at the base of the unit and represents foreset to bottomset beds. Sample 5 represents topset beds. The diagram illustrates the coarsening upward trend typical of a prograding spit.
deeper water. Once deposited as foreset beds within water as deep as 10 m, longshore currents no longer entrained the sediments.

The ferruginous bone-bearing siltstone is interpreted as either a deeper water hemipelagic deposit that developed slightly basinward of the prograding spit, or possibly as a paleosol. The underlying unit is interpreted to represent shoreline deposits developed basinward of strong longshore currents. Convoluted bedding indicates fast sedimentation rates and/or quick burial or possibly fluctuations in the groundwater table after subaerial exposure.

Depositional History

The above interpretations lead to 2 possible scenarios concerning the depositional history of the ground sloth bones. The 1st scenario involves deposition and burial by spit progradation during the Provo regressive phase of the Bonneville lake cycle (Machette 1992). It represents the simplest explanation and is preferred by the authors. Sedimentologic and taphonomic data suggest that the sloth carcass may have washed into Lake Bonneville relatively intact. The carcass was transported some distance along the Wasatch Front by longshore drift. As the carcass continued to be transported toward PM, it made its way to the edge of the wave-built terrace of a large spit. The spit would be migrating to the west, but the longshore current and direction of the spit would have produced foreset beds oriented to the northwest. The carcass eventually fell off the wave-built terrace of the spit and settled into deeper water (approximately 10 m) that had been receiving only suspended-load, hemipelagic sediments. Eventually, foreset lamination from spit progradation buried the carcass, thus preventing scavenging and disassociation of the skeleton. With continued regression of Lake Bonneville, the bone and associated siltstone entered the vadose zone. The combination of atmospheric oxygen penetrating the large pore spaces of the coarse-grained sediment and occasional meteoric water that perched on the impermeable siltstone upon which the skeleton lay, altered the siltstone into a groundwater laterite.

A 2nd possible scenario involves deposition of the sloth during Stansbury time and burial either by spit migration during the Bonneville transgressive phase or much later burial by spit migration during the Provo regressive phase. This more complicated scenario suggests that the ferruginous siltstone developed under subaerial conditions resulting in a soil horizon. The paleosol developed during the short regression that followed the Stansbury highstand. The animal died on dry land and became iron-stained during soil-forming processes. Sometime later it was buried, either during the Bonneville transgressive phase or the Provo regressive phase of the Bonneville lake cycle. Taphonomic observations, including the lack of bite or gnaw marks on bones, the absence of any indication of weathering of the bone such as described by Behrensmeyer (1978), the lack of scattering of bones, and enough bones to produce both an articulated left and right manus (Figs. 6A, B), suggest that scavenging must not have been a significant factor. These observations weaken this 2nd scenario.

Fig. 5. Clay layer at 1370 m elevation. This unit is very close to the Stansbury Level (Currey et al. 1984). Note the water associated with this relatively impermeable clay. The ferruginous siltstone bed within which the *Megalonyx* was discovered may have been oxidized post-depositionally by a perched water table such as this.
Fig. 6. Selected bones of the especially large *Megalonyx jeffersonii* (BYU 13610) from Point-of-the-Mountain, Salt Lake County, Utah: A, dorsal view of articulated partial left manus; B, dorsal view of articulated partial right manus; C, proximal view of left navicular; D, proximal view of left astragalus; E, lateral view of left radius.
Since no collagen was present in the *Megalonyx* bones (Austin Long, personal communication, 1998) a carbon-14 age could not be obtained. Therefore, its age needs to be estimated based on Bonneville lake levels that have been dated (Oviatt et al. 1992, 1994). The age of the bone can be bracketed between approximately 22 ka and 13 ka based on lake level ages previously derived (Currey et al. 1984, Currey 1990). Assuming the bone was deposited subaqueously and quickly buried, as in the 1st scenario discussed above, the age would be approximately 13 ka. This interpretation concurs with Machette (1992), who mapped surface exposures in the study area as being deposited during the Provo regressive phase of the Bonneville lake cycle. If the sloth was deposited subaerially, as in the 2nd scenario discussed above, the age would be approximately 22 ka.

The large size of the specimen would suggest the younger of the 2 alternative interpretations for the age of the sloth. As discussed below, there was a trend of size increase in *Megalonyx* from its first appearance in the late Hemphillian ca 5.2 ma (Hirschfeld and Webb 1968) through the Tertiary and Quaternary, with the largest specimens being latest Pleistocene in age.

