



The Black Range Naturalist

Volume 5, Number 3
July 3, 2022

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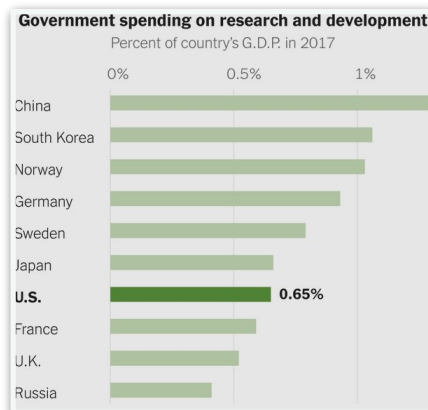
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Unattributed material is contributed by the editor.



Jonathan Gruber (MIT)



Cupressus arizonica var. *arizonica* - Near Cooke's Peak Township

Arizona Cypress in New Mexico: Current History and Status

There is a relict stand of Arizona Cypress, *Hesperocyparis arizonica*, about two miles north of Cooke's Peak. Although this species was probably more widespread in New Mexico in the past (perhaps distant past), the trees in this stand are thought to be the only native population of the trees in the genus *Hesperocyparis* currently living in New Mexico.

When I initially wrote this article it was under my by-line (Bob Barnes) because I thought it was about my road to "discovering" this small group of trees above the grasslands of the Chihuahuan Desert. Eight years ago, when I set out to find this stand and to see what it was all about, there were many questions about it, so many confusing answers, and sometimes no answers at all. In the fall of 2021 I went down the rabbit hole to tell a fairly straightforward story, a few interesting twists and turns of course, but basically straight forward. I didn't have to go very far down that burrow to find a whole slew of researchers interested in the questions I had. In some cases they had strong memories of their encounters with these trees, sometimes more than fifty years ago. I concluded that this was not my story to tell. True, I could transcribe, but the story had its own legs. I removed my by-line and put versions of this article out to be chopped at. In my mind, it has evolved to the first step in a much broader process; the rabbit hole is deeper than I imagined. A number of people have opined on this article. To the extent that there are errors of omission or commission they are my own.

In this article, we lay the foundation for what I hope will be a series of articles:

- We begin with the basics: how do we describe and name this species;
- We document the known native range of the species and hint at questions associated with speciation due to geographic dispersion;
- We describe the discovery and rediscovery of the Cooke's Peak stand, including my own little adventure. We also mull why the stand was discovered so late in our history;
- We describe some of the methods used to determine if a particular plant (vs. a species) is native to an area or introduced, using a stand of Arizona Cypress in Ash Canyon in the San Andres Mountains as a case study;
- We list significant specimens of this species collected in New Mexico; and
- We posit a course of action for further exploration of some big questions, with the Arizona Cypress as our guide.

Species Description and Taxonomic Determinations

Arizona Cypress, *Hesperocyparis arizonica*, was first described by Edward Lee Greene in 1882. His description (in the *Bulletin of the Torrey Botanical Club*, 1882, Vol. IX, No. 5, p. 64-65) follows:

"CUPRESSUS ARIZONICA. – A tall, conical tree 40-70 feet high, with horizontal branches; trunk 2-4 feet in diameter, covered with a dark red fibrous bark; bark of the branches flaking off in thin plates and leaving a smooth surface; branchlets stout and rather rigid, sharply quadrangular; leaves closely imbricated, very glaucous, neither pitted nor glandular; their margins entire, or, in the very oldest, denticulate; cones crowded on short, stout peduncles,

globose, about an inch in diameter, of 6-8 very thick, and strongly bossed scales; seeds numerous, 2 lines or more wide.

This fine cypress was discovered by the writer on the mountains back of Clifton, in the extreme eastern part of Arizona, on the first day of September, 1880.

Abundant specimens of wood, and fruiting branches were secured, and soon distributed under the above name, to the principal herbaria of this country, and several in Europe, including that of the Royal Gardens at Kew.

In the course of the year and a half that has since intervened, the species has been collected at different points in the southern and eastern portions of the same Territory, by Messrs. Rusby, Pringle and Lemmon. The tree is peculiar in that, while the bark of its trunk is as shreddy as that of any cedar, that of the branches, even the larger ones, is scaly, falling off in thin plates. The wood is light and straight grained, splitting with the utmost readiness; that of the heart being dark red, resembling that of red cedar. The branchlets bear so strong a likeness to those of *Juniperus pachyphloea*, Torr., that without fruit they are hardly distinguishable. It is the principal tree of the mountains which lie to the north of Mt. Graham, and forms dense forests, particularly on the northward slopes."

The genus name was changed to *Hesperocyparis*, from *Cupressus*, in 2013. The change is not universally accepted.

Elbert Little in *Names of New World Cypress* (1970) noted the splitting and lumping process as it pertains to *Cupressus* taxonomic decisions (p. 431).

Little lumped five (then described) species into one in 1966, retaining *Cupressus arizonica* as the species name. At page 433, Little provides the nomenclature history for the species. And at page 436 he provides a breakdown of his taxonomic determination for *C. arizonica* (middle right); these are the currently accepted taxonomic determinations.

Flora of North America notes that

"bark texture and foliage features have been used to distinguish geographic varieties or segregate species. Although bark texture may be consistent within populations, over the species as a whole there is complete intergradation between smooth and fibrous barks."¹

The U. S. Forest Service [Fire Effects Information System](#) describes the natural history of this species and discusses the effect that fire suppression may have on its reproductive success.

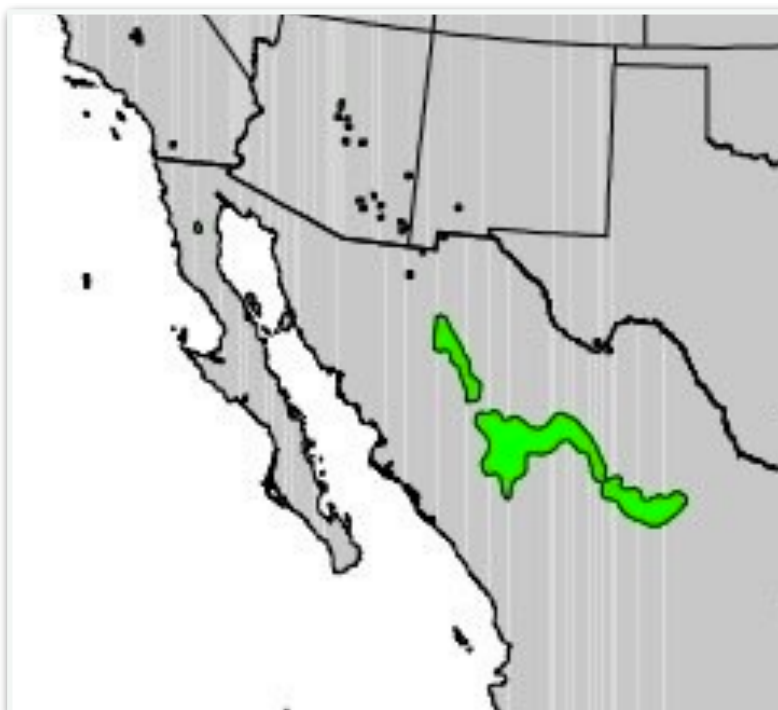
Little (1970)	Little (1953)	Wolf (1948)	Sudworth (1927)
1. <i>arizonica</i>	<i>arizonica</i>		
var. <i>arizonica</i>	(<i>arizonica</i>)	<i>arizonica</i>	<i>arizonica</i>
var. <i>glabra</i>	(<i>arizonica</i>)	<i>glabra</i>	<i>glabra</i>
var. <i>montana</i>		<i>montana</i>	
var. <i>nevadensis</i>	(<i>arizonica</i>)	<i>nevadensis</i>	(<i>macnabiana</i>)
var. <i>stephensonii</i>	(<i>arizonica</i>)	<i>stephensonii</i>	

Sargent (1922)	Sargent (1896)	Abrams (1923)	Jepson (1923)	Jepson (1909, 1910)
1. <i>arizonica</i>	<i>arizonica</i>			
var. <i>bonita</i>				
(<i>macnabiana</i>)		macn. nevad.	nevadensis	

Taxonomic determinations for Arizona Cypress, Little, *Names of New World Cypress*, p. 433.

1. *Cupressus arizonica* Greene, Arizona cypress
var. *arizonica*, Arizona cypress (typical) (or Arizona rough cypress)
var. *glabra* (Sudw.) Little, Arizona smooth cypress
var. *montana* (Wiggins) Little, San Pedro Mártir cypress
var. *nevadensis* (Abrams) Little, Piute cypress
var. *stephensonii* (C. B. Wolf) Little, Cuyamaca cypress

Little, page 436



Synonyms of *Hesperocyparis arizonica*

- *Cupressus benthamii* Endl. var. *arizonica* (Greene) Mast. 1896
- *Callitropsis arizonica* (Greene) D.P. Little 2006
- *Hesperocyparis arizonica* (Greene) Bartel 2009
- *Neocupressus arizonica* (Greene) de Laubenfels 2009
- *Cupressus arizonica*

Other North American Common Names

Arizona Rough Cypress, Rough-bark Cypress, Smooth-bark Cypress, Cedro, Cedro Blanco, Cedro de la Sierra, Pinobete,

1. James E. Eckenwalder, *Flora of North America* - Vol. 2.

Species Distribution

The Sibley *Guide to Trees* indicates that there are several populations of Arizona Cypress in New Mexico, apparently using the data set used by [USDA NRCS](#). However, the United States Department of Agriculture (USDA), Forest Service (and others) provided information in the range map (preceding page) from the USGS Geosciences and Environmental Change Science Center. It indicates that the Cooke's Peak grove is the only native Arizona Cypress population in New Mexico.

There are small scattered populations of Arizona Cypress, *Hesperocyparis arizonica*, in the American Southwest. None of the populations are very large. In February 2016, I spoke with Dr. Richard Felger of the University of Arizona Herbarium about the Cooke's Peak grove. Dr. Felger was one of the premier botanists in the Southwestern United States. He indicated that the Arizona Cypress specimens from the Gila and from the San Andres Mountains in the UNM collection were from human planted trees and that the only native population of Arizona Cypress in New Mexico was the Cooke's Peak grove - and that "they were on the way out".

At p. 440 Little notes that

"Early reports of Cupressus arizonica - Greene as native in New Mexico have been questioned by recent collectors. E. O. Wootton and Paul C. Standley (Flora of New Mexico, 35-36, 1915) recorded these species from the southwestern corner of New Mexico. That was based on the specimens collected by Mearns as part of his work for the International Boundary Commission. The collection sites for those specimens are in present day Mexico."

Roger Peterson (March 4, 2022), noted that in regards to:

"Mearns' boundary collections: In the 1970s young trees of a Mexican stand came within 150 yards of the New Mexico border along a north-flowing usually dry stream just west of the San Luis Range. That shows as a dot on the border in your map. Over the decades young trees have no doubt advanced and retreated."

In 1905, Theodore F. Rixon, wrote: *Forest Conditions in the Gila River Forest Reserve, New Mexico* (USGS Professional Paper No. 39). In that publication he reported "a scattering of cypress" in Township 8S, Range 17W (p. 38), "with a scattering of cypress along the creeks" in Township 14S, Range 11W (p. 76), and "a few cypress" in Township 15S, Range 21W.

Roger Peterson (January 11, 2013), noted that Rixon's "stand descriptions seem accurate except that I cannot find the cypress, not even by looking for cones in dry stream beds (which record all the other conifers listed)."

Little noted that Posey and Goggans had

*"suggested that there may have been one widespread species throughout the Southwest. Environmental conditions changed faster than the species could evolve; thus the species has retreated to a few environmental niches still suitable for growth and reproduction. Decreased population size, geographic isolation, and different selection pressures have produced substantial variation. Some groves are now classified as different species."*²

This question, of how and why relict populations develop, is intriguing and, hopefully, will be discussed in future articles. Suffice it to say that these populations may have developed as the result of climatic (and in some cases, geologic) changes over spans of time which may be measured in hundreds of thousands or even millions of years. We may be entering an era when the types of climatic change which may have segregated these populations will cause similar actions - over hundreds of years - and we have no real appreciation or understanding of that process or its implications.

Arizona Cypress in Ash Canyon San Andres Mountains

As noted above, the population of Arizona Cypress in Ash Canyon, in the San Andres Mountains which border White Sands to the west, are believed to be introduced. Since discussions of this group of trees comes up periodically it is worth spending some time discussing it.

The question usually arises because of specimens in the University of New Mexico Herbarium collection, collected by J. Von Loh and others. Here we discuss the history of these specimens and how the determination was made that this population was initially planted by humans.

It can be difficult, at times, to determine if a specimen is native to the area in question or has been introduced by human actions. In general, if specimens are located at human habitations or areas of human activity, but nowhere else, they are assumed to be introduced.

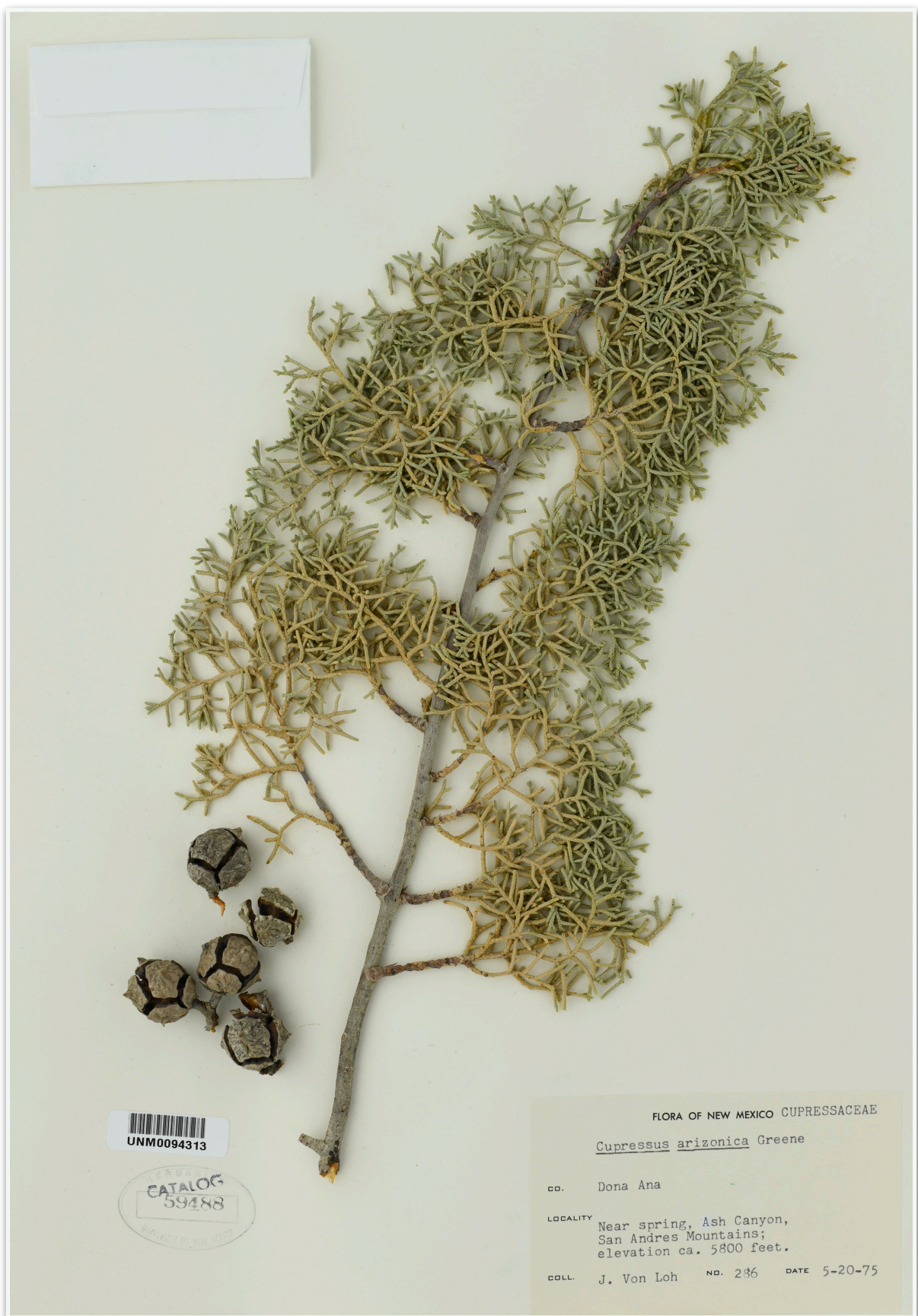
Applying this rule results in a conclusion that only the Cooke's Peak stand of Arizona Cypress is native to New Mexico, as Richard Felger concluded, (see above).

Note, however, that "New Mexico" is a completely artificial construct based on human politics. When the USGS range map is viewed, the Cooke's Peak population is simply an outlier, at the edge of the range. That, of course, has implications for the stand because of the political boundaries drawn by humans.

The specimen sheets in question, accessed via SEINet, are:

- ✦ Several specimens including #59488, collected by J. Von Loh on May 20, 1975, in Upper Ash Canyon of the San Andres Mountains (32.65744859 -106.4612695 and 32.62689887 -106.5296113 +/-15m.). See specimen sheet on the following page;
- ✦ #5309 collected by Kenneth Heil, Dave Anderson, and Patrick Alexander on September 9, 2010, at about the same location as J. Von Loh's collections (32.6355333333 -106.5465166667);

-
2. Goggans, J. F. and C. E. Posey. 1968. "Variation in seeds and ovulate cones of some species and varieties of Cupressus". *Circ. Agric. Exp. Sta.*, Alabama 160: 1-23



UNM0094313



FLORA OF NEW MEXICO CUPRESSACEAE

Cupressus arizonica Greene

CO. Dona Ana

LOCALITY Near spring, Ash Canyon,
San Andres Mountains;
elevation ca. 5800 feet.

COLL. J. Von Loh NO. 286 DATE 5-20-75

Readers of this magazine will probably recognize that "J. Von Loh", who made the original collection, made major contributions to the April 2022 issue of this magazine on butterflies. Jim noted in his Master's thesis that the trees "were introduced into the canyon some twenty years ago." That would be in the mid 1950s. On March 8, 2022, he noted:

"that was me when I was a puppy at UNM - my MS thesis is: "A Floristic Inventory of the San Andres National Wildlife Refuge, Dona Ana County, NM." (1977). I would travel in with Refuge Manager, Doyle Day and grab plant specimens like crazy while he counted desert bighorns and graded roads with a WWII surplus bulldozer . . ."



On March 14, 2022, Von Loh noted that:

"The people with the most intimate knowledge of Refuge resources then, and whom I interviewed in 1975, were Dr. Carlton H. Herbel; Research Leader, Jornada Experimental Range (Dr. Herbel maintained and allowed me access to a small herbarium collection at JER) and SANWR Manager, Mr. Doyle Day (by agreement with WSMR and NWRs, Doyle was required to accompany me into SANWR for my specimen/photography collecting trips or access would be denied - he was a treasure-trove of local and Refuge knowledge). They were my most likely sources for this Arizona cypress information."

Over the years, the trees at this site have been observed by various naturalists, Anderson, Hall, Alexander, Logan, and Allred for starters.

Ken Logan and Linda Sweanor's book, [Desert Puma: Evolutionary Ecology And Conservation Of An Enduring Carnivore](#), is based on their years of experience doing Mountain Lion research in the San Andres Mountains.

In correspondence of March 5, 2022, Logan noted that

"When we were there, that part of Ash Canyon had high puma travel, so we consistently ran a snare line there. I vaguely remember crawling on my hands & knees under the dense growth at the upper reaches of the spring flow and encountering those strange cones."

The photographs of Arizona Cypress, top right, are from Ash Canyon, by Kelly Allred. His visit to the site on November 18, 2015 was part of a larger study. At the time he described the trees as:

"there are only two large trees of about the same size, with some saplings beneath, but no other trees in the canyon or in the entire San Andres mountain range (as far as is known, but the area has been combed pretty well by various botanists and wildlife folks). The trees are at a place that used to get quite a few picnickers back in the day, and there used to be an outbuilding there. If the population were relictual, I

would expect to find other aged trees away from these two, and perhaps stumps or something to indicate other individuals. So, I cannot be sure of the provenance of these trees, and we suspect that they might have been planted by early visitors/settlers. These were popular ornamental trees back in the 30's-50's (or earlier) and we find similar sized trees on campus here and around old buildings. Of course, we cannot be sure, and it is possible that seeds were dropped by birds or spread by browsing animals.

I think all of the specimens you have seen from Ash Spring or Ash Canyon are from these same trees."

The Cooke's Peak Grove Discovery and Rediscovery

The uncertainty about origin that Allred addressed when discussing his visit to Ash Canyon was faced by Barnes and Shaw when they visited the area above Cook's Townsite and encountered outliers from the main grove.

The Cooke's Peak stand of Arizona Cypress was (most likely) first discovered by Sidney Paul Gordon, who was working for the New Mexico Game and Fish Department (Game and Fish) at the time, in about 1954.

North of Cooke's Peak there is a long sloping saddle which is crossed by an old two-track (mining or ranching) road at the north end. The cypress stand is located roughly one kilometer to the northeast of the point where the road crosses the saddle (about two miles north of Cooke's Peak).

Little mentions the Cooke's Peak site and no others in his article. He included two photographs taken at the Cooke's Peak grove in February 1956 by Sidney P. Gordon, two years after Gordon had discovered the grove (Little, pp. 441-442).

Although the location of the grove was undoubtedly known to someone, its location seems to have been lost to the common knowledge by the late 1950s.

John Hubbard noted that (January 12, 2013):

"As far as I am aware, the location of this grove of cypresses was most recently (re)discovered by Andrew Sandoval (a Wildlife Biologist with NM Department of Game and Fish) (on) September 24, 1977. I was en route in our departmental truck with some of my fellow endangered-species biologists to work a pronghorn hunt on the Gray Ranch in Hidalgo County, when we saw him driving onto the Hatch-Deming highway following his survey in the preceding range (Cooke's Peak). We spoke to him on our two-way radio and asked him if he had found anything of interest there, such as its "long lost" stand of these cypresses! He replied in the affirmative and went on to tell us where they were found, which soon led to our visiting the site on an overnight stay in upper Hadley Draw on the 28-29th. While driving up the draw on that first afternoon, I noticed an old miner's cabin beside the road, in the yard of which one or more rough-barked Arizona cypresses were growing -- leading me to surmise that it was either already there when the builder first arrived, or had been planted from local stock or its seeds.

I also remember asking Andrew Sandoval on the radio on the 24th if he had ever encountered Arizona cypresses growing in the wild elsewhere in New Mexico, and I am almost certain that he said "no." This is a man who could keep up with bighorns in the field, and had combed the uplands of southern New Mexico searching for and studying them and their habitats, former places of occurrence, and potential transplant sites for several years. This definitely included the Animas Mountains in Hidalgo County, where I had been unsuccessfully looking for Mearns' purported Arizona cypresses since November 1960 -- both on foot in the Indian, Bear, Pine, Black Bill, and Deer creek drainages, and once during an extensive aerial survey from a fixed-winged aircraft (i.e., a Helio Courier).

