

Class Mammalia

Order Perissodactyla

Family Equidae

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Equus sp.—Horses // Equus sp. (small)—Small Horse // Equus sp (large)—Large Horse // Equus calobatus—Stilt-legged Onager // Equus conversidens—Mexican Horse // Equus cumminsii—Cummings' Ass // Equus enormis—Enormous Horse // Equus francescana—Francescana Zebra // Equus francisci—Stilt-legged Onager // Equus fraternus—Fraternal Horse // Equus giganteus—Giant Horse // Equus niobrarensis—Niobrara Horse // Equus occidentalis—Western Horse // Equus pacificus—Pacific Horse // Equus scotti—Scott's Horse // Equus simplicidens—American Zebra // Equus Species A—Unidentified Equus

## ***Equus* Nomenclature**

Horse nomenclature is a mess and has been for many years. The situation in the Southwest was discussed at some length by Harris and Porter (1980). A later study by Winans (a 1985 dissertation and the resultant, somewhat altered 1989 publication) either clouded the issue or clarified it, depending on viewpoint.

Winans (1989) recognized one group in the late Rancholabrean of North America possessing elongated metapodials (stilt-legged horses: *Equus francisci* group) and two groups of stout-legged horses: large horses which she assigned to the *Equus laurentius* group and a small horse assigned to the *E. alaskae* group. She did note (p. 295) that "It is possible that some of the groups which I have defined encompass more than one species, . . ." Harris and Porter (1980) recognized three species at Dry Cave: *E. scotti* (later re-identified as *E. occidentalis* by Harris [2013]), *E. niobrarensis*, and *E. conversidens*. Winans (1989) recognized none of these latter three names, assigning horses generally assigned to *E. occidentalis* to the *E. laurentius* group, *E. niobrarensis* as a synonym of the *E. scotti* group, and *E. conversidens* as a synonym of her *E. alaskae* group.

The names used herein are used for convenience, having been widely used for Southwestern species; no attempt at solving nomenclatural issues is implied except as noted. For further comments on the validity of *E. conversidens*, see Scott (2004).

Based on tooth enamel patterns, Barrón-Ortiz and Theodor (2011:148) found three morphological groups of stout-legged *Equus* in the late Pleistocene: ". . . a medium stout-legged equid (specimens previously identified as *E. conversidens*, *E. fraternus*, and *E.*

*lambei*), a large stout-legged horse (specimens previously identified as *E. complicatus*, *E. niobrarensis*, and *E. mexicanus*) and *E. occidentalis*." In contrast, Weinstock et al. (2005) suggested that based on molecular data, a single species of caballine (=stout-legged) horses and a single species of stilt-legged horses may have made up the entire North American late Pleistocene equine fauna. It should be noted, however, that their sample is highly biased toward northern North America with only one specimen (from Gypsum Cave, Nevada) from south of Wyoming.

The conclusions of Weinstock et al. (2005) do not hold up with the morphological data from the Southwest. Weinstock et al. imply that the morphological differences seen within North American stout-legged horses are adaptations of a single species to different environments. However, occurrences of two to three "morphological species" in what basically is geographic and chronologic sympatry (as at Dry Cave) renders this unlikely since interbreeding would quickly break down the morphological differences. On the other hand, it is easy to visualize different species morphologically adapted to different environments occasionally overlapping in space and time.

In current attempts to characterize the equine fauna of Dry Cave, measurements of horses from McKittrick and Rancho La Brea were taken as representing *E. occidentalis* and those from San Josecito Cave as representing *E. conversidens*. Seemingly no suite of measurements suitable for multivariate analyses for Dry Cave horses intermediate in size were available to me except those from Dry Cave (I consider the summary measurements of Winans' [1985] Rancholabrean "big horses" to include both *E. occidentalis* and the Dry Cave intermediate-size horses).

Separation of the Dry Cave horses (plus a few from other sites in New Mexico) into multivariate categories equivalent to the samples of *E. occidentalis* and *E. conversidens* left an intermediate category hypothesized as a third species, that recognized as *E. niobrarensis* by Harris and Porter (1980). This is shown especially well in a cluster dendrogram (Gower paired-group) of second phalanges (Fig. 1).

*Fig. 1. Dendrogram showing clustering of second phalanges, interpreted as representing E. conversidens (red), an intermediate-sized horse (blue-green), and E. occidentalis (magenta). Specimens with labels starting with 192/ are from San Josecito Cave; those starting with CIT are from McKittrick; the remainder are from UTEP specimens. All measurements are by myself. Based on measurements 1-6 of Harris and Porter (1980).*

Utilizing a variety of univariate measurements, the specimens used as representing *E. occidentalis* and *E. conversidens* agree well with Winans' (1985) summary univariate statistics for Rancho La Brea and San Josecito, respectively, indicating correct assignments. The Southwestern specimens hypothesized by Harris and Porter (1980) as *E. niobrarensis*, which would be placed in the "big horses" category by Winans (1985), differ

in various measurements (e.g., proximal metacarpal width) from Winans' Rancho La Brea sample (of Winans' "big horses" category) by  $p = <0.001$ ; that sample also differs from Winans' San Josecito sample ("little horses") by  $p = <0.001$ . The overall result of both univariate and multivariate analyses is division into three groups best considered as separate species. It thus appears that the late Rancholabrean large, stout-legged horses of Winans include at least three species.