**Specimen Description**

Preserved portions of the partial skeleton of *Megalonyx jeffersonii* (BYU 802/13610) from PM include the following elements: left scapula, portions of both humeri, left radius (Fig. 6E), left manus: scaphoid, lunar, magnum, unciform, metacarpal II, metacarpal III, metacarpal IV, metacarpal V (Fig. 6A), partial right radius, right manus: scaphoid, lunar, ulnare, trapezoid, magnum, unciform, metacarpal I, metacarpal II, metacarpal III, proximal and second phalanges of digit III (Fig. 6B), parts of left tibia, left astragalus (Fig. 6D), left navicular (Fig. 6C), left partial cuboid, fragment of calcaneum, right fibula minus distal end.

Bone preservation is excellent despite the complete depletion of collagen. None of the bones show any signs of weathering as described by Behrensmeyer (1978), suggesting immediate burial following death of the animal. While the mode of discovery by heavy equipment prevented any observation of the specimen in situ, recovery of most bones of the manus on both sides, as well as numerous other small bones, makes it reasonable to infer that the animal was buried as a fully intact or reasonably complete carcass. Fresh fracture surfaces on several bones indicate significant breakage and probable loss of some skeleton during bulldozing operations. Examination of recovered parts of the skeleton did not reveal any evidence of tooth marks caused by scavenging by predators or gnawing by rodents, also suggesting rapid burial.

While we postulate that burial of the carcass may have occurred following some transport in the lake by longshore currents, transit time must have been minimal. Schaefer (1972) noted that both whales and seals tend to sink at death unless the animal has a high fat content, in which case it may float longer before sinking. Submerged carcasses may later become buoyant and float following gas buildup in the body cavity due to decomposition. This occurs only if the animal does not sink into anaerobic waters where conditions are unfavorable for bacterial activity so that insufficient gases are produced to cause the carcass to surface. Our postulated water depth of 14 m for the final resting place of the carcass was probably too shallow to produce anaerobic conditions. If the original location where the animal died was on a shallower wave-built terrace of the spit, then the carcass may have become partially bloated and been able to float a short distance before sinking into deeper water on the face of the prograding spit. It is possible that some parts of the skeleton had already separated from the carcass prior to this secondary transport. As noted by Schaefer (1972), the jaw and then skull are among the first parts to separate from the carcass in a floating animal. While the skull and jaw of the PM specimen were not recovered, their absence may reflect either their separation from the carcass prior to its transport to its final resting place or destruction by heavy equipment before recognition of the existence of the specimen. However, no traces of teeth or skull bones were found after careful picking of all the bone material.

While all preserved bones of the PM specimen can be readily referred to the genus *Megalonyx*, none of the available material actually includes those portions of the skeleton...
that provide diagnostic features used in identifying the species as *M. jeffersonii* (McDonald 1977). The Orem specimen described by Gillette et al. (1999) included the co-ossified proximal and second phalanges of the third digit of the pes, one of the features used by McDonald (1977) to distinguish *M. jeffersonii* from all earlier species of *Megalonyx*. In earlier species of the genus the 2 bones are separate. Other features such as dentition and skull features, parts absent in the PM specimen, can also be used to distinguish *M. jeffersonii* from other species. Currently, only a single late Pleistocene species of *Megalonyx*, *M. jeffersonii*, is recognized. The extremely large size of the individual (with caveats discussed below), the age of the deposits from which it was recovered, and the geographic proximity of the new specimen to other *Megalonyx* that can be securely referred to the species make it reasonable to refer the PM sloth to *Megalonyx jeffersonii*.

One of the evolutionary trends of *Megalonyx* has been an increase in overall body size through time. The PM specimen is among the largest individuals known of *M. jeffersonii* (Fig. 6, Table 1). The only other known specimen of *M. jeffersonii* similar in size to the PM individual is from Darke County, Ohio (Mills 1975). The Ohio specimen is dated at 12,190 ± 215 BP, and so it is close to the younger of the 2 possible ages for the PM specimen. The 2 skeletons have 4 bones in common, the radius (Fig. 7), second metacarpal (Fig. 8), third metacarpal (Fig. 9), and navicular (Fig. 10), which permit direct comparison of their size and dimensions. These bones and their measurements are given in Table 1. The *Megalonyx* from Orem is also a large individual, but because it does not share any bones with the PM specimen, a direct comparison cannot be made.

The closest sample of *Megalonyx* outside the Bonneville Basin is on the Snake River plain, the possible source area for dispersal of *Megalonyx* into the basin (Gillette et al. 1999). The PM specimen is larger than *Megalonyx* from American Falls Reservoir, Idaho, considered to be Sangamon in age, ca 100,000 years (Pinsof 1998), and thus considerably older than the PM individual.