I first became familiar with the rough-barked Arizona cypress in the wilds of the Chiricahua Mountains of southeastern Arizona between 1957 and 1960 -- and later observed others growing in that state in such places as the Santa Ritas and north of Clifton on what used to be Highway 666, plus in the western end of the Sierra San Luis in Sonora. Meanwhile, the smooth, reddish-barked form was noticed after its having long been planted abundantly in southern New Mexico (e.g., Silver City and a few in Glenwood), and locally northward to Albuquerque and in very protected sites in Santa Fe. I have failed to find any rough-barked ones (wild or otherwise) in such places in this state as along San Francisco Valley, and in the Mogollon, Pinon Altos, Big Lue, and Big Burro ranges in the southwest."

A number of other naturalists visited the grove in the period following its initial rediscovery.

Also on January 12, 2013, Kelly Allred reported that "I went up Hadley Draw with" Tom Hamilton "back when he was working on the Cooke's Range....I do remember seeing the trees on the trip."

In a response to Allred, Hubbard notes that "You remind me that there were, indeed, old planted cypresses at the townsite."

Tom Hamilton to Roger S. Peterson and others, on January 14, 2013, summarized the email chain referenced above as:

"the only known native stand of Arizona Cypress in New Mexico is located in the Cooke's Mt. Range, associated with the peak just north of Cooke's Peak. This is just north of Deming, New Mexico. This stand only comprises about 300 acres and is located between 7,000 to 7,450 ft. elevation. From the attached picture you provided, they are clearly rough-bark Arizona Cypress. This makes perfect sense with rough-bark cypress located to the south-east at Big Bend National Park and to the west at Chiricahua National Monument (please correct me if the above is incorrect).

...My work with the cypress on the Chisos Mts. of Big Bend has shown that their cones are not serotinous as is often stated in books. The mature cones of those cypress are dumping their seeds in the fall. By mid-October ~85% of seeds had emptied out of the cones. I suspect the same will be true of the Cooke's Peak Cypress."

Replying to Tom Hamilton, Roger Peterson (January 14, 2013) identified the location of the Cooke's Peak grove as

"The eminence to the north of the saddle ("Cypress Ridge") is a long ridge with cypress all along the top (and better ones just beyond the top). Can't miss it, walking, for instance, north-northeast from the saddle. If one has binoculars and knows what one's looking for I think one can see the trees from the saddle...(later correspondence) The Cooke's Range cypresses are on both convex and concave surfaces. But, unlike in the Chiricahuas, where the cypresses in concave bottoms are a thousand feet below those on convex uplands, at "Cypress Ridge" all are in a more or less unified stand, all upland. See attachment. The attachment's "valley" of Section 13 is not properly a valley but a steep wash dry 99.99+% of the time. The biggest, healthiest trees are just north of the ridge-top, under its protection, but there are also many smaller trees on top of the ridge. ("Protection" in the Southwest usually refers, as here, to protection of soils from excessive sunshine.) Probably collectors should be warned away from planted cypresses in the old townsite in upper Hadley Draw. Likely they're from the native stand above the Draw, but we don't know."

On September 27, 2014, Tom Hamilton emailed Roger Peterson and John Hubbard noting that at Cooke's Peak townsite:

"we proceeded up on foot from Cooke's town across a slope leading to the eastern knoll of the stand...We first saw dead trees at perhaps 6,900', and then started running into live ones. They were as you described, short and stunted, a Bonsai Cypress forest at about 7,000'. Estimate approx. 40% of stand was dead. Looked like in the last 5 yrs. bad heat and drought must have hit this area. Did observe several seedlings about 12" or so tall, so some regeneration is now occurring. The trees on the north slope appeared to be in much better shape, perhaps only 10% mortality on existing trees. Of course they were taller also.



At 52:07 in the road video [at this link](#) we arrive at the location marked by the star.

The triangle indicates the approximate location of the two specimens found by Shaw and Barnes in February 2016; see following page.

The small circles indicate the locations where some of the specimens referenced here were collected.

John Hubbard

On March 5, 2022, Dr. Hubbard noted his "many fond memories flooding back into my aging but still active mind, and especially about that wonderful morning in late September 1977 when Carl Gregory Schmitt, the late Marshall Cameron Conway, and I eagerly climbed from the southernmost downside of the northerly ridge upon which we had already been able to see a few of those marvelous trees outlined against the evening skyline from our night camp just to the south in uppermost Hadley Draw! I was a mere 42 years of age, and had never been so excited to climb any mountain in this state to learn more firsthand about its biota--except possibly since my younger brother George Craig Hubbard had done so together into the western Animas Mountains by toiling up Black Bill Canyon in our state's Hidalgo County in November 1960! Even by the latter date and as an undergraduate student in biology at New Mexico Western College in nearby Silver City, I had already begun learning that there are many magical places here in the Southwest--among which certain aspects of their biological history are laid out in plain sight and merely waiting for us properly curious, respectful, and responsive human beings to stumble upon, learn about, and hopefully react to them as positively as possible for the benefit of all life in our universe!

Among the various other worthwhile things that I noted about the Cooke Range stand of cypresses on that day some 45 years or so ago, was that these trees were then growing most abundantly in three successive and northerly-located portions of said ridge--the first stand (A) along its relatively-level crest; the second one (B) on a down-tilting bench below a sheer rim; and the third (C) in a similarly-oriented bench below an even higher rim. At the top of the last stand (C), I measured a cypress that I referred to in my notes as the "owl tree" (which writings about unfortunately do not indicate why it was so-named by me!) with an estimated diameter of 3.5 feet; a measured circumference of 10 feet; and an estimated total height of 50 feet. For my tape measure, I tied a series of beargrass (*Nolina*) leaves together, which I then later checked against a yard-long ruler! Three other large cypresses that I also partly measured then in that area had circumferences of 7, 8, and 9.5 feet! I also made notes on the more-dominant vegetation of each of these three stands of cypresses that day, plus two crude drawings of them."

The trees all were *C. arizonica*, the rough-barked cypress. Some of the trunks must have exceeded 18" in diameter, regret that I did not measure that. We proceeded across the saddle but did not go up the taller western knoll...We observed two anomaly cypress sites on way down...presumed they were the same population but planted by man at some point.

On February 17, 2016, Harley Shaw and Bob Barnes found two Arizona Cypress on the high slopes above the Cooke's Peak townsite (13S 244134.48 m E 3605858.67 m N at 6570'). These trees are about one mile south and 500'-600' lower in elevation than the stand described in this article. One was a mature tree (pictured in two images at the upper right), the other was much younger and stood about ten feet tall (photographs at middle and lower right). Because the trees we found are outliers and because they are in the proximity of mining activity it is unlikely that they were part of the natural stand. This is especially true of the older tree. The younger tree was probably not planted by humans but may have grown from seed of the older plant. Whether or not these trees grew without human intervention is a matter of (informed) speculation.

The Cooke's Peak Grove

The University of New Mexico Herbarium has specimens of *Cupressus arizonica* (name change not reflected by the time of this writing) in its collection, collected by Roger S. Peterson on 24 June 1978. In private correspondence dated January 11, 2013, he states that the Cooke's Peak population of Arizona Cypress is "definitely a native stand with trees pre-dating European arrival."

The following specimen sheets, accessed via SEINet, were collected from Arizona Cypress at the Cooke's Peak site (this list is not complete). Except as noted, these specimen sheets are part of the UNM Herbarium collection. Specifically:

- ✦ the specimens from the Cooke's Range. Herbarium collection #86922 (see specimen sheet on following page), #71083, and #101047 from Hadley Draw (32.56900543 -107.7251834 +/-1138m. - T20S, R9W, Sec. 13) by Roger S. Peterson on 24 June 1978;
- ✦ Specimen #16544 of the New York Botanical Garden Steere Herbarium, collected by R. W. Spellenberg on October 28, 1977, at 32.5831 -107.7228 +/-969m - T20S, R9W, Sec. 12-13;
- ✦ Specimen #3631 of the University of Texas at El Paso Biodiversity Collections Herbarium, collected on October 8, 1978, by William H. Reed. at T20S, R9W, Sec. 13;
- ✦ and #127252 collected by Deming Gustafson on April 10, 2010, 2 miles NE of Cooks Peak, at 32.573217 -107.726267 - T20S R9W, Sec. 13.



Arizona Cypress on the slopes north of Cooke's Peak. These photographs are of the "outlier" trees discussed in the narrative to the left.



Cupressus arizonica var. *arizonica* on the ridge west of Cooke's Peak Township. Shaw and Barnes, February 17, 2016.

The significant geographic range of error given on some of these specimen sheet descriptions appears to result from the



PLANTS OF NEW MEXICO

Cupressus arizonica Greene.

Luna County: Cooke Range, T105, R9W
Sec. 13. 7050 ft. elevation.
Hadley Draw.

24 June 1978

R.S. Peterson 78-72

Near southern edge of C. arizonicus.
Juniperus deppeana-Quercus spp. stand.



UNM0094311

conversion to Lat/Long or UTM from the Range/Township location information from the specimen sheet (which is less granular).

More Recently

Some seeds from the stand have been collected and propagated. For instance, the Sooner Plant Farm and other gardening sites list a cultivar known as Cook's Peak Arizona Cypress. At the Sooner site the author states that *"I'm not sure how this plant got it's name, but it was given to me by a friend nurseryman. He said it was discovered at Cookes (Cooks) Peak, New Mexico."*

In 2010, the Bureau of Land Management published an Environmental Assessment for a prescribed fire over the entire Cooke's Peak Wilderness Study Area. The report is quite clear that the purpose of the fire is to restore grazing lands that have been "encroached on" by woody vegetation. The report notes five species of concern in the area of the proposed burn: Grayish-white Giant Hyssop, *Agastache cana*; Mimbres Figwort, *Scrophularia macrantha*; Night-blooming cereus, *Peniocereus greggii* variety *greggii*; Wright's Campion, *Silene wrightii*; and Wright's Globe Mallow, *Sphaeralcea wrightii*. Arizona Cypress is not mentioned as a species of concern in the report, although at page 16 (Section 3.12) the report states that:

"There is a small stand (approximately 70 acres) of Arizona cypress (Cupressus arizonica) located approximately 2.5 miles north of Cooke's Peak. This relict conifer woodland has been known since 1954 (Little, 1970) and was once known as the only definite locality of the species in the state of New Mexico (Columbus, 1988). Although that is no longer believed to be the case, this grove of Arizona cypress is truly unique to the area...The area around the stand of Arizona cypress would need to be protected from the burn. The stand would be evaluated to determine if the area needs to be handlined or blacklined prior to burning."

The assertion that the Cooke's Peak grove is not the only native grove of Arizona Cypress in the state is not substantiated in the report and is contrary to the opinions of the known subject matter specialists.

On November 20, 2017, Joe Malone provided this information:

"I just visited the Grove a few days ago and put up a [YouTube video](#) about it... I last visited it in 2014. The main population "hides" out from the sun under a North-facing escarpment where there are some very large trees, (very) tall . . . Aside from that, there are a few more in the wash that drains South of there, since water is really the only dispersal mechanism for cypress seeds. Likely this tree occurred more widely throughout the Cookes Range a thousand years ago and has become restricted to that small escarpment on the North side of the Ridge. Morphologically it is strange because this population has no resin glands on the foliage scales like most Arizona Cypress do and it has smooth pink bark, like the smooth bark Arizona cypress."

Questions Big and Small

The existence of the stand of Arizona Cypress north of Cooke's Peak raises several questions, some of import, some not.

Musing about the less important leads me to ask *"Why does the stand exist there? Not in terms of long-term biological trends, but rather short-term human actions."* There was a substantial amount of mining in this area from the late 1800s to the mid 1900s and there were multiple townsites in the area (some even had post offices) where the miners lived and received services. Evidence from other locales in the Black Range, and the southwest generally, is that such activities (mining/small towns) consumed wood (firewood, wood for construction) at vigorous rates, such that the areas surrounding mines and settlements were shorn of their trees.

More importantly John Hubbard wondered:

"why the noted botanical collector Charles Wright did not collect any Arizona cypresses in this mountain range, given that he and the rest of Col. James Graham's U.S. Boundary Survey party passed through this area going to and coming from the Copper Mines (or Santa Rita del Cobre) in the summer and autumn of 1851? In fact, neither he nor any other member of that survey collected any material of this species even in southeastern Arizona (e.g. Torrey, Botany of the Boundary, 1859:211), which is perhaps understandable in light of the fact that none of them appear to have penetrated its present range in that state (e.g., the Santa Catalina and Chiricahua mountains.)"

There are multiple parts to Hubbard's query. The first is probably a matter of logistics. Wright, et al., crossed over into the Mimbres at Cooke's Spring, across what is now known as Massacre Pass. This area is south of Cooke's Peak, and there are many intervening canyons between the grove (to the north) and the pass (to the south). Although he was collecting on his trip to Santa Rita del Cobre, it was not much; he was traveling - fast. He did his collection from his base in the Mimbres, at the mine, and at that point the grove would have been quite far to the south and east. Why the species was not collected in Arizona is interesting, maybe for the same reason, maybe not.

The question is pertinent and informative. Why is it that the grove was not discovered by botanist or naturalist until mid 1950? It is not that there were no naturalists prowling through the area. In [Early Naturalists of The Black Range](#) we do a reasonable job of documenting the activities in the range during this period. The answer may be more fundamental: How is it that a small area of vegetation is ever discovered? It takes a lot of work, sustained effort, and luck. As discussed below, we hope to embark on a process of documenting the negative, the absence, of the species elsewhere in the southern part of the state - a daunting task. But sometimes, documenting the presence of something can, also, be extremely difficult.

To repeat an earlier entry, Posey and Goggans

"suggested that there may have been one widespread species throughout the Southwest. Environmental

conditions changed faster than the species could evolve; thus the species has retreated to a few environmental niches still suitable for growth and reproduction. Decreased population size, geographic isolation, and different selection pressures have produced substantial variation. Some groves are now classified as different species.”²

This question, of how and why relict populations develop is intriguing and worthy of pursuit.

Summary

The population of *Hesperocyparis arizonica* north of Cooke’s Peak was first discovered in 1954 by Sidney P. Gordon. The population’s existence apparently was lost to the collective memory, although it was rumored to exist, until September 24, 1977 (or slightly before) when the grove was rediscovered by Andrew Sandoval. Since that time the grove’s existence has been generally known to specialists in the field (but a rather small group). In 2013 there was a flurry of activity centered around once again “rediscovering” the site of the grove. Most recently Barnes and Shaw have found trees of this species in the area and been near the area of the grove and Malone recorded the stand (photographs and video) in 2017.

The Cooke’s Peak grove is now considered by most, but not all, authorities to comprise the only native *Hesperocyparis arizonica* trees in New Mexico. We believe it is the only native stand in the state. There are many data bases and studies in the world; it is sometimes difficult to get them all on the same page.

At times there are reports of trees which are possibly this species, but none have been substantiated and/or found to be native.

Metcalfe’s Penstemon, *Penstemon metcalfei* by Daniela Roth

Daniela Roth is the former State Botanist for New Mexico. She routinely surveyed rare plant populations within the state. The following is a reprint (with permission) of her 2011 Status Report on this species. All images in this article are by the author.

INTRODUCTION

In 2013 the Silver Fire burned 138,698 acres of the Black Range, including the entire known range for Metcalfe’s penstemon (*Penstemon metcalfei*) (Figure 1). Prior to the fire 5 sites were known to occur within the fire perimeter (Roth 2016). One could not be located post-fire due to errors in mapping the collection location (no habitat was found at or near the mapped location). No plants were found at the type locality in Trujillo Canyon, likely due to the severity of the fire at and above this location, combined with significant debris flows and post-fire erosion caused by floods in the canyon bottom. In addition to fire severity impacts and canopy removal, much of the stream bank habitat of Metcalfe’s penstemon was significantly impacted by post-fire erosion, including stream bank scouring and incision,

debris flows and large volumes of debris deposition (Figure 2). Three sites were found to be extant, containing 18 (Mineral Creek), 20 (North Percha), and 100 plants (Cross-O Mountain). The majority of the occupied habitat of Metcalfe’s penstemon had burned moderately to severely. Although no invasive species were documented in the vicinity of any of the Metcalfe’s penstemon sites, regeneration of deciduous native woody species including aspen, Gambel oak, New Mexico locust, and chokecherry was significant and was expected to provide significant resource competition and potentially impact the recovery of extant Metcalfe’s penstemon sites. Due to the severity of fire impacts and the significant changes to the habitat caused by the fire impacts, the long-term persistence of the species is questionable.

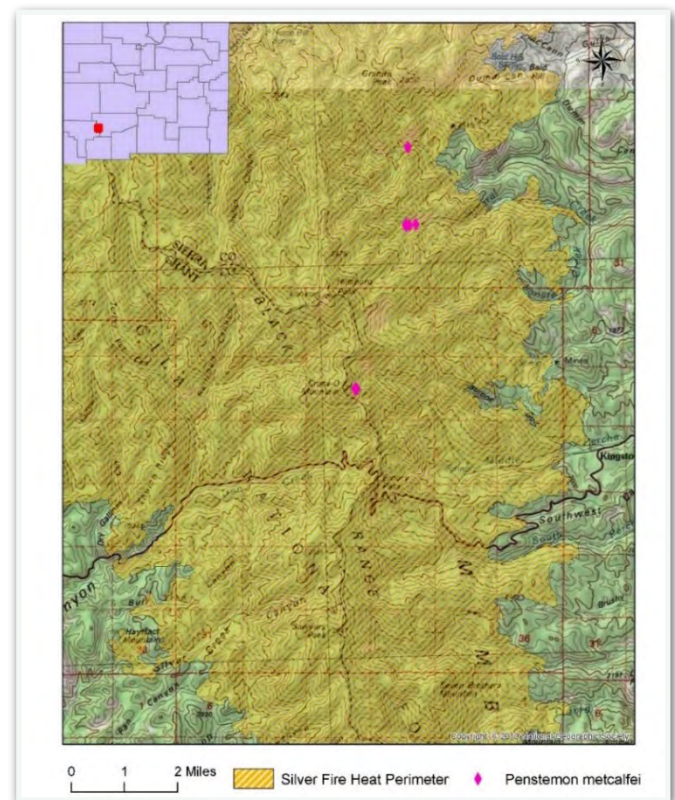


Figure 1. Post -fire distribution of Metcalfe’s penstemon in 2014

Metcalfe’s penstemon is a perennial herb in the plantain family (*Plantaginaceae*). It is restricted to the Black Range of the Gila National Forest in Sierra County. It occurs on cliffs or steep, north-facing slopes and drainage bottoms in lower and upper montane coniferous forest between 6,600 and 9,500 ft (NMRPTC 1999). Associated species include Douglas fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), orange gooseberry (*Ribes pinetorum*), alpine woodsorrel (*Oxalis alpina*), scarlet penstemon (*Penstemon barbatus*), New Mexico locust (*Robinia neomexicana*), red elderberry (*Sambucus racemosa*), chokecherry (*Prunus virginiana*), canyon maple (*Acer grandidentatum*), and aspen (*Populus tremuloides*).

In response to the 2013 Silver Fire impacts and the low number of documented extant plants Metcalfe’s penstemon was listed endangered in the state of New Mexico in 2020. NatureServe



Figure 2. Post-fire habitat condition at the Trujillo Canyon type locality for Metcalfe's penstemon, 2014.

gives Metcalfe's penstemon a global and state conservation rank of G1/S1 (critically imperiled). It is also a US Forest Service Sensitive species. The New Mexico Rare Plant Conservation Strategy gives the species an Overall Conservation Status of 'Weakly Conserved' due to low population numbers and high levels of threat, primarily from wildfire impacts.

METHODS

All three previously extant populations in the Black Range were targeted for surveys in 2021 (Cross-O Mountain, Mineral Creek, North Percha). Site locations were provided from the 2014 post-fire surveys (Roth 2016). All three extant sites are located north of HWY 152 along slopes and in drainages on the eastern front of the Black Range. Waypoints and associated data were collected with a Samsung Galaxy S2 tablet using the Collector App. Additional information was collected on the vigor, reproductive status and recent disturbances associated with the general area of occupation.

RESULTS

Cross-O Mountain: In 2021, 223 individuals were documented from 8 waypoints along the trail at the Cross-O Mountain site. Plants were rated in normal or vigorous condition, even though the area was severely burned and only a few live overstory trees remain at the western edge of this site (Figure 3). The majority of plants were flowering at the survey date in early August. Many plants were located in the immediate vicinity of the trail to Hillsboro Peak which is maintained to the fire lookout. Individual plants are impacted by trail maintenance and hiking activities (Figure 4). No other human caused threats were observed. Plants occur on steep N-facing slopes with significant

regeneration of New Mexico locust (*Robinia neomexicana*), Gambel oak (*Quercus gambelii*), mountain spray (*Holodiscus discolor*), blackberry (*Rubus* sp.), and wild cherry (*Prunus* sp.). No conifer regeneration was observed. New Mexico locust was the dominant woody species growing in the immediate vicinity and with Metcalfe's penstemon. Most woody vegetation was less than 3 ft tall, with a few up to 5 ft tall. No obvious signs of erosion were observed.

Mineral Creek: The Mineral Creek site is located approximately 3.5 miles west of the North Percha Road, just outside the boundary with the Aldo Leopold Wilderness. This site was attempted on August 11, 2021. Access to the site from North Percha Road is entirely on foot along and above Mineral Creek, which is very narrow much of the distance. Access is initially through an unburned section of the canyon via an old mining road which ends at an old mine above the canyon, ca. 1.5 miles west of North Percha Road. The road disappears shortly thereafter, and cross-country bush whacking is required to pass along steep slopes above a narrow impassable section of the canyon. In 2014 access was still possible via an old mining trail but there was no sign of a trail in 2021. The area beyond the mine was severely burned in 2013. Difficulty of terrain along with a threatening monsoon storm, 2 bear encounters, and one close call with a rattlesnake called for a retreat for safety reasons at mile 3. This population contained only 18 individuals in 2014, which is significantly fewer than reported pre-fire (100 plants). The location was severely burned in the 2013 Silver Fire. Considering the small number of plants found at this site in 2014, it is uncertain whether these plants persisted. Considering the difficulty of access, we may never know.



