The overgrazing of Arizona rangelands

You could actually throw a rock from one carcass to another

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Lands in southern Arizona still may not have fully recovered from past overgrazing. Coronado brought the first cattle into Arizona in 1540 (Sayre, 1999). However, people ate them or these animals otherwise perished without establishing breeding populations. Padre Eusebio Kino brought the first enduring herds into Arizona. He dispersed cattle and other livestock to the missions and *visitas* (visiting stations of the '*cabecera*' or primary mission) he founded in present-day northern Sonora and southern Arizona between 1687 and 1710.

The limited and often contradictory historical accounts of cattle in southern Arizona during Hispanic times provide little information about the impact of livestock grazing on the environment. Scholars disagree about the numbers of and the environmental impact of livestock during Hispanic times. One view is that Hispanic stock raising may never have been sustained enough to have a widespread impact in southern Arizona except along the Santa Cruz River (Bahre, 1991; Sheridan, 2000). Some authors contend that even along that river livestock numbers possibly were not particularly large during Hispanic times (Bahre, 1991). For example, an 1804 report recorded 3500 cattle, 2600 sheep, and 1200 horses at Tucson, then the largest Spanish settlement in Arizona (Bahre, 1991). In contrast, an interview with a centenarian of Tucson in 1873 reported that during the Hispanic era the country [presumably near Tucson] was covered with horses and cattle that were so plentiful on many of the trails that it was inconvenient to get through the large herds (Cooke and Reeves, 1976).

Sheridan (2000) concluded that the most land extensive Euro-American transformation of the Sonoran Desert was the introduction of stock raising. Cattle, horses, goats, and sheep looked for forage along the river floodplains to up along the mountain crests. Overgrazing became a problem in more settled areas such as central Sonora. For example, the military garrison in the town that today is Hermosillo alone had 5000 cattle, 3422 sheep, 435 goats 2138 horses, and 367 mules in 1804. However, Sheridan argued that Apache hostilities prevented Spanish and Mexican ranchers from extending significantly beyond the Santa Cruz Valley.

Hereford (1993) contended that large numbers of cattle were present in the Upper San Pedro River valley since at least 1820. He concluded that people introduced cattle to the valley in 1697 or possibly even a decade earlier and that the valley was settled and had cattle ranching from 1820-1831, as shown by petitions filed by Mexican Nationals for land grants that form the present San Pedro Riparian National Conservation Area. Hereford asserted that the ranching was unsuccessful because of Apache attacks, and the ranches were soon abandoned. However,

he contended that abandoned livestock multiplied successfully without human intervention after the abandonment of the ranches. Hereford's conclusions about the early establishment of cattle in the Upper San Pedro River valley agree with a historical record that shows that there were relatively peaceful relations with the Indians from 1790 into the 1820s. These peaceful relationships allowed ranchers to establish several secular cattle operations in favorable locations in the Santa Cruz, Sonoita, San Pedro, and Babocomari Valleys (Sayre, 1999).

At least two other workers (Bahre, 1991; Sayre, 1999) hold to an opposing view that Apache hostilities prevented Spanish and Mexican ranchers from extending significantly beyond the Santa Cruz Valley. The Mexican government during the 1820s and 1830s issued nine land grants in southern Arizona. However, ranchers largely abandoned them by the 1840s because of the Apaches. A visiting Jesuit reported in 1764 that nearly 300 ranches and estancias in Sonora (which then included present-day southern Arizona) had been abandoned in the preceding seven years and that thousands of heads of livestock were lost to the Indians (Sayre, 1999).

Peace broke down in the decades after Mexican independence, and ranchers abandoned the herds (Sayre, 1999). The cattle reverted to a feral stage on the range, and Indians and others hunted them as game. US military parties in the 1840s and 1850s found the remnants of these herds, mostly bulls, to be extremely wild and dangerous. Turner et al. (2003) noted that visitors to Southeastern Arizona in the 1840s and 1850s found evidence of former cattle ranching and saw cattle herds. However, they concluded that early reports of large numbers of cattle were probably exaggerated and ultimately produced the myth of great herds. The authors reported that any large herds were probably gone by 1854 because records kept that year by cowboys passing through Southern Arizona on a large Texas Trail Drive indicated that no signs of wild cattle were seen. Moreover, the authors noted that centrifugal windmills did not appear before the 1870s and before that, livestock would have been clustered around natural water sources. Visitors may have noted the locally dense herds near natural water and extrapolated such numbers across the vast adjacent areas without natural water.

