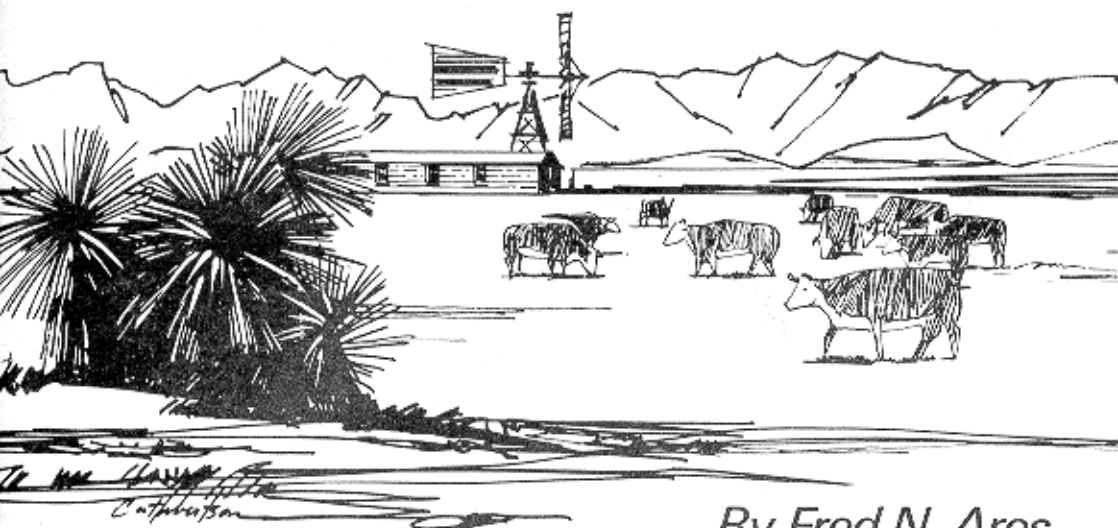


The Jornada Experimental Range

An Epoch in the Era of Southwestern Range Management



*To the Honorable
C. Campbell*

*By Fred N. Ares
Edited by R.S. Campbell*



Fred Arce, right, with Assistant Ranger Claire Sharp, following the trail of wild horses, February 16, 1929, at an elevation of 9667 feet in the White Mountain District, Apache National Forest, Arizona. Temperature: -30° . A sample of the so-called "easy life."

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The Jornada Experimental Range

An Epoch in the Era of Southwestern Range Management

By Fred N. Ares

Range Scientist (retired), Jornada
Experimental Range, Agricultural
Research Service, U.S. Department
of Agriculture.

Edited by Robert S. Campbell

*Cooperative investigation of the
Agricultural Research Service and
the Forest Service, U.S. Department
of Agriculture, and New Mexico
State University Agricultural Experi-
ment Station.*

SOCIETY FOR RANGE MANAGEMENT

DENVER, COLORADO

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SRM

Assistance in meeting the costs of the cover illustration and photos in this publication was provided in memory of John S. and Mabel Harris Campbell, who in 1933 enjoyed a wonderful Christmas and New Year's season on the Jornada with "the boys."

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Introduction

This little booklet tells in words and pictures the story of the lands in the Jornada Experimental Range during the past 125 years. The Jornada Experimental Range is an experimental cattle ranch, occupying some 190,000 acres (72,850 hectares) of semidesert rangeland in southern New Mexico. Hereafter, I shall refer to the area as the Jornada Range, the Experimental Range, or simply the Jornada. Fred Ares has lived on the Jornada Range for 43 years. He has put together this account of the research problems, results and ranch life not given in the average western paperback or cowboy movie thriller. Fred knows how to tell a good story – the reader should look for his humorous little gems interspersed throughout this factual presentation of rangeland problems and solutions in the great Southwest.

This introduction aims to explain, especially for the lay reader and for those from other countries: (1) the use of Southwestern rangeland, particularly the Jornada, and the legal requirements governing its use; (2) the work of early-day range men and their philosophy leading to the establishment of the Jornada Range in 1912; and (3) how the Experimental Range was established as a formal cooperative venture between a private rancher and the U. S. Department of Agriculture. If this introduction seems oversimplified to the professional range man, he should keep in mind a question asked of me in 1963 when I retired to the Midwest and took up editorship of the *Journal of Range Management*. A dear lady inquired: “And what stove company do you work for?”

The sheer size of the Jornada Range is staggering – it is one-fourth as large as the entire state of Rhode Island, or enough land to accommodate the actual playing area of 172,000 American football fields. The Jornada lies at an elevation of about 4,000 feet (1,220 meters) above sea level, rising to 8,000 feet (1,440 m) in the mountains. Average annual rainfall is less than 10 inches (25.4 cm.). Most of the area supports a sparse vegetation of grasses, “weeds,” and shrubs which grow mainly during the short summer rainy season. There is a surprising variety of wild animals, birds, and reptiles. This kind of land is important watershed in a territory where water is scarce and vegetation cover is needed to protect against excessive erosion and sedimentation in reservoirs. I could go on at great length about the scenic beauties and recreational opportunities of the great Southwestern semidesert.

This country is great for cattle raising, but many are the problems facing the rancher – problems of animal production and nutrition and health; of growing sufficient forage on the range for yearlong grazing; and finally of managing both the livestock and the rangeland for a profit. To emphasize the difficulties, just

visualize the forage production on one acre (0.4 ha) of this range and on good pasture in the Midwest or South. Cultivated pasture (soil prepared, seeded, fertilized, maintained, and perhaps irrigated) may grow enough good forage on 1 acre to keep one cow well fed all summer. In contrast, the average acre on the Jornada grows enough grass or other forage to keep one cow well fed for only one or two days! That old cow may be well fed, but she must keep moving and graze over a lot of acres during the year. This measure of a range (acres per cow per year) is called *grazing capacity* or *carrying capacity*.

Yet another phase of this problem of low rainfall and meager forage production is the year-to-year variation. Total annual rainfall during 52 years at Jornada Headquarters reached a high of 17.73 inches (45.03 cm) in 1926 and a low of only 3.03 inches (7.70 cm) in 1953. Annual forage growth varied accordingly.

In the early days of the Southwest, it was extremely difficult for a rancher to hold together enough rangeland to graze the several hundred cattle needed to make a satisfactory living. This deserves some explanation. The lands now in the Jornada Experimental Range became a part of the "unreserved" Public Domain when much of eastern New Mexico was included in the so-called Texas Purchase of 1850. The United States paid Texas in cash to satisfy that new state's claim to the New Mexico lands. The Public Domain was simply land owned by the United States government for the general public.

Public land policy in the United States, first formulated by Alexander Hamilton, aimed to sell public lands to settlers at a reasonable price in order to encourage rapid colonization and to provide tax revenue. Later, the basic homestead law offered 160 acres (64.7 ha) free to settlers who wished to make a home on the land. The law was suitable for the eastern half of the United States, but what good was 160 acres of semidesert rangeland (hardly enough to support one cow yearlong)? In spite of this legal limitation, the number of cattle in New Mexico increased from about 158,000 head in 1870 to more than 1,000,000 in 1886 during the great boom. How did such a thing happen?

Cattle raisers did the best they could under the law to "control" enough land to graze several hundred cattle and to defend that control against other ranchers. There were range wars, as detailed in Ares' text, but the general practice was to homestead or otherwise acquire key tracts of 40 to 60 acres (16.19 to 24.28 ha), well distributed at distances of 6 to 10 miles apart on an area of rangeland large enough for a ranch. By meeting the minimum work improvement and time required by the Homestead Law, or any one of a hundred other laws dealing with mining claims, timber or rock claims, or by using military service script, ranchers could "prove up" on a final claim of ownership and obtain a "patent" to each key tract. Such tracts usually were used for wells, ponds, springs, and other essential developments for water, corrals, dwellings, etc. The situation on the Jornada Range is fully described in Ares' text.

Inevitably the range became overgrazed, owing to the naturally low productivity, lack of fencing or other control over the Public Domain, and increasing numbers of cattle. Palatable grasses and shrubs were grazed too closely and weakened or killed. Grazing capacity began to decline, and range depletion was widespread before 1900.

Many workers in the U. S. federal and state experiment stations recognized the damaging effects of the free-for-all use of the Public Domain. Such men as F. V. Coville, Jared G. Smith, and A. F. Potter pointed out the conditions and the need for action. Timberlands were assured beneficial use when the Forest Reserves were authorized in 1891. But action on Public Domain ranges was much longer in coming. President Theodore Roosevelt appointed a commission in 1903 to look into conditions and recommend needed changes in land laws. In 1905, W. A. Richards, F. H. Newell, and Gifford Pinchot reported to Congress,

in part as follows:

"The general lack of control in the use of public grazing lands has resulted, naturally and inevitably, in overgrazing and the ruin of millions of acres of otherwise valuable grazing territory. Lands useful for grazing are losing their only capacity for productiveness, as, of course, they must when no legal control is exercised."

vi In 1907-08, Dr. E. O. Wooton made a survey of conditions on some 31,000,000 acres (12,545,300 ha.) of rangeland in New Mexico. His report recommended that the remaining unreserved Public Domain be administered by a cabinet official, anticipating the need to develop management plans for wise use of the range with benefits to both the livestock and the rancher. He emphasized "control" as the outstanding problem.

But land legislation continued to lag, because of the violent disagreements among the various interests. It was not until the best grazing lands had been picked over that the Taylor Grazing Act was finally passed in 1934, authorizing regulation of 80,000,000 acres (32,374,000 ha) of Public Domain to be included in the new Grazing Districts.

Now, we must get back to the Jornada. As early as 1904, Wooton had started to gather information on how many cattle should be grazed on the range, on forage plants, season of grazing, etc. One of the ranches on which he obtained data was grazed by the cattle of C. T. Turney. Wooton needed a large area on which to work, and after several years the 190,000 acres of Public Domain comprising the Turney ranch was set aside in 1912 as the Jornada Range Reserve. The area was fenced and managed under a cooperative agreement. Turney owned only a few hundred acres of key lands occupied by watering places such as deep wells with windmills, springs, corrals, and dwellings. He also owned and managed the cattle and took the profits or losses from the operation. In addition, he put up a bond to assure compliance with the terms of the agreement. The U. S. Department of Agriculture provided trained men to keep records of numbers of cattle in the various pastures, numbers of calves born, steers bought or sold, and response of the vegetation to rainfall and to grazing. An ever-present problem was what to do with the cattle or how to provide feed for them during severe drought.

New cooperative agreements were made in later years, with the government each time taking over more of the operation to assure conformance with specified study plans aimed at urgent problems. The name was changed in 1927 from Jornada Range Reserve to Jornada Experimental Range. Finally in 1958, a new agreement provided that the entire operation would be managed under the direction of the government scientist in charge. By this time, some very sophisticated research was being conducted by the USDA and cooperating staff of the New Mexico Agricultural Experiment Station. The aim was to determine not only what happened to plants and animals under various treatments, but why. For example, these intensive studies involved such items as soil fertility, soil moisture, plant biochemistry, and blood samples of the animals for content of vitamins and minerals.

One may conclude that the Jornada Experimental Range was a sorely needed project during the early 1900's. During the past 60 years, it has played a unique and important role in developing scientific range management in the Southwest. Fred Ares, who has resided on the Jornada for two-thirds of that time, has done a remarkable service in recording the highlights of the work. And the Society for Range Management deserves special commendation for publishing this document.

Quincy, Illinois
December 1, 1973

R. S. CAMPBELL



Preface

When we use the expression *that's water under the bridge* we are referring to that which cannot be recalled, that which is unchangeable. The scope of history is aptly probed in a verse of the immortal *Rubaiyat of Omar Khayyam*:

The moving finger write; and, having writ,
Moves on: nor all your Piety nor Wit
Shall lure it back to cancel half a line,
Nor all your Tears wash out a Word of it.

However, almost a paradox, history does repeat itself. Obviously, its being man's story, this must occur. He simply cannot learn the full lesson from precept and example, nor from the experiences of his forebears; he must discover for himself the often bitter truth from that hard teacher "experience." Such knowledge is, without question, the best obtainable and is lasting for a good reason. The school colors of the "University of Hard Knocks" are black and blue! But the price tag on such instruction! Its acquisition often leaves scars that cannot be erased, resources destroyed, damage inflicted never again to be restored. If this erosion, or attrition, takes place in and with the subject only, well and good; he alone pays the price. Sadly, this is not the case. In an ever expanding circle, all about suffer the consequences for generations to come.

However, unfortunate as it is, this may be the inevitable price tag tied to pioneer research. Experimental work minus precedents must start from scratch, thence proceed by trial and error. Lessons are well learned, but they cost a bundle!

Nevertheless, research must begin sometime and somewhere along the line to ensure continuity and success of any project. For so many lines of endeavor are interwoven, dependent upon each other to the extent that if one failed they would all come tumbling down like a row of dominoes. If, for example, a study of the use and misuse of the nation's natural resources could have been initiated decades before it was, we would not today be facing shortages of various commodities, erstwhile luxuries, absolute necessities as of now. It is plain that if our country reaches the point where we are dependent upon imports from foreign lands, our present position as top nation of the world in wealth, power, and prestige will be seriously jeopardized and compromised.

Until fairly recent years an obscure term, *ecology*, has become a household word throughout the nation. This is fortunate because this term deals with the relation of organisms to the environment and thus has opened eyes everywhere as to "what ails us" and what must and can be done to arrest the rapidly

deteriorating situation. The mounting interest in our environment has revealed to a startled people just how profligate, wanton, and careless we have been with our precious resources, some of which, alas, cannot be renewed or restored.