North Percha: The North Percha site is located approximately 3.6 miles west of the North Percha Road, inside the Aldo Leopold Wilderness. In 2014 an old mining road turned trail was still visible after the fire and regrowth was minimal. Access to the site from North Percha Road is entirely on foot along North Percha Creek, which is very narrow much of the distance. This location was attempted on August 12, 2021. The terrain was severely overgrown with willow and locust throughout the drainage, making passage nearly impossible after the first mile. Difficulty of terrain along with a threatening monsoon storm and fresh bear sign required a retreat for safety reasons. This population contained only 20 individuals in 2014 and the occupied habitat was light to moderately burned. The slopes were heavily eroded from recent flooding. Considering the small number of plants found at this site in 2014 and the close



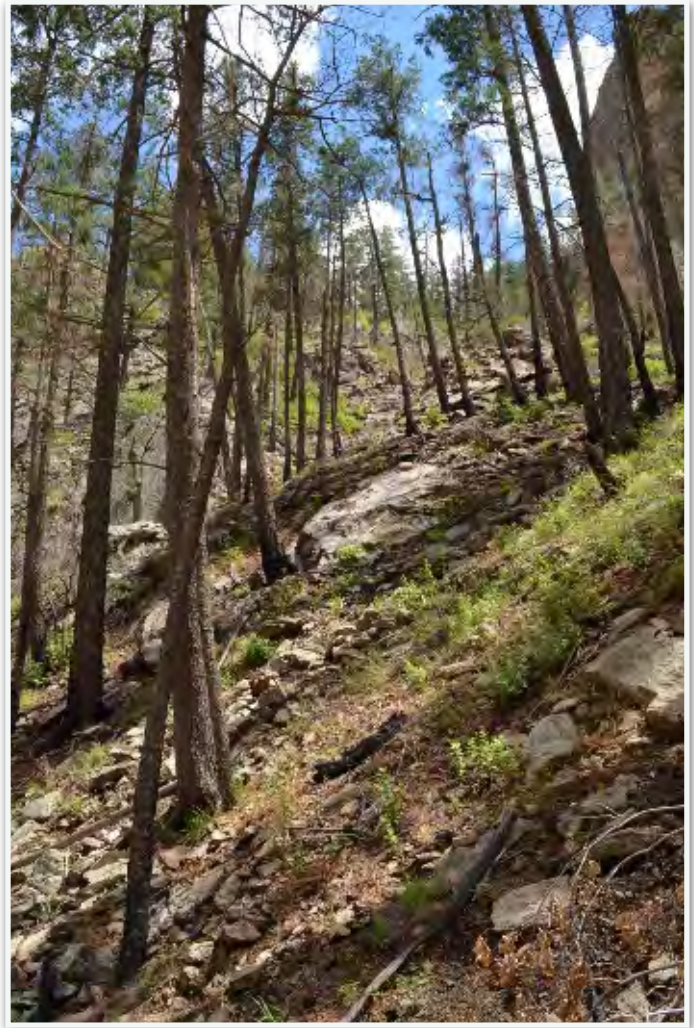
Figure 3. Metcalfe's penstemon persisting in a severely altered habitat below Cross-O Mountain in 2021.



Figure 4. Metcalfe's penstemon along the Hillsboro Mountain trail.



Mineral Creek



North Percha

proximity of plants to North Percha Creek, it is uncertain whether these plants persisted. Considering the difficulty of access, we may never know.

DISCUSSION

The Cross-O population occurs along a north facing slope just below the peak of Cross-O Mountain. It is not associated with any drainage. Therefore, this population was not exposed to extensive scouring along a streambank or debris deposition caused by post-fire floods. In 2014, 100 plants were estimated from this site, which was similar to 1999 estimates (Roth 2016). Whether the 2021 population estimate represents an increase in the number of plants is unclear. Previous estimates were taken nearly 3 weeks earlier than the 2021 estimate (8/4). Hence it is likely that not all plants were flowering during the earlier survey dates and therefore more difficult to discern in 1999 (7/14) and 2014 (7/15).

Many of the burned areas in the Black Range are returning to true wilderness, largely inaccessible to humans. Many of the trails were old unmaintained mining roads and trails, turned into hiking trails. Post-fire erosion and explosive growth of deciduous woody species, especially along riparian areas, have largely obliterated these historic trails, which are not expected to be reestablished by the Forest Service. Targeted surveys along

accessible routes during the flowering season of the species may yield additional populations of this rare species. The Cross-O Mountain population should be closely monitored for population trends and trail crews should be made aware of the sensitivity of this site. Seed collection for ex-situ conservation purposes and future population augmentation needs to be seriously considered to prevent catastrophic population losses in the future.

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Mimbres Figwort, *Scrophularia macrantha* by Daniela Roth

Daniela Roth is the former State Botanist for New Mexico. She routinely surveyed rare plant populations within the state. The following is a reprint (with permission) of her 2021 Status Report on this species. All images in this article are by the author.

INTRODUCTION

In 2013 the Silver Fire burned 138,698 acres of the Black Range, including a significant portion of the known range for Mimbres figwort (*Scrophularia macrantha*) (Figure 1). In 2014, survey results showed that Mimbres figwort was far more rare than previously thought (Roth 2016). No plants were found in previously documented unburned sites for unknown reasons, although they may have experienced consequences of some post-fire flooding. Other reasons may include misidentification and poor mapping. The majority of plants documented in 2014 were located inside Railroad Canyon, within the Silver Fire perimeter. Because Mimbres figwort appears to have a preference for growing in cool, shady areas, underneath the canopy of mixed conifer forests and along stream banks, it was feared that the species may not persist over time in the majority of documented sites on the Gila National Forest due to radical habitat alterations caused by the Silver Fire. An informal survey in Railroad Canyon in 2018 found a significant decline in the number of plants over the 2014 count (74% decline). Declines were attributed to drought conditions and post-fire habitat alteration.

DESCRIPTION AND STATUS

Mimbres figwort is a perennial herb in the figwort family (Scrophulariaceae). It is only known to occur in Grant and Luna counties of New Mexico, where it grows on steep, rocky, usually north-facing igneous cliffs and talus slopes, and occasionally in canyon bottoms along streams in piñon-juniper woodlands and lower montane coniferous forests between 6,500 and 8,200 ft (NMRPTC 1999). Associated species include ponderosa pine (*Pinus ponderosa*), pinion pine (*Pinus edulis*), Douglas fir (*Pseudotsuga menziesii*), chokecherry (*Prunus virginiana*), New Mexico locust (*Robinia neomexicana*), Arizona walnut (*Juglans major*), alder (*Alnus oblongifolia*), boxelder (*Acer negundo*), scarlet cinquefoil (*Potentilla thurberi*), Fendler brickellbush (*Brickellia fendleri*), mountain brickellbush (*Brickellia grandiflora*), James buckwheat (*Eriogonum jamesii*), mountain brome (*Bromus carinatus*), Gambel oak (*Quercus gambelii*), Mexican catchfly (*Silene laciniata*), scarlet bugler (*Penstemon barbatus*), fetid goosefoot (*Dysphania graveolens*), scarlet gilia (*Ipomopsis aggregata*), sweet four o'clock (*Mirabilis longiflora*), mountain leaftail (*Pericome caudata*), and Carruth sagewort (*Artemisia carruthii*).

Mimbres figwort was listed endangered by the state of New Mexico due to wildfire impacts and limited distribution. It is also listed sensitive with the BLM and the US Forest Service. NatureServe gives Mimbres figwort conservation rank of G2/S2

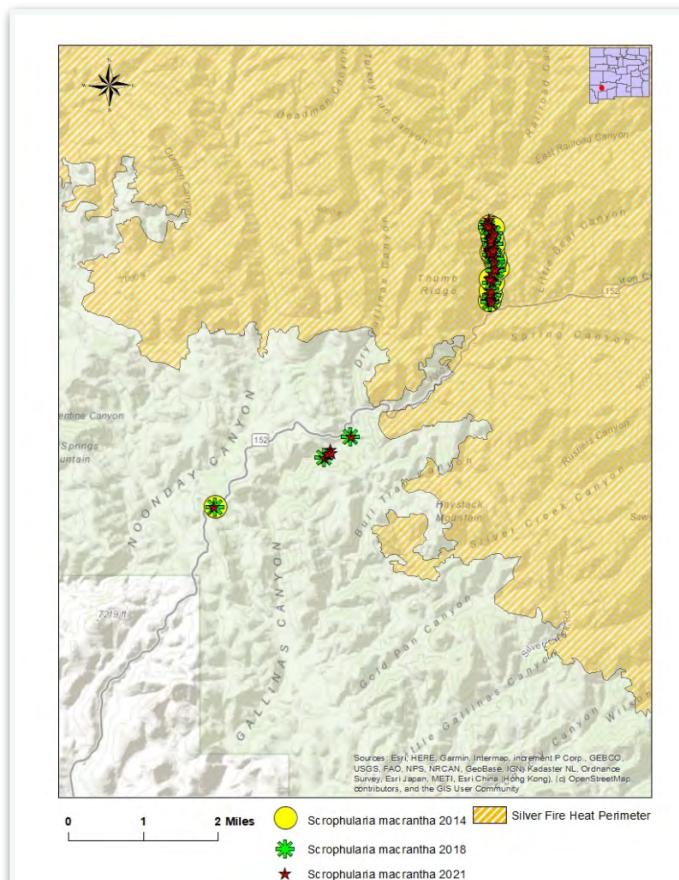


Figure 1. Documented distribution of Mimbres figwort in the Black Range, Gila National Forest.



Habitat

(imperiled). The New Mexico Rare Plant Conservation Strategy gives Mimbres figwort an overall Conservation Status of 'Weakly Conserved' due to its limited distribution and high levels of documented threats, including wildfires, mining and quarrying (EMNRD- Forestry Division 2017).

METHODS

All occupied sites in the Black Range found in 2014 were visited in 2018 and 2021, including the Railroad Canyon site which was lightly to severely burned in the 2013 Silver Fire, the unburned HWY 152 site and the unburned lower Gallinas site which could not be accessed in 2014 due to flooding during the survey period (Figure 1). Surveys were timed with the flowering period of the species, during late July and early August. In 2018 surveys were performed on 7/25 and 8/7, in 2021 surveys were performed on 8/3, 8/4, and 8/5. Location information came from the 2014 status survey (Roth 2016). Waypoints and associated data were collected with a Samsung Galaxy S2 tablet using the Collector App. Additional information was collected on the vigor, reproductive status and recent disturbances associated with the general area of occupation. At some waypoints the number of plants was estimated within the range of visibility due to the steepness of the terrain and accessibility issues.

RESULTS

Five years after the fire only 67 individuals were documented in Railroad Canyon in 2018 (Table 1). Twenty plants were



Habitat

documented along HWY 152 and 22 plants were found below lower Gallinas Campground. The lower Gallinas site could not be accessed in 2014 due to flooding during the survey period, but the creek was dry in 2018 and the historic sites were relocated and documented. In 2021, 467 individuals were estimated from Railroad Canyon, 79 plants were documented from the lower Gallinas Creek site, and 30 individuals were observed at the HWY 152 site (Figures 2 & 3, Table 1). The majority of plants were flowering at the survey dates in early August. In 2021 most plants were rated in good condition, some were rated in vigorous condition and none were considered stressed. Site

Site Name	Number of Plants		
	2014	2018	2021
Railroad Canyon	255	67	467
Lower Gallinas	N/A	22	79
HWY 152	10	20	30

Table 1. Number of Mimbres figwort plants at 3 sites in the Gila National Forest from 2014 to 2021.

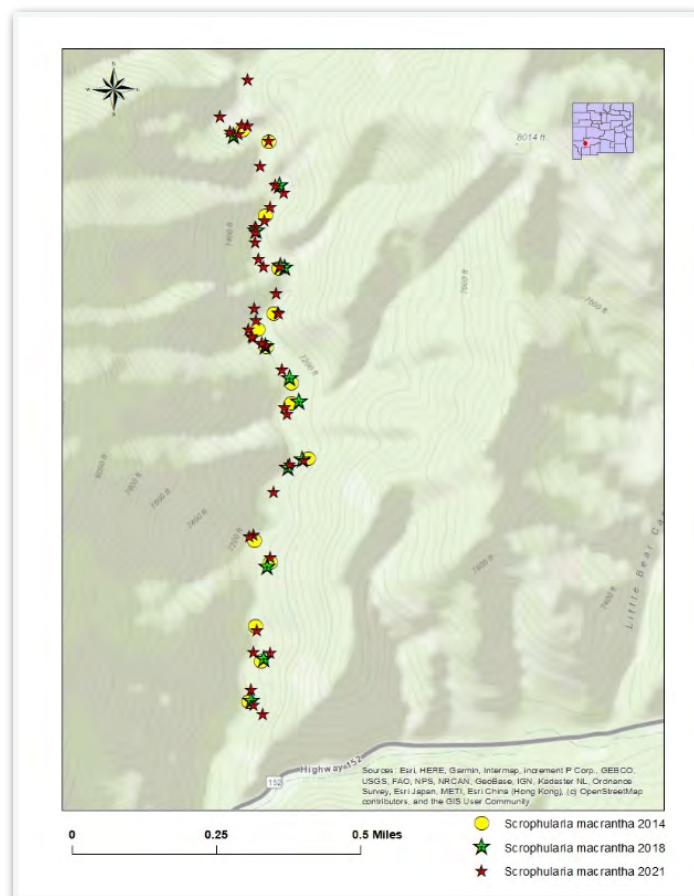


Figure 2. Distribution of Mimbres figwort in Railroad Canyon, within the fire perimeter.

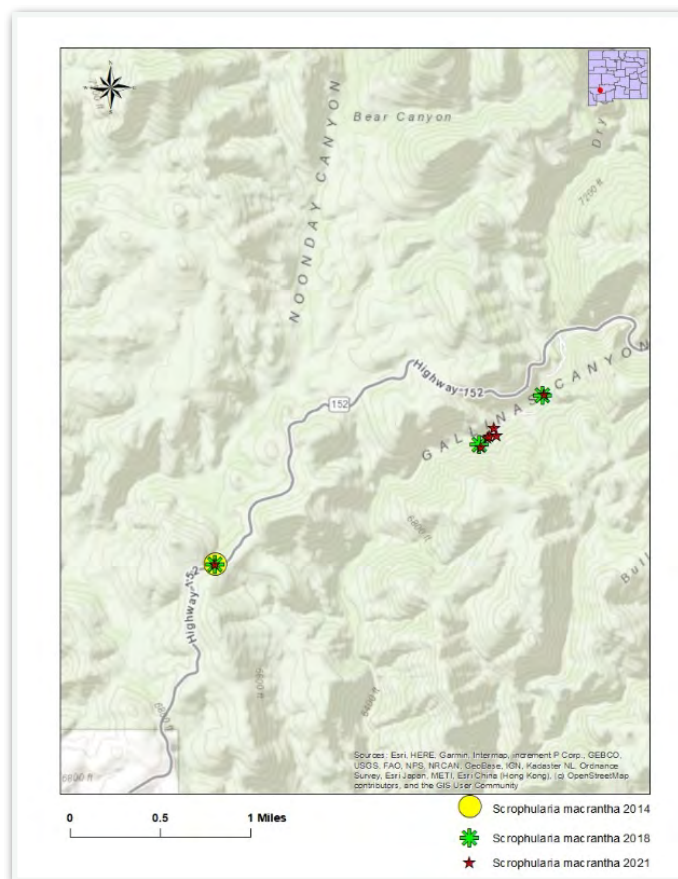


Figure 3. Distribution of Mimbres Figwort outside the fire perimeter in lower Gallinas Canyon and along HWY 152.



Figure 4. Site condition 8/4/2014, upper Railroad Canyon.



Figure 5. Site conditions 7/25/2018, upper Railroad Canyon



Figure 6. Site conditions 8/8/2021, upper Railroad Canyon

conditions had changed drastically from 2018, largely attributed to rainfall in 2021 (Figures 4, 5, & 6). In 2018 there was no water in Gallinas Creek, nor in Iron Creek, both of which are largely perennial streams, especially during monsoon season. The highest number of plants were found in Railroad Canyon during all three survey years. The majority of plants were found in the upper reaches of the Railroad Canyon sites, in habitats that burned moderately to severely in the 2013 Silver Fire.

DISCUSSION

Concerns for the continued existence of Mimbres figwort within the burn perimeter at Railroad Canyon rising from the severity of the fire and the 2018 survey results were alleviated in 2021 when many more plants were documented not only from Railroad Canyon but also from the other 2 unburned sites. The species is doing well with increased competition from other native plants that are thriving in the post-fire habitat, in the absence of an overstory tree canopy. Mimbres figwort appears to be more impacted by drought conditions than by the removal of the canopy in severely burned areas following the fire. We do not have population estimates from prior to the fire. Hence, we cannot say whether the increased number of plants represent recovery post-fire, or just an exceptionally good year for the species. Although plant numbers increased at all sites over previous estimates, including the unburned sites, indicating a response to rainfall in 2021. The nearest rain gauge is located in Kingston, about 8 miles due east of Railroad Canyon. The 30-year average annual rainfall for Kingston is 19.01 inches between October and September of the following year

(CoCoRaHS 2021). In 2018 the annual rainfall amount was only 16.58", over 3 inches less than in 2021 (19.89"). In 2014 the majority of plants occurred in the upper extent of the population in Railroad Canyon, which was moderately to severely burned with little or no overstory remaining. In 2018 only 6 plants were found in a location where previously 100 - 200 plants were documented. In 2021, 92 plants were documented from the same vicinity. It is unknown whether the high number of plants in the upper severely burned reaches of Railroad Canyon is due to fire impacts or whether population numbers were highest in this area even prior to the fire. It is likely that Mimbres figwort is a weak perennial with recruitment depending strongly on rainfall amounts. The majority of plants remain in the upper reaches of Railroad Canyon below the junction with Gallinas Canyon. It is possible that additional plants occur beyond the junction of the 2 canyons, but none have been documented at this time.

Eight years following the Silver Fire, Mimbres figwort has recovered well from the fire and is experiencing little impact from long term habitat alterations caused by the fire. It is unknown whether populations are corresponding positively to fire due to a lack of information on population status prior to the Silver Fire. However, climatic fluctuations clearly impact the abundance and persistence of this species and prolonged drought conditions brought on by climate change may negatively impact Mimbres figwort populations over the long term. Populations should be closely monitored for population trends in burned and unburned areas, and seeds need to be collected for ex-situ storage and conservation purposes.

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In March 2022, Daniela wrote: "If folks think they found new sites for these species I would recommend taking photos of the plants and a GPS point. The Gila NF is currently employing a botanist, Jim McGrath. I contacted him and he is willing to provide verification of identification. He can be contacted at james.mcgrath2@usda.gov."

Follow-Up: While Looking at Butterflies - Other Insects

Captions and photographs by James Von Loh

While gathering material for the April 2022 issue of *The Black Range Naturalist*, on butterflies, James Von Loh was able to photograph many other species of insect. The following examples, including the water strider below, indicate the range of variation found in small areas.



Water Strider.



In the photo above, a Dung-rolling Beetle has formed a ball of domestic dog scat and is moving it to a site off-trail. An unidentified species of metallic green fly extracts nutrients from the dung ball as it is rolled across the sandy trail by the beetle. Right: Dung-rolling Beetle dorsal view.





An unknown species of Robber Fly ingesting nutrients from a captured White Checkered-skipper in Fillmore Canyon.



Above: A Soldier Beetle appeared to be foraging from the wing margins of a Sleepy Orange, or at least crawling over the wings while both were at a seep. Left/Center: A Beefly/Drone Fly. Left Bottom: Beefly.

The Deer of Black Canyon

The fluctuation of Mule Deer populations has been problematic for land and game managers in the west since at least the 1880s. Assuming that humans have the ability to effectively “manage” land and game is problematic in itself.

One of the premier events in the human-ecological dynamics of Mule Deer population fluctuations occurred on the north rim of the Grand Canyon in the early 1900s. In the late 1890s and early 1900s overgrazing of the north Kaibab, by cattle, sheep, and horses, had become a serious problem. So much so that the ranchers had moved elsewhere, but not before they had depleted the deer and predator population of the area. In 1906, President Theodore Roosevelt established the Grand Canyon National Game Preserve and banned deer hunting within the area of the Preserve. At the same time, predators were hunted even more aggressively. Between 1907 and 1939, federal government predator control in the area resulted in the deaths of more than 800 Mountain Lions, 7300 coyotes, 500 bobcats, and a few wolves.

By 1924 the deer population on the North Kaibab may have been as high as 100,000. That population was significantly greater than the carrying capacity of the land, and deer began to starve. Much has been made of the population dynamics which occurred on the North Kaibab. Some authorities argue that the sudden rise in population and subsequent starvation events were due to an imbalance between prey and predator populations (no predators). Some have posited that overgrazing by cattle triggered the event. Some state that the event was due to drought conditions. Some have said that it was due to all three. Others have argued that there were other factors involved. The North Kaibab experience did lead many to reconsider how effective human attempts to “correct” complex systems can be, not only because of the inherent knowledge requirements of such tinkering but also because of human socio-economic systems that often mandate solutions which have nothing to do with the science of the topic. Market hunters, indigenous hunters, sport hunters, trophy hunters, ranchers, locals supplementing their diet, and

conservationists all came at such issues from different perspectives.

In the early 1930’s another experiment in controlling deer populations happened here in the Black Range, in an area on the west side of the Range called Black Canyon.

In 1931 the U. S. Forest Service successfully lobbied the NM State Legislature and the State Game and Fish Department to open a two deer either-sex season in the area of Black Canyon to alleviate an overpopulation of deer. As a result, 2,333 deer were killed in an area of about 100 square miles in a short special hunting season in 1931.

A report on the special hunt was written by Robert H. Stewart for the New Mexico Game and Fish Department in 1962. The events on the North Kaibab and in Black Canyon are remarkably similar. The primary actions utilized to control the deer population, aggressive culling by hunters and the reduction of cattle grazing were the same in both areas.

Much has been supposed, studied, and written about the fluctuations of Mule Deer populations in the Southwest of the United States, what is and what is not known, and the relative effectiveness of the “solutions to the problem”. We do not focus on this material extensively in this article; rather, we focus on the human dynamics and human actions which are associated with these two cases. In this issue we discuss that which has come before and that which we know now, as well as the difficulties of knowing the full picture, the inclinations by policy makers to bend to the thought of the moment and special interests, and the concepts of management and restoration. Obviously, this will be a broad brush approach, but we will attempt to provide a foundation of knowledge for those interested and point to some resources for further study.

The North Kaibab population and what happened to it is one of the most storied in natural history, the Black Canyon population is less well known, perhaps as instructive, and our own story to tell.

This is a study of how humans mess things up, struggle to understand what they did, and decide how to fix it. The first component is the easiest to

understand, it is simply what humans do. As a species driven by greed and selfishness we are not different from other species. Our efforts to understand what we did and how it came to happen is hampered by our hubris and arrogance. To use an analogy which plays out at times in the following pages, we are good at understanding some of the simpler dynamics of why the egg fell, not very good at fully understanding what we did to cause it to fall, and rather poor at figuring out what to do about it. There just are not enough “king’s men” to put Humpty Dumpty back together again. The best we can do is construct a facsimile, like calling a tree farm a forest.

Our first step is to discuss the human side of the issue, the socio-economic dynamics, from there we briefly discuss the ecological issues.

Socio-Economic Dynamics

Societies exist to allocate resources. To that end, organizations are created to control the production, access, and allocation of those resources. Those organizations may be informal or formal; they may be highly structured and complex or extremely simple and focused; and they are founded on a belief system about what the proper allocation of resources is. Not all members of a group share the same belief system and not all members have the same ability to influence the allocation of resources. Within a polity there may be various organizations vying for the same resource.

The Black Canyon, as a multiple-typed resource, provides an opportunity to examine some of the dynamics which are at play in natural resource decision-making.

In a multi-player decision-making forum, parties will often attempt to vilify those who are in competition with them for a resource. Here we will, hopefully, avoid that trap, but a candid assessment of the motivations and actions of various parties will undoubtedly be considered criticism.