The key question as regards livestock during the Hispanic period is not whether or not they were present but whether or not they overgrazed the range there. Several accounts suggested at least moderately abundant cattle in local areas of southern Arizona between 1846 (time of the Mormon Battalion) and the Gadsden Purchase of 1853. However, these accounts do not establish overgrazing of the rangeland. Lieutenant Colonel Philip St. George Cooke led the Mormon Battalion through southeastern Arizona in 1846 and reported (Bahre, 1991) that wild cattle attacked it at the junction of Babocomari Creek and the San Pedro River. He also reported, "There is not on the open prairies of Clay County, Missouri, so many traces of the passage of cattle and horses as we see every day."

In 1851, John Russell Bartlett, Commissioner to the United States-Mexican Boundary Survey, entered southern Arizona along with other members of the boundary survey (Bartlett, 1854). His report showed that cattle were present in southern Arizona but did not indicate that overgrazing was occurring. His travels took him into the San Bernardino Valley, located east of current day Douglas in southeastern Arizona. Bartlett first viewed the valley from a high hill and characterized it as "the rich valley of San Bernardino" and recorded, "Here was stretched out before us a level patch of green, resembling a luxuriant meadow." He visited the ruins of the former San Bernardino ranch and reported that vast herds of cattle were raised there before

Apache attacks caused abandonment of ranching approximate 20 years previously. Bartlett reported that cattle that had strayed away had greatly multiplied since and roamed over the plains and valleys and had produced cattle trails, some of which were fresh. He encountered small herds, comprising up to six cattle, and each led by a bull. At one campsite in the San Bernardino Valley Bartlett and his party used dried cattle dung as fuel for a campfire. The bellowing of bulls and the incessant yelping of wolves occasionally disturbed the sleep of him and his companions.

According to Bartlett, Colonel Cooke in his march to California supplied his whole command with beef from these cattle, and travelers journeying to California also used this source of meat. Bartlett reported that the valley of the Babocomari River also contained an abandoned ranch that had not less than 40,000 head of cattle as well as a large number of horses and mules when Apache attacks forced its abandonment. He reported that many of the cattle had remained and spread themselves over the nearby hills and valleys and given rise to many herds that then ranged along the entire length of the San Pedro River and its tributaries. Additionally, Bartlett reported that a party of 30 to 40 Mexicans was camped at the junction of Babocomari River and the San Pedro River to hunt wild cattle.

While Bartlett reported that one place in the San Pedro River Valley (near St. David) had abundant mesquite but sparse grass (probably a mesquite bosque), he also found that abundant grass was present in another place near the river alongside springs – probably in a cienega. (A cienega is [Hendrickson and Minckley, 1984] a wetland that is typically sustained by springs and is rich in organic matter.) Bartlett also reported abundant grass in other areas of southern Arizona.

If the rangeland of southern Arizona had been seriously overgrazed in 1851, the cattle would have previously eaten the abundant grass near springs and elsewhere. While Bartlett reported cattle in several areas, his report does not indicate that large numbers were present in most regions he visited. On several occasions, Bartlett reported that his party was running low on fresh meat and referred to taking sheep along to provide meat. If cattle had then been generally abundant, Bartlett's party would have hunted them and not needed to bring sheep for meat.

Bahre (1991) also cast doubt upon the idea of significant cattle herds in the 1820s and 1830s. He noted that there were no windmills or stock tanks and that it was difficult to believe that grass and other suitable plants adjacent to major sources of perennial water could have supported high numbers of cattle. Moreover, he concluded that there was no evidence of overgrazing during the 1820s and 1830s as suggested by the journals of travelers from 1850 to 1880 who emphasized the presence of largely pristine vegetation ideal for cattle.

Evidence against the overgrazing of the San Pedro River Valley before 1859 comes from a talk given by S. Mowry in 1859 to the American Geographical Statistical Society (Mowry, 1859). He described the valley as, "par excellence, the agricultural district south of the Gila. The valley is wide, very rich . . .." His paper had no mention of overgrazing in the valley or elsewhere in Arizona and Sonora.

Bahre (1991) concluded that although large numbers of cattle were driven into southeastern Arizona to meet government and local needs after 1866, large-scale cattle ranching did not begin until nearly a decade after the Civil War. In 1872, the most prominent Anglo rancher in southeastern Arizona was H. C. Hooker who had 11,000 cattle in the Sulfur

Springs Valley. At this time there were small numbers of cattle in the Santa Cruz Valley south of Tucson, in parts of the San Pedro River Valley, along Babocomari River between its junction with the San Pedro River and present-day Sonoita, along the Gila river from Duncan to Thatcher, and along Sonoita Creek West of present-day Patagonia to Calabasas.