2 It is to the credit of this nation that once alerted to the dangers involved, for instance in the pollution and befouling of our once-clear atmosphere, and of the clear, sparkling waters of our streams and lakes, a multitude of people are ready and anxious to take a hand and do whatever is needed to reverse the dangerous trend. It is my sincere desire and hope that this narrative may find a place and be of value and encouragement to those who wish to devote efforts and even their careers to this cause. Covering as it does the span of three score years, the work at the Jornada has been devoted to one important segment of our environment; namely, our natural grazing resources. Individuals, especially students, who wish to make a contribution or devote their careers to this particular phase of the work may find a wealth of information in the great amount of published material emanating from the Jornada Experimental Range and listed in the bibliography. Representing the many and varied efforts of the numerous researchers who have "Paso por Aqui," as Gene Rhodes would say, a fairly complete story is told. Recorded are negative as well as positive results; gains as well as losses; successes as well as setbacks. To use a popular expression, "it is told as it is," no punches are pulled. The publications, most of which are extant, are available to those interested and who have a desire to pick up the torch and carry it on from here.

FRED N. ARES
Las Cruces, New Mexico
December 29, 1972

ACKNOWLEDGMENTS

The author is pleased to acknowledge gratefully the help, inspiration, and encouragement from various friends in the preparation and writing of "The Jornada Experimental Range, an Epoch in the Era of Southwestern Range Management."

Thanks and accolades especially to **Dr. R. S. Campbell** who volunteered to take on the job of editing. "Bob" Campbell had long before won the writer's undying loyalty and gratitude. His patient training and field instruction in range research when his student was a raw rookie of the first order on the Jornada, plus his insistent urging that his protege take at the first opportunity the Forest Service extension courses in ecology, range management, and watershed management, no doubt made possible his student's promotion in 1935 to Officer in Charge with full responsibility for the Jornada. Now he helps to whip a loose-jointed, amateurish, journalistic effort into the form of an acceptable publication. So "Viva" Bob Campbell!

Secondly, I wish to comment on the splended cooperation and contributions of **Mr. C. L. Forsling** of Albuquerque, New Mexico, whose contributions added much in the way of interest, as well as accuracy, to the Jornada's early history.

Much credit is also due **Dr. Carlton Herbel**, who spent much time reviewing the paper and making needed revisions and additions. This additional information described some results of his microclimate and other very technical studies, much of which was beyond the writer's depth and his capacity to "savvy."

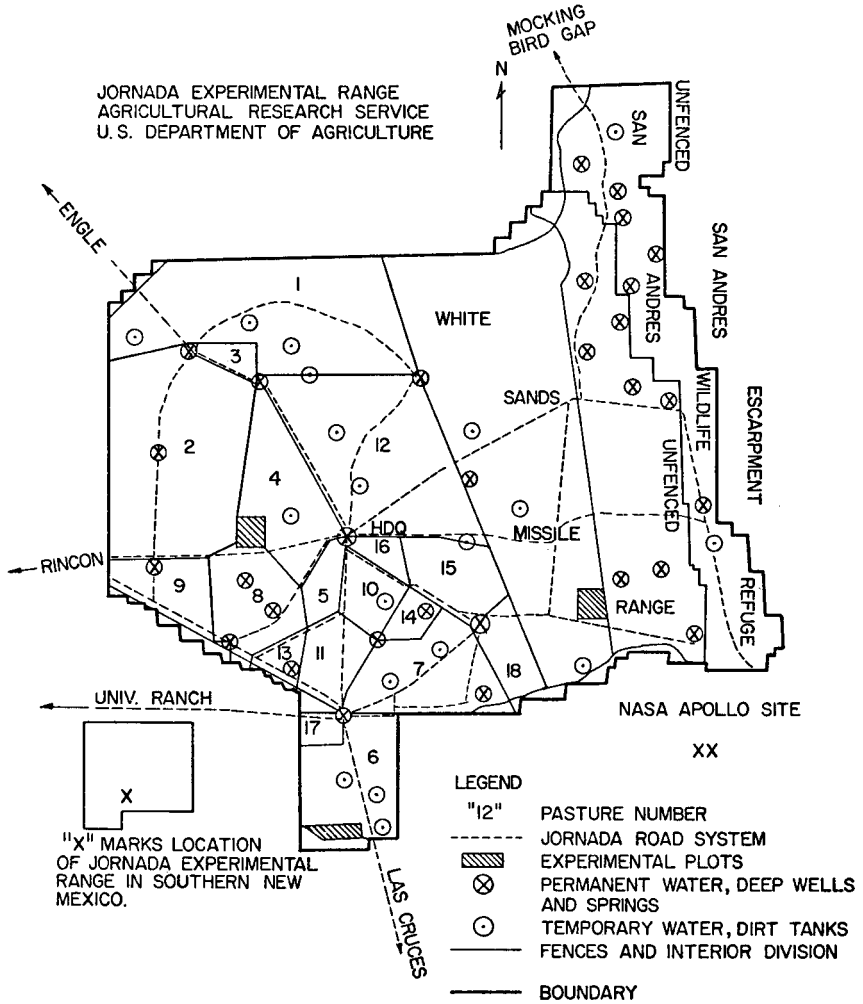
Thanks are due **Dr. Wesley Keller**, leader, Arid Pasture and Range Investigations of Logan, Utah, who offered various helpful suggestions for the needed revisions and whose ardent desire and determination to have the Jornada history written and published certainly acted as a necessary spur. The going was hard at times, but always in these low pressure areas, Wes Keller, bless him, came along with the needed boost to keep on "keeping on."

Picture yourself pounding away over the same manuscript four or five times in the space of a few months until it is memorized; translating obscure scratches—does he mean "Well" or "Hell"?; correcting misspells, ad infinitum. Such has been the lot of our eagle-eyed co-worker **Mrs. Donna Mabie**, secretary to Dr. Carlton Herbel. Orchids and kudos to her for a splendid job, her patience, her cheerfulness in situations aggravating to a sphinx! May her tribe increase!

Jornada Calendar

- 1858 First land survey of Public Domain later incorporated into Jornada Range, with records of soils and vegetation. 3
- 1885 Horace Ropes located ranch in mountain portion of Jornada.
- 1901 C. T. (T-Hook) Turney settled at site of Jornada Headquarters.
- 1904 E. O. Wooton started cooperative range investigations in south New Mexico.
- 1908 Wooton published *The Range Problem in New Mexico*.
- 1912 Jornada Range Reserve established and fenced by USDA: C. T. Turney, cooperater; E. O. Wooton of BPI, in charge.
- 1915 Jornada Range transferred from BPI to U. S. Forest Service: Turney, cooperater; C. E. Fleming, in charge.
- 1916 L. C. Hurtt assigned in charge.
- 1917 C. L. Forsling assigned in charge.
- 1920 E. W. Nelson assigned in charge.
- 1924 Turney's Cooperative Agreement expired; cattle removed. J. D. Schoeller assigned in charge.
- 1925 W. H. Waggoner took over as new cooperater. Forest Service Grazing Studies transferred to branch of Research under E. H. Clapp.
- 1926 Jornada restocked with cattle; range closed to hunting.
- 1927 R. S. Campbell assigned in charge. College ranch established adjacent to Jornada.
- 1928 McSweeney-McNary Forest Research authorization act passes Congress.
- 1930 Jornada incorporated in new Southwestern Forest and Range Experiment Station as one of five field stations.
- 1931 Fred N. Ares assigned as superintendent of Jornada, 37 years!
- 1933 B. A. (Ace) Christmas became new cooperater. Civilian Conservation Corps camp. established.
- 1934 R. H. Canfield assigned in charge.
- 1935 Fred Ares assigned full responsibility for Jornada.
- 1938 Annual Rancho Day started in cooperation with College Ranch.
- 1945 U. S. Army took over mountain portion of Jornada for White Sands Missile Range.
- 1951 Start of Great Drought—7 years.
- 1953 H. A. Paulsen assigned to Jornada.
- 1954 Jornada Experimental Range transferred to Agricultural Research Service: Fred Ares, superintendent; Robert Wagner, project leader.
- 1956 Wesley Keller assigned as project leader; Carlton Herbel, resident researcher.
- 1958 Cooperative Agreement expired; J. O. Bridges new cooperater; ARS manages stock.
- 1963 NASA-Apollo Space Center becomes Jornada neighbor.
- 1967 Dick Davis new cooperater.
- 1968 Fred Ares retired; Clyde Yarbrough, new superintendent.
- 1972 Project Leader Wesley Keller relieved of Jornada supervision. Southern Region newly organized.

4



Map of Jornada Experimental Range, showing pasture layout, deep wells, dirt tanks, and springs. Note eastern boundary along San Andres rim.

Jornada Beginnings:

Pre-1915

Debut Troubles

The range inspector and his tough packer-helper were camped for the night not far from the ranch headquarters. The mesquite-root and cowchip embers glowed under the blackened coffee pot. A cooling breeze flowed gently from the east, bearing the faint aroma of creosotebush and tarbush from the upper plain. Scattered cattle grazed or chewed their cuds on the nearby black grama ridges and tobosa grass flats. Tall soapweeds stood in the gathering dusk like silent Indians. What a relief from the midday heat and sand blowing from the mesquite sandhills to the west! In the twilight, the purple haze deepened on the pinon-juniper slopes of San Andres peak to the east, on the Organ Mountain spires to the southeast, the neighborly Dona Anas to the south, and the distant Uvas to the northwest. The only sounds were the lazy creak of the 20-foot Sampson windmill, the occasional bawl of a calf seeking its mother, or a far-off coyote howl. The range inspector sat cross-legged on his bedroll, savoring the biting flavor of his third cup of Arbuckle's coffee. What a perfect setting to ponder and plan the future of these 300-odd sections of semidesert southwestern cattle range.

The foregoing paragraph could be the start of a western paperback thriller. Or it *could* have happened in 1912, as E. O. Wooton of the U. S. Department of Agriculture inspected and planned the establishment of the Jornada Range Reserve on the Turney Ranch, north of Las Cruces in southern New Mexico.

As with many new projects, the Jornada Range was born in considerable travail. Its inception almost caused a range war. After all, 1912 was not distant from the wild days of the Southwest when men often settled disputes in the most direct way without recourse to legal channels. In my lifetime, I have seen and been in rather close quarters with many such affairs; my father at one time served as a deputy sheriff in Eddy County, New Mexico. The most tragic case of this sort occurred not too distant from our home ranch. In a dispute over a water hole, a neighbor dropped a handful of strychnine capsules in his own brother's water bucket. That dispute was settled in a hurry! Most discord occurred in quarrels over range and water. Legion have been the incipient feuds, wrangling, and actual range wars stemming from this source. They date way back to the dim reaches of antiquity. The Bible records a range war 5 millenniums ago: the herdsmen of Abraham and of his nephew Lot contending for the best range and water on the plains of Jordan.

Such a conflict almost flared up in the process of laying out and fencing boundaries of the Jornada Range in 1912, as described in a letter from

Dr. Wooton in 1936:

The Jornada Range Reserve, as we designated it without much thought as to the accuracy of descriptiveness, or desirability of the name, was somewhat like Topsy, "It just grewed!"

6

To begin with, about 1904, I commenced some cooperative work in range investigation. Later when I went to Washington to make a report, I remarked that we had secured our data from too small an area of land and suggested that C. T. Turney, who had undisputed possession of a large range, would be glad to give us all the data we wanted. So Mr. Turney, Luther B. Foster,¹ and I met and planned the Project. Our principal desire was to obtain accurate data on grazing capacity of a large ranch area, and we expected Mr. Turney to run the ranch as usual since he knew more in a day about raising cows than the rest of us in a lifetime.

We made many mistakes in getting started. For instance, we asked for Mr. Turney's range only. But the federal Land Office extended the reserve to the township line 3 miles east of the mountains, consequently running the line near the middle of the range of the Lucero brothers. The Luceros then thought Turney was trying to steal their range and that I was helping them.

Among rancher circles of Dona Ana County, this dissention stirred up some exciting speculation, for the Luceros, Jose and Felipe, were the famous frontier sheriffs known all over the Southwest for their ability to get their man, and the right one. Law-abiding citizens, these men nevertheless were "pizen" to trifle with.



Large Jornada sign with headquarters in its background. The sign was designed to convince visitors that the Jornada is an Experimental Range, not individual ranch property. The wagon wheels are for decoration, not intended to indicate status of Jornada research. (USDA photo, 1959.)

Wooton continues his story:

I gave the range its name because it was at the lower end of the region shown on the old maps as Jornada del Muerto. The range experiment station, as it was described in the presidential order setting aside the land, never had a director. Such a development as has since occurred was not within our wildest dreams. The only assistant I ever had was a temporarily hired man to go along with me to tend camp and cook. The last one was a man who, I learned after we came back from an extended trip, had just finished a term in the penitentiary for manslaughter.

All things considered, Dr. Wooton evidently felt himself very fortunate! Incidentally, the GLO obligingly corrected their error by moving the line back

¹ Luther B. Foster at that time was president of New Mexico Agricultural and Mechanical College at Mesilla Park near Las Cruces.

west to the San Andres rim. However, it was generally understood that the aforesaid Lucero brothers were never fully satisfied, and perhaps for a good reason.



7

Professor E. O. Wooton, 1912 faculty of the New Mexico Agricultural and Mechanical Arts College, botanist, explorer, photographer, and author. He was a prime mover in establishing the Jornada Range Reserve and first Officer-in-Charge.