Major Players

In the next section, we broadly describe the major groups involved in decision-making about the allocation of resources

in the Black Canyon. These groups are just as active in decisions about resource allocation in the area now as they were in the early 1900's. The factors influencing these groups and their relative positions have not changed in the last century.

Ranchers

When someone says "rancher" today, the assumption is that the rancher is raising cattle. In the Black Range, sheep raising played an important economic role as well. Whether you were (are) a cattle herder or a sheep herder, the desire for access to low to no-cost forage was a major component of the business model. For the Black Canyon case study, we will limit our discussion to cattle herding, because sheep herding was not a major factor in the area during the period we discuss.

Hunters

This category is probably excessively broad, but in the minds of many, hunters are all alike. Subsistence and market hunters are, for the most part, a thing of the past, but were just passing from the scene in the 1920's and 1930's, the period when the Black Canyon saga unfolded and the aftermath was felt.

Trophy hunters are separated from sportsmen in this discussion because they had different linkages to other groups.

Economic Development Entities

These groups were inclined to present two faces. In the first instance, they were (are) unabashed about their desire to exploit the resource for their (often couched in terms of "our") economic gain. In the second, they often integrated themselves with other groups, especially hunters, conservation groups, and government.

Conservation Groups

The drivers for the various conservation groups varied significantly at the time.

The General Public

Although the public was often a bit-player in these issues, the general tone of public opinion was sometimes a major consideration for all groups, except the hunters, who seemed to come to appreciate this group later than the others.

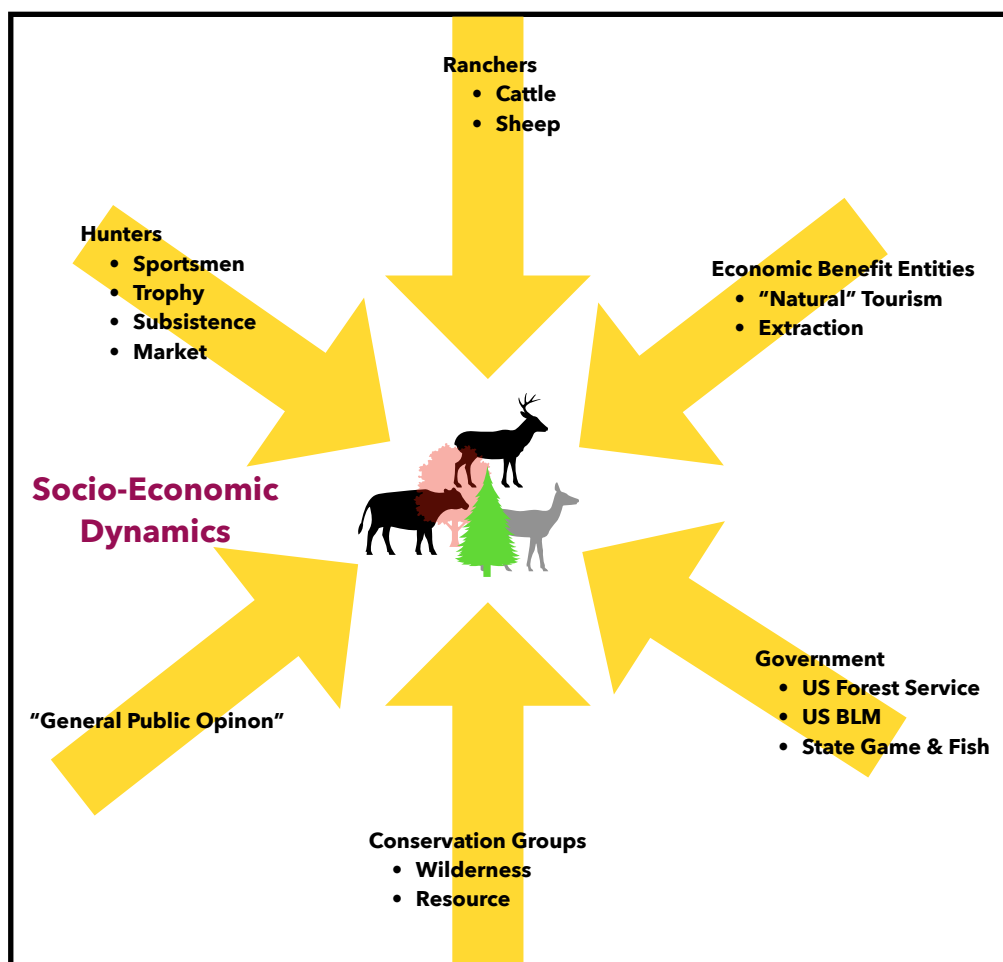
Government

In many governments the primary agents for actions are agencies with some type of local presence. Governments represent (in some form) polities

with significantly different, and often conflicting, goals. The traditional solution to this dilemma is to establish a separate organization to advocate for, and assist, the various constituents. The general populace often recognizes this technique and does so with a certain disdain, thus, agency nicknames like the "Bureau of Livestock and Mining". The nickname is meant to heap shame on the agency but actually is a fairly accurate description of the core mission of the BLM. The US Forest Service and logging are joined at the hip, and the NM

Department of Game and Fish is a major agent for hunters and fishermen. These agencies are performing the functions which have been established for them by the political forces of the nation, forces which the general public, arguably, have some sway over.

Like many other groups, the constituent parts of "government" do not see eye-to-eye because the entities that they advocate for do not see eye-to-eye.



Such groups might be driven by a desire to place restrictions on hunting, for instance, so that long term hunting would be safeguarded. Or, they might be driven by a "nature for nature's sake" mentality. This group has changed somewhat in the last century as those interested in retaining the "natural state" have gained influence.

Major Factors Influencing Group Actions and Significant Relationships

In the following discussions we hope to provide a broad overview of the interactions between these groups. It was the nature of these interactions and the relative strength of the various groups which determined the decisions which were made about the situation in Black Canyon. The relationships between the various groups was not static. There was more of an ebb and flow to how they dealt with each other; at times friends became outright enemies.

Within each group there were (are) varying opinions, and individuals sometimes acted as individuals, sometimes in support of the stated purpose of the group, sometimes not.

Ranchers

The major consideration for ranchers, then as now, is access to cheap forage. The federal land agencies have traditionally provided such access at prices significantly below market, and they have agreed to long-term use arrangements. In providing such access the agencies are performing their stated mission; it is a political decision, not an agency decision, per se.

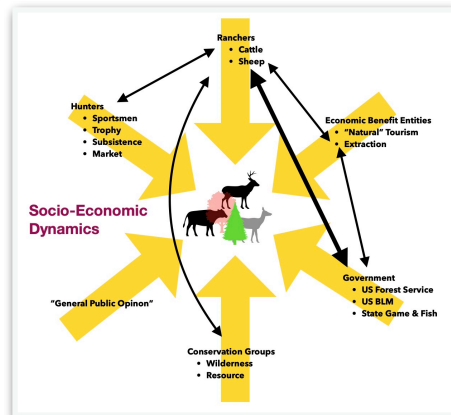
Overgrazing of the resource by cattle has been, and is, a major problem in the western United States. Economically it is unsustainable, and it is environmentally devastating. Overgrazing occurs on both public and private land. Whether or not overgrazing is more of an issue on public property than on private has not been thoroughly studied.

Overgrazing destroys the diversity of an area and in doing so changes the ecology of the area. Overgrazing may have been the most important reason that the Black Canyon deer population increased. It resulted in a major shift from grasses to browse in the Black Canyon area, and in many other places as well.

The cattle industry has always been a major economic force in the American West. As discussed later, there was a major push by the Federal Government to increase beef production during the First World War. Although wrapped in a

flag and presented as helping the war effort, the number of people eating meat did not increase during the First World War. It actually decreased: there was a lot of killing going on.

Prior to the First World War there had been efforts by some groups to limit the overgrazing of federal lands. That was swept away by war fever. Before the war the AUM's (animal unit months) allocated on the Gila had been roughly twice that allocated in the later part of the 1900s. When the United States entered the war and the Federal Government actively pursued a policy of more meat production, the AUM allocation in the Gila jumped dramatically. The pre-war allocation had been significantly higher than the carrying capacity of the land in the area, and during the war years, and the period



immediately thereafter, the allocations were catastrophically higher than the carrying capacity. This resulted in major ecological changes in Black Canyon.

Some of the hardest issues for a business entity to deal with are fluctuations in demand and change of inventory. These two factors typically result in "boom and bust" economies if not managed well, and seldom are they managed, well or otherwise.

In this case, overproduction created a "bust" and the cattle industry experienced major economic pressures in the early 1920s. And, the land had been overgrazed so significantly that its grazing potential was greatly reduced.

As a result, the demand for AUM allocations was greatly diminished following the First World War. With the pressure off, the US Forest Service began lobbying for a reduction in the deer

population so that the habitat of the Black Canyon could be restored. (We discuss the problems of this line of thought in the Ecological Dynamics section.)

Overgrazing was considered a significant issue by some conservation groups. The manner in which the federal agencies allocated natural resources led to the establishment of new agencies, like the US National Park Service, to help alleviate the concerns of conservation (recreationists and environmentalists) groups. In turn, the creation of the new agencies modified the actions of the established agencies (USFS and USBLM, in particular) as they sought to protect their niches by being more responsive to the conservation groups which were growing in influence.

The relationship between the government agencies, ranchers, and economic benefit entities was significant because of the economic multiplier effect of local production (purchasing supplies, using services, etc.). A successful cattle industry had a positive economic impact on local communities - as long as the long-term resource was not destroyed.

As with most things economic, short-term vs. long-term trends were often in conflict, and long-term considerations do not generally fare well.

For the purposes of our discussion, the cattle industry is not considered further here. It had done its damage and was not a factor in future discussions except in small interactions with hunters about the shooting of cattle during deer season and the geographically situational, and continuing, problems of overgrazing in riparian areas throughout the Black Range.

Hunters

The opinions of various hunting groups are among the most complex of the group dynamics discussed here.

Subsistence hunting was basically over by the time discussed here. Earlier in the century, encounters between European hunters and native hunters had occurred with some frequency. But in the late 1920s and 1930s that occurred much less frequently. Native hunters were often subsistence hunters and frequently

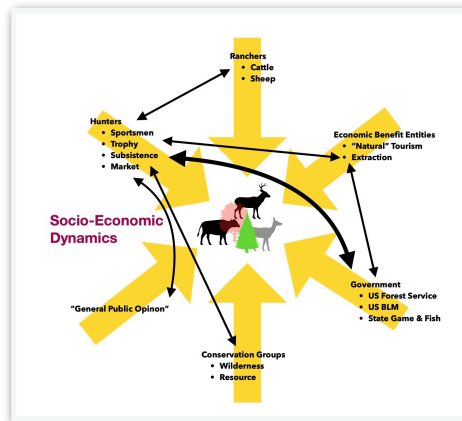
market hunters. Native populations continued to diminish and became more segregated from society as a whole. State game tag regulations, and more vigorous enforcement of those regulations, reduced market hunting significantly. A drop in demand for game meat may also have been a factor in the reduction in market hunting. In the competition between sport hunting and market hunting the sport hunters won.

Trophy hunting, in particular, and sport hunting were considered economic drivers, with trophy hunters often coming from outside the area and state. As such, trophy hunters were considered low-cost high-reward sources of income. Trophy hunters were more likely to pay for more expensive tags and were more likely to employ guides and guide services. Sport hunters were more likely to be local or from within the state and did not add as much revenue to the local economy on a per capita basis, but there were more of them. Trophy hunters and sport hunters were generally not in competition with each other.

Sport hunters, in particular, brought a different sort of demand to the system. Many, for instance, were enamored with the romantic notions of hunting, but, although they did not necessarily want it to be easy, they did not want it to be hard. Access was, therefore, a major consideration for this group. The demands of sport hunters and of ranchers for access were major factors in the opening up of the North Star road on the west side of the Black Range, bifurcating the wilderness area.

Deer hunters tended to oppose the reduction or elimination of predator control and were strong supporters of federal and state predator control programs. There is strong evidence that their position on this issue was wrong-headed, not based on fact, and even counter-productive, but that is not the issue. They tended to be against predator control.

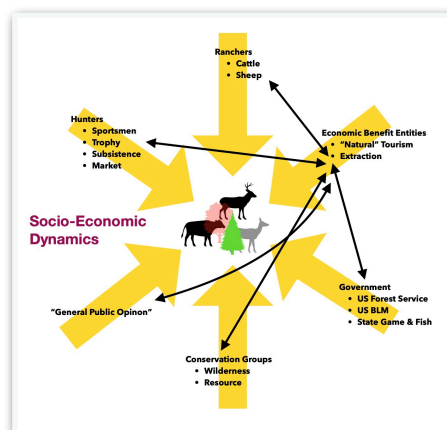
Hunters were increasingly concerned about state tag allocations, especially those allocations made to the owners of large land tracts who sold the tags to both trophy and sport hunters for use on their land. These package arrangements were often lucrative for the land owners. For those who utilized such offerings, the hunting experience was more expensive.



The status of the State's deer herds was of special concern to the New Mexico Department of Game and Fish. The perception of the Department during this era was that the deer population was depressed. In a significant way, this put them in conflict with the US Forest Service, which felt that the deer population in the Gila, and within Black Canyon particularly, was too large. The establishment of special committees, consisting of representatives of various interest groups, was driven by a desire to resolve these disagreements of fact. Once "the facts" were established the committees could go on to make recommendations about the allocation of the resource. Disagreements about the size of the deer population continued and was a major point of contention addressed (by assertion) in Stewart's 1962 report (see later).

Economic Benefits

If anything characterizes the groups covered by this umbrella it is that they did not believe in a zero-sum game. There was always more for everyone. In their opinion, if ranchers wanted a greater allocation of the resource, then



they should get it, the more hunters and tags the merrier, and roads should be built everywhere.

Whether such groups made conscious efforts to integrate with other groups or members of these other groups simply shared the same views is difficult to say. It is fair to say that economic considerations of deer hunting was a factor in the decision making process, but probably not the primary factor.

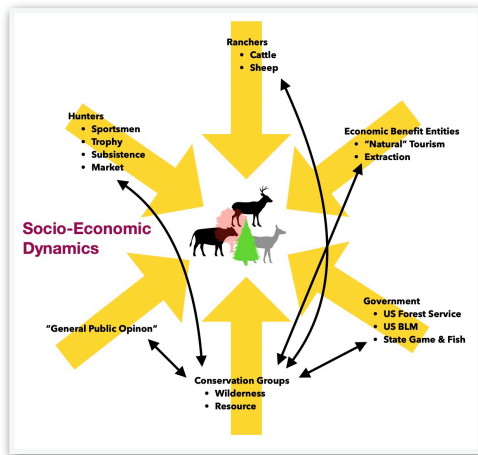
Conservation Groups

It would be a mistake to assume that the influence of conservation groups during the early 1900's was comparable to that of today or that the motivations or perspectives of those groups is the same now as then.

In general, conservation groups broke into two major categories, those interested in longer-term economic benefits and those who were interested in wilderness. The former groups were the most influential. Although there were recreationists among the wilderness advocates, much of the recreationist activity centered on hunting.

Hunting, as an extraction industry, was considered by many as a long-term economic driver. Because of this, the carrying capacity of the land had to be matched with the resource (deer) and the users of the resource (hunters). In a real sense the state game agency was the primary agent in assuring that this balance was approached, and/or, maintained. Maintaining a deer hunting resource was never a major function of the US Forest Service, but it was one of many niche functions which was supportive of the agency and thus the agency's key mission of supporting cattle and timber production. For the other major federal agency in the area, the Bureau of Land Management the calculus was basically the same except for the emphasis on mineral extraction in addition to cattle production. To the extent that hunters shot cattle they were a bother. To the extent that being the steward of public land on which hunting could occur encouraged support for the agency among hunters and the general public, that was a good thing.

The Border Game Protective Association took issue with the number of does



which were killed as part of the Black Canyon special season hunt. They were able to exercise enough influence, especially with the general public, that the New Mexico Department of Game and Fish hired Robert Stewart in 1962 *"To offset this opposition"*. Stewart's report is discussed elsewhere in this issue, not because it represented good science but because it continues to be cited (directly and indirectly) in current literature despite its many flaws. It is a document meant to justify past action.

Although the activities of groups like the Border Game Protective Association would appear to put them at odds with the hunting community, that is not necessarily the case. Many conservationists were hunters. In general, they were set apart from the "run and gun" hunters by the fact that they had a vision of what nature should look like and that vision was long-term, not limited to a season or two. This distinction also set many of the conservationists apart from the ranching community. Although some ranchers were conservationists, many, perhaps most, were focused on activity which would enhance narrowly defined profit.

Those groups and individuals which were focused narrowly on shorter term economic gain were sometimes conservationists and used that relationship to further their primary goals. However, that dynamic proved to be a two-way street and over the decades conservationists were increasingly successful in touting the economic advantages associated with their vision of nature.

Conservation campaigns were increasingly successful in swaying public opinion to be more accepting of their view and less accepting of that espoused

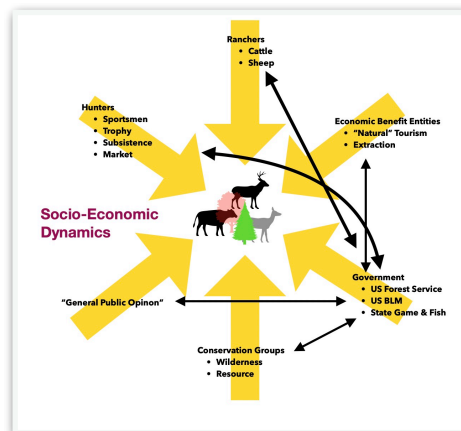
by extractive industries like mining and ranching. Within the more narrowly defined mining and ranching communities they have never been very successful in instilling their core values.

Government

There is nothing like excess to change the direction of a pendulum.

The role of government, primarily the state Department of Game and Fish and the United States Forest Service, is by far the most interesting set of relationships in decisions about the Black Canyon hunt, in part because grouping the two agencies together as if they were a monolithic entity is misleading. Before we discuss this aspect of the socio-economic dynamics, we will discuss the more general relationships.

The relationship between the government agencies and the ranching, hunting, and economic benefit communities is pretty straightforward, as discussed earlier. The government agencies were resource gatekeepers, controlling the access to resources. Today, those agencies would prefer to



use the term "steward". It would be a reach to assert that steward should be used instead of gatekeeper during the time leading up to, and for a couple of decades after, the special hunt in Black Canyon. That is not to say that there were not employees of the agencies who had a stewardship mentality; there were. They did not play a dominant role in decision making, however.

As long as there was enough resource in the West for everyone to get a big piece of pie, the relationship between the agencies and the general public was

fairly straightforward. Policing was generally restricted to trying to control poaching of timber, game, or grass (by cattle) to prevent that illegal activity from being too egregious.

In the case of the Department of Game and Fish, concern over a diminishing deer population was significant in the years running up to the special deer hunt. Without deer, they would not be able to accomplish a major part of their core mission. Diminished deer populations were likely to increase pressure on the agency from hunters, the general public, and those who believed in the economic benefits of trophy and sport hunting.

The U. S. Forest Service was facing a different set of decision drivers entirely. There was little doubt that the range in Black Canyon was degraded. The Forest Service had been a party to the degradation but not in control of their role. Ranchers wanted more range and the war provided political cover for politicians to insist that they be granted more access. The Forest Service, as a government agency, had to take the political actions specified. Overgrazing left a badly degraded range and dramatically changed the ecology of the range. Grasses became less dominant and woody plants became more prevalent. By the 1920's the Forest Service was trying to piece all of Humpty Dumpty's eggshell parts back together. But we all know that "all the king's horses and all the king's men" couldn't accomplish the task. Once you screw it up so dramatically it will never be the same again. It might be something else which is green, even dynamic, but not the same.

Because of the reduced demand for (basically) unrestricted grazing, the cattle industry was in the bust phase of boom and bust, the Forest Service reduced the level of resource allocation. The Forest Service is prone to describe this as good management practice, but it was just as likely to have occurred because there simply was not demand for the product. That suited the world view of some Forest Service personnel and they jumped at the opportunity to reduce pressure on the habitat. That is not the same, however, as an agency taking aggressive proactive decisions to reduce habitat destruction. Spine aside, some Forest Service personnel felt that

the reduction of cattle loading was not sufficient to restore the habitat. They felt that the deer population would have to be dramatically reduced as well. There is no way for us to know just how serious the increase of the deer population in Black Canyon was: There are basic disagreements about fact, the Forest Service saying the numbers were substantial, the Department of Game and Fish saying the population was not that high. The solutions available to the Forest Service were limited. Even if the agency had been inclined to reduce predator control, the hunting and ranching communities - and probably the general public (which had become acculturated to the concept), would not have supported this option. More predators would most certainly have meant fewer deer, but most ranchers have a knee-jerk reaction to any increase in predators (for whatever reason), and many hunters felt there was no such thing as "too many deer".

The destruction of the grasslands by overgrazing had enabled the encroachment of woody plants. The increase in browse and strong predator controls suited the deer population just fine. They rollicked and procreated. What they did not do was enjoy a rain shower every now and then. During this time the area experienced one of its periodic droughts, not the most significant in its history but enough to diminish the chances that the grasses would return. The lack of rain also depressed woody plant germination and reduced the ability of those which did germinate to survive. There was also an increase in the mortality of mature woody plants. Deer populations increased, food either stabilized or decreased (no way of knowing), and deer began to browse less favored

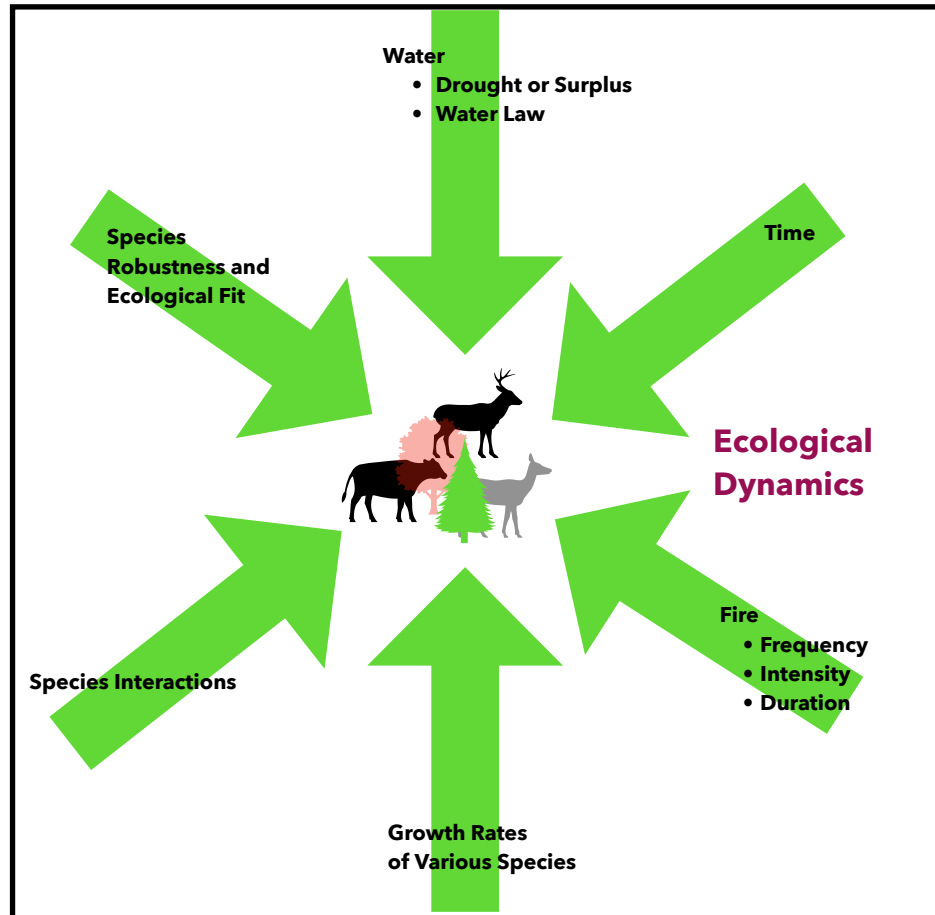
vegetation and at times starve. At the time, the Forest Service argued that the starvation was due to inordinate numbers of deer and was proof that overpopulation existed. Although this may be true in the abstract, it is not necessarily true in the absolute. It may be that the numbers of deer were not huge but rather that there simply was not food for whatever number there were. This may have been the reason the population estimates from the agencies were different. It should be noted that

point that it could not support larger populations - probably both.