This confirmation that the Dry Cave fauna included three stout-legged species led to looking more closely at the horses identified by Harris and Porter (1980) as

*E. niobrarensis*. Utilizing the data in Winans (1985), it became apparent that the Dry Cave measurements fit closely with those of *E. scotti*, though Winans (1989) had listed its chronologic range as late Blancan and early Irvingtonian. This fit between *E. scotti* and various samples of late Rancholabrean horses has been noted by others (e.g., Lundelius 1984). In addition to limb measurements, late Rancholabrean horses that approximate *E. scotti* in size approach the so-called zebrine condition of the lower molars, wherein in the first two molars the ectoflexid tightly approaches or inserts itself into the isthmus connecting the metaconid-metastylid unit to the rest of the tooth (see Fig. 2, *E. scotti* account). To a degree (generally approaching, but not entering except with heavy wear), this is the case, for example, in the Dry Cave and the Cueva Quebrada samples; other species of North American, late Rancholabrean horses lack this character (Winans 1985). Presence of an infundibulum in the lower incisors further separates this taxon from *E. conversidens* and *E. occidentalis*. On the basis of the characters noted, I now recognize *E. scotti* rather than *E. niobrarensis* as present in the Southwest and I accept *E. niobrarensis* as a synonym of *E. scotti*. **However, since this decision has not reached general acceptance, identifications have been changed only for specimens examined by myself; separate lists are given in the *E. scotti* account for specimens seen by myself and judged to represent *E. scotti* and for those listed in the literature as *E. niobrarensis* and not examined by me.**

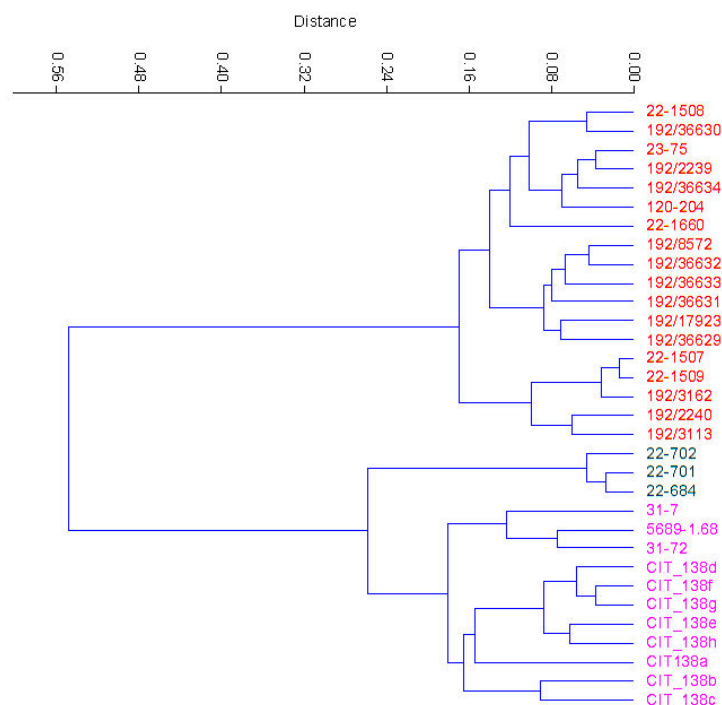
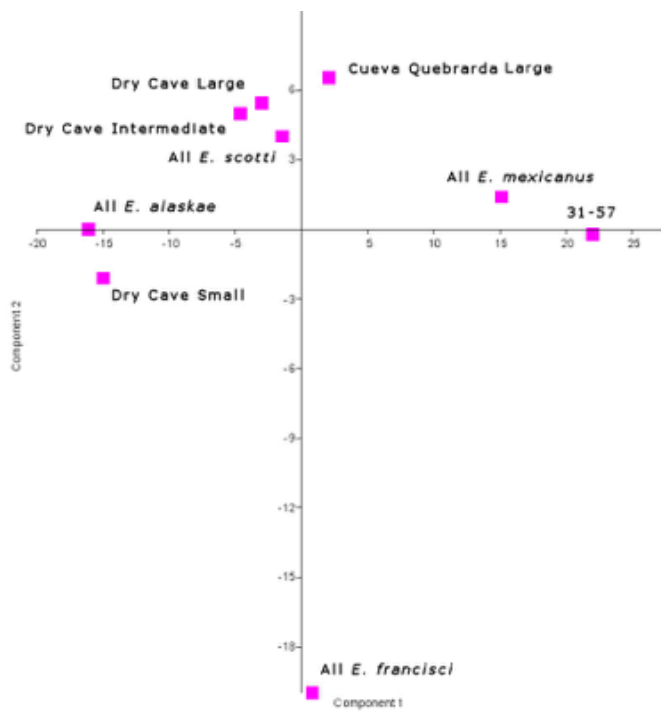


Fig. 2. Principal components plot of *Equus* metacarpal measurements. "All large Dry Cave", "All *E. scotti*", "All *E. alaskae*", "All *E. mexicanus*", "All *E. francisci*", and "Cueva Quebrada Large" are based on data from Winans (1985). "Dry Cave Intermediate" and "31-57" are from my data. Measurements 1-8 of Harris and Porter (1980).