Who Owns What?

There is some question about Wooton's use of the term *undisputed possession*. Nevertheless, Turney did have the only control of the public range possible in that far-off day. That could be accomplished only by the purchase of all private land and developments, usually deep wells or springs, from the settlers and homesteaders on the desired area, including their small parcels of patented land surrounding such water developments. This afforded some semblance of ownership. But keeping a neighbor's cattle off the range was something else, due to bovine indifference to imaginary lines. Before barbed wire came into common usage, the only protection was to stock with sufficient animals to really graze the "range" to the degree and extent that trespass could be no temptation to man or beast.

A pertinent comment is here presented by C. L. Forsling, in charge of

Jornada from 1917 to 1919.

8 The springs of any account in the mountain area were held by mining claims for the most part. Goldenberg Spring was the best because it was close enough to pipe the water out onto the plain, and it had a pretty good supply. The only other one of any account that drained to the west was Ropes Spring. Several on the east slope, especially San Andrescito and Lead Mine, were pretty good springs for watering the adjoining Jornada range, and enough water flowed out to the east to water cattle outside the Jornada. Salt, Ash, and St. Nicholas Springs—all in the southeast area of the mountain pasture—were of some value but were little developed. The mining claims were worked enough to get by as “being developed.” This was supposed to be \$100.00 assessment work per annum. Before the Jornada was established, the requirement was usually met by paying some old prospector about \$100 per year to be ready to swear that he had done the required work. Withdrawing the land from entry proved to be a sad break for the prospectors like old Green Crawford, whose source of income was cut off.

Echoes of the Eighties

In 1936, the aforementioned Ropes Spring was developed by the Civilian Conservation Corps for use as a public recreation and picnic area. Water from the spring was piped to supply the area and also to fill a large 75,000-gallon, combined livestock water reservoir and swimming pool. The spring itself has a very interesting history, dating back to the early eighties. It so happened that while the CCC work was going on, Mr. Horace Ropes, after whom the spring was named, visited the “side” camp there. Mr. Ropes, then a retired faculty member of the Massachusetts Institute of Technology, afterwards wrote to the boys who entertained him:

The improvements around the spring in the nature of trails, buildings, pools, have transformed the site from a rocky, barren spot on the mountain slope, into an attractive picnic ground, very different from when I lived there 50 years ago.

It was in the spring of 1885 that I decided to start raising cattle there. On my first visit of inspection, a prominent object was a fairly fresh grave with an unmarked rock slab for headstone. I learned later from an item in a local newspaper that a troop of cavalry, after chasing a band of Apaches into the mountains, had camped at the spring for the night, and early next morning were attacked by the Indians. An Indian scout attached to the U. S. force was killed and buried on the spot. As Chief Nana's Apaches were active at the time within a few miles of Silver City and Deming, the grave suggested the possibility of my having to fight Indians also.

The ensuing three decades between 1885 and 1912 were not in any sense a peaceful era. The menace of the rampaging Apaches was finally dispelled by shipping all the insurgents in box cars to a reservation in Florida, where most of them died. The vast expanse of western range lands, now safe for settlement by whites, then became another kind of battleground. Hordes of livestock, mostly cattle, poured into the public lands, there for the taking. A multitude of problems soon developed, however, mostly because of lack of permanent water. Minor feuds soon blossomed into range wars, of which the Lincoln County War was one of the worst. It involved two very renowned characters—exact opposites. General Lew Wallace, famous as the author of *Ben Hur* and also for his service at the battle of Shiloh in the Civil War, was then governor of New Mexico Territory. He was persuaded to make a peace pact with the notorious outlaw, Billy the Kid, who was famous or rather “infamous” for the number of men he had killed. Obviously, this pact with the wild one did not last long; the bloody war had to be settled by bringing in some of the tough cavalry Indian fighters from the U. S. Army at Fort Stanton.

The advent of barbed wire plus the faithful old windmill served to alleviate a lot of the difficulties stemming from the use of the uncontrolled public domain.



Lunchtime, just before completing the boundary fence of the Jornada Range Reserve, October, 1912. Around the chuck wagon are (l. to r.): "George," the cook; two unknown laborers; George Lynch, county surveyor; two unknown laborers; and C. T. Turney. (Photo by E. O. Wooton.)

Fencing then was the solution to the problem of possession of the range in 1912, but where to build the fence—a mighty touchy problem. It required the wisdom of Solomon, the patience of Job, and liberal portions of diplomacy to locate a fenced line between adjoining neighbors. No doubt the Jornada was no exception.

It is a real tribute to the bulldog tactics of the rancher, C. T. Turney, plus the diplomacy of Dr. Wooton, that this matter was settled quickly. At that, oldtimers generally agreed that in their way of expressing it, "both of them fellers came in to water after night for quite a spell thereafter."

What's in a Name?

The Jornada Range comprises the southern extremity of the famous Jornada del Muerto (Journey of Death). The plain extends from the Dona Ana Mountains in the south to Bosque del Apache Grant near Socorro, New Mexico. It is bounded on the east by the escarpments of the San Andres Range.

Many are the stories as to how this plain gained its rather gruesome title, "Journey of Death" or "Journey of the Dead," as some would have it. Dating back to the "Forty-Niners," several groups of gold seekers were said to have perished for lack of water as they crossed the plain. This is not likely. The Jornada plain, while nearly 150 miles in length, is only a few miles wide; perhaps 25 miles at most. The Rio Grande borders it on the west; the San Andres Mountain with numerous springs, on the east.

The most likely origin of the name extends way back before the beginning of the last century. The old Camino Real, or Kings Highway, used by ox team freighters hauling supplies north from Mexico to Santa Fe, traversed the full length of the Jornada Plain. Traveling in convoys, they were no doubt under frequent attack from hostile Indians from the adjacent San Andres Range or from the brushy river banks. The attacks by hostiles could very easily apply to much more recent years. The fierce Apaches under Geronimo, Nana, Victoria, and other chiefs, broke out of their reservations in the eighties, the war-like parties spreading over New Mexico, Arizona, and northern Mexico. In their

depredations before finally being corralled, they accounted for the lives of over 3,000 people: troopers, ranchers, miners, and settlers, with, of course, their entire families. This is not to mention property destroyed and livestock killed or stolen and driven away. Numbering fewer than 700 braves, they broke up into small bands and held their own for several years against the overwhelming armed forces hunting them down. The United States Army established forts and supply bases all over the Southwest and at one time had over 7,000 troops, mostly cavalry, in the field. Since Chief Nana and his warriors roamed the San Andres at about this time, it is quite likely that a death toll was exacted from the Jornada plain.

The Jornada Range

The Range is fairly typical of a very large area in New Mexico, Arizona, western Texas, and northern Mexico. Practically all the area is classed as semidesert, the rainfall averaging less than 10 inches. The climate is characterized by fairly mild winters, high winds in spring, and hot, dry summers. Elevation varies from 4,000 feet to 8,000 feet. Vegetation is composed of such grasses as black grama, tobosa, dropseeds, burrograss, and three-awn or needlegress, together with various kinds of shrubs as yucca, mesquite, creosotebush, tarbush, and chamisa. The area abounds with wild animal life, which will be dealt with in due course.

The original area of the Jornada Range, 190,000 acres, is typical as to vegetation, soils, and climate of some 30 million acres of semidesert range in the Southwest. The present Range is enclosed and subdivided into 18 experimental pastures by 207 miles of 4-wire fence. Water for the livestock is provided by 13 deep wells, approximately 400 feet deep and equipped with windmills, pumps, and water storage tanks with drinking rims or troughs. This permanent water is supplemented by a large number of small surface tanklets, plus 26 large earthen tanks for temporary water. Six and one-half miles of pipeline lead out from the wells. In the mountain area, seven springs or seeps have been developed.

T-Hook Turney—Party of the First Part

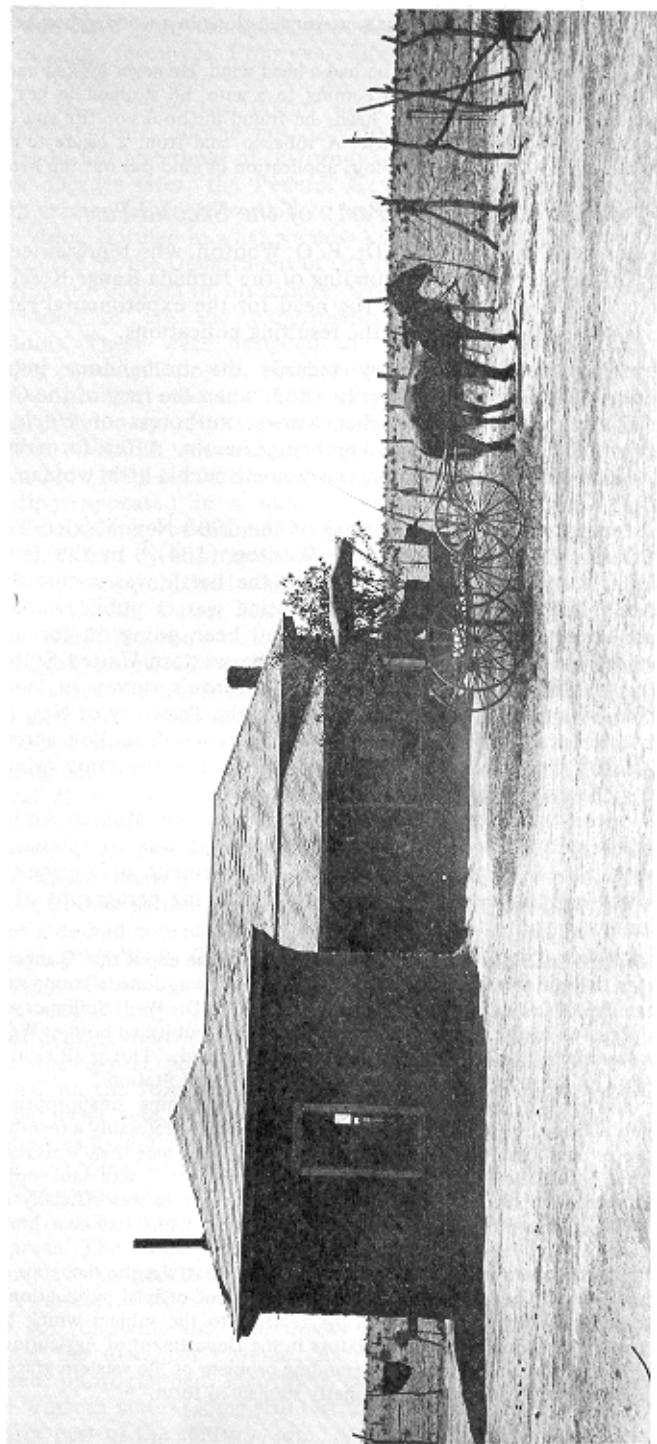
By 1912, Turney had obtained title to all the small patented plots of land around permanent water, thus fulfilling the requirements of the "unwritten law" of control over all the other public domain lands comprising the Jornada Range Reserve.

Turney thus became the Jornada's first cooperator, legally known as the "Party of the First Part" in the formal cooperative agreement with the U. S. Department of Agriculture. A large, heavy-set man with snapping black eyes, Turney was the typical man of the range; one of New Mexico's great cattlemen. He came into Dona Ana County from Sutton County, Texas, in 1901 and settled on the Jornada plain at the site of the present Jornada Headquarters.

C. L. Forsling, a close friend of Turney's, contributes the following amusing episode:

Charles T. Turney once told me he had been on his own since he was 8 years of age. First, he was just a kid on a ranch. He wanted to be a cowboy and a cattleman. He had little schooling and could barely write his own signature. But he did learn to read pretty well. His son Joe told me that once before automobiles, he purchased a set of good books from which he would read, sitting cross-legged Indian fashion on the seat when driving his heavy buggy and good road team from the ranch to town or elsewhere.

He smoked cigarettes of his own manufacture. He whittled dry plug tobacco, catching and holding the plug and the crumbs in one hand while he whittled with the other until he had enough to make a smoke. From his shirt pocket he would then pull out a pack of heavy brown Mexican cigarette papers and take usually two papers into which he would pour the tobacco and form it into a cigarette. The crumbs of tobacco would become hot coals and often fell and burned holes in his shirt, which fires he



Original house at "Headquarters" of C. T. Turney's ranch, before Jornada Range was established. Adobe dwelling with modifications still stands and is in use. Buggy and team was the transportation used by E. O. Wootton, who took the picture.

would bat out when the heat penetrated his shirt and underwear. He smoked often while reading one of his books; the other books were carried along in a wooden box behind the buggy seat.

One day while driving to the ranch he had a head wind. He never looked back at the contents of the buggy as he drove. On coming to a gate, he stopped to get out and thought he smelled smoke. Turning his head, he found the books on fire and the blaze spreading to the woodwork of his vehicle. A tobacco coal from a cigarette had been whipped into a flame by the wind. A copious application of sand put out the fire.

12 E. O. Wooton, *Representing the Party of the Second Part*

The reader has been introduced to Dr. E. O. Wooton, who represented the U. S. Department of Agriculture in the founding of the Jornada Range Reserve. But to understand why Wooton visualized the need for the experimental range, we must summarize some of his work and the resulting publications.

Power of the Printed Page. History records the tremendous impact of publications—even that of a single issue. In 1863, when the fury of the Civil War had reached its height, Harriet Beecher Stowe, authoress of *Uncle Tom's Cabin*, was introduced to President Abraham Lincoln. After formalities, he turned to her and exclaimed, "My, my, but you are such a little woman to have started such a big war!"