The Department of Game and Fish came under significant pressure from conservation and hunting groups because of the collapse of the deer population. The Forest Service was keeping a low profile.

While the game and fish Departments in many other states enjoyed a positive (or at least a workable) relationship with the

Forest Service, that type of cooperation had not materialized in New Mexico by the 1960's when Stewart wrote his report. There may have been many reasons for this, and they may include the fact that the Game and Fish Department felt they had been forced into something they did not want to do and then left out to dry. Or, there may be other reasons. Undoubtedly, cooperative efforts existed between individual employees on topics of common interest. But the situation is especially notable given that the



the techniques used for estimating population at that time did not result in the accuracy which is more likely from such estimates today.

Due, almost exclusively, to the pressure from the Forest Service, the Department of Game and Fish authorized a special hunt in one hundred square miles (10 miles x 10 miles) in the Black Canyon area in 1931, and at least 2,333 deer were killed during a few weeks.

Afterwards, the deer population did not bounce back. This may indicate that the take was too much or it may indicate that the habitat was still degraded to the

State Game Warden (of more than 30 years) had spent 10 years in the Forest Service prior to that, working under Aldo Leopold for a good part of his Forest Service tenure.

Ecological Dynamics

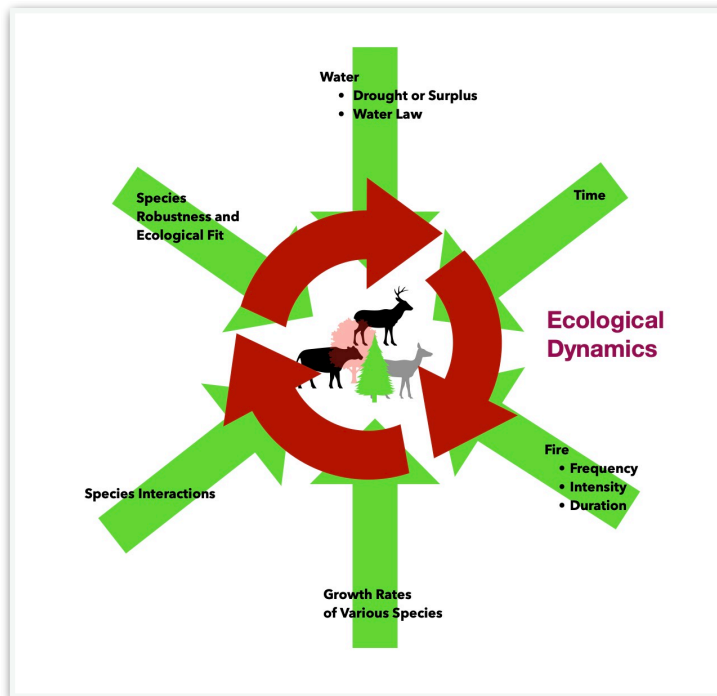
All of that swirl of human activity occurred in a system which was basically devoid of scientific input. The various committees formed at the time to determine when to do something, and what to do, were composed of representatives of various interest groups. This was true, at one point,

even of the United States Biological Survey. In general, decision making was made on expert and public opinion, neither of which was terribly informed by today's standards.

The major reason for the environmental collapse and the increase in deer population was overgrazing, but that was too hot a potato to acknowledge.

The decision-making environment on many natural history issues is much the same today. True, there is more scientific knowledge but it is often suppressed by human politics.

Humans, for all their hubris and arrogance, do not deal with complexity very well. The natural world



is complex. Natural history dynamics do not fit into sound-bite sentences very

well. Here we will not try.

It is fair to say that every element in the graphic to the left (and there are both more elements than those listed and significant nuances in those that are listed) affects every other element. At any moment, the effect may differ from that a moment before because of the timing, intensity, duration, etc. of something else happening in the system. Dynamic is the term we use and it is hopelessly inadequate. There are not enough humans to put the egg shell back together again when we break it. Best not to break it in the first place!

On the following pages we discuss several papers on deer population dynamics.

The Deer of Black Canyon - Stewart

In 1962, the New Mexico Department of Game and Fish, under the direction of Fred A. Thompson, directed a study of the deer population management effort in Black Canyon in 1931. A study of the event was performed by Robert H. Stewart. **The study** performed by Stewart is far from unbiased. In his abstract, Stewart notes that either-sex hunting is controversial and that there is "opposition" to the concept. In his introductory statement Stewart notes that the purpose of the report was "To offset this opposition". To that end, he conducted "a historical review . . . of available data on the facts up to the 1931 hunt, the special hunt, conditions following the hunt, and the present day conditions." Studies are always easier when you know the answer up front.

Putting the stated purpose of the study aside is helpful because Stewart's study remains one of the few efforts to gather information on the events which led up to, and followed, the special hunt.

The history of the special hunt is laid out in a reasonably comprehensive manner. However, caution should be exercised before accepting the conclusions (explicit or implicit) in Stewart's report.

We quote extensively from Stewart's report. These quotes are in *italic* and include the page number of the report at which they appeared (see link above for a complete copy of the report). Comments and assessments of the report are interspersed with the quotes. This analysis is found in boxed text.

Stewart starts his report with:

"A decline in range conditions due to overstocking of cattle and deer was noted by the Forest Service as early as 1922." (p. 1)

"The area considered overpopulated with deer by the Forest Service consisted of about 840 square miles. In attempting to mitigate the deer pressure the Game Department opened approximately 100 square miles in the vicinity of Black Canyon to a two deer, either-sex season . . . Two thousand three hundred and thirty-three deer were removed from

this area in October 1931. Deer in the Black Canyon special hunt area and adjacent areas declined in numbers because of the almost total destruction of the range by overuse (see sections on vegetation) until they reached a low in 1946.

Apparently the killing of 2,333+ deer in 1931, in a relatively small area, was not a factor in the decrease in deer population.

Since the special season, the general public has complained bitterly about the lack of deer in the Black Range. The special hunt of 1931 provided the public with a scapegoat. They have distorted the facts to the point that attempts to conduct either-sex hunting in the south-west area of the state are usually to no avail. In an effort to evaluate the effects of this controversial management procedure, a systematic check was made of all available data prior to the establishment of the 1931 special season and all relative data since the special hunt." (p. 4)

There is an inclination to simplify natural history dynamics throughout the report. In this case, the cause of the "decline in range conditions" is due to excessive populations of deer and cattle. Drought conditions are not included in this summary (but, at times, in other assessments in the report, they are). Major long-term droughts occurred in New Mexico during 1931-41 and 1942-79 (Waltemeyer and Gold, USGS). During 1900-1910, the decade prior to 1931, 1932-1937, and 1945-1956 (periods covered in this report), the state had droughts which had "particularly acute impacts". (New Mexico Drought Plan: 2018)

We do not assert that deer and cattle populations had no effect on range conditions, they most surely did. There were other factors at play, however. In this report there is a tendency to minimize the complexity of the situation whenever that supports decisions made by the responsible agency. This tendency should cause pause before accepting any analysis found in the report.

Starting at page 7, Stewart assesses the changes in the deer population during the historical period. Referring to Lang's study (E. M. Lang, 1957, *Deer of New Mexico*, Bull. No. 5, Dept. Game & Fish, Santa Fe, N. Mex.), Stewart concluded that "New Mexico has not always had large concentrations of deer . . . (that in) 1889 the first conservation law, a bounty law concerning predatory animals, was passed because of the seemingly continued decline in game numbers . . . (however, bag limits were not adhered to by the public, and) . . . the territorial law makers placed a five year closure on the hunting of deer, elk, antelope, and mountain sheep. In 1903 the deer season was again opened for a buck deer . . . The state deer herd continued its decline reaching its lowest ebb in 1924. By 1926 the deer herds started a comeback and their estimated population at that time was 41,000" (p. 7) (Here Stewart references J. Stokley Ligon, 1927, *Wildlife of New Mexico*, Dept. of Game & Fish, Santa Fe, New Mexico.)

In the Gila region, however, the deer population was robust. John Kerr reported that deer populations in the Gila River drainage were "peaking out"

Here, as in other places in the report, Stewart will cherry-pick data, taking Ligon as an example, sometimes Ligon is a cited expert, sometimes he does not know what he is talking about. That is probably true of all of us, our competence lacks consistency, but within the same data set the range of deviation is generally not extraordinary.

in 1922, and D. A. Shoemaker reported the same finding four years later (memorandum to District Forester, July 22, 1926).

"In 1927 J. Stokley . . . (found a deer population of) . . . 34 to 43 deer per square mile or an average of 38 deer per section" in a sample size of 10 square miles in Black Canyon. (p. 7) Range Examiner Mussey asserted that the "damage was due to the large increase in the deer population during a period of no appreciable reduction in the number of cattle."

Shoemaker, who was Inspector of Grazing by 1929, believed that Ligon's estimated deer population was conservative. At the same time, a Game Department Publication called "The New Mexico Conservationist" put the deer population in the Black Range at about 5 deer per section.

The Gila Forest Supervisor, James Scott, reported that the deer population had quadrupled between 1925 and 1929 to about 44,000 "but the greatest increase has been in what is known as the Black Canyon section." (p. 8)

In 1929, a committee "formed from representatives of the Game Department, U. S. Biological Survey, Forest Service, and the Silver City Game Protective Association" reviewed the issue and "concluded that Ligon's estimate of 38 deer per section was as accurate as any available data". (p. 7)

In 1930, Forest Service Game Specialist M. E. Musgrave stated that "Parts of the Black Canyon range are in as bad condition as that of the Kaibab and the area covered by this herd of deer is much larger in extent. Taking the area as a whole there are also more deer on the Black Canyon Range than there are on the Kaibab." (memorandum to District Forester, May 3, 1930)

During this period, the State Game Department, focusing on state-wide figures, felt that deer populations had decreased, while the U. S. Forest Service, focusing on the Gila, felt the watershed was overstocked (with deer, not cattle).

To resolve the disagreement a second investigation of the deer population was conducted in 1931. The committee conducting the investigation (with representation from many interest groups) found differing populations in different parts of the Gila and suggested that in the "Black Canyon area each hunter be allowed to take two deer..."

The State Game Commission broke ranks with the Committee and the State Game Warden, Elliot S. Barker, reported:

"On all of the ranges examined, without exception, the evidence is very plain that this country was, a number of years ago, overstocked by cattle. This, I believe, caused the destruction of the brush forage on the range more than any other one thing . . . In the Black Canyon unit there is apparently a heavy concentration of deer at the present time. Mr. Ligon does not believe that there are any more deer there now than there were four or five years ago..." (p. 9)

By page 9 of the report it is possible to ascertain the "lay of the land". There were conflicting interest groups (this was, after all, a matter of public policy) and those interest groups had different goals and perspectives, often at odds with each other. The players involved in making decisions came from differing backgrounds and held different perspectives.

What is clear at this point is that in the area of the Black Canyon significant overgrazing/browsing had occurred. The Forest Service argued that this situation was created by deer, ignoring past overgrazing by cattle. The State Game Commission was not so sure that deer were the only source of the problem, but they were under significant political pressure to do something. The landscape at that time had undergone significant degradation at the hands of humans. The image of Mogollon in 1905 (following page) is from page 267 of "The Early Days". Sheep and cattle over-grazing had degraded much of what the humans had not. Any additional pressure at the time (i.e.,

increase in deer population) was likely to have a significant effect.

Fire suppression was a good thing at the time, New Mexico State Game and Fish Department had started a small fish hatchery on the West Fork of the Gila at White Creek, and stock and allotment management was a nightmare. There was a lot going on and another variable (increasing deer populations) was not appreciated.

Ligon in 1931 noted that *"In my judgement browse on which deer feed, with the exception of the younger juniper, is showing satisfactory recovery . . . while this improvement in condition of the browse does not apply to Lower Black Canyon, even here, it seemed to me, that the oak shows an improvement . . . Just why deer are now browsing juniper so excessively on portions of the Gila Drainage is not easy to determine."* (p. 14) The "investigating committee" felt otherwise, and the Regional Forester stated that the area *"shows an over-utilization of browse plants, by deer"*. By 1932, Barker reported *"A few fawns were found that had died from poverty as was indicated by the fact that they were not eaten by predatory animals."*

At the time, some members of the investigating committee, like Walter Taylor of the U. S. Biological Survey, were reporting their concern with sheet erosion created by a lack of ground cover. The subject report attributes the lack of ground cover to the significant deer population. In 1921 the NM Department of Game and Fish had established four game reserves to ensure a *"permanent reserve supply of game"* (p. 15). One of these reserves was in Black Canyon.

During this period, Ligon *"considered predatory animals, after livestock, the most serious enemy of game conservation."* (p. 16) Federal, state, and private hunting of wolf and cougar had diminished their numbers significantly. The Investigating Committee of 1929 had suggested that predatory control programs be stopped as a way of reducing excess deer numbers. The Investigating Committee of 1931 strongly opposed this suggestion.

Deer hunting had increased from an average of 356 hunters annually (1921-1926) to 1209 hunters in 1928.



Figure 24. Mogollon, N.M., a few miles east of Alma. The slopes of the Gila National Forest above Mogollon were deforested for mining and construction timber and later for firewood. Photo by W. R. Mattoon, September 1, 1905.

Elliot S. Barker was an early employee of the Forest Service in Northern New Mexico (December 1908 to 1919). After he left the Forest Service he was a rancher and then became the State Game Warden. In 1912 he was transferred to the Carson National Forest where Aldo Leopold was Supervisor. Speaking of that time Barker said *"It so happened that Aldo Leopold was Supervisor of the Carson National Forest. Even then our avocations more or less coincided. Our thinking on wildlife, the outdoors, recreation, that sort of thing, we just hit it off wonderfully well from the very first time we met right on through. I never had the slightest trouble up there. Leopold put me to work on things I knew how to do and could do, and I did the best I could for him. I think it was the most fortunate thing that ever happened to me to be able to work under a man like Aldo Leopold, who later became perhaps the world's greatest authority on wildlife and wildlife management . . . Naturally we were having to initiate programs to put*

into effect programs of reduction of stock to the carrying capacity of the range. That was not easy to do. It caused a lot of resentment from the permittees . . . (by 1917) and the worst thing that happened to us was that we got orders from Washington to take care of just as many additional livestock as was applied for to aid the War effort, to produce meat, to produce more meat to aid the War effort. Well, it was a shortsighted policy because it didn't actually aid the War effort. By the time they got around to producing more meat the War was over . . . So at the end of the War we had more stock on than we had back when Leopold tried to reduce it, and that was a very bad situation. Some of our areas had become badly overgrazed."

From: *The Early Days: A Sourcebook of Southwestern Region History - Book 1* - Compiled by Edwin A. Tucker, Cultural Resources Management Report No. 7, USDA, Southwestern Region, 1989 (pdf, pages 203 - 214)

At this point in the report Stewart asserts that there are several causes for the significant habitat degradation which was occurring:

- ◆ The fact that the Black Canyon area is "the best deer country in the Southwest" (per Ligon);
- ◆ The area had never been intensely hunted;

- ◆ Predatory control;
- ◆ Abundance of browse;
- ◆ Mild climate; and
- ◆ the establishment of the Gila Wilderness and roadless areas.

Overgrazing by cattle was not listed as a causal factor.

For its part, the NM State Game Commission opened the Black Canyon Refuge area to hunting in 1927 and again in 1928.

The Gila Forest Supervisor, James Scott, recommended an aggressive hunting program and no adjustment to the cattle allotment.

In 1930, the North Starr road was reopened to allow greater hunter access, splitting the Gila Wilderness into parts. A special season was established within Black Canyon which allowed a take of two deer per hunter. In 1932, the Black Canyon Refuge was abolished.

Barker reported that 1684 does, 601 bucks, and 48 fawns were (officially) taken during the 1931 special season. Ligon estimated that this represented 70% of the herd and that deer killed but not taken out probably accounted for an additional reduction of the herd by 500 (but a later estimate was that this additional kill was lower).

The Border Game Protective Association felt that the number of does which were killed as part of the hunt was excessive.

As would be expected, the number of deer counted in subsequent surveys was lower. In the most heavily hunted areas, browse was not eaten as intensely in subsequent years, but in areas farther from access points there were reports of heavier browsing.

In 1922, the Forest Service's position was that the Gila National Forest "can safely carry about 56,055 head of cattle and horses and 19,415 head of sheep and goats." (United States Department of Agriculture. 1922. *The National Forests of New Mexico* [Circular No. 240]. Washington, D.C.: U.S. Government Printing Office, p. 15) A decade later the number of animal unit months per acre (AUM/acre and AUM respectively) had dropped significantly. This drop coincided with declarations of habitat degradation by the Forest Service.

The Forest Service established three study plots during the 1930's to study the availability of browse, the effect of cattle/deer on browse, and resilience of the plants. (p. 29) The study was temporally based, comparing present to past, and did not control for any factors other than the presence of cattle and deer, with some reference to horses. Each plot was 50 square feet.

150 square feet of forest (50 square feet x 3 plots) was intended to give insight into the habitat changes going on at the time. It is amazing what conclusions people reach from such a small sample.

In 1936, a Forest Service report indicated that "practically 100% of the browsing

on ponderosa pine reproduction in this area is chargeable to cattle." (p. 27)

What evidence there was, however, seemed to indicate that browse was not recovering. The study plot survey seems to have been terminated after 1938.

"Proposed management for future seasons was apparently based on proposals to offset any public objections or criticisms toward the harvesting of does rather than attempting to balance the deer herd with the carrying capacity of the range. Barker . . . in a report to the Game Commission commented: 'In my opinion a one deer season in this whole country will sooner or later be necessary and desirable. It is doubtful if any more does would be killed than in a buck season where many does are shot and left lay. The present needs are for a better distribution of hunters. Every effort should be made to get hunters to pack into the inaccessible areas where there are abundance of bucks. With a longer season and the general public sentiment against the killing of does it would be inadvisable to open a season on does in this section this year.'

Musgrave's proposed recommendations for the 1932 season were presented in a memorandum to the Regional Forester. 'Taking into consideration the depleted condition of forage plants on the two-deer area and on the surrounding ranges, the great number of deer found there

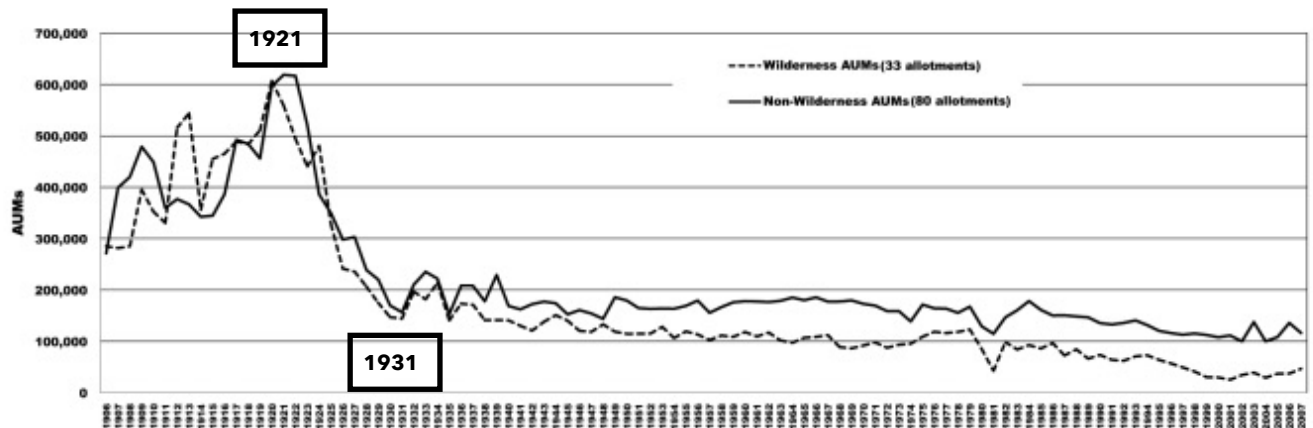


Figure 2. Total AUMs on Gila Forest wilderness and non-wilderness, 1906-2007 (Apache Forest not included).

Wilderness Designation and Livestock Grazing: The Gila Example; 2012; Ashcroft, Fowler, Beuhler, and VanLeeuwen; NMSU, Cooperative Extension Service, Agricultural Experiment Station; p. 9.

During the First World War, ranchers and natural resource agencies were encouraged/mandated to increase animal protein production to support the war effort. On the chart on the previous page, this period is indicated by a sharp rise in AUM's prior to 1921.

Following the war, the price of beef collapsed and with that the pressure to allocate forest land usage beyond its carrying capacity decreased.

There are many players involved in this dynamic and it is not possible to ascertain all of their motivations or how those motivations interacted with each other. Therefore, it is inappropriate to state that the Forest Service suddenly saw the error of its ways and reduced allocations. Or, that absent political pressure, the players who felt that overgrazing was a problem, which should be dealt with, suddenly had more latitude to push their agenda. Or, that the ranchers simply walked away from the excess allocations because those allocations were no longer financially viable. The change in AUM's allocated was probably due to all of these factors. For this assessment, the important fact is that the AUM's decreased significantly. The over-allocation of AUM's was a significant factor in the degradation of the habitat in this area, the damage was done, and it was going to take a long time to repair.

This may explain the relative dearth of finger-pointing at over-grazing as a major contributing factor to the degradation. There was simply nothing to be gained. The level of grazing was decreasing in the decade prior to the special hunt. For whatever reason, it was decreasing.

this spring, the increasing numbers of antelope on parts of this range, and the inaccessibility of the greater part of this over-populated deer range it is going to be necessary to continue the removal of a part of the breeding stock as well as the annual increase if we expect to give the forage a chance to recover. With this in mind I, would recommend that the State Game Commission permit the taking of one deer per hunter regardless of sex' (p. 30) in the Black Canyon area.