Since so few articulated specimens of *M. jeffersonii* are available, this new specimen permits an evaluation of the range of variability that exists within the species. A comparison of relative lengths of metacarpals of the Utah specimen with an articulated hand from American Falls Reservoir (IMNH 23034) and the 3 associated metacarpals of the type of *M. jeffersonii* from West Virginia (ANSP 12508; Fig. 11) indicates that despite differences in size, relative proportions of this segment of the hand remain constant. Figure 11 also provides an indication of the relative size range that existed in *M. jeffersonii* with regard to the range of metacarpal lengths. It must be remembered that samples for each metacarpal represent a span of time and are not from contemporaneous individuals. Since there was a size increase in *M. jeffersonii* from its initial appearance in the late Irvingtonian land mammal age (McDonald 1977) until its extinction at the end of the Rancholabrean, this produces a considerable range of size for the species. This is best illustrated by comparing the largest and smallest adult fifth metacarpals in Figure 11. The largest specimen, from the Darke County, Ohio, individual, has a length of 135.8 mm, which is 154% larger than the smallest individual at 88.1 mm from San Josecito Cave, Nuevo Leon, Mexico. The age of the San Josecito fauna has been recently dated between 27 and 11 ka (Arroyo-Cabrales et al. 1995), which makes it roughly contemporaneous with both the Point-of-the-Mountain and Darke County *Megalonyx*.

Most known specimens of *M. jeffersonii* do not have associated absolute dates. Therefore it is not possible to quantify precisely the rate of size increase through time for the species. Size may be useful in a biostratigraphic context but only in a generalized way. An added problem is that the overall sample size for each bone is so small that it is not possible to take into account size differences that may reflect differences in latitude or other environmental gradients that might affect the size of a local population. Size differences between the larger specimens from the north, PM (40.5°N) and Darke County (40°N), and the individuals from San Josecito Cave (24°N) suggest that a positive Bergmann’s response may exist in *Megalonyx*. Confirmation of this pattern will require a larger sample than is presently available.

While precise quantification of size versus time is not presently possible, there is no question that within the *Megalonyx* lineage there was a trend toward an overall size in-
crease through time. This is clearly indicated for a variety of bones: radius (Fig. 7), second metacarpal (Fig. 8), third metacarpal (Fig. 9), navicular (Fig. 10), and astragalus (Fig. 12). As can be seen in most cases, specimens identified as *M. jeffersonii* are larger than the ancestral species, *M. wheatleyi*, based on samples from Port Kennedy Cave, Pennsylvania, and the McLeod Limerock Mine in Florida. While the large sample size of the second metacarpal (Fig. 8) does result in slight overlap in size between the 2 species, this would be expected in an evolving population. Largest individuals of *M. wheatleyi* are from younger populations of the species, while smallest *M. jeffersonii* are from older populations. Identification to species in the different samples is based on discrete morphological criteria and not size. In all cases the PM specimen is the largest individual within the *M. jeffersonii* sample, which most likely reflects its relatively young age.

**DISCUSSION**

While *Megalonyx* was widely distributed across North America and is present in numerous Rancholabrean faunas in the western United States (Gillette et al. 1999), until recently it was not known from Utah. This is surprising given the number of localities in the state that have produced remains of Pleistocene vertebrates (Jefferson et al. 1994). McDonald (1996)
noted that the 3 species of ground sloths found in the western United States tended to utilize different habitats, thus reducing the probability of association with each other in faunas. While this is also true of the Utah record, the extremely small sample size is not a valid test of this hypothesis. However, the rarity of all 3 sloths in Utah, compared to other large herbivores, suggests either that suitable habitats that could support these animals were marginal and may have supported only small populations or that we have not yet sampled their preferred habitats within the state.

*Paramylodon harlani* is known from only one locality, Silver Creek (Miller 1976), at higher elevations away from the Bonneville Basin. *Nothrotheriops shastensis* is reported from Cowboy Cave and Bechan Cave on the Colorado Plateau based on dung (Mead et al. 1984, Mead and Agenbroad 1992) and is also absent from the Bonneville Basin. Since the only 2 records of *Megalonyx* found in Utah are associated with deposits that accumulated along the eastern margin of Lake Bonneville, it may be that *Megalonyx* was restricted to riparian habitat closely associated with the lake margin. These nearshore deposits of sands and gravels (see above discussion on sedimentology) form a narrow band along the eastern shore of the lake at the Wasatch Front, which acted as a sediment source.