To some extent, the same could be said of the 1908 New Mexico Territory Experiment Station Bulletin No. 66, by Wooton (104).² In the first two decades of the century, the lines were drawn; the battle was on for the open range resources of the West. Since it was a losing war, a public warning was needed to alert the nation to what was and had been going on for only too long—the rape of vast areas of grazing lands in the western United States. This was all loosely labeled the "Public Domain." Wooton's survey in 1907-1908 covered only the 31 million acres of such land in the Territory of New Mexico. However, it was generally conceded that an estimated 400 million acres in the western part of the United States should be included in the same category. It was in the same jeopardy, too, from mismanagement.

Professor Wooton was at this time botanist of the New Mexico Agricultural Station located near Las Cruces. After the manuscript was completed, it was offered to both the Station and the U. S. Department of Agriculture for publication. What happened is set forth in the following paragraphs of a 1939 letter from Wooton:

Number 66 presented the ideas which I held at that time about the "Range Problem in New Mexico." Some of the field work for that bulletin was done in cooperation with what was then the Office of Farm Management, of which Dr. W. J. Spillman was chief. The Ms was prepared in the expectation that it would be published both at Washington and in New Mexico. When Dr. Spillman read the Ms he said, "This is all right, but we can't say it—you go ahead and publish it from the Experiment Station."

He referred to the recommendation that the remaining unappropriated and unreserved public lands be administered by a federal official—preferably a member of the Cabinet—more or less after the plan that the Forest Service was then working out for grazing on the forest lands. Secretary Wilson—"Tama Jim," was still opposed to increasing the regulatory duties of his Department, although he was officially in charge of the Pure Food and Forest Service administration, both of which had been more or less "thrust" upon him.

My recommendations were not new, though I think that was the first time they had been published, even in a generalized form in any sort of official publication. Similar ideas had been eliminated from manuscripts relating to the subject which had been offered for publication by various investigators in the Department of Agriculture before I entered the field. "Control" was the outstanding problem of the western grazing lands; I merely was able to say it publicly in a properly sponsored form.

² Numbers in parentheses refer to Bibliography.

This bulletin was and is the first "properly sponsored form" of protest. It could well have been the spark that set off the counterthrust against further waste of range resources. Four years later, anticipating the Federal control of all western ranges, Wooton was the prime mover in setting up the Jornada Range Reserve. He foresaw the urgent need of developing pasture and livestock management plans tailored not only to meet the requirements of the ravaged range lands, but also those of the producer.

Two decades later, the Federal Government did take over control of the western grazing lands. It is good to know that Dr. Wooton lived long enough to see his vision fulfilled in what we now know as the Taylor Act of June 28, 1934, administered by the Department of the Interior. More on this later.

During the 3 years of his tenure, Wooton not only had the area fenced, but found time to lay the experimental groundwork and establish research procedures. These were designed to obtain the definite range information, "carrying capacity" mostly, which he knew was desperately needed. He further analyzed the data collected in his previous territorial survey of New Mexico. Adding preliminary results from his work on the Jornada, Wooton in 1915 published "Factors Affecting Range Management in New Mexico," USDA Bulletin 211 (105). He further aired the views expressed in Bulletin 66. Only this time, they appeared in a bulletin sponsored by the U. S. Department of Agriculture. It may be assumed, among other things, that pressure for control of public lands had by this time eliminated the opposition encountered previously.

Although not published while he was in charge of the Jornada, another USDA Bulletin, "Certain Desert Plants as Emergency Stock Feed," (106) reflects in large measure, Wooton's work on the Range. It was here that subsequent feeding of chopped soapweed was first tested and suitable machines developed to properly shred the leaves and stems of the desert plant. Due to heavily stocked ranges plus low rainfall at the time, this emergency feeding was timely and saved hundreds of cattle from starvation.

During the 3 years Wooton was in charge of the Jornada, he conducted a very practical study—the much-discussed Pasture 2 experiment. It made quite an impact at the time.

Pasture 2, an area of 34,000 acres, was fenced in 1912. Wooton selected an area of approximately the same type and surface area west of and outside the Jornada, known as the old Detroit range. At that time, both Pasture 2 and the outside area had considerable black grama forage. Later, quadrats (meter square) were set up by W. R. Chapline at ½-mile intervals up to 4 ½ miles from water in both areas. Stocking on the outside range was continued as usual, yearlong without any attempt to regulate grazing to provide seasonal use or any other form of management.

For the 3-year period, all known plans of management were applied to Pasture 2 on the Jornada side. Growing season stocking was reduced to less than half the usual rate. Throughout the remaining 8 months, the usual rate of stocking was used along with more and better distribution of watering places.

The outcome of the experiment showed that in 3 years Pasture 2 had improved approximately 50% in producing capacity over the outside area. This conclusion was drawn after measurement of the plant density on the quadrats of both areas. The cattlemen viewing the areas believed the researchers' estimate too low; they judged 100% to be the degree of improvement.

In a variety of ways, Wooton was a most remarkable man. Insofar as possible to do so, following his trail might prove to be a fascinating study in itself. Consider the distances covered, mostly by primitive modes of travel; plants collected, photographed, identified, and classified. His travels covered nearly all of the Western states (some still territories at the time), and northern Mexico. In the early part of the century, some of this land had been explored and surveyed,

but a goodly portion could have been classified as “wild and untamable.” Had he chosen to write, a written account of his adventures doubtless would have been a best seller. At any rate, it is not difficult to reach the conclusion that Dr. Wooton was a combination of human dynamo, wizard, and near genius for getting things done. His many published works are indeed impressive from the standpoint of quantity as well as quality.

Plants of New Mexico—Afterthoughts

Towering above all Wooton's publications, and now a collector's item, is the *Flora of New Mexico* (107, 108), written in collaboration with Paul Standley. Much work on the *Flora* was done on the Jornada. Reminiscing years later, Dr. Wooton, in a personal letter, discussed some afterthoughts concerning his monumental work, of interest to taxonomists and ecologists:

The *Flora* is really only a preliminary list of the best names Standley and I could find for the plants of which we examined specimens collected in New Mexico. Since we could not monograph all the families of which we had specimens, the resulting list is necessarily quite uneven in the treatment. We followed what we considered the best authorities. But each authority had a set of standards of his own for what constitutes a “species” (which, by the way, is a concept of a species maker and not a biologic entity at all), consequently, said “species” as named in any list such as ours, are not similar in a statistical sense and are therefore not comparable in any strict sense.

When we found what seemed to be a group without a name, we offered one for taxonomic specialists to pass judgment upon. In other words, the work is merely a first step towards a manual; a framework upon which more data might be “hung”; each new contribution or correction being attached in its proper place.

Expressing (gratuitously) my own opinion about the present status of taxonomic botany (and imposing upon you, who are at my mercy), I do not believe that there are nearly enough names listed in the *Flora* to cover the actual number of recognizable groups of individual plants that are similar enough to constitute a “good” species; notwithstanding the amount of “lumping” that has gone on in recent years. I'm a confirmed “splitter,” because I feel reasonably sure that botanical taxonomy, as a branch of scientific effort, is in about the same state of development as classical physics was before the discovery of radium. The real biologic unit—a species—is probably about as much smaller than the unit now used as an electron is than an atom. Of course, this means that there will be many more names instead of fewer.

Ecologists are generally opposed to this idea because they (probably subconsciously) want *fewer* instead of more names (and plants) to learn (preliminary drudgery) before they commence the study of distribution, etc. They don't seem to see that if they lump species, all their ecologic conclusions are bound to be muddled and the phenomena hard to explain.

Did it ever occur to you that the area of the western hemisphere where corn was probably originally native—certainly where “corn was king” in pre-Columbian time—is not in the corn belt nor anywhere near it? In 1921, the most reliable cultivated crop on the plains of eastern Montana, the crop on which the continuity of dryland farming depended, was not wheat or flax but *corn*. But it was as different a “corn” from those grown in the corn belt as if it had been (as it probably is) a different species of the genus *Zea*. That we should call it a “variety” or a “strain” is nothing but an attempt to retain Mosaic ideas of genetics instead of junking them.

To give credit to whom it is due, it must be mentioned that others besides Wooton were concerned about the state of things, range-wise, in the West. Even as early as 1891 and on through the turn of the century, pioneer range researchers voiced this concern in publications and by other means, pushing toward some sort of control of the public domain (Chapline et al., 40). Thus, while Wooton deserves much credit for his foresight, energy, and hard work to get the need of range management on the public domain grazing lands recognized, he was only one of a good many who came, saw, and pushed as pioneers in what was required to bring better range management to these vast lands.

Still Life on the Jornada

Wooton's interest in plants, plant names, and forage values was shared by Forest Service range men, including those who came to staff the Jornada Range in 1915 and later. The Jornada Herbarium is now a very impressive collection of semidesert plants, consisting of specimens with identification, Latin and common names, abundance, soil type, growth habits, and other ecological information. Most important are the "economic notes" or indications of forage value.

Beginning with W. R. Chapline in 1915, nearly all technical personnel have been involved in the collection and may be credited with bringing the Herbarium to its present valuable status. It includes all species that possess any forage value and are sufficiently distributed to be of any value on the experimental range and the surrounding plain. A few plants occur on the Jornada which have not been collected and identified, such as a few smuts, one cactus, and one liverwort. These eventually will be added to the catalog as additional collections are made, along with other species that may have extended their range over the Jornada.

The present catalog includes a total of 502 species in 294 genera, and 88 families (exclusive of the mosses, algae, fungi, and lichens).

The following is a summary of the species list, by the four main forage classes:

<i>Grasses</i>	76
<i>Grass-like Plants</i>	11
<i>Weeds</i>	292
<i>Browse</i>	123
Subtotal	502

Plants Not Ordinarily Classified as Forage Plants

(*Bryophytes* and *Thallophytes*)

<i>Mosses</i>	3
<i>Algae</i>	1
<i>Fungi</i>	9
<i>Lichens</i>	3
Subtotal	16

Total Number of Species of All Classes 518

A compilation of Jornada plants, based on the Herbarium, was published by Little and Campbell (80). Other publications drawing on the Jornada collections were prepared in the Office of Range Forage Investigations in Washington, D. C., under the supervision of W. A. Dayton. The best known of these is the *Range Plant Handbook* (43). A few of the common plants mentioned in this report are listed in Table 1.

Table 1. Plant names listed in manuscript.

Latin name	Common name
Grasses	
<i>Aristida longiseta</i>	Red threeawn
<i>Bouteloua eriopoda</i>	Black grama
<i>Bouteloua curtipendula</i>	Sideoats grama
<i>Eragrostis pilosa</i>	Indian lovegrass
<i>Hilaria mutica</i>	Tobosa
<i>Muhlenbergia porteri</i>	Bush muhly
<i>Scleropogon brevifolius</i>	Burrograss
<i>Sporobolus contractus</i>	Spike dropseed

continued . . .

... continued

Table 1. Plant names listed in manuscript.

	Latin name	Common name
16	Forbs	
	<i>Asclepias galioides</i>	Whorled milkweed
	<i>Drymaria holosteoides</i>	Thickleaf drymary
	<i>Salsola kali-tenuifolia</i>	Tumbling Russianthistle
	Shrubs and trees	
	<i>Atriplex canescens</i>	Fourwing saltbush (chamisa)
	<i>Agave lephantha</i>	Mescal
	<i>Dasyliirion wheeleri</i>	Sotol
	<i>Flourensia cernua</i>	American tarbush
	<i>Gutierrezia sarothrae</i>	Broom snakeweed
	<i>Juniperus monosperma</i>	Juniper
	<i>Larrea tridentata</i>	Coville creosotebush
	<i>Nolina greeni</i>	Beargrass
	<i>Opuntia filipendula</i>	Pricklypear (Walking stick cactus)
	<i>Pinus cembroides</i>	Pinon
	<i>Prosopis juliflora</i>	Honey mesquite
	<i>Yucca elata</i>	Soaptree yucca (soapweed)





Old Problems, New Faces: 17

1915 - 25

The Jornada Range Reserve was transferred in 1915 from the Bureau of Plant Industry to the Forest Service within the U. S. Department of Agriculture. This top Bureau has been known for decades as Uncle Sam's most efficient and best organized, the only one that not only pays its own way but actually yields a profit and deposits a surplus in the Treasury nearly every year. Forsling has contributed an interesting report of the transfer:

Neither the Forest Service nor Jim Jardine stole the Jornada Range Reserve as some have assumed. In the early part of 1915, the Forest Service was before a Committee of the House of Representatives testifying for its appropriation requests for the next fiscal year beginning July 1. Jim Jardine was explaining the item on range investigations to support the Great Basin Experiment Station in Utah, and other range research. When Jim had finished, the Chairman said that the Committee had before it a request from another Bureau for an appropriation to make grazing studies on the desert range in New Mexico, and also in Arizona (the Santa Rita Range). He went on to say that it seemed inadvisable for the Department to have two Bureaus working on the same sort of thing. Therefore, since Mr. Jardine's office had already been working on the problems for several years and had experience in them, the Chairman asked should the new work not be undertaken by the Forest Service. Jardine replied that he did not feel qualified to answer the question because he had never been in that area and knew nothing about it. The Chairman then proposed that Jardine make an examination in the next few weeks and come back to the Committee with his observations and recommendations. I don't know with whom Jardine conferred in the BPI, other than with Dr. F. V. Coville, who was working with the Forest Service on certain range matters. Anyway, Jim reported to the Committee, and the appropriation was made to the Forest Service; the Jornada and the Santa Rita Ranges both were transferred to the Forest Service.