Winans (1989) recognized only one stilt-legged horse, *E. francisci*, Irvingtonian to Rancholabrean. However using her data, Coleman (listed as *E. francisci*) clusters with *E. conversidens* in a principal components plot, and the Arkalon small horse, the type of *E. calobatus*, and the Silverton specimen plot far from the otherwise tight cluster, leading to the suspicion that more than one species is involved. Likewise, such statistics as the coefficient of variation and the standard error of the mean are much larger than in a comparable sample of *E. conversidens*.

Fig. 3. Principal components plot of

metacarpals considered by Winans (1989) to represent *E. francisci* showing the separation from the stout-legged taxa (numbered 5 - 7) and the wide spread of "francisci" (numbered 1 - 4). Measurements 1-8 of Harris and Porter (1980).

In Fig. 3, the emphasis is on the separation of Winan's *E. francisci* group from her stout-legged groups and on the wide spread within the *E. francisci* group. The outliers of the *E. francisci* group are 2, Arkalon small *Equus*; 3, *E. calobatus*, and 4, Silverton.

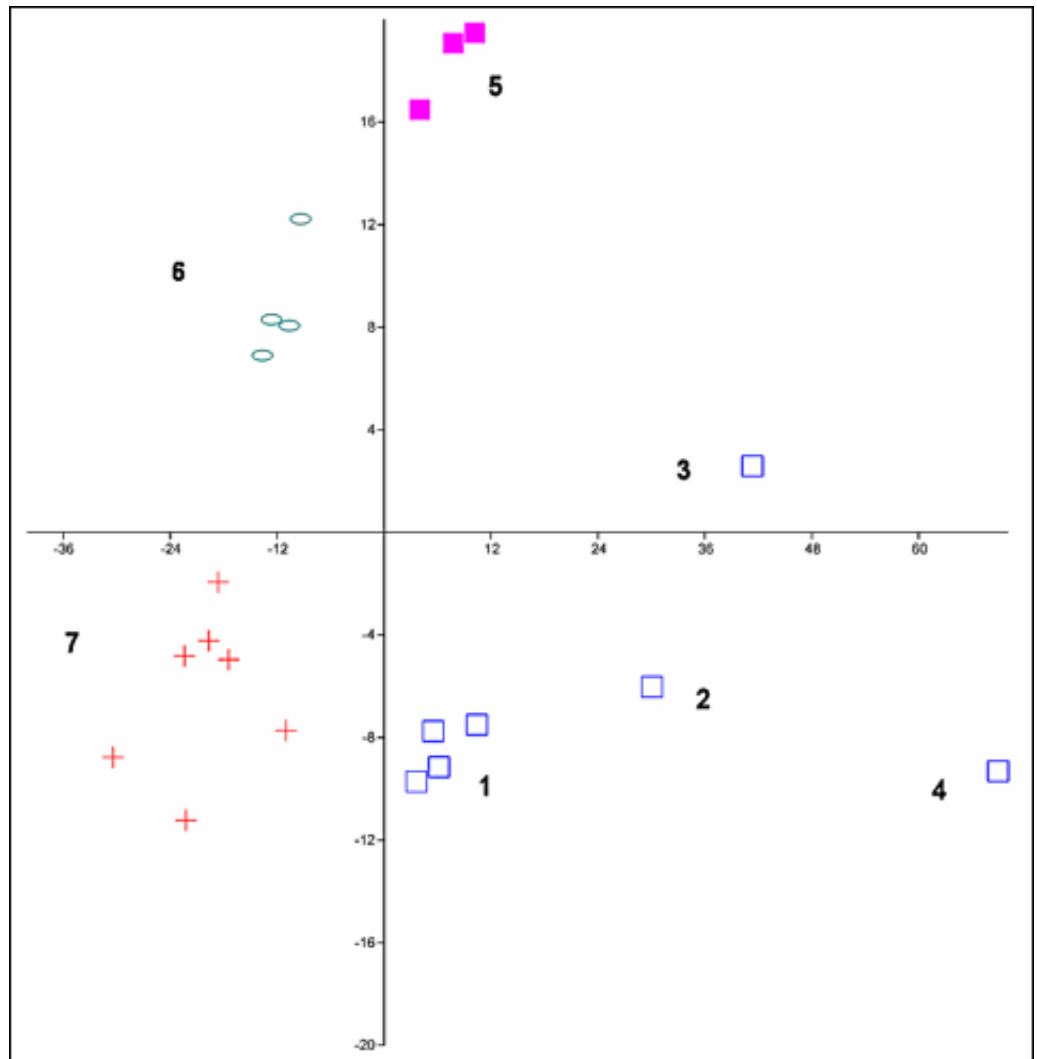
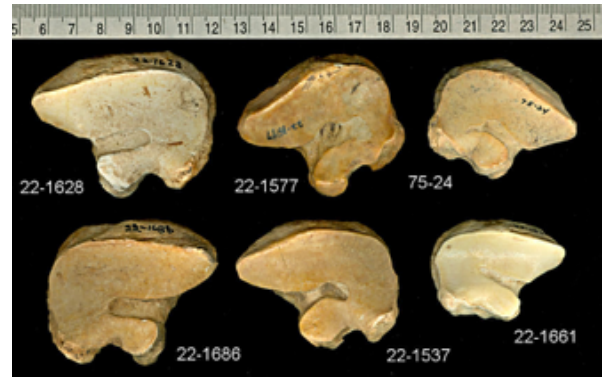


Fig. 4. Navicular (central tarsal) of three species of fossil horse (left to right): *E.*

*occidentalis*, *E. scotti*, *E. conversidens*. *UTEP* locality 22 is the Animal Fair complex of Dry Cave; locality 75 is Dark Canyon Cave.