"From 1932 through 1942 management procedures consisted of restricting all seasons to the hunting of bucks. In 1943 the area was again opened to either-sex hunting. What prompted this action is not known. The seasons were again restricted to buck hunting from 1944 through 1953. Again in 1954 the area was opened to either sex hunting but from 1955 through 1959 the bag limit was one buck deer. The 1960 season allowed the harvesting of antlerless deer the last two days of the regular buck season." (p. 30)

The charts on the following pages indicate the hunting activity during the period under discussion, as reflected by the Mimbres Check Station.

In 1962, the deer population in the area was estimated to be 13.9 per section based on pellet group transects (p. 35). Such a population is roughly a third of the population estimated by Ligon in 1927 (38 per section - p. 7). At the same time an assessment was made of the annual twigs browsed by species. A third of all annual twigs were found to have been browsed along the pellet group transects. Mountain Mahogany was found to be the most heavily browsed (53.8% of annual twigs browsed), with Gray Oak (32.4 %), and Gamble Oak (27.6%). (p. 35)

In 1936, studies found that from 12.2 to 20.4% of Mountain Mahogany was dead and that 4.6 to 14.3% of oak was dead. (Ed. Assuming that the range of percentages reflects different geographic areas, but this is unclear.) Compared to a 1962 estimate that 90% of oak and Mountain Mahogany is now dead or dying with little browse reproduction. (Note 'dead and dying' vs. dead.)

Attempts were made to determine the reproduction rate and success of deer in/about 1962. These efforts concluded that when there was better browse and that successful reproduction rates were higher.

Stewart concludes that hunting pressure in the area had stabilized based on a weighted average of the recorded years 1940 - 1954 (based on table 2, following page). He stated that hunting pressure could only be "increased by offering the hunting public some type of additional inducements." He goes on to conclude that the present day harvest records

(1960) show a sharp decline in deer kill when compared with the period of 1939 - 1954. (p. 37)

Sometimes truth is a function of the data set being used. Arguably, Stewart's assessment considers only changes since the hunt. However, by not including the data from earlier years which, were not only readily available but found elsewhere in the report (in Table 1 and the narrative), the assessment is skewed significantly. This is a separate issue from the methodology used in the analysis and the conclusions reached.

Stewart's "Discussion and Conclusions" supports the stated objective at the beginning of the report. It concludes that : "1 + 1 + 1 = 17". Or to put it another way:

"A decline in range conditions was first reported by the Forest Service in 1922 and this decline was substantiated by numerous surveys conducted from 1926 through 1936. The decline was further documented by the Forest Service through vegetative enclosure studies, which in 1936 indicated up to 20 percent of the mahogany and 14 percent of the oak was dead. Current studies by the Department show up to 90 percent of the oak and mahogany is now dead or dying.

The deer herd, from 1927 through 1960, has shown a decrease of 65 percent and this decline could be as high as 90 percent. From the foregoing material presented in this report the apparent cause of the decline can be attributed to the loss of the staple deer foods, mountain mahogany and oak. This loss was due to a combination of factors such as overuse by deer and livestock compounded by years of low precipitation which apparently induced plant diseases and parasitic infestations. As a result of the loss of the bulk of the deer food, the deer herd had no alternative than to be reduced by natural causes to a point where the deer herd reached the maximum number the range could support. (p. 37)

The interpretation of the 1931 hunt data by various individuals who conclude the special hunt nearly eradicated the deer herd in the two-deer hunt area as well as the Black Range is not supported.

Table 1. Harvest figures 1921 through 1928, Mimbres Station.

Year	Harvest	Number of Hunters	Hunter Success
1921	131	473	29.2
1922	203	423	48.0
1923*	145	322	45.0
1926	155	210	73.8
1928	530	1209	43.8
1929	614	1196	51.3

*Records from the Border Game Protective Association, Deming, N. Mex. (1923).

Page 18 of the subject report.

Table 2. Deer Harvest Mimbres Check Station 1932 through 1960

Date	Harvest	No. Hunters	% Hunter Success
1932	-	-	-
1933	-	-	-
1934	-	-	-
1935	-	-	-
1936	-	-	-
1937	187	742	25.2
1938	226	645	35.0
1939	312	804	38.8
1940	330	1005	32.8
1941	409	1106	36.9
1942	339	850	39.9
1943*	1106	1455	76.0
1944	-	-	-
1945	425	1943	21.9
1946	425	1679	25.3
1947	248	1386	17.9
1948	259	1264	20.5
1949	254	1317	19.3
1950	229	1350	16.9
1951	236	1297	18.0
1952	210	1577	13.3
1953	246	1227	20.0
1954*	350	1215	28.8
1955	-	-	-
1956	-	-	-
1957	-	-	-
1958	-	-	-
1959	-	-	-
1960**	113	1392	8.1

* Either-sex hunting in effect.

** Last two days of season open to either-sex hunting.

Page 34 of the subject report.

The special hunt area according to Barker constituted but two percent of the entire hunting district . . . of which not more than 50 percent was accessible to the hunter. Therefore, it would hardly be possible to exterminate a deer herd through a controlled hunt by hunting one percent of the entire hunting district. Furthermore to conclude 70 percent of the deer occupying the hunt area were harvested (Ligon, 1951b) is unlikely. Heavily hunted either-sex areas in Colorado, Piceance-White River herd, and in Utah, Fishlake herd, show removals of only 17 and 33 percent of the base herd (Robinette, 1956) while the heaviest hunted deer herd in New Mexico, Capitan herd, shows only a 20 percent removal (Stewart, 1958).

Prior to the establishment of the Gila Primitive area in 1924, accessibility to the various portions of the Black Range would have to be considered as good. With the creation of the Gila Primitive area that part of the Black Range south of Black Canyon was virtually rendered inaccessible. The establishment of the Black Range Primitive area in 1951 and the Gila Wilderness in 1955 provided additional access as corridors between the primitive areas and the wilderness area were established for the North Star and Copperas Canyon roads, but any ranch, logging or mining road within the primitive or wilderness areas were unusable. It is therefore doubtful if hunting could even be considered a limiting factor during the past 35 years because of limited access afforded by presence of the primitive and wilderness areas.

1954 the season bag limit from 1922 through 1961 has been one forked-antlered buck.

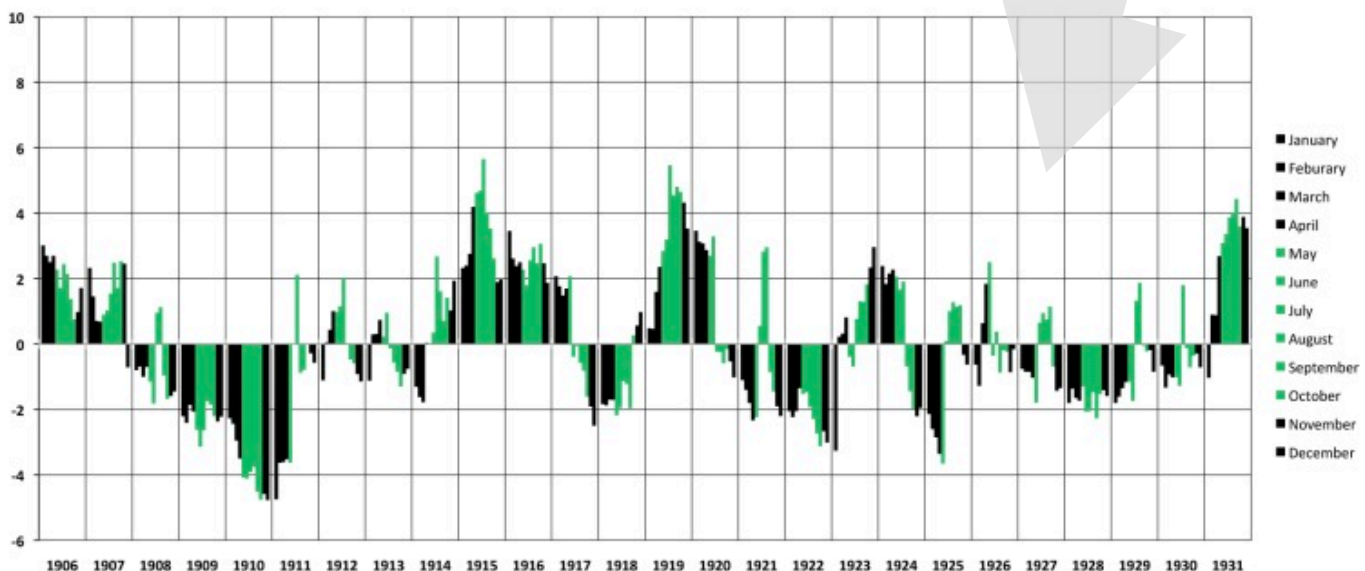
The present attitude of the hunting public is strictly against the harvesting of antlerless deer, since the hunting of does and fawns is considered the major factor limiting an unrestricted deer population. It is apparent the hunting public is in need of an educational program in range management.

Improvement in range conditions through accomplishment of reproduction in the major browse species is the only method whereby deer populations may be substantially increased. To accomplish this, further reductions in deer and cattle numbers are required to improve future range conditions on the present basis of evaluation." (p. 38)

Another "slice and dice" issue. As noted on page 1 of the report, the special hunt area was 100 square miles of the 840 square miles identified by the Forest Service as problematic.

Check station records from the Mimbres station also verify that hunting can hardly be considered a limiting factor. The data show hunting pressure has increased gradually from 1922 through 1943 and then remained fairly constant through 1960. Harvest records reveal that only twice from 1922 through 1960 has the recorded kill exceeded 1928's harvest of 530 deer, this being in 1931 and 1943 when 2533 and 1106 deer were removed. These two seasons allowed the harvest of both sexes. The 1960 kill of 113 deer was the lowest recorded kill even though the taking of either-sex was allowed the last two days of the season. With the exception of 1931, 1943, and

The Palmer Drought Severity Index (PDSI) is used to determine drought severity and in many Drought Contingency Plans it is used to trigger certain actions. Here, we show the PDI record for the period leading up to the 1931 hunt. With the exception of the 1924 water year the decade before the hunt was very dry. This, undoubtedly, was a contributing factor to the poor state of browse during the period, both in terms of the reproduction success of browse but also in terms of changes in deer behavior the drought conditions may have triggered.



Overall Assessment

What is it that we are supposed to make of this report.

Firstly, Stewart has (apparently) done a yeoman's job of gathering some of the historical factoids which might otherwise be lost.

Secondly, the bias in the report was probably driven by the desire of the Department of Game and Fish to address criticism which was directed at it for the 1931 special hunt and to assure that "opposition" did not affect future programmatic determinations or Department latitude. The degree to which the report reflects Stewart's personal bias cannot be determined with the information at hand.

And, thirdly, through all of the muddle and the self-justification several things are clear:

- ◆ The perspectives of interest groups influenced the report directly and the decision making which occurred in and around the time of the hunt.
- ◆ These interest groups were reflected directly in the makeup of the two special investigation committees and in the positions of agencies and agency personnel. (It is important to remember that positions of agencies and agency personnel are not always the same.)
- ◆ Some significant factors (which for the most part were not within the control of the operating agencies) were not addressed directly or were only considered obliquely. For instance, the overstocking due to the war effort and the subsequent collapse of the cattle market were not directly addressed in the assessment of the habitat damage which occurred and the subsequent "change of position" which the Forest Service exhibited as it reduced grazing load. Nor was the long term effect of drought given its due. Even when there are not other externalities, vegetation recovery from a diminished state is much more difficult under drought conditions.
- ◆ The deer population was directly affected by predator control policies and that these policies were driven by interest groups (especially the cattle industry).
- ◆ Given the degree of habitat degradation and drought conditions

the reduction in AUM's during this period was not sufficient to enable habitat restoration. The reductions in AUM's occurred during the decade prior to the hunt, but not all at once. The cattle pressure on the habitat was still three times what it is currently within five years of the habitat assessment by the Forest Service.

- ◆ Increases in deer population created by predator control and (most likely) a reduction in competition from cattle made habitat restoration more difficult and perhaps impossible.
- ◆ Human meddling had created an untenable situation and a major cull of the deer population was probably due in 1931.

This report should give us pause for three reasons: 1) institution driven "science" is sometimes not science; 2) public policy driven by groups consumed by self-interest is seldom good public policy; and 3) humans often overrate their knowledge and their role in complex systems.

It is easy to criticize someone's efforts decades after they occurred. There is no way of knowing the limits on information which Stewart faced nor the pressures he may have been under to deliver a particular type of product. That is a fact. It is a fact which should be acknowledged in the assessment of the final product (subject report). It does not, however, change the inadequacies of the report.

In 1997, Harley Shaw wrote a paper on Mule Deer mortality on the North Kaibab for a [Deer/Elk Workshop](#). We reprint it next to demonstrate the complexity of just one facet of the issue. The substance and tone of this work are markedly different from those of the Stewart paper. Not only had survey techniques improved in thirty years, but the nature of the paper is different; justification by Stewart vs. education by Shaw. Our

knowledge and the techniques used to acquire it have continued to improve since that time. See the [WAFWA](#) website.



What is this all about?
Photographs by Matilde Holzwarth



The North Kaibab Deer Herd 1968-1983: The "Research" Years

by Harley G. Shaw

Abstract: The North Kaibab mule deer herd declined from approximately 15,000 to 5,000 deer between 1966 and 1976. The cause for this decline is unknown. A study of deer mortality, combined with an assessment of mountain lion numbers, began in 1977. The deer herd increased rapidly in size after 1978. This increase was due to concurrent occurrence of buck-only hunting, improved precipitation, declining mountain lion numbers, and reduction of cattle. No one factor can be clearly implicated as the cause of either the decline or of the subsequent deer herd recovery. This overview illustrates the insufficiency of reactive, short-term research and supports the need for long-termed monitoring of deer populations, along with major factors that may create fluctuations in those populations.

INTRODUCTION

Swank (1998) has summarized the history of the North Kaibab mule (*Odocoileus hemionus*) deer herd to about 1968. As we can see from his presentation, calling the 1970s the research years is somewhat of a misnomer. Field studies of the Kaibab deer herd began in the late 1940s (Kimball and Watkins 1951, Diem 1954). Ryan Station was built in 1952 as a base for a biologist assigned to work on Kaibab deer, and Ken Diem initiated studies. Following Diem, John Russo took over work on the Kaibab and produced the first major publication on that herd (Russo 1964). After Russo's work, studies evaluating the effects of juniper eradication on Kaibab deer were carried out by McCulloch (1967).

The years surrounding the decade of the 1970s are significant on the North Kaibab, because an unexpected decline

in deer numbers occurred in spite of intense management of the herd through the 1950s and early 1960s. Between 1966 and 1976, the estimated herd size dropped from 15,000 to approximately 5,000 (Fig. 1). Arizona Game and Fish Department responded in 1977 by switching to buck-only hunting and initiating an intense research effort to identify the factors suppressing the herd. In 1979, the deer population began to increase, and by 1984, it was approaching numbers similar to the pre-1966 levels.

The mortality study, extending from 1977 to 1984, involved 5 years of intensive radiotracking the deer (Barlow and McCulloch 1984, McCulloch and Brown 1986, McCulloch and Smith

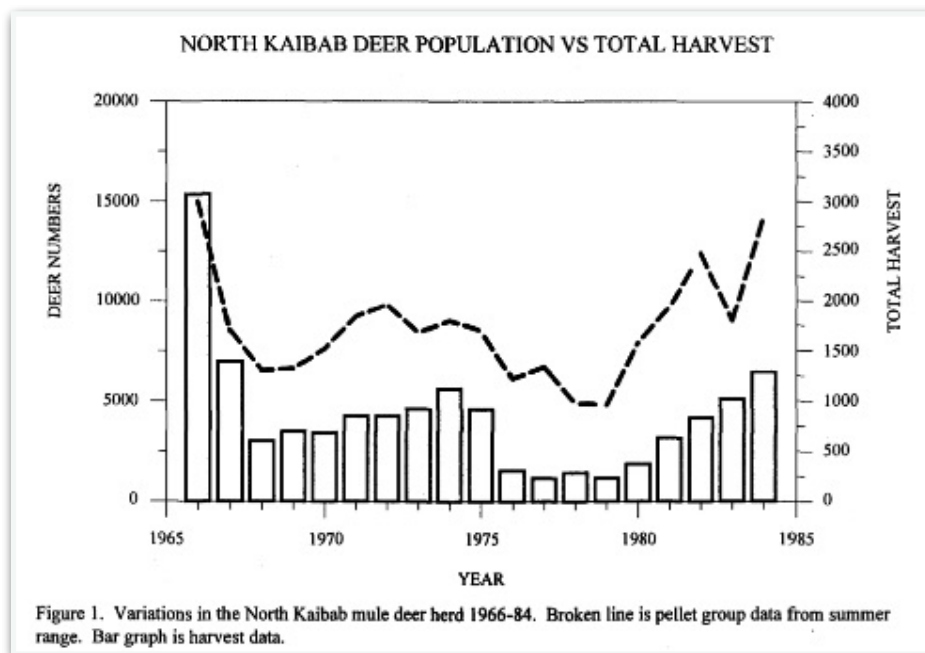
been monitored and related to fluctuating deer numbers.

The Initial Decline

The cause of the decline in deer numbers from 1966 to 1976 is unknown. Drought and increased predation, particularly by mountain lions, were implicated (Barlow and McCulloch 1984). Legal harvest was considered to be a small portion of the total mortality during this period (McCulloch and Brown 1986), but high any-deer harvest in 1967, combined with then unsuspected increased natural mortality, may have helped to accelerate the decline (T. L. Britt, Arizona Game and Fish Department, pers. commun.).

Harvest Effects

In 1967, two 10-day any-deer hunts, with 4,000 permits allowed for each hunt, were held on the North Kaibab. This was in response to estimates of an increasing number of deer on the area and was intended to stabilize the herd below carrying capacity. In spite of the relatively large number of permits and long season, the harvest was 1 of the lowest experienced before that time. Extremely heavy snows occurred throughout northern



1991), documenting causes of death, and a 3-year study of mountain lion (*Felis concolor*) densities and predation on the Kaibab Plateau (Shaw 1980). I do not intend to review in detail the results of these various studies. Rather, I will summarize events occurring on the Kaibab between 1966 and 1983 and provide an overview of the factors that potentially affected the herd.

A variety of factors affect the Kaibab mule deer herd at all times. These include harvest rates, predation, disease, climate, and competition with other herbivores. These factors can cause direct mortality of deer or they can affect fawn production of the herd. At no time in the history of Kaibab deer herd management have all of these factors

Arizona during December 1967. The winter range of the Kaibab received 1-2 feet of snow within a single week. However, the deer hunts were over before these snowfalls occurred. Thus, a sudden decline in deer numbers had apparently occurred between 1966 and 1967, before the hunting effort was increased and prior to the 1967 snowfall.

The total harvest of deer through the 1970s parallels fairly closely the estimated deer herd based upon pellet group data (Fig. 1). The extremely low harvest from 1976 to 1980 reflects both the low deer numbers and a shift to buck-only hunting in 1977. Buck only hunting was initiated just before the

deer herd began to increase in 1979, and the cessation of doe harvest must be considered as a possible factor in reversing the deer decline. However, deer harvest amounted to less than 15% of the total mortality during the period of 1972 to 1978 (McCulloch and Brown 1986), hence cannot be considered the only factor suppressing the herd during that period (Fig. 2). Mortality due to hunting made up an even lower portion of total mortality during the period of herd increase after 1978. Based upon these data, hunting cannot be considered the cause of deer decline or suppression in the 1970s.

Productivity

Post-hunt fawn:doe ratios do not reflect the decline in deer populations, nor do they explain the apparent continued low population during the 1970s decade (Fig. 3). While fawn survival rates, based upon classification counts, tend to be lower throughout Arizona than they are in states further north, a ratio of 50 does per 100 fawns is generally considered to be adequate to sustain a deer population under normal conditions of adult mortality. With the exception of 1978, fawn:doe ratios remained above 50%, with only three years dropping below 60% (Fig. 3). Ratios were actually more stable during this period than they were during the 1960s, when the herd increased. It must be noted, however, that deer classification data were gathered from helicopters during the period from 1971-74, and McCulloch and Smith (1991) rejected helicopter surveys for this period. They were mainly critical of the buck:doe ratios gathered by aerial surveys, however. Fawn:doe ratios for the years that helicopter surveys were used are included here.

Precipitation

McCulloch and Smith (1991) have provided an in-depth analysis of the relationship of weather to the North Kaibab deer herd. Fluctuation in deer numbers was found to correlate with cumulative precipitation beginning as early as three years prior to a given year. Data for the October to September water year preceding the deer herd estimate (Fig. 4) suggest that 1966 through 1977 was a period of water deficit, with 8 of 12 years having precipitation below the long-term average. This pattern changed

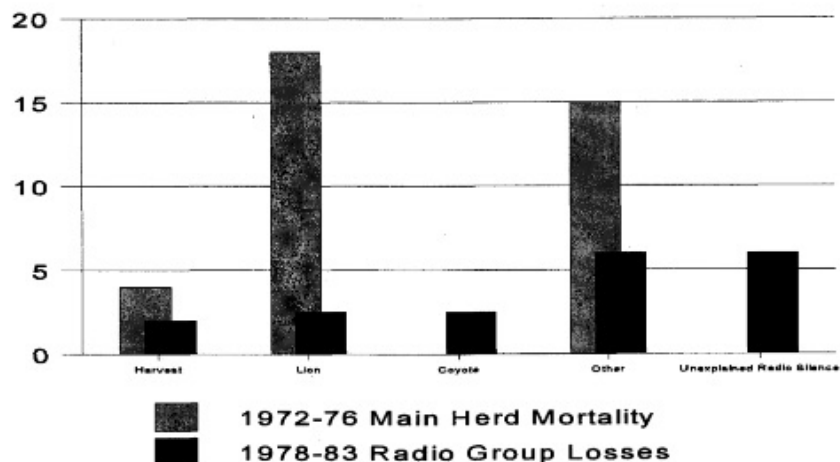


Figure 2. Mortality sources for does older than 12 months in the North Kaibab mule deer herd during the period of deer decline (1972-76) and during period of herd increase (from McCulloch and Brown 1986). Mountain lion mortality data for 1972-78 are based upon an extrapolation from the mountain lion population estimated in 1977 and may be unrealistically high. Lack of mortality due to coyotes during this period is also unrealistic. Mortality figures for 1978-83 are based upon mortality rates of radiomarked deer.