Jardine at that time was Chief of the Office of Grazing Studies in the Forest Service, and W. R. Chapline was his assistant. Jardine left the Forest Service in 1920 to become Director of the Oregon Agricultural Experiment Station and later moved back to Washington, D. C., as Chief of the Office of Experiment Stations in the U. S. Department of Agriculture.

C. E. Fleming succeeded Wootton in charge of the Jornada, arriving May 15, 1915. Chapline and Jardine arrived about the same date. As Chapline states in his letter:

We looked the general situation over and prepared the basic plans for research, bringing to conclusion the cooperative plans which Jardine had already formulated. Fleming was then in direct charge of the Jornada. I simply aided in formulating the procedures relating chiefly to vegetation, and all three of us laid out most of the quadrats and decided which plots should be fenced. I then began charting many of the quadrats. This was carried on along with Stanley Coville and L. C. Hurtt when the latter arrived as assistant to Fleming in July 1915.

Jardine was a frequent visitor and very active in Jornada affairs. He was senior author of two very important USDA bulletins from the Range, which will be summarized in some detail.

Fleming left the Jornada in February, 1916, to join the faculty of the University of Nevada and was replaced by Leon C. Hurtt.

18 Hurtt teamed up with Jardine to publish the first USDA bulletin from the Jornada in 1917 (70), on increased cattle production on Southwest ranges. It recognized the different characteristics of forage types and shaped the grazing management plan accordingly. The concept of seasonal use of black grama and tobosa grass types was developed and tested; an important step forward. Supplementing this, the value of many well distributed watering places was stressed. This was necessary to obtain a more uniform pattern of grazing to keep both range and cattle in good productive condition.

A very significant paragraph of Bulletin 588 (p. 31) is quoted herewith:

In order to provide extra range for the breeding herd in poor years, one-third of the stock on a range unit should be steers. It is then possible to reduce the number, when necessary, by selling steers without great loss and without interfering with the breeding stock. In good years, the number of steers can be increased, or in bad years decreased.

Thus, long ago the all-important principle of flexible herd management appeared in embryonic form. Later adopted and implemented, it was proven to be the only workable form of drought insurance available to the beleaguered cowman.

Plenty was said in Bulletin 588 of the many and various ways of providing supplemental feed for livestock on the range. This was very timely indeed, considering the inevitable drought and declining forage at the time. All this was combined with a rate of stocking well calculated to take one's breath away. Feed was required in such quantities that the valley farms could not meet the demand. Hence, the use of the soaptree, mescal, pricklypear, and other desert shrubs as emergency rations.

Earl Hummel and Stanley Coville were field assistants in 1916. While in charge of the Jornada, Hurtt had as distinguished guests such personages as Will C. Barnes (incidentally, a winner of the Congressional Medal of Honor as a young trooper in the Indian wars of the late eighties), and A. F. Potter, both high officials of the U. S. Forest Service, Washington, D. C.

In March, 1916, Clarence L. Forsling reported as Hurtt's assistant.

In April 1917, Hurtt transferred to Montana and C. L. Forsling replaced him in charge of the Jornada, remaining until he transferred to the Washington Office in May 1920. He had as field assistants: Earl Hummel, Chester Lee (brother of Floyd Lee, long-time president of the New Mexico Wool Growers Association), Fred Quesenberry, Julian Howells, and Joe Turney (son of the cooperator, C. T. Turney).

More About T-Hook and the Ranch

At this point, we must finish the story of T-Hook Turney. As cooperator, he retained the grazing use of the experimental Range until the cooperative agreement expired in 1925. During the 3 years following 1912, when the experiment was set up, the area was favored by good rainfall and fairly steady livestock prices. Mr. Turney "done well" in the cowboy vernacular, and was able to purchase and graze on the Jornada an average of 3,000 head of cattle, with temporary maximum numbers reaching approximately 4,000 head.

At about this time, "T-Hook" tempted fate by ignoring some good advice when he purchased another ranch—the Bar Cross. This was a large spread on which the Western writer Eugene Manlove Rhodes was once employed and mentioned frequently in his stories. Anyhow, this move on the part of Turney



C. T. (T-Hook) Turney in 1912 with sons, left to right: Floyd, Edgar, Joe, Jack, and Mike. In the background is an old adobe bunk and feed house. (U.S. Forest Service photo.)

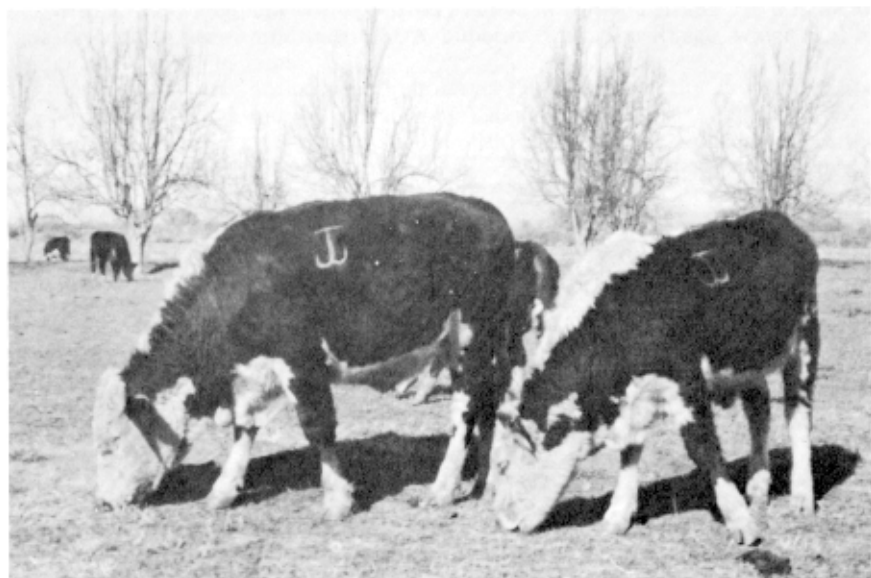
proved to be a gamble which did not pay off. Forsling fills us in:

I arrived at the Jornada early in March 1916. My job was to help gather and ride tally on just under 1500 two- and three-year-old steers from the mountains and from Pasture No. 2, and help trail them to Rincon, where we loaded them on railroad cars. They were shipped to an Indian Reservation in South Dakota, where the buyer had a leased range. After that sale, "T-Hook" paid all his debts and had \$35,000 to work with until next shipping time a year later (happily). Because of the drought he didn't buy many yearling steers that fall; just kept those of his own raising.

T-Hook had been dried out by the 1908-1909-1910 drought and finally, after heavy death losses, moved the remnants to pasture in Old Mexico. He was practically broke when it was all over, but managed to borrow enough money on his face to stock the Jornada. When rains came again, he had by 1915-16 built his herd up to 3,000-4,000 head and was out of debt with another \$35,000 in the bank. This did not include the value of an 800-acre irrigated farm near Mesilla, where he lived.

Actually, it was the Bar Cross deal that broke Mr. Turney. He mortgaged everything he had, except the farm in Mesilla. I pleaded with him to leave that in his wife's name, keeping it out of the Bar Cross deal. I have always felt good for that because when it was all over, the farm was all she had left.

After rains came in mid-1919, T-Hook paid a steep price for a big string of yearlings and 2-year-old steers to add to the 2,000 cattle acquired on the Bar Cross. The influence of war prices was still present. He ran those steers and some of his own raising on the range, feeding some cottonseed cake the winters of 1919-20 and 1920-21. Finally, in the summer of 1921, he shipped them to bluestem grass in Kansas, hoping for some weight gains before shipping them to market. I was in Kansas City the day Mr. Turney sold those steers, some of them 4 years of age. The price slump for farm products, including cattle, following World War I had set in in 1920 and was going strong. Turney had to sell the steers for a lesser price per head than he paid for them in 1919 as 2-year-olds. He also sold some of his own raising which were then 2- and 3-year olds. But this is what broke him, and not overstocking the range. The Bar Cross range was hard hit by the drought, but the number of cattle had been cut way, way down from the 6,000 to 8,000 run by the Bar Cross outfit a couple of years before. Had Turney stayed with the Jornada, he would have survived financially. He never did recover from the debts he incurred in buying the Bar Cross and the steers to stock it. He was nearly broke when he sold out, except for the farm.



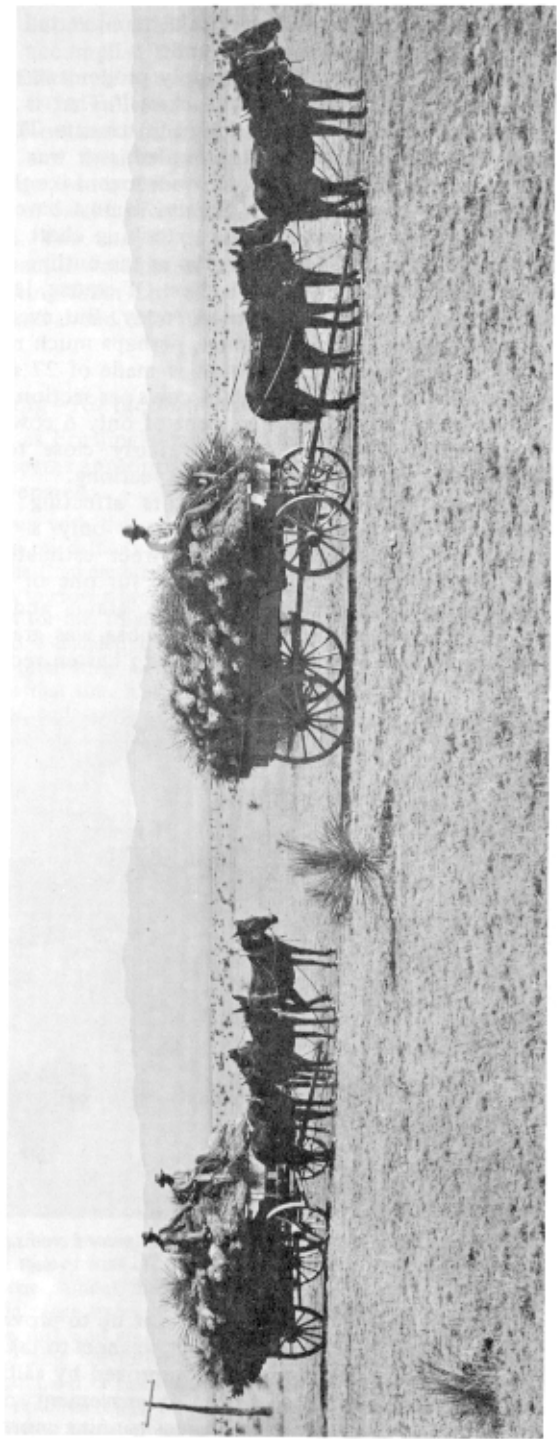
Two young bulls with the famous brand of C. T. Turney, the source of his familiar name, "T-Hook Turney." (U.S. Forest Service photo.)

Meanwhile, although the original plans for the Jornada Range were modified to some extent, the program went on much as intended. A major modification was the removal of all cattle from the range when the rains came after the 1st of July of 1919. It was decided that, after 3 dry growing seasons, with moderate to heavy overuse of the pastures during that time, it would be best to give them all a rest during the growing season of 1919; so the cattle were moved to the Bar Cross range where there had been only light stocking. I have no doubt in my mind but that the Jornada would have carried the T-Hook cattle through 1919-20 had there been some more culling of cows, and all yearling steers sold to get the numbers down to carrying capacity. At any rate, with the good rains in the growing seasons of 1919-20, the range (especially black grama grass) had pretty well been restored to maximum of the 1915-16 period by the end of the 1921 season, according to Nelson's study.

Shadows of Coming Events—Bulletin 1031

The next publication based on the Jornada work was "Range and Cattle Management During Drought" by Jardine and Forsling (69). The drought of 1916-1919 created a real emergency. Some 1,000 breeding cows were threatened with starvation. The emergency was met by chopping and shredding a common range shrub, soaptree (45), continuing the earlier work of Wootton and Hurtt. Mixed with a small amount of cottonseed meal and fed to the starving animals, it was credited with saving at least half the weaker cows, which otherwise would have died.

Other theories advanced in Bulletin 1031 are: (1) heavy culling of livestock, especially cows; (2) reducing stocking to a degree needed to provide residual forage; (3) reserving portion of the range for the critical winter-spring season; (4) early weaning of calves; (5) limiting breeding herd to capacity of range during lower rainfall years. This publication, remarkable for its time, threw the spotlight on the entire range picture. It pointed out very clearly the solution to the ranchers' woes and problems. If promptly accepted and universally applied,



Hauling soapweed or yucca plants to be cut and shredded. Mixed with cottonseed meal, they served as emergency rations to drought-stricken cattle on the Jornada Range. (U.S. Forest Service photo, 1918.)

these precepts could well have prevented innumerable bankruptcies and monumental losses. Who knows, this perhaps could have averted the transition to near wasteland of an empire of prime grazing land.