In the late 1970s, I made measurements of a number of equine elements at the Los Angeles County Museum and the Philadelphia Academy of Natural Sciences, which I gratefully acknowledge. Records of occurrence of horses with the source given as "Harris data" are based on those studies.



Since the above was written, Barrón-Ortiz (2016) completed his doctoral dissertation on late Pleistocene horses of the interior of North America. Based on a combination of ancient mitochondrial DNA and tooth morphology, he recognized two caballine and two non-caballine taxa, although he stressed that the names he applied were tentative.

Caballine horses are those related to the domestic horse, *Equus ferus caballus*. According to Barrón-Ortiz, one taxon, *E. ferus lambei*, is found only in the Far North (Beringia). The other is a large horse which is recognized above as *E. scotti* and by Barrón-Ortiz as *E. ferus scotti*).

The remaining two taxa that, according to their dental morphology and ancient DNA, were non-caballine horses, Barrón-Ortiz recognized as *E. cedralensis* from Mexico and *E. conversidens*. The latter species is distributed from Mexico to southern Canada. These two species fall into the stout-legged group of late Pleistocene horses. According to Barrón-Ortiz, morphological and DNA evidence indicates that *E. conversidens* was the taxon that Weinstock et al. (2005) considered the only New World "stilt-legged" horse. In part, this may have been because, according to Barrón-Ortiz, *E. conversidens* may form a cline in slenderness of metapodials, with the more northern populations being more slender; nevertheless, these two species do not reach the slenderness seen in taxa considered to be stilt-legged. If this is the case, Weinstock et al. (and Barrón-Ortiz) had no ancient DNA from New World slender-legged horses.

Barrón-Ortiz (2016) apparently did not consider *E. occidentalis* as a member of the interior North American fauna, though he did note that it is a non-caballine horse.

### ***Literature.***

Barrón-Ortiz and Theodor 2011; Barrón-Ortiz 2016; Harris and Porter 1980; Scott 2004; Weinstock et al. 2005; Winans 1985, 1989.

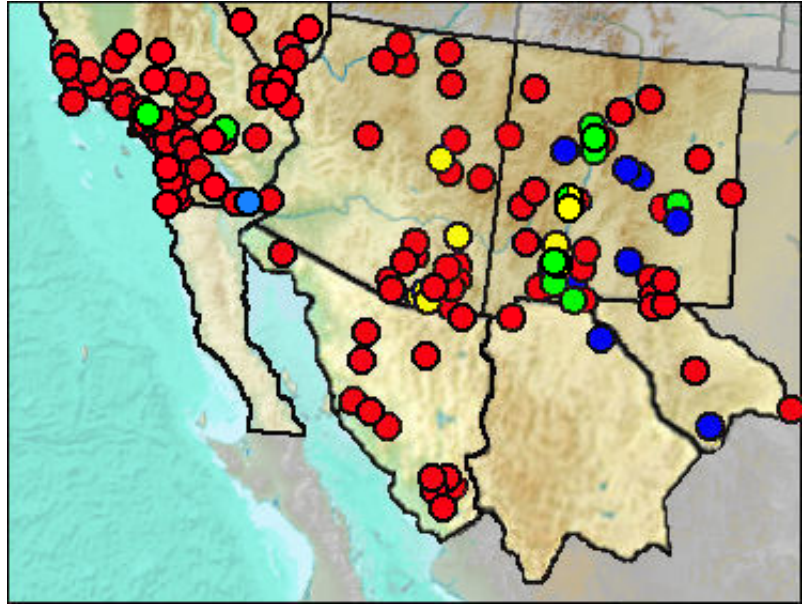


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## *Equus* sp.—Horses

Fossil horse material is relatively easy to identify to genus on many elements, but often very difficult to place to species. As a result, much equine material is recorded only as "horse" or "*Equus* sp."

The Pleistocene material earlier noted as from Skull Ridge (e.g., Harris 1993c) has been included in the Santa Cruz site, following Morgan and Lucas (2005).



### Sites.

Several areas of the map have far too many localities to be able to show them all.

*Pleistocene*: Encino Blowouts (Agogino 1972); Floyd (Morgan and Lucas 2005); Fresno Canyon (Morgan and Lucas 2006); Holtville (Jefferson 2014); Laguna (Morgan and Lucas 2005); Lazy E Ranch (Morgan and Lucas 2005); Moriarty (Morgan and Lucas 2005); Pecos River near Roswell (Morgan and Lucas 2005); Terlingua (Cockerell 1930).

*Blancan*: Silver Canyon (Morgan et al. 2009)

*Late Blancan*: Cal Tech (Lindsay 1984); California Wash (Morgan and White 2005); Curtis Ranch (Lindsay 1984); Fite Ranch (Morgan and Harris 2015); Kelly Canyon (Morgan et al. 2011); Prospect (Johnson et al. 1975); San Simon Fauna (Morgan and White 2005); Snowflake (Lindsay and Tessman 1974).

