The Desert Tortoise in Relation to Cattle Grazing

Vernon Bostick

The Historical Evidence

Early History

The desert tortoise has inhabited the Mojave and Sonoran deserts in the southwestern United States and Mexico for thousands of years. For the past three or four centuries, the desert tortoise has shared its habitat in Mexico and California with cattle.

There is no information on tortoise abundance in pioneer days, but we do have good information on cattle abundance and range conditions a century ago. The build up in livestock numbers in the 1870's and '80's, which is well documented in Arizona (Griffiths 1901, Thornber 1910), occurred over all the western range. Stoddart and Smith (1955) estimated that about 85 percent of livestock on the range perished in the late 1880's. We know that desert tortoises survived this severe overgrazing because they didn't become extinct.

World War I encouraged a second build up in range livestock numbers. Beef sold at high prices and the range was free. Universal overgrazing was the inevitable result.

The decade of the Thirties was ushered in by the severest drought of record. In addition to peak numbers of livestock, the western range was plagued by hordes of rabbits, rodents, and grasshoppers (Vorhies and Taylor 1933). Ranchers burned the spines off cactus in an attempt to save their cattle from starvation. Death losses from starvation and invading poison plants were severe. The destruction of the western range is documented in Senate Document 199 (US Forest Service 1930).

In view of the concern expressed by some people for the past ten years, it is amazing that any tortoise survived the many years of unregulated livestock grazing that preceded enactment of the Taylor Grazing Act of 1934. From a single census in a single year, Schneider (1980) drew the following conclusions: 1. That the population is declining rapidly towards extinction. 2. That overgrazing by cows is responsible. 3. That desert tortoises should be listed as endangered. 4. That their habitats should be closed to grazing. Schneider summed up his report with this statement: ". . . the outlook for the future of the species [desert tortoise] in the state [Arizona] appears grim."

Mortimer and Schneider (1983) censused a desert tortoise population with the highest density known in Nevada. Their data showed a 45 percent increase in population over a census made five years before by another biologist. Nevertheless, Mortimer recommended that this habitat be closed to cattle grazing for 15 years so the tortoise population could recover. He summed up his report with this statement: ". . . habitat and wildlife managers must determine if livestock grazing operations can co-exist with tortoise and other wildlife on the Mojave Desert Biome."

The Taylor Act

The Taylor Grazing Act of 1934 ended the free-for-all, get-all-you-can-while-you-can, uncontrolled grazing which had destroyed the range resource on the public domain. Every decade since the original reduction of roughly 50 percent in grazing use, the Bureau of Land Management has made reductions in the amount of livestock use permitted. Permitted use today is only about ten percent of the livestock use that occurred during the free range days. If the conservative grazing management that is being practiced today has such a detrimental impact on desert tortoise populations, how could the species have survived through all those years of uncontrolled livestock grazing?

Dr. Kristin Berry interviewed all the long-time residents in the Mojave and Sonoran deserts she could find and questioned them about the abundance of desert tortoises years ago.

The following quotation is from Dr. Berry's *Tortoises For Tomorrow:*

> "Long-time desert residents in California noted extraordinary densities [in the early Thirties] that could have been as high as 2,000 per square mile."

The evidence that Dr. Berry accumulated is ample to support her conclusion, but I will review only one interview: A member of a survey party in Antelope Valley in 1933 saw over 100 tortoises in one place at one time. He told Dr. Berry that tortoises "were everywhere. . .all over the ground."

A density of 2,000 tortoises per square mile is three tortoises per acre. The year 1933 was the third year of the great drought, and the culmination of years of overgrazing by livestock. Let's assume that forage production was 90 pounds per acre (on an overgrazed desert range in a drought year, this is a liberal estimate).

Cattle were starving; we can assume that they grazed the range as closely as possible. This means that cattle would have consumed about 90 percent of the forage produced. If there were any sheep on the range, forage use by livestock would be even greater. At the very most, there was only three pounds of forage left for each tortoise for the year. But in the early Thirties western ranges were overrun by jack rabbits (Vorhies and Taylor 1933)

Editor's Note:
Readers may also wish to read the article "Habitat Management for Desert Tortoise in Nevada" by Joseph V.H. Ross, *Rangelands*, 8(6):286-290, December 1986.

and heavily infested with grasshoppers.

Grasshoppers feed all day; jack rabbits all night; tortoises about 7 hours per week if the weather is not too hot or too cold for them to leave their well insulated burrows (calculated from data presented by Nagy and Medica 1986).

While livestock, jack rabbits, and grasshoppers were busy grubbing the range to stave off starvation, the tranquil tortoise whiled away the time snoozing in its burrow. Then how did they survive? Easy enough—they used a different food source.