22 In retrospect, of all these early attempts to apply proper and effective range management, it can be said, "One thing thou lackest!" That is the failure to place more emphasis and stress on timely stocking adjustments. The old concept of a fixed carrying capacity pretty much prevailed and was clung to and followed to the bitter end, regardless of current conditions. Like the ancient law of the Medes and Persians, "it altereth not." Surely, it must have been evident even in that far-off day that each annual range stocking chart should follow closely that of the rainfall. This latter is as irregular as the outline of a large pipe organ, or perhaps more so; very few years are alike. Of course, levels of proper stocking were high then compared to those of today. But even so, had the stocking rate been more subject to manipulation, perhaps much range damage could have been averted. For example, mention is made of 27 acres per head optimum stocking yearlong or approximately 24 cows per section. Compare the present Jornada proper stocking yearlong concept of only 6 cows per section, and that only for a small top range pasture fairly close to its original productivity. This represents over 100 acres per cow yearlong.

Bulletin 1031 brought together all the factors affecting the industry, beginning with drought, the biggest problem. With only a few years of observation, these men worked out a fairly correct estimate of drought occurrence: in every cycle of 8 to 10 years, look for one of 3 to 4 years' duration. They recommended seasonal use of black grama and tobosa grass ranges, the first to be deferred in summer while tobosa was grazed. Stocking reduced during droughts was to be increased slowly to hasten recovery, and so forth.



Ensilage machine in operation, chopping and shredding soapweed stems and leaves. (U.S. Forest Service photo, 1916.)

A more complex plan of herd management was set up to provide flexibility: breeding cows to be held at 50% of total, steers or weaners to take up the slack in good years. Distribution of cattle was to be improved by salting, plenty of watering places, riding herd, and so forth. Improvement of cattle was recommended to obtain more beef, rather than just running more livestock. In

other words, shoot for higher calf crops, more weight on weaners, and reduced death losses. Supplemental feeding of both cows and bulls was presented as one good way to accomplish this end. Altogether, the proposed plan was adequate, lacking only full implementation.

Forsling's 1924 bulletin, "Saving Livestock from Starvation on Southwestern Ranges," (46) outlined the need of better livestock, again warning of effects of overstocking and the ever-present threat of drought. Conservative stocking and adequate range water developments were recommended. Provision of supplemental feed for cattle, proper care, and attention to prevent livestock losses were also stressed. The use of native plants, yucca, beargrass, mesquite, sotol, and pricklypear cactus were presented. Shredding and burning thorns off these plants and then mixing them with small amounts of cottonseed meal made these plants a very economical and effective source of emergency forage.

C. L. Forsling—Range Manager

Inasmuch as Forsling's contributions constitute such a substantial part of this narrative, it seems appropriate to insert here a brief biographical sketch which he has kindly prepared:

I grew up with the cattle, range horses, and sheep (of our range competitors), and blizzards on my father's ranch in the "checkerboard" (railroad and open public domain) lands on the Cheyenne High Plains of western Nebraska. When the homesteaders came and started to grow wheat, raising cattle under herd-law or becoming a wheat farmer lost their charm for me. I had read about grazing on the national forests and about Gifford Pinchot. So I decided if I took forestry and got into the grazing end, I might have something interesting along with what sounded like a good life. The University of Nebraska at that time had Dr. Bessey, one of the best botanists of his day, and the best teacher ever, and excellent courses in the then-new science of ecology, as well as other pertinent biology courses; so it was the school I needed. After 4 years in college and 3 summers as field assistant, 2 of them in range work, I got my BSc degree in 1915, took the "grazing assistant" Civil Service exam, and stood at the top of the list that year. At that time, the University of Nebraska was furnishing most of the college-trained people entering range work in the Forest Service.

Forsling transferred to the Washington Office in May 1920; then in the fall of 1922, he replaced Dr. A. W. Sampson at the Great Basin Experiment Station in Utah. In 1930, the scope of the GBES was enlarged and became part of the Intermountain Forest and Range Experiment Station, which Forsling organized and directed until 1935. He then transferred to Asheville, North Carolina, as director of the Appalachian (now Southeastern) Forest Experiment Station. In 1937, he became assistant chief of the Forest Service, in charge of research for the entire United States.

His account continues:

Much of the work during the war years dealt with Forest Service participation with war agencies to get adequate production of forest products to meet Allies' war needs. Also, I carried much of the U. S. part in beginning the Forestry and Forest Products Division in the emerging Food and Agricultural Organization affiliated with the United Nations.

In May 1944, I was appointed director of the Grazing Service by President Roosevelt. The biggest task of that office at the time was to keep the job of regulating grazing in the grazing districts under the control of the U. S. Government, instead of its being taken over by the range users. A senator was the chief agent of the range users who were undertaking this land grab. A very much-needed move was to combine the Land Office with the Grazing Service and place the administration of the Bureau under other than the so-called Land Office influence. Action was initiated in the Secretary's Office, and about that time Secretary Ickes left office. A senator sent word to the new Secretary of the Interior that the combining of the two agencies would not be passed unless he was

promised that I would not be included in the top part of the new organization. I was not included. Matters looked dark for the good of the range for a while, but for some years now, things have been coming along very well. Things would have been much different had there been a strong Secretary like Harold Ickes on the job at the crucial point of the reorganization.

24

Forsling's comments, interspersed throughout this story, reflect an enduring enthusiasm and dedication to the research efforts that have advanced so far the cause of conservation of the forest and range, and other resources of the United States. The term *ecology* is certainly no stranger to C. L. Forsling, and has been in his sights for the past half century. He has, however, been only one of a great number of dedicated men who have labored in the same field. Not only the



C. L. Forsling astride a cow pony and with the accoutrements of a western "cowhand," was in charge of the Jornada Range Reserve 1917 to 1919. He was by no means a "drugstore cowboy."

Forest Service, but the National Park Service, the Bureau of Land Management, the Bureau of Indian Affairs, and the Soil Conservation Service each have their Hall of Fame—pioneers who looked ahead, saw chaos, and planned accordingly. Who knows—perhaps their efforts in this line of endeavor have already stayed the much abused and disoriented environment from reaching the point of no return.



U.S. Forest Service "brass" visit the Jornada, December 12, 1924. Left to right: J. D. Schoeller's horse (Jake's shadow taking picture at left bottom); Dave Shoemaker, chief of grazing administration, Region 3; Hurst Julian, Schoeller's assistant; and W. R. Chapline, chief of grazing investigations, Washington, D.C. Schoeller was in charge of Jornada.

Black Grama—Forage Par Excellence

Enoch W. Nelson came to the Jornada in March, 1920, and took over from Forsling in May. He made a study of calf crops on the Range (88). J. D. Schoeller and Hurst Julian were his assistants. Field assistants were Jack Marlowe, P. B. Lister, Robert Copple, and A. E. Hough.

Enoch Nelson (deceased) is remembered mostly for his exhaustive study of black grama, the most valuable forage plant found on semidesert ranges (89). The manuscript was completed anonymously by W. R. Chapline and published in 1934, 10 years after Nelson left the Jornada. Chief characteristics—growth habits, drought resistant qualities, high palatability, yearlong forage value—are all described in great detail. The study includes data for 13 years, and describes the plant's reaction to low rainfall, various degrees of grazing, its method of reproduction, and other information. This material is extremely valuable to ranchers fortunate enough to have a black grama range and a desire to maintain this top quality grass. A characteristic of black grama, the previous year's rainfall has more effect on its height growth than current rainfall. It is more responsive

to moderate grazing in growth and resistance to drought than to no grazing at all. Subsequent clipping and other studies have shown that the grass will survive indefinitely if not grazed too heavily during the growing season. Of course, the fatal effects of heavy grazing plus droughts are clearly pointed out: this climax plant can be killed completely, and if so, it is usually for keeps.

Nelson left the Jornada in July, 1924, to become Forsling's assistant at the Great Basin Experiment Station; later he took up a teaching career at Colorado State University. He was succeeded on the Jornada by his assistant and understudy, J. D. Schoeller.

And Great Was the Fall Thereof

Almost simultaneously with the expiration of Mr. Turney's agreement with the Department of Agriculture, all his ranch holdings went into receivership. This, by the way, was a very common happening at about that time. Many ranchers bought cattle at war-inspired prices before the end of World War I. Then came the drought of the early twenties, and along with it, a steep drop of nearly 70% in cattle values. Banks all over the Southwest had to make foreclosures, and so it came to pass that the vast "T-Hook" empire went out of existence. With the addition of the Bar Cross Ranch, it did cover a sizable patch of land. Bounded by the Dona Ana Mountains on the south, the towering escarpments of the San Andres on the east, his range extended north nearly to the line of the Old Pedro Armendaris Land Grant near Engle. No wonder that Gene Rhodes described the area as "an Half World" in one of his stories!



Changing Times : 1925 - 33

Late in 1924, a field examiner from an El Paso bank came to the Jornada to assess the situation and “pick up the pieces” of the erstwhile Turney empire. His name, W. H. Waggoner. He looked favorably on the Jornada potential and made necessary arrangements with the Forest Service and a certain bank that was very anxious to get out of the cattle business. In 1925, a new cooperative agreement was drawn up and Waggoner became number two in the line of Jornada cooperators.

The prospect was bleak to a newcomer, R. S. Campbell:

When I stepped off the train in Las Cruces on June 10, 1925, I was greeted by Schoeller, who immediately assured me that I was joining Grazing Investigations—the tail of the Forest Service—and that the Jornada was located at the base of that tail; except that his words were more specific and descriptive. I had lived as a boy in Pecos County, Texas, so this kind of range was familiar to me, but I was shocked at the appearance of the range at the end of the 1924 drought and close grazing until the cattle had been removed. On our way out to Headquarters, I turned to Schoeller and asked him why the range had been burned. The blackened stubs of the dry grass actually gave the impression of a recent fire.”

In earlier years, the blackened stubs that Campbell mentioned here could have been the charred ghosts of yucca plants burned before being harvested for cow feed. Here Campbell again comes on the stage:

Probably you never saw the skeletons around the Jornada after the drought; many were still there in 1925 until the bonepickers had a real harvest. There would be a pile of bones with a big ball of undigested soapweed fibers in the middle. As Dutch Candler, one of the hands, would say: “At least she died with a full stomach and a smile on her face”.

W. H. Waggoner’s tenure as the Jornada cooperator was not as spectacular as that of T-Hook Turney’s, but nevertheless was extremely profitable to the experimental set-up. Starting from scratch (in 1926 there were fewer than 100 cattle of the original herd left on the range), the experimental herd was gradually increased after the previous period of severe drought and heavy stocking. There was, therefore, ample opportunity to observe, profit from past experience, and establish plans for better research and management.

It was also a time of badly needed face-lifting for the Jornada. Before attaining full stocking, this time only about 1800 cattle, all improvements were rehabilitated; new concrete-steel storage reservoirs and drinking rims were installed in place of the old dirt tanks at each well. Some new fences and corrals were also built, altogether a fine job. To encourage this development, the

cooperator was allowed grazing credit on the entire amount spent for the purpose. Before the end of Waggoner's tenure in 1933, this advance credit had accumulated to the amount of \$48,000—a respectable sum at that time. Figuring grazing charges at the then-rate of \$1.50 per head for one year, it was not until 1953, 20 years later, that this credit was finally liquidated. Of the grazing charges for each year, the sum of \$500 per year was withheld for miscellaneous station expenses, a far cry from the present allowance.

28 Waggoner was favored with good weather conditions and benefited greatly from the high cattle prices of the late twenties. He sold the herd before the Great Depression prices dropped too low and was very well off when he left the Jornada in 1933.



J. D. Schoeller, right, seated, entertains New Mexico's county agents at Jornada Range Headquarters, November 1924. (U.S. Forest Service photo.)

"Jake" Schoeller continued in charge of the Jornada from July, 1924, to May, 1927. He has to his credit the first economic survey of the Jornada ranching operations (97). This contribution, titled "Cost of a Range Calf," was used in making range appraisals for adjustment of grazing fees on National Forest ranges.

Assistants who served under Schoeller were J. Kramer, A. Grasovsky, R. S. Campbell, and R. H. Canfield. Later, Kramer took his PhD and taught botany at the University of Montana.

Campbell offers additional information regarding Schoeller's career:

J. D. Schoeller (deceased) was a Californian, with a degree in logging engineering from the University of Washington. He was assistant State Forester in California for a time, served overseas with the U. S. 2nd Cavalry as a lieutenant during World War I, was a ranger on the Toyabe National Forest in Nevada, and in 1922 came to the Jornada as assistant to Nelson. He was a meticulous planner and data handler. It was he who drew up the specifications for the first concrete-steel water reservoir and drinking rims at headquarters installed in 1926, which served as a model for many others on the Jornada. Jake laid out and supervised the work on the black grama and tobosa grass clipping studies in 1926.



R. S. Campbell and Roy Canfield en route to field, charting quadrats. Transportation was air-conditioned Model-T, 1926 vintage. (U.S. Forest Service photo, 1928.)

We started the black grama clipping study with herbage removal at various intervals of time, but at only one height—2 inches above the ground. When Chapline came on inspection that fall, he insisted that we put in a second series of plots clipped at 1 inch above ground. They had started charting all the quadrats on the Jornada in 1915 at 1 inch above ground, because that was considered proper utilization. Of course, by 1926 we all were positive that grazing black grama to 1 inch was too close, but Chap was right in insisting that we have data to prove or disprove our observations. Chap and Jake went round and round over this, but we finally put in the second series of plots, clipped at 1 inch.

Jake also saw the need for, planned, and located most of the intensive network of rain gauges added to the Jornada system in 1925-26.

Much more could be said about the work involved in measuring these rain gauges and their importance in interpreting the studies of vegetation.

Another Cherokee Strip?