*Late Blancan/Early Irvingtonian*: Bosque (Morgan and Harris 2015).

*?Irvingtonian/Early Rancholabrean*: El Felipe Hills (Jefferson 1991b).

*Irvingtonian*: El Paso (UTEP).

*Early Irvingtonian*: Domingo (Morgan and Lucas 2005); Gypsum Ridge (Wagner and Prothero 2001); Inman Gravel Pit (Morgan and Lucas 2005); Kirtland AFB (Morgan and Harris 2015); Rincon Arroyo (Morgan and Lucas 2005); Tijeras Arroyo (Morgan and Lucas 2005).

*Latest Irvingtonian*: Village Drive (Jefferson 2014).

*Late Irvingtonian or Early Rancholabrean (?)*: Eighteenmile Bend (Morgan and Lucas 2005); Leon (Jefferson 1991b).

*Late Irvingtonian/Early Rancholabrean*: El Evado (Jefferson 1991b); Thorn, Victorville (Jefferson 1991b).

*Irvingtonian/Rancholabrean*: Fort Irwin (Jefferson 1991b).

*Rancholabrean*: Alameda and Workman streets (Workman Storm Drain) (Jefferson 1991b); Alkali Flat (Morgan and Lucas 2005); Amargosa Desert (Jefferson et al. 2015); Anaheim Blvd. and Henry Ford Blvd. (Jefferson 1991b); Arizpe (White et al. 2010); Bachoco (White et al. 2010); Ballona Creek Wash (Jefferson 1991b); Bedford Road (Jefferson 1991b); Bajimari (White et al. 2010); Black Rock (Morgan and Lucas 2005); Boquillas Station (Mead et al. 2005); Bow Willow (Jefferson 2014); Brea Canyon (Jefferson 1991b); Calico Road (Jefferson 1991b); Camarillo, Las Posas Estates (Jefferson 1991b); Carbon Canyon (Jefferson 1991b); Cedros (White et al. 2010); Century City, Los Angeles (Jefferson 1991b); Centennial Parkway, Las Vegas Valley (Jefferson et al. 2015: small and large species); Cerro Colorado (Mead et al. 2005); Cerros Negros (Mead et al. 2005); Charley Day Spring (Lindsay and Tessman 1974); Chatsworth, Plumer, and Farralone avenues (Jefferson 1991b); Chino (Jefferson 1991b: cf. gen.); Chino Hills (Jefferson 2014); Chinobampo (White et al. 2010); Coachella Canal 2 (Jefferson 1991b); Choate Ranch (Mead et al. 2005); Conejo Valley (Jefferson 1991b); Corona, California (Jefferson 1991b); Costa de Hermosillo (White et al. 2010); Crenshaw Blvd. and 236th St., Torrance (Jefferson 1991b); Culver City East (Jefferson 1991b); Cypress and Slauson avenues, Hyde Park (Jefferson 1991b); Danby Lake (Jefferson 1991b); Davidson Brick Quarry, Belvedere (Jefferson 1991b); Davies Tank (Morgan and Lucas 2005); Detention Basin, Upper Las Vegas Wash (Jefferson et al. 2015: small and large species); Dagoon Mountains (Mead et al. 2005); Eagle Crest (Jefferson 2014); Edwards Air Force Base (Jefferson 2014); El Carrizal (White et al. 2010); El Fin del Mundo (Sanchez et al. 2009); Empire South (Mead et al. 2005); (Jefferson et al. 2015); Fenn Site (Mead et al. 2005); Fresno Canyon (Harris 1993c); Glasell and Fletcher, Orange (Jefferson 1991b); Goldfish Point (Jefferson 1991b); Guadalupita Canyon (Gillette et al. 1985); Harbor Blvd. and First St., San Pedro (Jefferson 1991b); Harbor Freeway and 112-113th streets (Jefferson 1991b); Hermosillo (White et al. 2010); Hicks Canyon (Jefferson 2014); Hill and 12th streets (Jefferson 1991b); Hord Rock Shelter (Smith 1934); Isla Vista (Jefferson 1991b); Jack Rabbit Trail Gravel Pit (Jefferson 1991b); Jalama State Park (Jefferson 1991b); Joseph City (Mead et al. 2005); Jusibampo (White et al. 2010); Keams Canyon (Lindsay and Tessman 1974); Kester Ave., Van Nuys (Jefferson 1991b); Kingston Wash (Jefferson 1991b); Kramer (Jefferson 1991b); La Angostura (White et al. 2010); La Botana (White et al. 2010); Laguna Hills (Jefferson 1991b); Laguna Niguel (Jefferson 1991b); Lake San Agustín (Weber 1994); La Playa (White et al. 2010); La Puercera (White et al. 2010); Las Posas Hills (Jefferson 1991b); Las Vegas Basin 1 (Jefferson et al. 2015); Lewis Site (Mead et