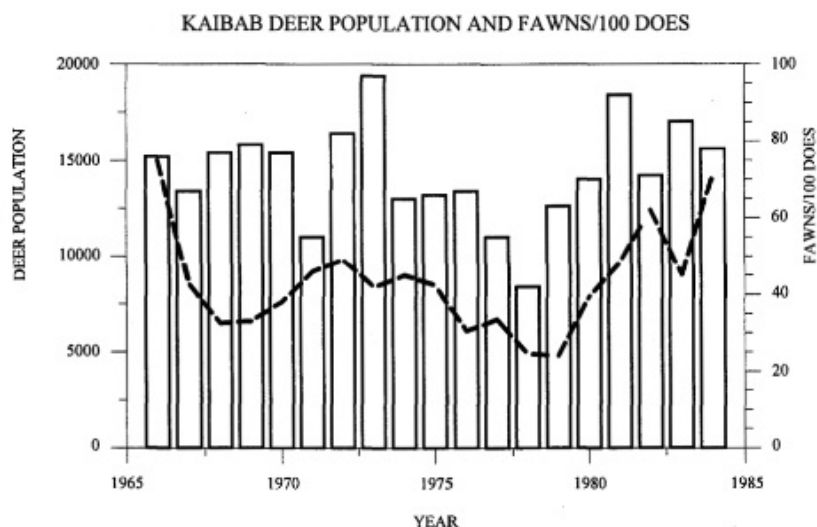


Figure 3. Fawns:100 does (post-hunt surveys — bar graph and population estimates based upon pellet group surveys (broken line) for the North Kaibab deer herd 1966-85.

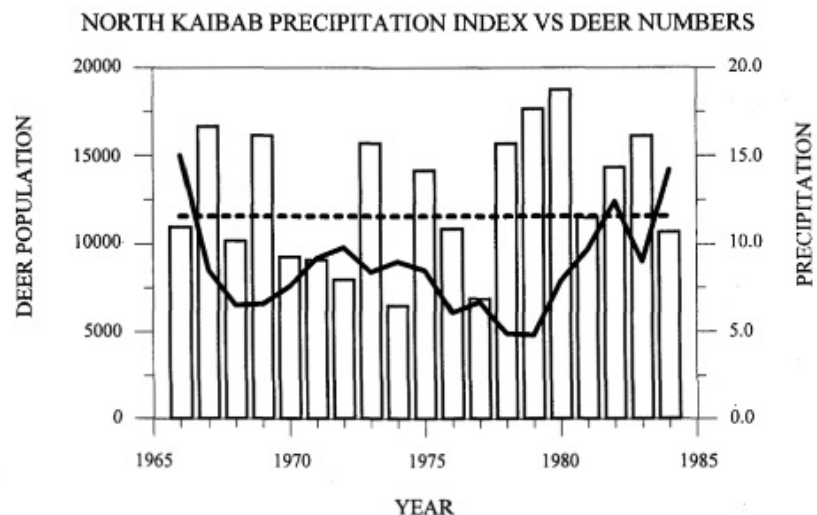


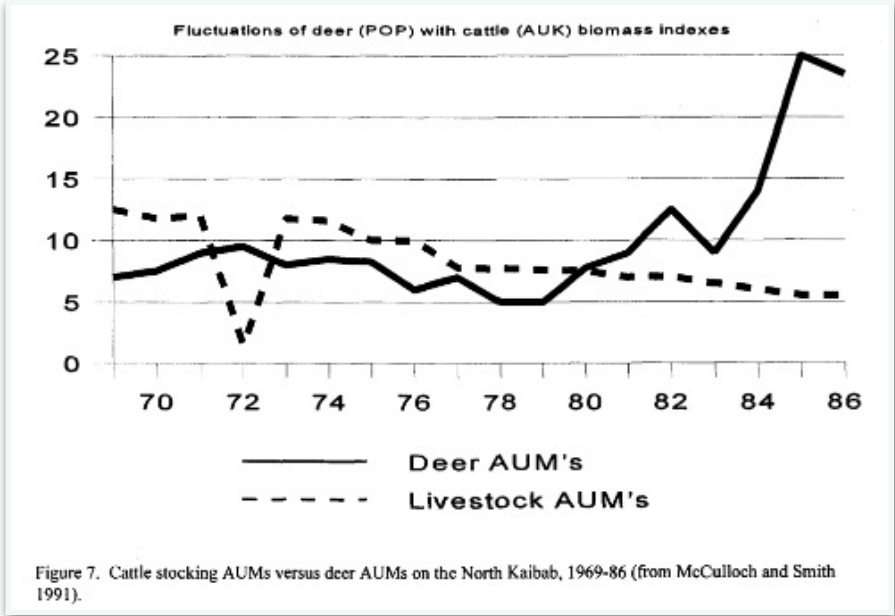
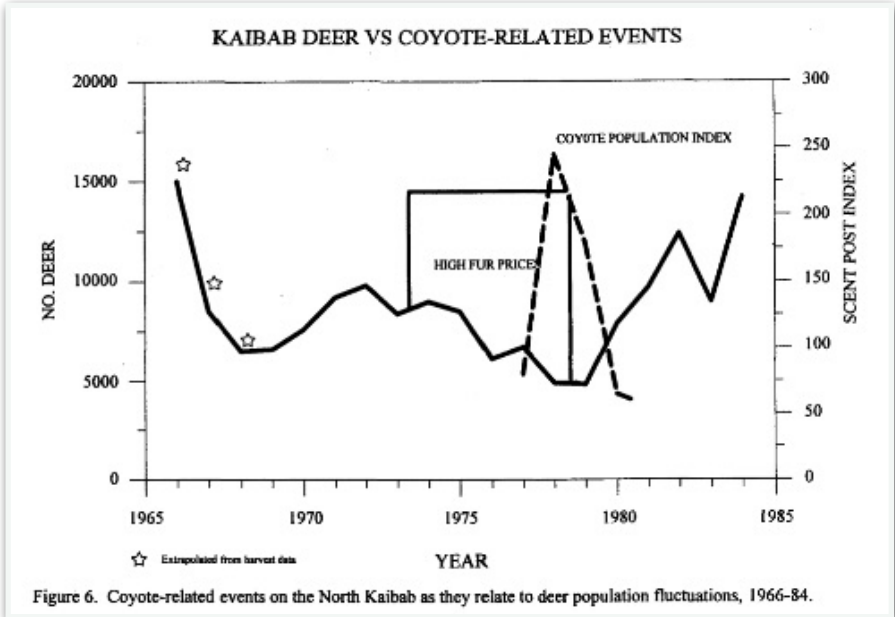
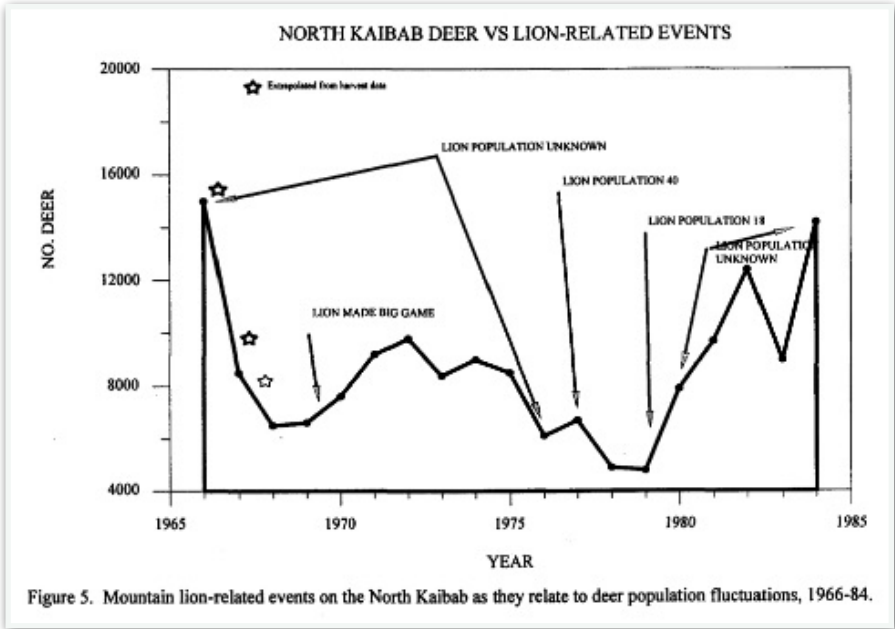
Figure 4. Water year (October-September) precipitation index (bar graph) and mule deer population estimate (solid line) for North Kaibab, 1966-84. The dashed line is the long-term average precipitation on the Kaibab Plateau.

in 1978, and precipitation was at or above the average through 1983. Good rainfall and its effect on forage was undoubtedly a factor in the increase in deer numbers on the Kaibab that began in 1979.

Predation

Mountain Lions: Mountain lions were implicated as a major component of deer mortality during the period of decline and depression of the deer herd (McCulloch and Brown 1986; Fig. 2). Prior to 1977, however, no actual measurement of lion numbers or numbers of deer taken by lions were available for the area, and the estimate of lion mortality shown in Figure 2 is based upon a backward extrapolation of the estimate of lion numbers made in 1977-78. The mortality estimates for 1978-83 are based upon actual losses of radio-marked deer. A mountain lion tagging, radiotracking, and reconnaissance effort began in 1977 and continued throughout the summer of 1980 (Shaw 1980). Forty adult lions were estimated to be on the area in 1977 (Fig. 5). By 1979, this number had decreased to approximately 15 adults. Mortality of adult lions between 1977 and 1980 was attributed to hunter kill (21 animals), capture mortality (1), and natural mortality (3). Eighteen of the hunter-killed lions were taken between 1977 and 1979. One female lion lost 3 of 4 litters birthed during the study, and another female known to have kittens starved during the severe winter of 1978-79. The deer herd began its increase in 1979, after the lion population declined. The 5-year average lion-caused mortality rates of adult does during this period was only 0.028, compared with a speculated rate of approximately 0.15 during the period of decline.

Coyotes: No data are available for coyote (*Canis latrans*) numbers or coyote related deer mortality during the period of decline. Scent post surveys made between 1977 and 1981 fluctuated widely and suggest a declining coyote population after 1978 (Fig. 6). The highest coyote population index occurred in 1977, at the end of a period of high fur prices and increased trapping effort throughout the state. Fur trapping on the North Kaibab during this period, however, was carried out by locals who traditionally trapped each winter. Effects



of trapping probably did not increase significantly in the area due to fur price fluctuations. During the period of increasing deer numbers, coyote-related mortality of adult does was 0.038, actually slightly exceeding lion-caused mortality.

Disease

No data are available on the effects of disease on the deer herd, either through the period of decline or during the mortality study. Disease was included as unidentified mortality factors by McCulloch and Brown (1986).

Livestock

Actual effects of cattle numbers on deer numbers on the Kaibab is not known. Cattle numbers on the winter range dropped in 1978 and continued to decline through 1986, reaching a low for the century (Fig. 7). McCulloch and Smith (1991) noted that total ungulate animal units (including both deer and cattle) correlated negatively with deer physical condition between 1970 and 1986. Thus, a decreasing number of cattle should allow a larger number of deer to maintain healthy condition.

CONCLUSIONS

This paper obviously presents a highly over-simplified history of factors affecting the Kaibab deer herd between 1966 and 1984. It is not intended to be exhaustive, and anyone interested in greater detail are referred to Russo (1964), Shaw (1980), McCulloch and Brown (1986), and McCulloch and Smith (1991). From the above discussion, however, a few conclusions are possible.

1. The North Kaibab mule deer population declined between 1966 and 1977, going from an estimated 15,000 deer to approximately 5,000. The cause for this decline is unknown, and it was unexpected when it occurred. The available evidence implicates low precipitation combined, perhaps, with a high mountain lion population.
2. The herd reversed its downward trend in 1979, when several factors combined to create favorable conditions. These include a change in 1977 from any-deer hunting to buck-only hunting, a shift in the

precipitation patterns from drought to above-average precipitation, a significant decline in lion numbers in the area, and a long-term reduction of livestock.

3. While the Kaibab deer herd was monitored closely prior to and during the 1970s decline, intensive efforts to identify mortality sources began after 1977. As a result, estimates of the lion population, a coyote population index, and an estimate of mortality sources were not available until after the deer herd had actually begun to increase. As a result, we do not know what the relative effects of lion predation, coyote predation, and precipitation patterns may have been during the period of decline. Similarly, after the deer herd began to recover, monitoring of predator populations and deer mortality ceased. Hence, information available covers only a period when conditions were particularly favorable to deer.
4. Short-termed, reactive research, such as the work done on the North Kaibab between 1977 and 1985, is therefore of limited value. The importance of sustaining long-termed studies that intensively monitor not only deer numbers but also potential factors that may influence those numbers, including predator populations, is evident. With all of the literature available on the Kaibab deer herd and for all of the years of study that have occurred there, solid documentation of events surrounding periodic declines in deer numbers has not yet been accomplished.

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This paper was originally presented at the [May 21-23, 1997 Western Association of Fish and Wildlife Agencies, Deer and Elk Workshop](#) at Rio Rico, Arizona, Reprinted by permission of the author.



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Significances of the Kaibab Deer Herd

by Wendell G. Swank

At the same workshop in which Shaw made his presentation (see previous article), Wendell G. Swank made a presentation with the title above. Wendall Swank was long-retired when he gave his paper. It is probably the last thing he ever published. After receiving his Ph. D. in 1937, he went on to become the first head of the research branch for Arizona Game and Fish in the mid 50s. By 1957, he was Assistant Director for the Department. By 1963, he was Director. He was especially protective of the research branch and kept it attached directly to the Director's office, rather than placing it within the Wildlife Division. He placed the research branch employees on university campuses and negotiated full faculty positions for them. He wanted the Branch to be doing basic research. That attitude was not necessarily held by later directors. When he left Arizona Game and Fish, he became the Director of the Kenya-Uganda game agency. He ultimately retired back in AZ and died at age 100. He was in his 90s, when he gave the referenced presentation.

Swank's presentation (as is true for Shaw's) can be found in the compilation of proceedings. His description of the deer population fluctuations, possible causes, and decision making process (and parties) is much superior to Stewart's. We do not delve into any of that here, however. [If it is of interest, please follow the link.](#)

What we focus on here are the conclusions which Swank reached. They are as instructive now as they were a quarter of a century ago. Quoted from page 22 of the proceedings.

WHAT WE LEARNED FROM THE KAIBAB EXPERIENCE

1. *Integrating the management of deer and people requires a great amount of lead time by the management agency. The attitudes of people are not readily changed, so we must plan ahead if we anticipate making changes in our management programs. As an example, how long did it take us to gain acceptance by hunters of the necessity of taking antlerless deer? I would say a half*

century, and perhaps we have convinced no more than 50% at that.

2. *We must have data that the public can easily comprehend, stated in terms that are normally used in daily discourse. As an example, the Wildlife Management and Research Divisions of the Arizona Game and Fish Department began calculating and using numbers of deer to replace trends as a management tool in 1952. There was a lot of opposition and some ridicule because logic tells anyone that we can't get a precise figure on the population of deer in an area. Nevertheless, the general public thinks in numbers. They balance their check books, adjust their budgets, and get reports on their investments in numbers of dollars. Using trends they may see whether their stocks and bonds have gone up or down, but they cannot determine how much money they lost or gained if they do not know the number of dollars they have invested. Moreover, numbers became important when we first began issuing permits to hunters because we anticipated and projected the number of deer that would be removed by a given number of hunters. On the Kaibab after the 1954-55 die-off we calculated the number of deer on the Kaibab back to 1951 (Swank 1958). Those data said that we had 24,668 deer prior to the 1951 hunting season and 36,627 prior to the 1954 season. The pre-hunt data for 1955 indicated that 11,889 deer were present before the hunt, so we had lost about two-thirds of our deer herd. Also working with actual numbers we showed that from 1951 through 1955 hunters removed a low of 10.2% of the population in 1951 and a high of 19.5% in 1955. As Russo (1964) points out, getting an estimate of the population gives us something concrete to work with, but we should constantly look at our data in an effort to come up with more accurate results.*

Information such as percent hunter success the preceding season and deer seen per mile on surveys may be acceptable when things are not critical, but when we are dealing with possible over populations of deer, over harvesting of deer by hunters, or low recruitment to deer populations we need better data, and finer tuning

of our management. People expect it, and we should provide it.

3. *We must be more diligent in getting continuity of data and emphasizing the importance of long-term research. I must say that preparing this paper is more of a rehash of previous experiences than of new experiences. Following the trail of data after the 1954-55 die-off was like following smoke. It became obscure, then disappeared completely. John Russo's book gave good information through 1961, but he skimmed through 1962 and 1963 because there was no resident biologist at the Kaibab for those years. There are few places where wildlife information is available over such a long period and as detailed as there is for the North Kaibab, but even there it is sketchy and incomplete. We must do better.*

See original for citations for referenced works.

Predator Control

In our area, the major predators of deer, and for that matter cattle, (other than hunters) have historically been Coyote, Mountain Lion, and Mexican Gray Wolf.

From the very earliest days of European encroachment, predator control has been a mainstay of the cattle and sheep industries and the mantra of many a hunter.

The killing of predators has been mixed in results. The Mexican Gray Wolf has been all but extirpated from the area while Coyote numbers ebb and flow as much as the deer populations do.

Many techniques have been used to limit the number of deer predators in the environment. The one thing they have in common is that they are all like using a jack-hammer for human heart surgery.

1080 and Coyotes

Compound 1080 was one of the most widely used poisons in the United States and is still used widely in New Zealand. It is generally delivered as a white powder which resembles powdered sugar; it is tasteless and odorless. Very small amounts (1/500 of an ounce) kill

coyotes, dogs, and cats. It is generally introduced into the environment in the form of laced meat. As such it is indiscriminate and kills endangered species as well as pets. Most 1080 use, in the United States, but not the most controversial use, was for rodent control.

Fluoroacetate, $C_2H_2FNaO_2$, is a sodium salt of fluoroacetic acid. In addition to 1080 it is known as sodium mono-fluoroacetate, SMFA, Tenate, Ten-Eighty, Fratol, and Ratbane. It was originally used in the United States in 1942 and entered operational use in 1945. It was widely used in the 1950s and 1960s. Its peak use occurred in 1963. It was banned on public lands by Nixon in 1972 when he issued Executive Order 11643, an order which was rescinded by Reagan.

EO 11643 read, in part, "It is the policy of the Federal Government to (1) restrict the use on Federal lands of chemical toxicants for the purpose of killing predatory mammals or birds; (2) restrict the use on such lands of chemical toxicants which cause any secondary poisoning effects for the purpose of killing other mammals, birds, or reptiles; and (3) restrict the use of both such types of toxicants in any Federal programs of mammal or bird damage control that may be authorized by law."

The practice of poisoning meat as a method of large carnivore control was utilized in the western United States as early as the 1870's, perhaps earlier. Prior to the development of 1080, strychnine and thallium were widely used as poisons.

Robinson and Spencer described typical poisoning cases in their assessment of 1080's effectiveness. A typical example of their case studies follows: *January 3, 1946: A coyote ate approximately half a pound from the hip of a sheep carcass that had been treated with 8 g of 1080. After eating, the coyote rested for some time near the station, then left, walking normally for about half a mile. During the next half mile, it occasionally made short runs. About one mile away from the station, it laid down briefly, then rose and ran excitedly for 300 yd. At this point the coyote vomited station material about the size of a man's fist. There followed running in circles, after which the coyote straightened its course and ran for about 1 1/2 miles, circling in the brush and*

running straight while in the open. It died in convulsions in the bottom of a wash about two air-line miles from the station; in all it had traveled 2 1/2 to 3 miles. The animal was unable to leave the site of the first knockdown convulsion." (Robinson, W. B., and D. A. Spencer. 1946. *Sodium fluoroacetate (Compound 1080) as a toxic agent in coyote control*. Wildlife Research Laboratory, Denver, CO., August 19, 1946. 39 pp.)

Robinson and Spencer noted the secondary kills from bait sites during their assessment but found them acceptable. *"Besides coyotes, the principal station feeders were the carrion-eating birds - chiefly magpies, ravens, crows, and to a lesser extent, eagles. Hawks, badgers, domestic dogs, and rodents fed irregularly. The reductional effects appeared greatest with respect to coyotes. Magpies, no doubt, were locally reduced, but their numbers as a whole not materially affected. Little is known regarding the population trends of crows and ravens. Some eagles were found dead, but these birds maintained sizeable populations in the presence of the stations. Due to a wide dispersal of stations, which gave some protection to the more sedentary mammals, and the fact that hawks were scarce during the period of station exposure, the other carrion feeders were killed only in small numbers."*

The following year, "Robinson concluded that effective control of coyotes by means of 1080 bait stations could not be achieved without also killing many of the other mammals that fed on the bait." (*Development and Use of Compound 1080 in Coyote Control, 1944-1972*, Guy Connolly, Western Regional Office, USDA APHIS Wildlife Services, Fort Collins, Colorado, 2004, p. 226)

Agencies and individual ranchers were clear about the purpose and use of 1080. Coyotes were cutting into the profit margin of ranching operations and 1080 was an efficient way to kill coyotes. Ranchers and agencies routinely downplayed the adverse effects of 1080 use.

Traps and Guns

A variety of other techniques have been used to limit the size of coyote populations: traps (generally neck snares

and leg-hold traps), guns (various 'vermin' control programs including gunning from aircraft), and hunting dogs. Bounties are routinely used.

In general, coyote control programs have been ineffective. In part, "Research suggests that when aggressively controlled, coyotes can increase their reproductive rate by breeding at an earlier age and having larger litters, with a higher survival rate among the young. This allows coyote populations to quickly bounce back, even when as much as 70 percent of their numbers are removed." (Humane Society of the United States, website, download December 2, 2021) The primary finding of the cited research is that in stable coyote groups only the alpha male and female reproduce. When one or both of them are killed, the remainder of the pack breaks into several new packs, each with a breeding pair.

Generally speaking, predator control activities are not productive. It may be that some type of predator control is necessary for the successful "management" of game species, and it is certainly true that ranchers will experience more of a take if the number of predators is increased.

Given the significant subsidies that ranchers receive, especially from the Federal Government, it is appropriate to revisit the question of predator control as desirable, since it reduces the "use" of a natural landscape by other parties. Conversely, compensating ranchers for proven predator losses* from a fund created from a greater charge for using public lands for commercial ventures would address the economic issues and would be more equitable for all users.

*Given the significant charges brought against ranchers and USDA Agencies (especially APHIS), that they operate in collusion to claim and certify false kills by predators, the certification of livestock deaths as predator kills should be assigned to an independent agency free of political control and influence. Such an action would lend credibility to rancher claims should they be found to be accurate.

Diary of the Hunt

by Edward D. Tittman

Edward D. Tittman was a leading citizen of Hillsboro, New Mexico, for several years. He was one of the delegates to the 1910 State Constitutional Convention, an author, attorney, and District Attorney for Socorro County.

This is Edward D. Tittman's account of a hunt on the east slopes of the Black Range which he went on in November 1909. It is transcribed here without alteration. Spelling, grammar, and punctuation errors are as in the original without the use of "sic". Images were not included in the original account.

Sunday November 7th 1909. Although everything was supposed to be ready for our departure this morning we did not get off until after ten o'clock. Unable to secure a packhorse we had a burro and this restricted our pack in weight to about 100 pounds. The trail lead over the Snake mine down to the Bonanza and from there past the cold springs and then the Warm Springs along the road to Hermosa to the top of the divide between Tank Canyon and Cave Creek. This was an uninteresting bit of journey along a valley desolate and bare of even oak brush, brown and yellow in tinge, and doubly wearying because the burro went so slow we had to walk our horses.

Now and then the beast of burden created a little intermezzo in the ennui that enwrapped us by trying to throw his pack off his back, or running full tilt and with marvelous speed considering his ordinary travel for some other burro that he had discovered in the distance. May be our conversation was too intellectual to be understood by him though on the part of Stevens speech consisted mainly of cusswords flung at the long ears of the ass.