The Schoeller story continues:

30 In preparing for new fencing in 1926, Jake got approval to make some slight boundary changes down near Stuart Well. He had to publish the proclamation in the local paper and part of the legal wording was that areas eliminated from the Jornada Reserve were "open to entry." This published legal announcement started the wave of homesteading entries south of the Jornada; some land was even plowed for dry farming. This certainly didn't make the Isaacks brothers any more friendly, because those homesteads came out of the public domain, which they considered part of their ranch.

Only three of four of these homesteaders survived, war veterans with pensions, mostly. The land in this vicinity is now selling for \$200-\$300 per acre. This illustrates a common problem of the old days for ranchers using public domain.

Schoeller moved to the Plumas National Forest in California in 1927, later worked as buyer in a meat packing plant (owned by his father-in-law), then retired early to Arizona.

Jornada Joins the Southwestern Team

In 1925 an important change was made in Jornada affairs. Campbell has contributed the following paragraphs from his first-hand acquaintance with the events.

The period from 1925 to 1933 witnessed the reorganization and expansion of all Forest Service research, including the Jornada. From 1915 to 1924, the Jornada Range Reserve was under the Forest Service administrative Branch of Grazing with Will C. Barnes as chief. In 1925, the Office of Grazing Investigations (with W. R. Chapline in charge) became the Division of Range Research and was transferred to the Branch of Research, E. H. Clapp, chief. Clapp's comprehensive planning and tremendous drive showed immediately. Range research was included in his 1926 publication, "A National Plan for American Forestry" (42). The legislative portion of this plan was enacted into law in the McSweeney-McNary Forest Research Act of May 22, 1928. This Act did three things directly involving the Jornada and range research in general: (1) authorized increases in range research to reach a total of \$275,000 annually within 10 years (dollars from heaven to an office which had \$25,000 in 1915, and still had only \$36,000 in 1925), (2) put into the basic authorization the wording "investigations on forest and *other* ranges," which had been carried only in the annual appropriation bills up to that time, and (3) established regional forest and range experiment stations. The effect of the authorization act was soon evident in range research appropriations, which gradually increased from \$45,000 in 1928 to \$123,000 in 1933. The Jornada, now called the Jornada Experimental Range, shared in these increases, with funding for a project on "restoration of mesquite sandhills range" in 1931.

It is interesting to reflect on the salaries paid to Forest Service employees of various grades a half century ago, and also the escalation to the present time. At the time of appointment in 1922 as an assistant ranger, my annual stipend was \$1,440. After my promotion to district ranger in 1923, the salary was raised to \$1,620. Grade increases and promotions brought this up to \$3,600 by 1939—16 years later! Campbell states as his salary history, a stipend of \$1,860, the base salary for a "grazing ass" at the time. Then, horrors; these munificent wages were cut 15% in depression years 1934-35. We were permitted in lieu of this reduction to take a month's leave without pay—a very attractive alternate. Then after World War II, salaries moved up and up until one could not even hire a good stenographer today for the price of two beginning grazing assistants in 1925.

Cooperation—The College Ranch

The college ranch of the New Mexico State Agriculture College adjoining the Jornada Range on the southwest was established in 1927 by J. L. Lantow, professor of animal husbandry, and college President Kent. The initial experimental herd came from the Jornada—the top 80 yearling heifers.

Presaging the annual “Ranch Day,” which began in 1938 and involved both ranches, J. L. Lantow in 1928 began an annual tour of the College Ranch area, “College Field Day,” to disseminate information gained from the various research projects for the benefit of local ranchers and farmers. The Jornada staff were invited to attend and participate in these meetings by presenting pertinent information from their own studies. Thus, a neighborhood spirit of cooperation, which has been maintained to this day, was established between the two experimental ranches: the State ranch specializing on animal husbandry, the Jornada on range management. The researchers from both ranches have worked together on many projects.

31

The Southwestern Regional Station

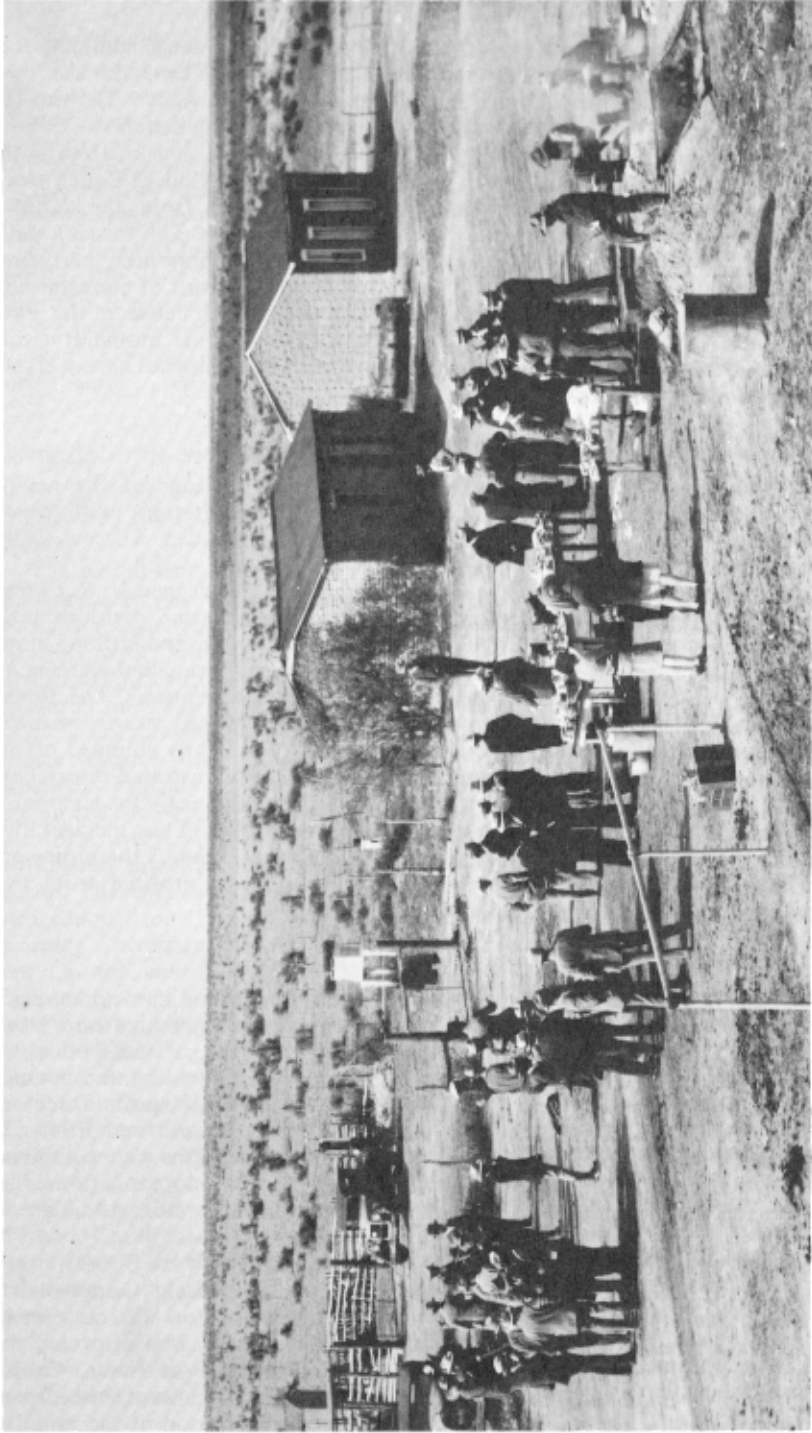
In 1930, the Jornada became one of five branch stations of the newly organized Southwestern Forest and Range Experiment Station, with headquarters in Tucson, Arizona. The Station’s territory included Arizona, New Mexico, and west Texas.

Since more university-trained men were brought in, the rugged U. S. Forest Service was updated, bringing management and administration divisions into direct contact with research activities and investigative work, and striking more of a balance between the practical and scientific. This correlation and merging of research and administration worked well, with minor exceptions. The forest rangers, chesty and brawny wearers of the bronze badge, looked askance at some of the research procedures, data collecting, etc., and frequently sounded off in “basso profundo,” tintured with guffaws. Lamented one frustrated researcher, “Gracious, they regard us and our work with amused tolerance! Our main job? To them, it’s counting rabbit pellets and collecting ‘scats!’” This, incidentally, was the scientist who was described as having more degrees than a thermometer. Nevertheless, the arrangement worked well; each division profited from the efforts made to solve mutual problems.

Help From Above

Establishment of the Southwestern Station in 1930 relieved the Jornada staff of much routine work of supply, fiscal, and personnel matters. More importantly, it brought to bear on the research a series of experienced scientists and administrators, who gave the program much closer supervision and counsel than had been possible by an annual inspection from Washington. Directors included: 1930-35, G. A. Pearson; 1935-41, Arthur Upson; and 1942-53, Raymond Price. The Southwestern and Rocky Mountain stations were combined in November, 1953, and Ray Price moved to Fort Collins, Colorado, as director. The Jornada was transferred to the Agricultural Research Service on January 1, 1954.

C. K. (“Coop”) Cooperrider was made associate director of the Southwestern Station in 1930, in charge of range and watershed research. Campbell has suggested that probably Coop’s most important contribution was his part in arranging for Ares to come to the Jornada. “Chapline and Coop inspected the Jornada in 1930 to consider how to spend an increase in funds. Coop’s conclusion was that it was imperative to add to the staff an experienced man who would handle the planning and day-to-day administration of the range as



R. S. Campbell, center rear, lectures to first Ranch Day crowd at Jornada Headquarters, October 1929. Barbecue is about to be served at the pit at the right. (U.S. Forest Service photo, 1929.)

superintendent. He recommended Fred Ares, and we were fortunate that he agreed to come."

Dr. William G. (Bill) McGinnies succeeded Cooperrider in 1939 as chief of range research at the Southwestern Station. He joined with Director Upson in 1939 to publish an article dealing with the value and importance of research to the rancher as well as to other enterprises (102). It opened a book that was otherwise closed to many land users. Another paper on range history was published in 1940 (82). McGinnies became director of the Rocky Mountain Station in 1942 and later accepted other important assignments to take full advantage of his comprehensive understanding of ecology.

33

Kenneth W. Parker (deceased), a Californian, started work with New Mexico Experiment Station, then went to the Southwestern Station in Tucson, assigned to the shrub invasion project. (Incidentally, Ken's wife is a PhD botanist.) Parker became chief of range research at the Southwestern Station in 1942; from there he moved on to Washington in charge of the Range Utilization Standards Project, then became division chief in 1956.

Parker contributed valuable information, looking toward solution of one of the most pressing problems facing range management in the Southwest; namely, invasion by noxious and worthless shrubs. His papers included: "Forest Grazing in the Southwest" (92), "Southwestern Stockmen Play to Win" (90), and "Juniper Comes to the Grasslands" (91).

Parker was succeeded as Station range division chief in 1948 by C. Kenneth Pearse, who had just completed 5 years in the Washington Office. "Kenny" already had made a considerable reputation at the Intermountain Station in range reseeding from 1930 to 1943. An important publication of his was "Regrassing the Range," USDA Yearbook (96). After his good work at the Southwestern Station, Pearse (now retired) was called to service in 1953 with U. S. Operations Missions in Egypt, Guatemala, Ecuador, and British Guiana; then in 1963 with FAO in Rome and Iran until 1969.

E. H. ("Bert") Reid succeeded Pearse as Station range research chief, shortly before the Jornada was transferred to ARS in 1954, but Bert continued to help push Jornada publications of Forest Service origin, especially the Paulsen and Ares work on grazing capacity and management (94, 95).

This account of "Help from Above" would be incomplete without a few words about the range research division chiefs in Washington, D. C. W. R. Chapline, familiar with the Jornada work from 1915 on, helped set up methods and basic plans for the research, most still in use. He did not then go off and leave it, but by frequent visits counseled, corrected, and nurtured it as a pet project. In 1926, he, with M. W. Talbot, published a USDA circular, "The Use of Salt in Range Management" (41). This paper really set the ball rolling in solving a most vexacious problem of range management—that of poor livestock distribution on the range. This produces an uneven pattern of utilization, heavy grazing on some areas and perhaps none at all on other more remote areas. Range salting greatly helps to correct this situation.

Talbot is credited with another landmark publication: "Indicators of Southwestern Range Conditions," first released in the late twenties in mimeographed form. When work on range utilization standards picked up, the release was published as a USDA bulletin in 1937. (101). This was widely distributed and used by range examiners and land users to determine before it was too late what they were doing to their grazing lands. Such guidelines were and still are very much needed.

When Chapline retired in 1952 to go with FAO in Rome, he was succeeded in turn by J. F. Pechanec, K. W. Parker, J. B. Hilmon, and Dixie Smith. These boys stepped into some mighty big shoes.



Technical staff of the Jornada Experimental Range in 1934 at Jornada headquarters. Back row, left to right: Dr. E. L. Little, J. T. Cassidy, Dr. R. S. Campbell (in charge), and K. A. Valentine. Front row, left to right: J. G. Keller, R. H. Canfield, F. N. Ares, E. H. Bomberger, and F. W. Engholm. (U.S. Forest Service photo.)

More Jornada Alumnae

R. S. Campbell took charge of the Jornada November 13, 1927, with R. H. Canfield as his assistant. Summer field assistants during the next 5 years included Frank Brown, G. D. Merrick, Lincoln Ellison, C. K. Pearse, J. G. Keller, Oran B. Stanley, and E. H. Bomberger—several fine ecologists there. In October, 1931, Fred Ares filled the new position of superintendent, by transfer from a ranger district on the Apache National Forest. He continued in that capacity for 37 years until he retired in October, 1968.