al. 2005); Lindsay Ranch (Mead et al. 2005); Llano Prieto (White et al. 2010); Lomita (Jefferson 1991b); Long Canyon (Jefferson 1991b); Los Alamos (Jefferson 1991b); Los Angeles Brick Yard No. 3 (Jefferson 1991b); Los Angeles Harbor Berth No. 128 (Jefferson 1991b); Los Angeles Police Station (Jefferson 1991b); Lynx Creek (Pasenko and Agenbroad 2012); Manchester and Airport boulevards (Jefferson 1991b); Manchester and Vermont boulevards (Jefferson 1991b); Melrose Ave. and La Cienega Blvd. (Jefferson 1991a); Mesa Redonda (Morgan and Lucas 2005); Mescal Cave (Jefferson 1991b); Mobile Oil Refinery, 190th St., Torrance (Jefferson 1991b); Naco (Sonora) (White et al. 2010); National City West (Jefferson 2014); Oso Creek, Mission Viejo (Jefferson 1991b); Moapa (Jefferson et al. 2015); Moorepark (Jefferson 1991b); Morongo Grade (Jefferson 1991b); Mount Signal (Jefferson 1991b); Norelle St. (Jefferson 1991b); Old Spring (Jefferson 1991b); Outfall Sewer, Culver City (Jefferson 1991b); Outfall Sewer North, Section 15, Culver City (Jefferson 1991b); Pacific Ave. and Second St. and Third St., San Pedro (Jefferson 1991b); Pala (Jefferson 1991b); Palomas Creek Cave (Harris 1993c); Pierpoint Bay (Jefferson 1991b); Piute Ponds (Jefferson 2014); Piute Valley (Jefferson 2014); Placitas (Morgan and Lucas 2005); Playa San Bartolo (White et al. 2010); Point Sal (Jefferson 1991b); Quiriego (White et al. 2010); Quitovac (White et al. 2010); Rabbit Springs (Jefferson 1991b: cf.); Rancho Aigame (White et al. 2010); Rosamond Boulevard (Jefferson 2014); Rubidoux (Jefferson 1991b); Sahuaro (White et al. 2010); Saltmarsh (Jefferson 2014); San Clemente (Jefferson 1991b); San Pedro Lumber Yard (Jefferson 1991b); San Pedro, Upper San Pedro (Jefferson 1991b); San Rafael Aqueduct (Mead et al. 2005); Santa Ana (White et al. 2010); Santa Cruz (Morgan and Lucas 2005); Scripps Institute (Jefferson 1991b); Searchlight (Jefferson et al. 2015: *E. (Amerhippus)*); Seff (Mead et al. 2005); Signal Hill, Long Beach (Jefferson 1991b); Socorro (Morgan and Lucas 2005); Sonoita (Mead et al. 2005); South of Charleston (Lindsay and Tessman 1974); Springerville (McDonald et al. 2004); Surprise Springs (Jefferson 1991b); Sylmar (Jefferson 1991b); Tehachapi (Jefferson 1991b); T rapa (Mead et al. 2006); Thompson Sand Pit (Jefferson 2014); Tooth Cave (DeSaussure 1956); Torrance Recharge Basin, Torrance (Jefferson 1991b); Torrey Pines Beach State Park (Jefferson 1991b); Tucson Brickyard (Mead et al. 2005); Tule Springs 2 (Jefferson et al. 2015); Tule Springs 3 (Jefferson et al. 2015); Tule Springs 4 (Jefferson et al. 2015); Tule Springs 5 (Jefferson et al. 2015); Tule Spring 6 (Jefferson et al. 2015); Tule Springs Stein (Jefferson et al. 2015); Tule Spring Scraper (Jefferson et al. 2015); Tule Springs General (Jefferson et al. 2015); Whipple Gravel (Mead et al. 2005); Whitewater Draw (Mead et al. 2005); Wicks St., Arrow Rock (Jefferson 1991b); Willcox (Mead et al. 2004); Wilshire Blvd. and Bedford (Jefferson 1991b); Wilshire Blvd., 10580 The Wilshire, Los Angeles (Jefferson 1991b); Yeso Creek (Agogino and Stevens 1972).

*Rancholabrean/?Early Holocene*: Mitchell Caverns (Jefferson 1991b).

*Late Pleistocene*: Wanis View (Jefferson 2014).



*Sangamon*: Anaheim Blvd. and Normandy Ave., Harbor City (Jefferson 1991b); Bonito Creek (Jefferson 1991b); Chandler Sand Pit, Rolling Hills Estates (Jefferson 1991b); Costa Mesa Santa Isabel (Jefferson 2014); Gaffey St. Union Oil Refinery, Harbor City (Jefferson 1991b); Kelly Pits (Jefferson 1991b); Naval Fuel Reserve Quarry (Jefferson 1991b); Naval Housing Unit (Jefferson 1991b); Pacific Ave. and Olive St., San Pedro (Jefferson 1991a); Pecho Creek (Jefferson 1991b: ? gen.); San Pedro Lumber Co. (Jefferson 1991b: cf.); U. S. Veterans Hospital, Long Beach (Jefferson 1991b).

*Wisconsin*: Bluefield, Whittier (Jefferson 1991b); Fullerton (Jefferson 1991b); ; Glen Abbey, Bonita (Majors 1993); Imperial Highway (Jefferson 1991b); La Brea Blvd. and San Vicente St. (Jefferson 1991b); La Mirada numbers II-X, Coyote Creek (Jefferson 1991b); Palos Verdes Hills (Jefferson 1991b: ? Wisconsin); Zuma Creek (Jefferson 1991b).

