



Where Have All The **FLOWERS** *Gone?*
BY DR. CHARLES KAY



Photo - Ryan Hatch



“While cattle, elk, and domestic sheep can survive and do well on grass, mule deer can not. Forbs are also necessary to fuel lactation in does and antler growth in bucks.”



As part of my research on long-term ecosystem states and processes, I have analyzed every published, first-person, journal of western exploration. In addition to recording when and where early explorers reported mule deer, elk, and other wildlife, I have also paid close attention to the plant communities described by the earliest adventurers. One of the things I found most interesting were descriptions of abundant flowers and floral meadows. Two are hard to forget—General George Armstrong Custer’s expedition to the Black Hills in 1874 and Clarence Dutton’s description of the North Kaibab in 1880.

Prior to Custer’s excursion, no whites had entered the Black Hills, or if they had, they had all been killed by the

Sioux. Thus, the vegetation as seen by the members of the expedition represented the conditions that existed prior to European settlement and the onset of livestock grazing; a rare ecological benchmark. Several members of the expedition maintained day by day accounts and all commented on the abundance of wildflowers, called forbs by range managers.

Professor A.B. Donaldson’s account is representative. “The floral decoration is the very richest. Every order and species seem to vie with every other giving brilliancy to the display... [At present] there are about 50 species in flower, about 25 have flowered and perhaps about 50 [species] are still to bloom. It is hardly possible to exaggerate in describing this flowery richness... Everybody, even [mule skinners] were enraptured with the flowers. Everybody was making bouquets



Tall forbs inside a sheep-proof enclosure south of Cedar Breaks National Monument. Grazing by domestic sheep has eliminated tall forbs outside the enclosure.

[These were hardened soldiers and frontiersmen!] All sorts of interjections were used to express wonder and admiration. Some said they would give a hundred dollars [which was a great deal of money in 1874] to have their wives see the floral richness for even one hour." Well, I have revisited the places described in the good professor's journal and either he and the others were prodigious liars or something has changed because there is nothing now that can match the earlier descriptions. Most of the flowers are gone,



Cow parsnip and angelica inside an elk-proof enclosure in Colorado's Rocky Mountain National Park. Heavy elk use has eliminated tall forbs from the adjoining meadow.

especially the palatable ones.

In 1880, geologist Clarence Dutton left the earliest known description of the North Kaibab; an area now renowned for world-class mule deer. According to Dutton, "From early June until September there is a display of wildflowers which is quite beyond description. The [valleys]...are resplendent with dense masses of scarlet, white, purple, and yellow. It is noteworthy that while the trees exhibit but few species, the humbler plants [forbs] present a very great number both of species and genera." While at other points in his journal, Dutton described "an unwonted wealth of floral beauty" and that "every ravine is...carpeted with a turf of mountain grass, richly decked with flowers of rare beauty and luxuriance." A rare world indeed and one that no longer exists. So, where have all the flowers gone?

To answer that question, we first have to understand how plants grow. Grasses, when in the vegetative state, grow from the bottom up, which is why you can repeatedly mow your lawn without killing it. The plants' growing points, or meristematic tissue, are near the ground surface, which

makes grasses resistant to defoliation. In contrast, forbs and shrubs grow from the tip outward. That is to say, the growing tissue is elevated making it easily accessible to herbivores. Moreover, when animals consume the upper parts of forbs, the plant is forced to begin growth anew from lateral or adventitious buds. Many grasses can be heavily and repeatedly grazed, and survive, but if forbs are repeatedly grazed, they often die.

Moreover, all ungulates, be they mule deer, elk, domestic sheep, or cattle, graze/browse selectively. Think of it as a buffet. Some plants are higher in nutrients, while others are laced with chemicals that inhibit digestion. All animals, and especially mule deer with their smaller mouth parts and rumens, select the most nutritious, easiest to digest, plants and plant parts. In general, growing forbs provide higher-quality forage than shrubs, while shrubs generally are more nutritious than grasses, especially cured or dry grass.

With 50 or more plants to choose from in normal range settings, what do deer, elk, and domestic sheep eat first? Why, forbs! Furthermore, within an individ-



Indian paintbrushes are mostly red and various species can be found from low-elevation deserts to the alpine.

Photo ~ Ryan Hatch



ual plant, the actual flowers usually contain more protein than the leaves or stems, hence flowers are often the first to be eaten. But if their reproductive output is consumed, forbs cannot re-grow from seed. Graze forbs too heavily for too many years and floral valleys become grass-dominant pastures. But while cattle, elk, and domestic sheep can survive and do well on grass, mule deer can not. Forbs are also necessary to fuel lactation in does and antler growth in bucks.

So I ask again...where have all the flowers gone? Historically it is a story

of too many domestic sheep, followed by more mule deer than the range could support during the 1940's - 1960's, and now we can add ever growing numbers of elk. It must also be remembered that not all forbs are palatable, so there are always a few flowering plants left and the real nasty ones we call weeds. Thus, grazing tends to eliminate the more palatable species, thereby changing the species composition of rangelands. Tall, highly-palatable forbs such as Indian paintbrush, penstemon, cow parsnip, and angelica, among a long list of others are usually the first to go. In the trade, these

highly palatable forbs are called "ice cream" plants, because everything eats them. Flowering plants that appear early in spring can be hard hit, as both wildlife and domestic animals are starved for high-quality forage after coming through the winter. This is especially true back East where the country is overrun with white-tailed deer.