The Gadsen Purchase in 1853 set the stage for future intensive cattle raising and overstocking of ranges in southern Arizona (Sayre, 1999). Most of the Purchase area became "public domain" lands upon which ranchers could crowd as many cattle as possible. The arid nature of the land prevented the successful agricultural settlements that were envisioned in the Homestead Act of 1862, and most of the land remained in the public domain.

Researchers agree that intensive cattle ranching and overstocking of Arizona ranges began with the 1881 arrival of the Southern Pacific that provided a means of transporting cattle to market (Bahre, 1991; Sayre, 1999). Additionally, the spread of windmills and the elimination of the Apache threat opened up southeastern Arizona to ranching. The Southern Pacific advertised for settlers in 1881, and soon afterwards, ranchers began moving their herds from overgrazed areas in Texas, New Mexico, and the Mexican states of Durango, Chihuahua, and Sonora. Southern Arizona had large public domain areas of desert grassland with "free grass." The transformation of the rangelands was so rapid that by 1884 a pioneer rancher in the San Rafael Valley complained that every running stream and permanent spring has been claimed and adjacent ranches stocked with cattle. In 1870, there had been fewer than approximately 40,000 cattle in Arizona, with slightly over a third of them in the Gadsden Purchase area. Twenty-one years later, there were approximately 1.5 million, with about 400,000 of them grazing in southeastern Arizona. American settlers had little experience with arid ecosystems and optimistically noted the perennial grasses that blanketed the broad valley floors because of several years of good rain. The settlers did not realize that Arizona would have years with much less precipitation. The years of plentiful rainfall produced an optimistic determination to not sell cattle during dry years.

Ranchers and the territorial government became concerned about overstocking of cattle in the San Pedro River Valley (Brown, 2009; Turner et al., 2003). In 1885, the Tres Alamos Association passed a resolution stating that the ranges were "already stocked to their full capacity" and demanding that the influx be controlled. In 1886, the Tombstone Stock Grower's Association reported that, "a crisis is fast approaching", and that the San Pedro River Valley ranges have been stocked to the extreme limit of their capacity, leaving no surplus grass. However, ranchers continue to increase their herds throughout the rangelands of Arizona. The Southwestern Stockman reported in 1891, "the malady of overcrowding is with us in an aggravated form" and reported that disaster had been averted that summer only by the "phenomenal" late rains. An official assessment roll for 1891 showed 720,940 cattle in Arizona, and the governor wrote that there were "closer to 1,500,000." An 1890 census estimated that the territory of Arizona had more than a million cattle. A report by the governor of the Arizona Territory reported that the amount in 1891 was probably "closer to 1,500,000."

Sheep were also present in Arizona in significant numbers, but sheep grazing was more geographically restricted then cattle raising (Sheridan, 1995), with more of them in northern Arizona than in the southern regions of the state. In northern Arizona, Hopis and Navajos raised sheep since the 1600s. In southern Arizona a herd of 5000 sheep at Tubac produced enough wool for 600 blankets in 1804. However, significant development of the commercial sheep

industry did not start until the mid-1860s when the Candelaria brothers drove New Mexican flocks into Apache County. A *Special Report of the Sheep Industry* produced by the Department of Agriculture in 1892 stated that non-Indians in Arizona ran 803 sheep in 1870, 76,524 in 1880, and 698,404 in 1890. These numbers were probably too conservative, and in 1879 the Arizona Weekly Star reported 78,500 sheep in Pima County but only 68,600 cattle (Bahre, 1991). Before approximately 1892 sheep apparently outnumbered cattle (Bahre, 1991). In 1879,. The Cienega Ranch, just west of the Whetstone Mountains, reportedly had 23,000 sheep in 1880. In 1892, the Arizona Daily Star reported 20,000 sheep in the Chiricahua Mountains. Between the late 1870s and the early 1890s there were also large numbers of sheep in the Sonoita Valley, Santa Rita Mountains, lower Santa Cruz Valley, and along the west side of the Chiricahua Mountains. Estimates from the Arizona Agricultural Statistics Service showed a dramatic increase in the numbers of sheep (Brown, 2009). These numbers increased from an estimated to 17,000 in 1870, to 600,000 in 1885, and to 625,000 by 1890.