From the top of Cave Creek hill the trail into the canyon was steep and about half way down the Burro succeeded in throwing his pack so that it slid down on one side of him. We had to take off everything and repack. Thus we lost half an hour.

The trail went up Cave Creek which soon became what the Germans call romantic,



Tittman, farthest right standing, with his two sons standing next to him, on an earlier hunt.

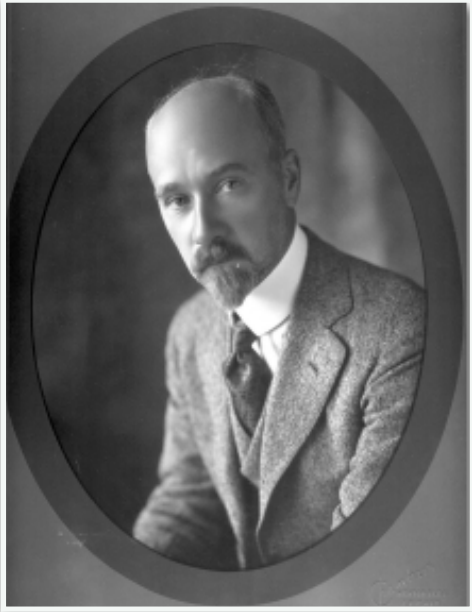
meaning wild, with steep cliffs ascending on either side several hundred feet. Finally the valley became so narrow that a wagon could hardly have gone through it. The horses had to wade through deep pools of water, the burro being submerged almost to his body. The canyon widened again we passed a goat ranch, where are now located the goats that used to bother us in the Ready Pay Gulch. We were getting into the pine country. Magnificent trees rose up everywhere some of them 70 feet high and five feet around. At four o'clock after we had travelled some 16 miles we made camp within sight of the goat ranch where Steven's goats are located.

We spread our bed under a Spreading Juniper tree. First we put down a large canvass. On this came three comforters, then each mans blankets, then two more comforters and the the end of the canvass or "tarp" was drawn over the entire bed. We cooked supper, that is Stevens cooked and I watched him. Bread made in a frying pan, much like a pancake, bacon and potatoes with a cup of weak coffee made up our meal.

We had hobbled our horses and they had just finished eating some corn which we had taken along when an accident happened, which is difficult to relate in polite society. Brownie, Stevens' horse, mistook our towels for what I do not know but at any rate he seemed to think they were diapers and we had to wash them in the creek.

As we finished supper the Mexican who has goats on shares came home with his wife and invited us into his cottage, made of upright logs with the spaces filled in with mud, a construction typical of Mexicans. Inside it was very nice and clean and he pointed out with pride what improvements he had made and what he still intended to do. He had a little girl who became very sleepy but the parents did not notice it till I called their attention to her whereupon they spread a comforter and some pillows on the floor and the little one was soon sound asleep. About half past nine we sought our beds and slept so soundly until morning light broke over the hills. It was very cold. During the night winter had set in and the water had half an inch

A year after this hunting trip (October 3, 1910, to November 21, 1910), Judge Tittman was a member of the 1910 State Constitution Convention held in Santa Fe. Tom Catron, the prosecutor in the Fountain Murder Trial held in Hillsboro eleven years before, was at the 1910 convention. The Santa Fe New Mexican (November 26, 1945) reported that when a priest began the opening prayer, a translator began to translate it into Spanish. At that moment, Catron is said to have told the interpreter, "Shut up, you fool; the Great God Almighty understands the English language."



Edward Tittman

of ice on it. All the rest of the nights were cold or colder and every morning we had to thaw out the dishes and the bread made the night before. While Stevens started to cook breakfast.

MONDAY morning I went after the live stock. I thought this would be easy but it proved otherwise as the horses though hobbled had wandered three miles down the creek so that before breakfast I had a six mile walk. About ten o'clock we pulled out of camp up the creek we travelled only about five miles that day as I wanted to inspect the cave after which the creek is named and also desired to prospect a little as I saw plenty of mineral signs. At Fulgum's Ranch about the head of the Cave Creek we made Camp and then started out on a walk during which we saw lots of deer track, Turkey tracks, tracks of wildcats

and even of bear but the only game that fell before our prowess was a nice fat squirrel which had evidently been living luxuriously on Fulgum's corn. I never saw a squirrel as fat. He made a nice



Alice Barnes Fulghum,
Mildred, Roscoe W. Fulghum
October 11, 1897



Hunting Party, November 1901 at the Barnes Fulghum 'Ingersol' home. This is the house Jay Barnes built about 300 feet from the original cabin. The party stayed here at least one night before going to the 'Magne Cabin' at a higher elevation. L to R: Mr Warner, Mr. Chamberland (who was killed in this area several years later when he accidentally shot himself), Miss Minnie Moffitte (niece of Major Morgan, well-known in early Lake Valley), Jennie McCadden (daughter of Mr. McCadden), Mr. McCadden, Jay Barnes, Alice Barnes Fulghum, Charles Hoyle of Lake Valley, Roscoe Fulghum. Apparently only the ladies got to ride, one at a time, the rest walked. More about the Barnes-Fulghum group can be read at [The Spell of the Black Range](#).

supper. We went to sleep under the stars without the shelter of a tree but as the moon was dark the starlight did not bother us. Lobo lay on the bed at my feet, our guns were at our sides and we slumbered peacefully and deeply. All at once, what was that, I rose startled on one elbow. Again the cry weird and wailing sounded from the hillside. This time it woke Stevens. It was some kind of a wild beast, most likely a coyote, calling to his mate. Then from the opposite hill came the answer or rather answers. It sounded as if there was a whole pack of them but there were only the two. Lobo barked loudly and started after them but I called him back for fear they might entice him away as the coyotes sometimes do. They kept their wailing up for a long time but finally they got tired and we went to sleep again. But just before morning when the stars first begin to pale we heard the beasts again. This time they were not alone but joined in a whole chorus of noises among which we distinguished the deeper notes of a real timber wolf. They were announcing the coming of morning. Then the cattle began to bellow and low and it was (Tuesday).

TUESDAY. Breakfast was the same as dinner except that the squirrel was all eaten up. After breakfast we started to climb up to the Cave. This is a natural opening in the rocks resembling the shell in which orchestras play at the seashore and elsewhere. The cave was fully 30 feet high about 50 feet deep and about 75 feet wide. Within were all kinds of small holes to each of which led tracks easy and distinctly to read. I challenged the heads of the various families to come out and give me battle but no reply. Of course they knew I had a shotgun and they being unarmed with such weapons naturally hesitated. Above in the walls of the cave were multitudes of little nests but not of birds but rather of bats. One large nest belonged according to all the signs on the door to a Mr. Hawk who however happened to be out. We descended and explored the surrounding country but



A hunting party at the Magne Cabin in 1901.

found nothing great in the way of mineral. The country had been prospected once, twenty years ago, in part at the expense of the late Bob Ingersoll but though there are signs of mineral it will cost money to get it out. We did not break camp that day and when I went to bed it was in the hope that musical coyote family might give us some more entertainment. But we were disappointed. We slept through without an adventure of any kind until (Wednesday).

Wednesday morning. Again the bill of fare was the same and while Stevens was getting it ready I went after the horses. I found them all O.K. and brought them back into camp. For lack of a rope my horse had to remain untied a few moments and during those moments while I was getting his bridle Kid skipped out. He went to a waterhole in the creek and I went after him knowing that as soon as he had drunk his fill he would let me fetch him. But Stevens wanted to play cowboy and while Kid was still at the waterhole Stevens rode up to him in spite of my warning and tried to rope him. Of course he missed and Kid indignantly galloped off and was seen no more as he was soon lost in the thick underbrush. I learned afterwards that he must have gone straight home as he arrived there that very afternoon. I left my saddle etc. at Fulgums and went on foot which I did not mind in the least as the trails were getting very steep and risky and a fall with the horse would have probably landed the outfit at the bottom of the canyons. I climbed on afoot and Stevens led the burro. We went up at least 200 feet over the creek bed and then down again on the other side where flowed

the beautiful Animas. We went up the Animas about 4 miles and camped for the night near an abandoned goat ranch. Here lived some five years ago a goat rancher named Sanders who was killed by the Indians while out herding one day. Many people however think he was murdered by a

worthless white man named Mills who was tried for the crime but could not be convicted for lack of evidence. It is a pretty place and adjoining it is another beautiful spot. The Sanders ranch could be home-steaded and as the Indians have been removed to a reservation far away there would be no danger anymore. The place just above is known as the Kelsay place and can be bought for \$10 an acre or \$1600 for the 160 acres. Any man who controlled both these places would have a beautiful summer home as well as a remunerative farm as most of the land is bottom land tillable and rich. Everywhere are beautiful pines, spruce, juniper, cedar, cottonwood, and other trees and the mountains are rugged and gorgeous, the views magnificent and the water neverfailing and good. The place is easy of access and can be reached by wagon road from Hillsboro in about two hours. There is plenty of timber and stone to build a nice home and outbuildings and by fencing the places in as you would have a right to do you would be secure from cattle or goats and could in fact have your own game preserve as it is impossible to descend from the tops of the hills into the valley at these points except at one or two places, so steep are the canyons. The land around is forest reserve. If I had this place and an law office and newspaper in Hillsboro I would never have to fear for a living and a good one and I would be one of the leading citizens in every respect in this county. And I would rather be a leading citizen here than a nobody in New York, or even a little somebody there.

Thursday morn we broke camp early and still going up the Animas came at last to the place where the creek forks. We turned up what is known as the West



Then, as now, some people find it easier to find deer than others. Mildred Fulghum (Rea) at her childhood home in Cave Creek.

Fork and camped in a lovely spot, where the brook murmured near by while stately pines and balsam firs swayed in the wind. It was noon when we made camp and for the next two days I explored the beauties of this secluded nook. We shot several pine squirrels, which are the kind they make in to fur coats and they made a very good stew a la chasseur. We found many bear tracks and one night Lobo barked at something that would not come into the range of the camp light but which by the tracks the next morning was a mountain lion.

Friday we devoted to hunting but got nothing. The deer were scare and the wild animals were wary. However which way we turned the scenery was magnificent. Saturday morning we started early and travelled back the road we came for a few miles and camped at the foot of what is known as the Monument, a natural stone column with a large flat stone on its top. This is where the trail to Vic's Park branched off where Vieg had said he found such good mineral indications. A "Park" in this country is a flat place up in the mountains where there is plenty of timber and generally water. So there is Magnus Park, Bear Springs Park etc.

Vic's Park is named after Victorio, the Apache Chief, whose stronghold it was during the Indian troubles twenty five years ago. Here were several skirmishes between the troops and Victorio who held a practically unassailable position as we found out when we climbed up the steep hogbacks where alone a man could get up without using a flying machine. Here the old chief was killed during a fight and Geronimo, who only recently died, took his place. No one knew that old Vic was dead until the new chief took hold. Well we climbed and climbed and climbed and finally reached the sheltered plateau but saw nothing of mineral indications. Later we found out that Vieg had forgotten the place and that he had meant Bear Springs Park several miles northwest. We returned to camp somewhat disappointed. Sunday morning we marched almost all day i.e. until half past three in the afternoon when we reached our old camping place at Folgums. On the way we secured five fat squirrels and had a fine meal of them. Monday morning we started for home as a fierce windstorm had blown up which made it impossible to keep much of a camp fire without setting the woods afire. This proved the only day I missed Kid as we had to go 20 miles and the last part of that through uninteresting territory. We got back about sundown and I sought an early bed as I had not walked that far since my student days in the Black Forest. As a result I am convinced that there is not much to be found in the Black Range in the way of minerals. The rock is to uniformly granite.

Plant Plasticity - *Argentina anserina*

In "Elevational divergence in pigmentation plasticity is associated with selection and pigment biochemistry" (*Evolution - International Journal of Organic Evolution*, 17 January, 2022) Koski, Finnel, Leonard, and Tharayil report on their findings about the flower color of the subject species. The common name of the species is Silverweed. Many sources refer to it under its Latin binomial synonym - *Potentilla anserina* (it is listed as such in the [photo gallery](#) at the Black Range website).

Many flowering plants utilize ultraviolet absorbing or reflecting chemicals to

produce patterns on their flowers, which humans cannot see but their pollinators can. Often the uv-absorbing chemicals are at the base of the petals while uv-reflecting chemicals are in the outer areas of the flower. This pattern creates a striking target for those that can see it.



In this study, the authors analyzed two populations of flowers which were separated by about 1,000 feet of elevation. They found that the chemical content of the flowers differed between the two populations. The population found at the higher elevation always had more uv-absorbing chemicals in its flowers, creating a bigger target for pollinators.



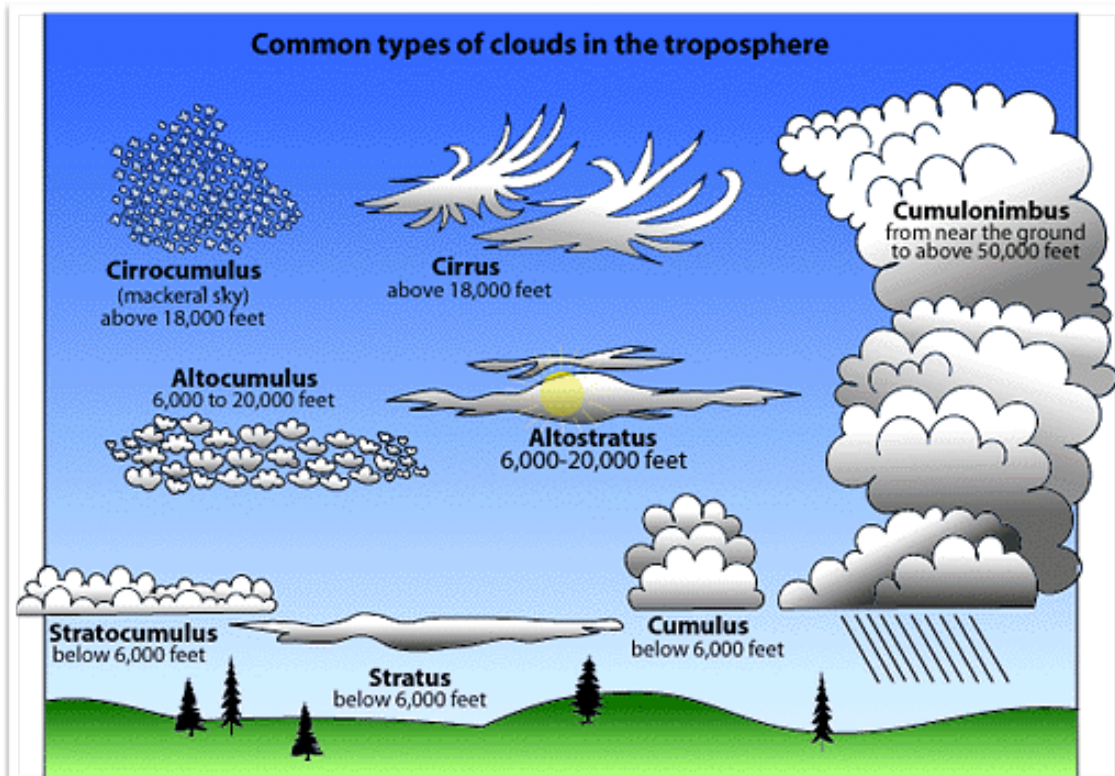
The researchers concluded that the differentiation that the species exhibited at different elevation, its plasticity, would be useful in dealing with global warming. Not only was the center of the "target" larger at higher elevations, but the increase in uv-absorption in that population appears to have made the pollen more viable. Photographs in this article were taken near Sawyer Peak in the Black Range.

Black Range Clouds

First of all, full disclosure. Clouds are not unique to the Black Range!! In fact, the clouds which float above and around us may not even be the best in the world, but we have some good ones, worthy of a few words.

Boxing is a tool used by humans to understand the world. Clouds are boxed in two ways: by their height above the earth and by their form or shape. High clouds are found between 16,000 and 43,000 feet above the earth, middle clouds are found between 7,000 and 23,000 feet above the earth, and low clouds are found below 7,000 feet. Within each of these "cloud groups" there are a number of "cloud types". The graphic at the upper right is from the [University Corporation for Atmospheric Research \(UCAR\)](#).

The photograph to the right was taken by [Nolan Winkler](#) in July 2021, in Hillsboro. [Mammatus clouds](#) like these are features that are formed by descending air in a cloud and usually hang beneath another cloud, generally a cumulonimbus cloud. Most clouds form by ascending air, not by sinking air. This in itself makes this cloud type worthy of note. This type of cloud generally forms in warm months and is often associated with strong storms. It is often formed mostly of ice but may be formed entirely of water. Cumulonimbus clouds are found from near ground level to more than 50,000 feet, so they span the full range of "cloud groups". The cumulonimbus clouds we don't see in this image (being



obscured by the mammatus clouds) are fairly low in altitude.

About those boxes, mammatus clouds are "a cloud supplementary feature rather than a genus, species or variety of cloud." This according to the World Meteorological Organization's, [International Cloud Atlas](#).

The descending air of mammatus clouds, in association with the ascending air of the cloud formation it hangs from, creates a significant shear zone of extreme turbulence - and weather.

This is the first in a series of articles about the wispy things above us.



Tom Lander

Our Covers

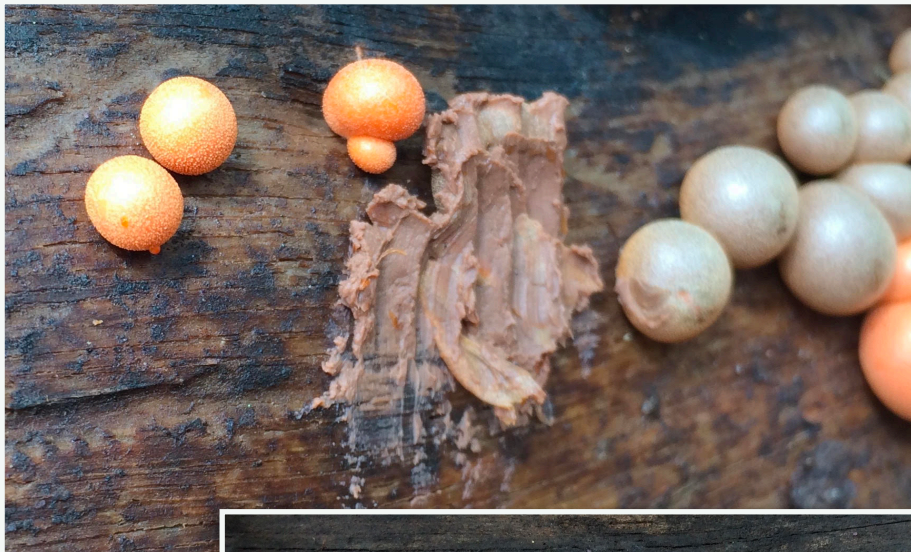
Tom Lander, of Kingston, provided the photographs on this and the following page - and on our back cover. This may not be a puffball, it may not even be a fungus. It may be *Lycogala epidendrum*, a species of myxogastrid amoeba. Common names include wolf's milk and groening's slime. *Myxomycetes* is a class

of slime molds which has about 900 species. Venturing into the realm of taxonomic determinations can be challenging, anyone having more definitive information is asked to provide it to the editor.

The slimy goo, see following page, is helpful in the identification of this species. When the species matures, the

goo will turn into a powdery mass of spores.

Conopholis alpina, Ground Cone (*C. a.* var. *mexicana* and in some sources *Conopholis mexicana*, Mexican Cancer-Root) was photographed along trail 135 east of Sawyer Peak. It is also found near the junction of the Railroad Canyon and East Railroad Canyon trails. It was probably parasitizing pine trees.



**Photographs by
Tom Lander.**



Remembering Lloyd Barr by Bob Barnes

Lloyd Barr died in late January of this year. Prior to his retirement, Dr. Barr was a professor of Molecular and Integrative Physiology at the University of Illinois at Urbana-Champaign. His research and publications were significant. Lloyd and his wife, Dr. Matilde Holzwarth, were both professors and researchers. Not wanting to rest on his laurels as a Professor Emeritus, Lloyd went in search of a new project. When he and Matilde moved to New Mexico they began research on the sensory systems of Western Diamondback Rattlesnakes. A topic Lloyd covered in the second issue of this magazine, in an article entitled, "[A Rattlesnake's World](#)".

I do not wish to dwell on his life prior to his move to New Mexico or his life following the death of his wife Matilde. Rather I would like to focus on the glorious decade which fell between 2008 and 2018.

Lloyd and Matilde epitomized the glory and joy of retirement. Retirement, that period when you are free to pursue the whims of your mind, unconstrained by institutions and finances, is a time in which he actively engaged in non-institutional science.

We first met Lloyd and Matilde in 2008. That first meeting was capped, not by their humor, intelligence, and cordiality - though all of that was impressive - no, it was the fact that they had electron-microscope photographs of cells adorning their walls, which Matilde had taken. We stood in front of some of those photographs and discussed what they showed, and their beauty. That was an indication of the type of talks we would have in the future.



Lloyd Barr & Matilde Holzwarth in Campeche, Campeche, Mexico, January 2015.

I was fascinated by their discussion of how they had gone about doing [rattlesnake research](#). I soon found myself in various washes taking high speed close-up video of diamondbacks crossing over various substrates: sand, rock, sticks, or anything else that came to mind. Lloyd was not convinced by the current state of knowledge about the physiology of snake movement. That work, which was nearing completion at the time of his death may be lost to all of us.

When I was delving into the work of Carl Woese and his discovery of the Domain of Archaea (separate from the Domain of Bacteria and Eukaryota [which includes the kingdoms of plants, animals, etc.]) it occurred to me that Lloyd might have known Woese. Yes, they had been pals. [He wrote an article about his friendship](#)

with Woese for this magazine, providing some insights about Woese that probably never made it to a professional journal.

Lloyd and Matilde's expertise extended far beyond physiology and between them they could speak on many topics: they introduced us to the *Triops* which were hatching at a nearby pond; the spadefoots along NM-27; and how to wrangle and transport rattlesnakes. Outside the realm of natural history, their love, appreciation, and understanding of classical music and in Lloyd's case jazz was humbling. The stories Lloyd told about sneaking off to listen to jazz in a south Chicago club, even though he was under age, because he loved the music always left me with a faint appreciative smile, reflecting on the journeys that all of us have taken.

Like many, Lloyd's interests were not always worn on his sleeve. Lloyd bought us a beautiful book on Mayan glyphs before we all went off for a few weeks to visit sites on the Yucatan peninsula and in

Chiapas. Perhaps we would all like to come up to speed on our glyph reading.... I remember vividly the evening we all stood at the mouth of a cave in the south of the state of Campeche, as millions of bats flew out, around our heads, between our legs, lots of smiles.

That was Lloyd Barr, a Doctor of Physiology willing to discuss the structure of different muscle types, the complexities of music, the beauty of small swimming creatures, the tricks to reading Mayan glyphs, the merits of being stung or bit, the beauty of an evening sunset.

I miss that unwillingness to live a life of the same day over and over, the desire to learn, to understand. I miss Lloyd and Matilde.