The toothless tortoise is ill equipped to harvest and masticate range forage. The tortoise can harvest only tender vegetation, and it can't masticate even that. The tortoise can't process enough bulky, low analysis forage fast enough to meet its nutritional requirements (Nagy & Medica 1986). They solved this problem long ago—they allow other animals to do it for them. Desert tortoises feed primarily on dung. The more animals using the range, the more dung, which makes more food available for tortoises.

In the millennia preceding the advent of domestic livestock on the range, tortoises subsisted on pellets excreted by rabbits, deer, and bighorn and scats of predators. Tortoise populations adjusted to the amount of dung available; their numbers were low (Mollhausen 1854).

The Western Regional Extension Publication No. 39: *By-products and Unusual Feedstuffs in Livestock Rations* (Bath et al. 1980) states: ". . . it is commonly estimated that 80% of the total nutrients in feeds are excreted by animals as manure." The desert tortoise is well adapted for making use of cow dung. Four days elapse between meals. This allows plenty of time for the tortoise to complete the digestion that began in the cow's stomach. The digested food moves slowly, ever so slowly, through tortoise intestines. This trip takes 17 days (Nagy and Medica 1986).

It is a biological law that all organisms tend to increase to the limits of their food supply. Therefore, it is natural and to be expected that desert tortoise numbers and livestock numbers peaked on the public domain at the same time.

It is also a natural law that if the food supply is diminished for any population, that population will adjust to come in balance with the reduced food supply. For 50 years BLM has been reducing the numbers of livestock permitted on the Federal Range. For 50 years desert tortoise populations have been declining.

Beaver Dam Mountains

We can be fairly certain that before the Mormon colonization of this area in the late 1850's, Beaver Dam Mountains in Utah was a Joshua-tree savannah with a bunchgrass understory similar to portions of the McCullough Mountains in Nevada that have never been grazed for lack of water (Bostick 1973).

Because of their persistence as relics, we know that bush muhly and Indian ricegrass were members of this pristine grassland community. Ten years after settlement Mormon cattle had become numerous and were grazing the range too closely to permit Indian ricegrass to mature seed. The original grassland was converted to typical Mojave Desert dominated by creosote bush and white bur-sage with an understory of exotic annuals from the Mediterranean region.

The intense competition for forage by livestock owners was halted by the Taylor Grazing act of 1934. The big reduction in grazing use in 1936 (about 50 percent) didn't bring about any noticeable range improvement, and another cut in authorized use was made by shortening the length of the grazing season. It was after this second cut that Woodbury and Hardy (1948) reported a desert tortoise population density of 150 tortoises per square mile.

BLM made further cuts in grazing use in the early fifties and again in the sixties. In 1970 1,500 acres of tortoise habitat were fenced and closed to all grazing by livestock. Sheep use was eliminated. Four years later Coombs (1974) reported 39 tortoises per square mile. Between Hardy's census in 1948 and Coombs' census in 1974, livestock grazing was reduced 100 percent. There was a 74 percent reduction in tortoise density.

Rabbits were abundant in the exclosure until 1982, and tortoises could meet their protein requirements by eating rabbit pellets. Rabbits were scarce after 1983. The tortoises were doing so poorly that a veterinarian, Dr. James Jarchow, was consulted. Dr. Jarchow (1987) found that the six tortoises from the exclosures that he examined were all suffering from osteoporosus. He attributed this condition to insufficient protein in their diet.

Dr. Jarchow wrote a prescription for these tortoises.

1. He recommended a predator control program "designed to eliminate those individual predators preying chiefly on this species."

2. He recommended that "desert tortoise habitat should be managed to promote the resurgence of *Muhlenbergia porteri* growth. . .and seeding campaigns should be instituted."

3. "Supplemental feed, in the form of scattered timothy or bermuda hay, should be provided in times of drought and midsummer."

4. Additional exclosures should be erected in critical areas."

This prescription is not backed by clinical experience; there is no evidence that any of these remedies prescribed are practical and beneficial. Years of management by untested theories have brought this once thriving population to the verge of extinction.

Dr. Jarchow examined five tortoises from the Littlefield plot, which is open to cattle grazing. For three of these he reported "No abnormalities were evident." The abnormalities noted in the other two specimens were not related to their diet. He also took blood samples from each tortoise and sent them to a laboratory for a complete analysis. From these data he concluded they ". . .were considered presently healthy and well nourished."

Although it is coincidental and not planned, these two plots in the Beaver Dam Mountains demonstrate the relation of cattle grazing to desert tortoise welfare. Cattle have been excluded from the Utah plot for 19 years; the tortoises exhibit symptoms of protein starvation, associated

with high mortality. The Arizona plot is open to cattle grazing; the tortoises are healthy and well nourished.

If tortoise biologists are correct, then areas from which livestock have been excluded for a long time should have thriving tortoise populations. On the other hand, the science of range ecology predicts that excluding cattle will reduce the tortoise population and they will become rare.