There are no generally accepted data about the impact of sheep on Arizona rangelands. Possibly the more localized distribution of sheep and seasonal migrations reduce the impact of sheep on ranges.

The concentration of sheep in localized areas, especially those of northern Arizona, is shown by statistics from the 1894 *Historical and Biogeographical Record of Arizona* (Sheridan, 1995). The publication listed 19,000 sheep in Yavapai County, 133,388 in Apache County and 201,449 in Coconino County. In contrast, it listed only 1620 sheep for Pima County, and 6435 for Cochise County. The reported numbers may have been much lower than the actual number of sheep, a specially in southern Arizona. The shipment of 20,000 sheep from Texas to the foothills of the Chiricahua Mountains occurred in 1892 and provoked outrage and resistance from local ranchers.

The seasonal migration of sheep began in the 1880s. During the spring and summer shepherds had their sheep graze on the grasslands of the Colorado Plateau (Sheridan, 1995). In the fall the shepherds brought the sheep southward, wintering them in the warm valleys of the Salt and Gila rivers.

Drought and overgrazing by cattle seriously damaged grasslands in southern Arizona and resulted in the deaths of many cattle (Bahre, 1991; Bahre and Bradbury, 1978). Rainfall in 1890 was less than normal. Summer rains were almost absent in 1891 and 1892. During the first months of 1893, 50 to 75% of the livestock died, mostly in southeastern Arizona.

Sheridan (1995) described the massive die off cattle. The losses were greatest in southern Arizona, where 50 to 75% of them died. Judge J. C. Hancock reported that San Simon Creek was littered with the bodies of cattle and that the cowboys strained their drinking water through burlap sacks to filter out the maggots. Rancher Edward Land recalled, "Dead cattle laid everywhere. You could actually throw a rock from one carcass to another."

Summer rains in July 1893 rescued the cattle industry from complete ruin, but overstocking and overgrazing continued (Bahre, 1991). Major changes in the landscape occurred after 1893, with many areas becoming almost completely denuded of grass cover, and the topsoil eroding and cienegas being destroyed. A government publication substantiated the degraded range conditions with pictures of southeastern Arizona in the Roskruge Photograph Collection at the Arizona Historical Society, and Tucson. The pictures showed hundreds of square miles of rangeland that were denuded of cover. The grasses, even the sacaton in the

bottomlands, were grazed to the ground. Cattle trails covered the hills, and erosion was rampant. Photographs taken in 1892 of the U.S.-Mexican Border Monument 105 in southern Arizona showed almost total destruction of the grass cover over vast areas of land. In 1891, a University of Arizona botanist reported that southeastern Arizona ranges were so depleted that it was difficult to find suitable grass specimens for study. He further noted that cattle then had to depend on oaks and shrubs for browse. By 1893, government range experts reported that watershed conditions had greatly deteriorated in the San Francisco Peaks Forest Reserve (Brown, 2009). The same experts also said that by 1904 all of the forage there was eaten or "sheeped out."

In 1901, D. A. Griffiths, chief botanist in charge of grass and forage investigations for the Arizona Experiment Station in Tucson, concluded that the rangelands of southern Arizona were more degraded than any others he had seen in the western United States (Bahre, 1991). He sent a questionnaire about range conditions to several pioneer ranchers. The answers of H. C. Hooker, proprietor of the Sierra Bonita Branch, and C. H. Bayless, owner of a large ranch near Oracle, provided information about conditions in the San Pedro River Valley.

Hooker reported that as of 1870 the valley had an abundance of willow, cottonwood, sycamore, and mesquite timber, large areas of sacaton and grama grasses, sagebrush, and underbrush of many kinds. The riverbed was shallow and grassy and its banks had a luxuriant growth of vegetation. He reported that conditions were quite different in 1901. The river was deep with washed out banks, trees and underbrush were gone, the sacaton had been cut by the plow and grub hoe, thousands of horses and cattle had grazed the mesa, and people had farmed the valley. There were many cattle and horse trails and paths to the mountains. Fire had destroyed much of the shrubbery and grass. Rains would sweep away much of the earth loosened by the feet of animals and in this way many waterways had been cut from the hills to the riverbed. Hooker reported that the unproductive condition of the range in the valley was principally because of overstocking of cattle. During drought, the livestock ate and destroyed even the roots of plants, and if not so destroyed, the roots would have grown out again with winter moisture.