Most vertebrate remains recovered from sands and gravels of Lake Bonneville consist of isolated bones, many of which are tumbled and abraded (Nelson and Madsen 1980). This suggests that most vertebrate remains preserved in sand and gravels associated with Lake Bonneville were transported as bones and not as carcasses. While the entire skeleton of the sloth was not saved, the presence of most bones of each manus suggests that, prior to disturbance by heavy equipment, the PM was probably still articulated and at least represented a partial carcass. This was also the case of the *Megalonyx* found at Orem in which many of the recovered bones were still articulated.
Gillette et al. 1999. Burial and preservation of at least a reasonably complete carcass suggest minimal transport and also indicate that the animal may have been living close to the shoreline and deposition site. None of the remains of either of the 2 most common species found in these gravel deposits, *Ovis canadensis* (mountain sheep) or *Bootherium bombifrons* (musk ox), have been found as partial skeletons.

Due to the alertness of workers at Geneva Rock Products sand and gravel pits at PM, especially Richard Trotter, a number of Pleistocene vertebrates have been discovered and donated to the BYU Earth Science Museum over the past 15 years. These include specimens of *Mammuthus* (mammoth), *Equus* (horse), *Odocoileus* (deer), *Camelops* (camel), *Bootherium* (musk ox), and *Bison* (buffalo), with the musk ox being best represented. Similar taxa along with several others have been found in Lake Bonneville deposits along the Wasatch Front, both north and south of the present locality (Nelson and Madsen 1978, McDonald and Ray 1989, Jefferson et al. 1994, Gillette and Miller, 1999, Miller in press).

A majority of the species recovered are grazers. Besides *Megalonyx* the only other browsers recovered are *Odocoileus* (deer) and *Bootherium* (musk ox). *Bootherium* appears to have been an eclectic feeder capable of feeding in woodlands but also able to use more xeric grassland vegetation, including *Agropyron*-like, *Bromus*-like, and *Poa*-like grasses (Guthrie
Any attempt to reconstruct an integrated ecology of the Bonneville shoreline 13,000 years ago is hampered by a distinct preservation bias. While the majority of vertebrate remains are from the eastern side of Lake Bonneville (Nelson and Madsen 1980), the documented paleobotanical record is primarily from the western margin of the lake (Rhode and Madsen 1995).

Rhode and Madsen (1995) recognized 3 sequential vegetation formations in the region during the Pleistocene–Holocene transition: cold montane steppe from 14,000 to 13,000 years ago, limber pine woodlands from 13,000 to 10,800 years ago, and woodland/steppe mosaic and xeric desert scrub after 11,000 years. The paleobotanical record indicates that montane shrub vegetation covered altitudes up to at least 2000 m in the western Bonneville Basin. The remains of wood recovered from lacustrine sediments in the northeastern Bonneville Basin (Scott et al. 1983) indicate that the Wasatch Front east of the basin may have supported coniferous forests. Rhode and Madsen (1995) suggest that differences in vegetation on the eastern and western sides of the Bonneville Basin may have resulted from more mesic effects and enhanced precipitation from lake effects. This in turn possibly would have limited the distribution of *Megalonyx* within the Bonneville Basin to the eastern margin of the lake where some type of woodland habitat existed.

As previously noted, while Pleistocene vertebrates (almost exclusively mammals), especially large ones, are not rare in Bonneville deposits along the Wasatch Front, neither are they abundant. Extensive excavations have taken place along the Wasatch Front, especially in the past decade. It might therefore be assumed that larger quantities of fossils should be uncovered than is the case. However, considering that the eastern shore of Lake Bonneville at all its levels lapped up against the steep Wasatch Front, only limited habitat would have been available to animals living in this restricted zone. With this consideration, fossils would not be expected to be abundant even though preservational conditions were favorable. The one exception is *Ovis canadensis* (Stokes and Condie 1961, Stock and Stokes 1969, Nelson and Madsen 1980), one of the most common species preserved in Lake Bonneville–related sediments in this area. The relative abundance of mountain sheep compared to other species probably reflects their ability to utilize the steep habitat of the Wasatch Front, certainly not a habitat that would be conducive to the success of a ground sloth.

While admittedly the 2 Utah records provide only a limited sample upon which to base any broad conclusions concerning the ecology of *Megalonyx*, the strong similarity in the occurrence of both does suggest a pattern. Despite the recovery of numerous mammalian taxa represented by a reasonable number of samples from sediments associated with Lake Bonneville (Nelson and Madsen 1980, Miller...
1982, Jefferson et al. 1994), only 2 records of sloth, both *Megalonyx*, have been found. Both were recovered from deposits associated with the Provo Level of Lake Bonneville. In marked contrast to other mammalian records, which consist of isolated bones, both sloth specimens are partial, articulated skeletons, suggesting rapid burial. It can be inferred that *Megalonyx* was restricted to a habitat closely associated with the margin of Lake Bonneville and that its absence in other Pleistocene faunas in the area reflects this habitat preference.

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