*Early/Early-Mid Wisconsin*: Lost Valley (Harris 1993c).

*Mid Wisconsin*: CC:5:6 (Mead et al. 2003); Canez Wash [age may be incorrect] (Mead et al. 2005); Kartchner Caverns State Park (Carpenter and Mead 2003); Lehner Ranch (mammoth site) (Haynes 2008); Shonto (Agenbroad and Downs 1984).

*Mid/Late Wisconsin*: Glendale (Jefferson et al. 2015); Rampart Cave (Wilson 1942); Sandblast Cave (Emslie 1988); San Miguel Island (Jefferson 1991b).

*Late Wisconsin*: Bonfire Shelter (Frank 1968); Conkling Cavern (Conkling 1932); Corn Springs ((Jefferson et al. 2015); Gypsum Cave (Glowiak and Rowland 2003); Hermit's Cave (Harris 1993c); Hord Rock Shelter (Smith 1934); La Mirada (Jefferson 1991b); Lake Otero (UTEP); Lehner Site (mastodon site) (Mead et al. 1979); Lucy Site (Agogino 1972); McCullum Ranch (Morgan and Lucas 2005); Maricopa (Jefferson 1991b); Murray Springs (Hemmings 2007b); Muskox Cave (Logan 1981); Naco (Mead et al. 2005); Pacific City, Huntington Beach (Jefferson 2014); Palo Verde Mesa (Jefferson 2014); Placitas (Morgan and Lucas 2005); Park Place, Irvine (Jefferson 2014); Sheep Camp Shelter (Gillespie 1985); Stanton's Cave (Harrington 1984); U-Bar Cave 15-18 ka (Harris 1989); Valley Wells (Springer et al. 2010).

*Late Wisconsin/Holocene*: Beyond Bison Chamber (Harris 1970a); Deadman Cave (Mead et al. 1984); Pratt Cave (Lundelius 1979).

## **Literature.**

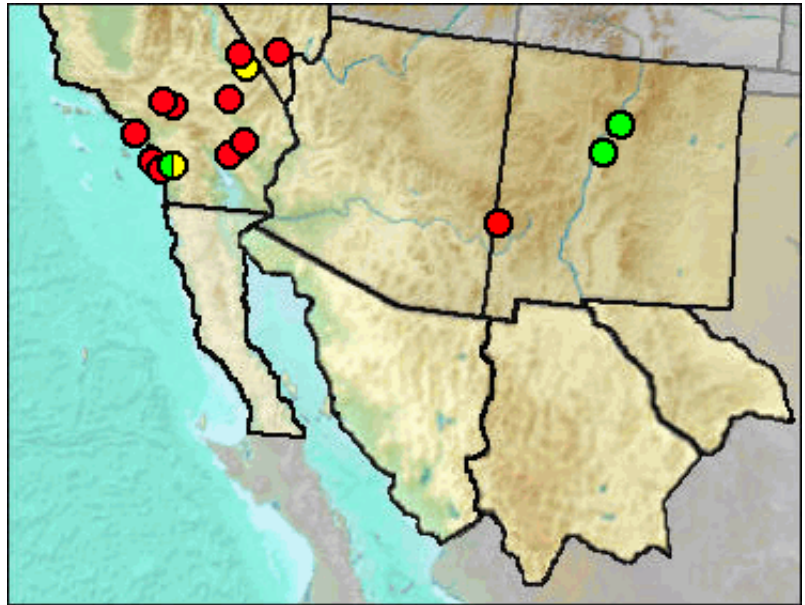
Agenbroad and Down 1984; Agogino and Stevens 1972; Cockerell 1930; Conkling 1932; DeSaussure 1956; Emslie 1988; Frank 1968; Gillespie 1985; Gillette et al. 1985; Glowiak and Rowland 2003; Harrington 1984; Harris 1970a, 1989, 1993c; Harris and Porter 1980; Haynes 2008; Hemmings 2007b; Jefferson 1991b, 2014; Jefferson et al. 2015; Lindsay 1984; Lindsay and Tessman 1984; Logan 1981; Lundelius 1979; McDonald et al. 2004; Majors 1993; Mead et al. 1979; Mead et al. 1984; Mead et al. 2003; Mead et al. 2004; Mead et al. 2005; Mead et al. 2006; Morgan and Harris 2015; Morgan and Lucas 2005; Morgan and White 2005; Morgan et al.

2009; Morgan et al. 2011; Pasenko and Agenbroad 2012; Smith 1934; Sanchez et al. 2009; Springer et al. 2010; Wagner and Prothero 2001; Weber 1994; White et al. 2010; Wilson 1942.

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## †*Equus* sp. (small)—Small Horse

Since the common late Wisconsin small horses were *Equus conversidens*, it seems likely that this is the taxon represented; however, this is speculation only, and the potential presence of a small horse having lower incisor infundibulae (Scott 1996), not the *E. conversidens* state, makes speculation dangerous.



### Sites.

*Late Blancan*: Tecopa Lake Beds (Woodburne and Whistler 1991: cf. gen.).

*Late Blancan/Early Irvingtonian*: Elsinore: Mimomys (Pajak et al. 1996).