Bayless concluded that the valley lands as of 1901 were unproductive due entirely to overstocking. He reported that the valley still received the same average amount of rainfall and sunshine necessary for plant growth and that droughts were not more frequent in 1901 than in the past. However, the earth had been stripped of all grass covering. When rain fell on the bare ground, water washed away in destructive volumes and bore with it all the lighter and richer particles of soil. The remaining sand and rocks were not adequate for native vegetation to thrive as previously. Cattle had trampled the roots of the grass, and there were no roots or seeds to provide for regeneration of native plants. Bayless reported that as of approximately 1889, 40,000 cattle grew fat "along a certain portion of the San Pedro Valley" where now 3000 were unable to find sufficient forage for proper growth and development. He noted that few of the former cattle were sold or removed from the range. Ranchers simply left them there until the pasture was destroyed and the livestock perished from starvation.

Concentrations of cattle along waterways in southeastern Arizona in 1891-1893 severely damaged waterside communities, especially cienegas (Hendrickson and Minckley, 1984). Cattle sought out and destructively grazed and trampled cienegas. These wetlands had the most permanent water supplies and supported lush plant communities made up of species palatable

to cattle. The activities of cattle fragmented the sponge-like surface deposits and promoted drying of part of the cienegas.

The severe overgrazing of lands in southern Arizona resulted from three human controlled factors that overrode negative feedback mechanisms that might have prevented the catastrophe (Sayre, 2005). The sustainable management of livestock grazing requires matching forage demand and supply, especially during drought. Natural grazing systems have built-in mechanisms to limit grazing by native animals. In natural populations, the scarcity of forage leads to animals leaving the overgrazed areas, increased mortality of animals, and reduced production of offspring.

The first factor was that markets for credit and livestock were national in scale, and speculation overheated them. The cattle industry was particularly dependent upon credit. When forage gave out in one area, indebted ranchers moved elsewhere rather than selling their livestock in a sagging market. Selling such livestock would've been tantamount to defaulting. The second factor was obstacles to rapid destocking during times of drought. One obstacle was the belief by early ranchers that rains would continue to be plentiful. The second obstacle was that meat processors began refusing to buy older cows in the 1890s. This refusal left ranchers with no economical way of disposing of excess livestock. The third factor was that government policies rewarded aggressive overstocking as a means to control land. The public rangeland was an open access free-for-all. Use it or lose it was the prevailing ethic. The result was that ranchers stocked all available public acres beyond the maximum carrying capacity of the land and encouraged their livestock to consume everything palatable.

The drought did not end grazing by cattle (Brown, 2009). The drought, with two minor exceptions in 1897 and 1899, continued through 1905. However, by 1909 the numbers of cattle had again increased. By 1912, an estimated 915,000 cattle and 1,260,000 sheep were in Arizona.

Trends in ranching and the government controls gradually limited the numbers of livestock in Arizona (Bahre, 1991). By 1900, the large ranches in southeastern Arizona had begun to acquire the smaller ranches. This consolidation along with the Stock Raising Act of 1916, that expanded the size of ranching homesteads, led to the death of the open range. In 1906, the forest service placed grazing control and operation on its lands. However, it was not until 1934 with the passage of the Taylor Grazing Act that there was an effort to stop injury to other public lands and to stabilize the livestock industry dependent upon public ranges.

Lands in southern Arizona have partly recovered from the overgrazing (Bahre and Shelton, 1993; Hutchinson et al., 2000). However, most such lands have notably less grass and much more woody vegetation such as mesquite. Scientists are still investigating the reasons for the great increases in mesquite and other woody vegetation in southern Arizona and in other areas of the Southwestern United States. Evidence to date suggests that most of this increase in woody vegetation is due to human activities. Livestock grazing has apparently significantly contributed to the reduction of grass and the increase of woody vegetation. Such grazing has reduced grass fuel and lessened the ability of the rangelands to carry hot fires that killed mesquite and other woody plants. The grazing also reduced competing stands of perennial grasses that when healthy and dense were able to keep mesquite and other woody plants in check. Livestock also increased the dispersal of woody plants by eating material that contained seeds. The passage of the seeds through the digestive tracts of the animals resulted both in the

spread of the seeds and in the seeds being scratched and being made more likely to germinate than non-digested seeds. In other words, overgrazing has contributed to public lands having less suitable food for cattle.

Federal laws now control grazing on public domain lands. Overgrazing during the 1880s and 1890s in southern Arizona was encouraged by the abundance of public grasslands. Because ranchers did not own such lands, they competed to have their cattle eat as much of the grass as possible on these lands. Hopefully, future overgrazing of public lands, especially those in nature preserves, will continue to be firmly controlled.

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