The scientific literature is awash with study after study documenting how whitetails are exterminating rare flowers, especially trillium and other native lilies. Many natural areas and preserves have had to institute special hunts to cull whitetails, usually after years of public protests and lawsuits from animal rights groups. Whitetails are even destroying shrubs and forest regeneration. As a result, whitetails are being culled in some Canadian National Parks, as well as parks in the U.S., such as Gettysburg National Historic Battlefield.

Dr. Jim Bowns, a range professor at Southern Utah University, has spent over 30 years conducting studies on Cedar Mountain southeast of Cedar City, Utah. Most of the mountain is privately owned and has a long history of first dairy farming and later sheep grazing. Today as you drive over the high plateau you are greeted with a sea of undulating grass, but was it always like that? Early written descriptions are lacking but there is one small quarter section that has never been grazed by sheep. We call it the "Flower Garden"

According to Dr. Bowns, Cedar Mountain and most high Utah plateaus historically supported tall forb communities, and native grasses were rare. Sheep arrive, selectively graze the forbs, and convert the areas to grassland. Grasslands that will support sheep, cattle, and elk, but not mule deer to any great extent.



To the left of the log fence luxurious stand of native grass with virtually no forbs. while to the right is a dense growth of tall forbs. Grass where the sheep have grazed and forbs where the sheep have never grazed.



Other fence line contrasts tell a similar story. To the right of the fence above are native grass and a distant aspen stand that has not successfully regenerated in many years. While to the left are tall forbs, shrubs (mostly snowberry), and lots of regenerating aspen. Why the difference? Both sides of the fence are grazed. Perhaps global warming only made it so far up the mountain? The right side of the fence has a long history of grazing by domestic sheep, animals that prefer to eat forbs, shrubs, and aspen. In contrast, the left side of the fence has been grazed by horses, animals that prefer grass and generally do not eat forbs, shrubs, or aspen.

Mule deer, too, can be their own worst enemy. As part of my research, I measure as many three-part exclosures as I can. One part of these experimental plots is protected by an 8-foot fence that excludes both wildlife and domestic livestock, while an adjacent part is protected by a low fence that allows deer or elk to enter but prevents use by cattle or sheep. A third, unfenced part is grazed by both livestock and wildlife. By measuring the vegetation in all three parts of the exclosure, changes due to wildlife can be separated from changes due to livestock, from changes due to climatic variation.

Many three-part exclosures were built during the 1950's and 1960's when

managers were concerned that large numbers of mule deer were overgrazing the range. These range reference areas are invaluable and are the only way to determine if plant communities are changing, and more importantly why? Unfortunately neither the Forest Service nor BLM have agency-wide programs to maintain these exclosures and many are no longer functional; i.e., the fences have fallen down.

The Hancock Flat three-part exclosure is located on Utah's Fishlake National Forest just south of Fishlake Hightop. The exclosure was built in 1962 and is situated in an aspen-spruce forest just below 10,000 feet on a domestic sheep allotment. Mule deer are the most abundant native ungulate, as elk are

rare at this particular site. In the total exclusion, ungrazed part of the exclosure, *Castilleja Miniata*, Indian paintbrush, occurred on 56% of my sample plots and had a mean canopy cover of nearly 30%. Where livestock were excluded, but mule deer alone were allowed to graze, Indian paintbrush occurred in only 6% of the plots with a mean canopy cover of 0.4%. Where both domestic sheep and mule deer grazed, Indian paintbrush occurred on only two percent of the sample plots with a mean canopy cover of 0.2%.

In addition, I measured the height, crown diameter, total number of flower stalks, and the number of grazed flower stalks on 25 randomly chosen paintbrush plants in each of the two fenced parts of the exclosure. Grazing by mule deer significantly reduced the mean height, crown diameter, and number of flowering stalks. Moreover, mule deer had grazed 63% of the flower stalks where livestock was excluded. By selective grazing, mule deer alone had reduced the abundance of this valuable forb. Add domestic sheep and the poor plants do not have a prayer!

However, none of this is really the deer or sheep's fault. A while back, I was contracted by the U.S. Sheep Experiment Station headquartered at



Dubois, Idaho to conduct range studies on the station's high-elevation summer range in the Centennial Mountains. That was a real eye-opening experience for a wildlife ecologist because even John Muir referred to domestic sheep as "mountain maggots" and wildlife professors routinely warn their students about the ecological dangers of "range maggots." In addition, environmentalists had called for closure of the Sheep Station because they claimed the sheep were "destroying the range."

One of the things I was contracted to do was to measure willow communities on the Sheep Station summer range. I then compared those data to my earlier research in Yellowstone National Park. Well, the station's willows were in excellent condition, while those in Yellowstone were among the most overgrazed in North America! The Centennial Mountains contain the northern most extension of tall forb communities in the West. I did not measure tall forbs but two other independent scientists recorded plant cover inside and outside long-term grazing exclosures. Surprisingly, those researchers could find no difference in tall forb abundance or species composition where the sheep grazed versus where sheep had not grazed for many years. Moreover, palatable forbs were abundant on the Sheep Station while they were virtually non-existent in Yellowstone Park.



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Thus, the problem is not really too many mule deer, too many elk, too many domestic sheep, or too many cattle. Rather the problem lies in how the animals are managed. Humans are the ones who allow the land to be overgrazed be it by domestic livestock or by not controlling deer and/or elk numbers. Another difficulty is that western range managers have not even acknowledged the problem of disappearing forbs. I spent more than ten years in college, working first on my B.S., then my M.S., and finally my Ph.D. and although I took every range ecology class the universities offered,

not once did I have a professor ask, "Where have all the flowers gone?" The scientific literature is equally barren. It is time for western land managers to wake up and smell the flowers, if they can find any!

Editor's notes: The University of California Press has just released a book on "California's Fading Wildflowers".