*Early Irvingtonian*: Pajarito Springs (Morgan and Lucas 2005); Tijeras Arroyo (Morgan and Lucas 2005),

*Early Rancholabrean*: Albuquerque Gravel Pits (Morgan and Lucas 2005); Shoshone Zoo (Jefferson 2014); Tecopa Basin (Jefferson 1991b).

*Rancholabrean*: Artesia (Jefferson 1991b); Campbell Hill (Jefferson 1991b); Pinto Basin (Jefferson 1991b); Salt Marsh (Jefferson 1991b); Sands (Jefferson 1991b); Shelton Canyon (Morgan and Lucas 2005); Tule Springs (Mawby 1967).

*Sangamon*: Newport Bay Mesa (Jefferson 1991b).

*Wisconsin*: Costeau Pit (Jefferson 1991b); Mojave River Bluffs (Jefferson 1991b).

*Late Wisconsin*: Schuiling Cave (Jefferson 1991b); Tule Springs (Mawby 1967).

### Literature.

Harris 1993c; Jefferson 1991b, 2014; Mawby 1967; Morgan and Lucas 2005; Pajak et al. 1996; Scott 1996; Woodburne and Whistler 1991.

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## †*Equus* sp. (large)—Large Horse

Either *E. scotti* or *E. occidentalis* could be represented here, and possibly *E. calobatus* in the Irvingtonian.

### Sites.

*Late Blancan*: Tecopa Lake Beds (Woodburne and Whistler 1991: cf. gen.).

*Late Blancan/Early Irvingtonian*: Elsinore: Mimomys (Pajak et al. 1996).

*Irvingtonian*: El Golfo (Croxen et al. 2007).

*Early Irvingtonian*: Inman Gravel Pit (Morgan and Lucas 2005); Adobe Ranch (Morgan and Lucas 2003).

*Late Irvingtonian*: Elsinore: Pauba Formation (Pajak et al. 1996).

*Late Irvingtonian/Early Rancholabrean*: Rancho California (Jefferson 1991b).

*Irvingtonian/Rancholabrean*: Manix Lake (Jefferson 1991b).

*Early Rancholabrean*: Albuquerque Gravel Pits (Morgan and Lucas 2005); Shoshone Zoo (Jefferson 2014); Tecopa Basin (Jefferson 1991b).

*Rancholabrean*: Algodones Dunes (Jefferson 1991b); Campbell Hill (Jefferson 1991b); Century Blvd. and Van Ness Ave. (Jefferson 1991b); Bitter Springs Playa (Jefferson 1991b); Cool Water Coal Gasification Solid Waste Site (Jefferson 1991b); Imperial Beach, Palm City (Jefferson 1991b); Pinto Basin (Jefferson 1991b); Salt Creek, California (Jefferson 1991b); Sands (Jefferson 1991b); Shea Homes, Laguna Niguel (Jefferson 1991b); Shelton Canyon (Morgan and Lucas 2005); Tule Springs (Mawby 1967).

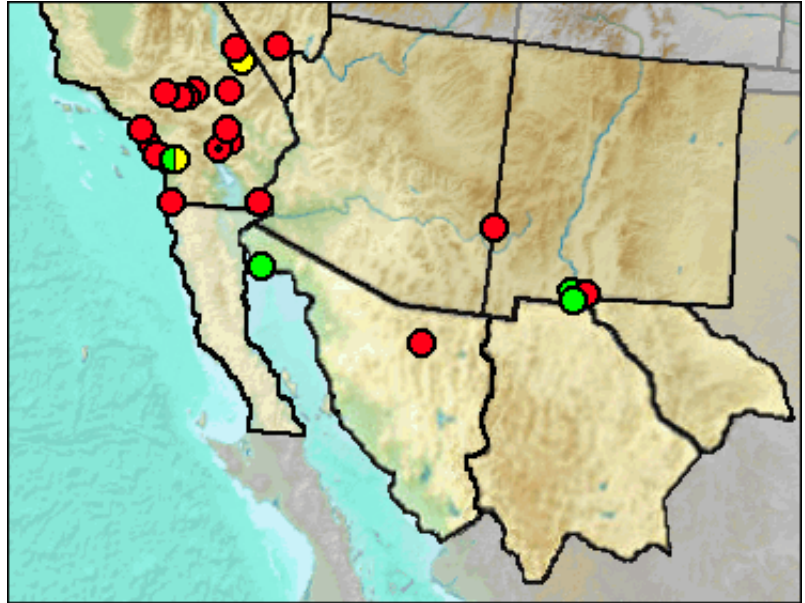
*Late Pleistocene*: Wanis View (Jefferson 2014).

*Sangamon*: Newport Bay Mesa (Jefferson 1991b); La Brisca (Van Devender et al. 1985).

*Wisconsin*: Costeau Pit (Jefferson 1991b).

*Mid/Late Wisconsin*: Shelter Cave (Harris 1993c).

*Late Wisconsin*: Schuiling Cave (Jefferson 1991b); Tule Springs (Mawby 1967).



**Literature.** Croxen et al. 2007; Harris 1993c; Jefferson 1991b, 2014; Mawby 1967 ; Morgan and Lucas 2003; Morgan and Lucas 2005; Pajak et al. 1996; Van Devender et al. 1985; Woodburne and Whistler 1991.

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