Cattle Excluded Areas

Cattle have been excluded from the Nevada Test Site and the Desert Wildlife Range for many years. Tortoises are rare and doing poorly at both sites.

A small tortoise population was studied intensively for ten years in Rock Valley on the Nevada Test Site from which cattle had been excluded for 40 years. These tortoises were under continual stress. They suffered from a scarcity of water, insufficient nitrogen (protein) in their diet, and an excess of potassium.

They could excrete the potassium in their urine as other animals do, but urinating would have left them dehydrated. Tortoises urinate only when they have water to drink. They could have converted the potassium to an insoluble form and excreted it in their scats. This requires nitrogen, which would have had to come from catabolizing their own tissues (Nagy and Medica 1986).

This stress could be relieved if these tortoises had access to their natural food source, cow dung. Fresh cow dung is 85 to 90 percent water. Bees and butterflies drink from fresh cow pies. Cow dung could also supply the high quality protein tortoises require. The excess potassium came from consuming plant material high in potassium but low in other nutrients.

Thousands of years of adaptation to a highly nutritious dung diet has left the desert tortoise ill prepared to switch to a bulky diet of fresh plant material. Nagy and Medica (1986) found that during the spring active period, desert tortoises would not or could not eat enough plant material to maintain their body weight. During the lush spring period desert tortoises were on a reducing diet.

Summary and Conclusions

The historical record shows that:

1. Desert tortoises have coexisted with cattle for 300 years in California and Mexico and at least 100 years elsewhere.

2. The highest tortoise densities known occurred at a time when overgrazing by livestock was the severest ever known.

3. The fewer the cattle on a range, the fewer the number of tortoises.

4. Excluding cattle for many years endangers the tortoise population.

It is known all over the world and is very well understood in the developing countries of Africa that overuse of the range by one species of animal will degrade the range for that species and its numbers will decline, but this same overuse will improve the range for another species and its numbers will increase. Severe overgrazing of the public domain by livestock after World War I improved the habitat for tortoise and brought on a population explosion similar to the famous deer irruption on the Kaibab.

BLM's conservative grazing management program is designed to restore ranges degraded by years of overuse by livestock. Restoring the range is beneficial to some wildlife, bighorn for instance, but it is detrimental to tortoises. Like jackrabbits and mule deer, desert tortoises thrive on deteriorated range lands. Declining numbers of desert tortoises since the Taylor Grazing Act of 1934 is a direct result of decreased livestock grazing and improved range conditions.

Literature Cited

Bath, Donald L. et al. 1980. By-products and unusual feedstuffs in livestock rations. WREP No. 39. Cooperative Extension Univ. of California.

Berry, Kristin. undated. Tortoises for Tomorrow.

Bostick, Vernon B. 1973. Vegetation of the McCullough Mountains Clark County, Nevada. Unpublished thesis Univ. of Nevada, Las Vegas. 232 pp.

Coombs, E. 1974. Utah cooperative desert tortoise study *Gopherus agassizii.* Report prepared for BLM Cedar City, Utah and Utah Div. of Wildlife Resources, Salt Lake City, Utah.

Griffiths, David. 1901. Range improvement in Arizona. USDA Bull. Plant Industry No. 4.

Jarchow, James L. 1987. Report on Investigation of Desert Tortoise Mortality on the Beaver Dam Slope, Arizona and Utah. Prepared for Ariz. Game & Fish Dept., Arizona Strip BLM, Cedar City BLM, and Utah Div. of Wildlife Resources.

Mollhausen, Heinrich Baldwin. 1854. From his journal quoted in "The Mohave Road" by Dennis G. Casebier. 1983. Published by Tales Of The Mohave Road Pub. Co.

Mortimore, Craig, and Paul Schneider. 1983. Population studies of the desert tortoise *(Gopherus agassizii)* in the Piute Valley study plot of southern Nevada. Unpublished report to NDOW.

Nagy, Kenneth A., and Philip A. Medica. 1986. Physiological ecology of desert tortoises in southern Nevada. Herpetologica 42(1)73-92.

Schneider, Paul B. 1980. A population analysis of the desert tortoise in Arizona during 1980. Unpublished report of work performed for BLM Phoenix, Ariz.

Stoddart, L.A., and A.D. Smith. 1955. Range Management. McGraw-Hill.

Thornber, J.J. 1910. The grazing ranges of Arizona. Ariz. Agr. Exp. Sta. Bull No. 65. 360 pp.

U.S. Forest Service. 1930. The western Range. Senate Document No. 199.

Vorhies, C.T., and W.P. Taylor. 1933. The life histories and ecology of jack rabbits in relation to grazing in Arizona. Ariz. Agr. Exp. Sta. Tech. Bull. 49.

Woodbury, Angus and Ross Hardy. 1948. Studies of the desert tortoise, *Gopherus agassizii.* Ecol. Monogr. 18:145-200.