A number of rangers from Region 3 of the Forest Service were detailed to the Jornada for 2 weeks each in 1928 to help chart quadrats and assist with the new range survey of the mesa pastures. Mighty good training for that rough and ready bunch!

The emergency NIRA crew of P-1 and P-2 men hired in 1933 included Dr. E. L. Little, Jr., John T. Cassidy, E. H. Bomberger, K. A. Valentine, J. G. Keller, and F. W. Engholm. Of the 13 temporary or emergency men hired in those years, 12 continued on in range or ecological work, at least for several years. Gordy Merrick (deceased) went to Montana, back to Tucson, and finally to the Washington Office. Linc Ellison (deceased) became chief of range research at the Intermountain Station. Kenny Pearse (retired) made a reputation in range reseeding at the Intermountain Station and was chief of range research at the new combined Rocky Mountain-Southwestern Stations after a term in the Washington Office and then went on to foreign service for several years. Jack Keller went with SCS and then became a practicing dentist. Oran Stanley earned his PhD and became a professor of ecology at Colgate University. Bomy

Bomberger served several special assignments in the field: as a captain, ecological advisor to Command, U. S. Navy in the Pacific during World War II; then to the Forest Service, Washington Office. John Tom Cassady worked at the Rocky Mountain Station; was a lieutenant colonel with Patton's Third Army in World War II. He later served with the Southern and Southeastern Stations, and then went with FAO in Kenya, Africa, for several years before retiring in 1973. "Wee Willie" Engholm went to the Indian Service, BIA, and then into the Marines and was killed in action on Tinian Island in the Pacific. "Doc" Little was called to the Washington Office, Forest Service as chief dendrologist. "Val" Valentine (retired) was appointed professor of range management and wildlife at New Mexico State University.

35

Campbell transferred from the Jornada in April 1934 to the Washington Office of Range Research as assistant to W. R. Chapline. When the Range Utilization Standards project was started in 1936, Campbell was assigned to organize the work with the six western regions and stations. He naturally drew on material with which he was familiar—from the Jornada. One result was USDA Leaflet 180, "How to Keep and Increase Black Grama on Southwestern Ranges" (28). This was the first in a series of new publications on range utilization standards, eventually involving every western station. It contained information and advice, which, if followed, would have almost guaranteed the survival of the valuable and most beautiful forage grass species, black grama. If Bob could have looked forward about 12 years, he would have qualified the above: "That is, if we don't have a successive 7-year drought; pray that we don't."

Campbell continued work with the Jornada utilization data, applying the computer's statistical expertise available in Washington. A 1943 publication established mathematical relationships between degree of utilization by cattle and such factors as intensity of pasture stocking, distance from water, proximity to saltgrounds, fences or roads, and relationships between species in mixed stands (23).

Another direct application of Jornada work to the Range Utilization Standard Project was based on Canfield's studies with the line transect method (37). After K. W. Parker took over the utilization Standards Project, he adapted the line transect method into the 3-step method of measuring range trend with loop samples (93). The method was applied widely on national forest ranges and elsewhere.

Campbell moved from the Washington Office to start range research at the Southern Station in 1943. After he retired in 1963, he served as editor of the *Journal of Range Management* until July, 1969. From the Jornada work, Campbell authored an even dozen publications, individually or with others, on range management and ecology (17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 29, 30). It was during Campbell's tour of duty that the Civilian Conservation Corps boys invaded the Jornada, but that tumultuous story must await the description of Jornada wildlife.

The Jornada and Its "Not So Still" Life

The Jornada boasts a full quota of desert denizens. The list includes big game animals such as deer and antelope, as well as rabbits and other rodents, game birds, reptiles, and many controversial predators.

Jake Schoeller gained approval in 1926 to prohibit hunting and to post the entire Jornada. It seemed a good idea at the time because deer numbers were at a low ebb in the mountains, and hunters were a nuisance. The idea backfired, as it turned out to be successful beyond our wildest dreams. Over a 16-year period, 1926-1942, counts made by helicopter and by other means revealed that the herd of deer in the mountain pasture had increased to about 1200 head. The

browse feed in the lower elevations was so closely grazed that the deer began to invade and establish "deer lines" at the higher elevations. This threatened the existence of the few mountain sheep on the area for which the special refuge was established in 1941. This steep part of the range was the natural habitat of the sheep, which, if forced out by lack of browse, would be exposed to poaching and starvation. Immediate action was needed to restore the balance. An open season was widely advertised for a total of 400 hunters to enter the area in the fall of 1942. Each one was given a permit on a first-come, first-served basis to kill two deer: a doe and a buck. The opening day resembled the Cherokee land rush; the many wardens on patrol, wearing conspicuous red on themselves and horses, felt as though they had been caught in the crossfire of a battle.

After a few years of this, the deer herd was reduced to what was considered proper stocking. Then the season was shortened to 2 days, buck only, in order to maintain this level of deer population.

The Jornada also supports a herd of antelope, which, as far as anyone knows, have always roamed the tobosa swales. Their numbers appear to be static; they have survived the predators and climatic ups and downs of the semidesert. They have an amusing habit of racing an automobile and invariably managing to cross the road in the lead.

The tough, enduring jackrabbits have been plentiful on the Range as far back as anyone can remember. They do consume a considerable amount of forage and are legal prey to all the predatory animals and rapacious birds, or to anyone who has a gun. But in spite of all this, their numbers do not vary much from year to year even though the predator numbers fluctuate. This is an enduring puzzle to biologists.

The badgers bore holes in the tank dumps in search of frogs. This sometimes means a washout and loss of water. They are anathema to the cowboys, whose horses are prone to step into their burrows and give the rider a tumble.

Skunks are not numerous on the Range, but occasionally one pays a courtesy visit to Headquarters and, there being plenty of dogs, creates a quite interesting and odoriferous interval.

Something that has not altered down through the years is the grand opera of the spadefoot frogs. This is enjoyed, or rather, endured, immediately after the first good rain of the summer. The roaring cadence of their song can be heard afar, a good sedative which can induce sound sleep, especially in a cowman desperately needing rain.

The Jornada Range being a sanctuary for all fauna, quail and doves abound. Ducks, once very numerous on the tanks, have almost disappeared. Quail became so abundant on the Range in some years that the Game Department trapped them for distribution to other areas in the state. The chukar partridge from Asia was introduced, with several hundred being planted on the area. The rapacious birds, hawks, owls, and eagles, very soon accounted for them; none have survived. Evidently, they were unable to adjust to this environment and could not devise a defense against their enemies.

The chaparral or road runner, the state bird of New Mexico, is a most interesting creature, running down the trail ahead of a horseman. Where house cats do not abound, they become very tame. Curious birds, they will find a vantage point from where they can survey every move made by workmen on a job. Hence, some call the chaparral the "Boss Bird." Hearsay has it that they are death on rattlesnakes.

The Trade-Rat Syndrome

Rats on the Jornada? Plenty of these mischievous imps! The "kangaroo" and his antics made a good story, but that is better told in our account of the other

characters—the CCC boys. There remains another species of rat which has evoked as much if not more picturesque language than his long-legged brother. This is the wood rat, “pack rat” or “trade rat” as he is more commonly and blasphemously called. He is large and able to carry sizable objects with which he builds a large nest. If while so engaged he spots something unusual in his path, he drops whatever he is toting, picks up the more attractive object and goes on his way rejoicing. Hence, the name “trade rat.” Enroute to Headquarters, I once spent a night with one of the freighters who was an explosive individual. He was very enthusiastic and happy over a pair of fine buckskin gloves he had purchased in town. After supper, he hobbled the team, rolled out his bed, and carefully placed the gloves near his head. Early the next morning, I was awakened by a resounding yell accompanied by some not-so-nice epithets. The gloves were gone; two joints of dried cactus rested in their place. Muttering threats, the bereaved one tore apart all the rat dens in the near vicinity, but no gloves. An even more “heartrending” exchange was suffered by a range examiner away on a range survey pack trip. At night he placed his dentures, both upper and lower, on one of his pack kyacks. Sure enough, the nocturnal transaction was made; two neatly stacked cowchips displaced the choppers. Fortunately, his remarks are not on record. This incident made the newspaper headlines. A reporter asked him where he now stowed his masticating equipment. His answer: “In my boots.”

Rattlesnakes and 7-year locusts or cicada together make up a strictly no-good team. Nothing is more terrifying than to hear that dry, ominous rattle near at hand, then see the camouflaged, mottled form of the reptile coiled ready to strike. This can and has rendered many a strong man a jittery wreck for the whole day. At a certain season, the cicadas are everywhere. The buzzing noise made as they fly out of a bush almost exactly duplicates the real thing. Under these circumstances, a surveying party could hardly be expected to follow a straight line; they would certainly learn to execute quick, high and wide jumps.

Snakes Alive?—A Night to Remember

Yes, there are rattlesnakes on the Jornada! I have many times found myself in close quarters with these reptiles. At one time, a horse was bitten under me so severely that he had to be led in. I had seen enough other horses, cows, and dogs bitten by these dangerous snakes to note the terrible after-effects of the bite and to give me a wholesome fear of these reptiles.

The story is told of Grulla, our steady, hard-working government horse. Unfortunately, one night in 1927, while grazing in the small “horse trap” near Headquarters, he was bitten on the nose by a rattlesnake. His nose swelled until he could hardly breathe. Jim Walk, the foreman, wrapped a gunny sack saturated with kerosene around the swollen nose. Grulla eventually recovered, but never had quite the same stamina as before.

The closest shave I ever had with a rattler, strange to say, occurred at the Jornada Headquarters. While I was walking across a yard, which was clear of all ground cover, I was intently watching the partly cloudy sky, hoping that rain might fall on some part of the dry range. Suddenly, I felt something slap against my leg. Looking down, I saw to my horror that I had stepped squarely in the middle of a coiled rattler, about 3 feet long. Fortunately for me, my foot had pinned him down sufficiently near the wiggling heart-shaped head to prevent the deadly fangs coming into play. Let not the reader think that I tarried in this position as long as it takes to tell it! My reflexes being perfectly normal, in less than 3 seconds I was airborne in a jump which for celerity and distance must have surely set some sort of record. Jittery as a locoed pony, I circled around Mr. Snake, now thoroughly upset and striking in every direction. Giving thanks

to a benign Providence, who looks after little children, nitwits, and irresponsible people who don't look where they are going, I armed myself with a long-handled hoe to make sure this "vipora" would never again scare anyone else out of their wits.

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Ken Parker made a special study of shrub invasion, with particular attention to broomweed or snakeweed. One of the first questions Ken asked was: "I wonder why this plant is called snakeweed?" Not very long afterward, while he was measuring plants on a plot, his question was answered; Ken yelled and jumped at least 4 feet in the air. These plants in hot weather make ideal shade and shelter for his majesty, *Crotallus* sp., and he resents interference.

Our mutual interest in herpetology brings to mind an incident, which I am sure Ken Parker did not forget. It was not overly amusing at the time. Back in 1941, we were on a camping trip, laying out grazing study plots on the Lincoln National Forest. Now Ken was extremely leary of rattlesnakes—almost as much as I am. On one occasion, we had discussed certain church people who handled these charming critters as part of their services. He expressed himself on the subject, "Why, I'd saturate that place with my absence and that right quick!" I heartily agreed. One day, we experienced some delay with a difficult plot and had to travel after nightfall to reach the next location. That morning, as usual, we had rolled up our camp beds and placed them with the cooking utensils and other equipment in the rear of the panel truck. The rear door mounting the spare tire was locked from the inside.

About half way to our next camp site, Parker driving, we encountered some pretty rough road. It was pitch dark, and our gear was bouncing around some. Suddenly a hissing, buzzing, sinister sound came from the dark recesses of the rear. Already "reptile conscious," we immediately diagnosed this as the real thing—a warning from "vipora sonora." I shouted, "Let's get outa here!" Ken had some difficulty controlling the vehicle. What to do—pitch dark, flashlight rolled up in the bed, no entrance from the rear. As we drove slowly along, we tried to plan a course of action. The noise ceased when we drove across smooth spots, but sounded again when we hit a rocky stretch. This proved that our passenger was being roughed up back there, and in due time would explore our end of the vehicle. Anticipating this, I hoisted my feet, propping them on the dashboard. Ken was unable to do this while driving. He had my sympathy. After a while, the noise from the rear remained constant. We decided to speed up and if the noise became louder and closer, we would leave the truck by the nearest exit. We speculated as to how in the world we had acquired this not-so-welcome guest. The only answer, we had to admit with a shudder, was that one of us had rolled him up in a bedroll when we broke camp. Wow! Ken practically fell out of the truck when we arrived at the camp site. I uncoiled my legs and exited with more dignity. Then we began rescuing our equipment and purging the panel truck of our hitchhiker. First, we built a huge fire near the truck for illumination. Then using a long stick, we finally worked our bedrolls out the doors of the truck. Gingerly, they were unrolled and spread out and their contents thoroughly examined in the firelight. No snakes! Recovering the flashlight, we closely surveyed the interior of the truck. Moving more boldly now, we soon discovered the true nature of noise scaring the wits out of two bemused campers. An iron skillet had fallen on the spare tire, and one of its three-inch legs had by some devilish coincidence, come into contact with the air core of the open valve stem on the tire—now almost flat. It was to laugh, howbeit nervously. Throughout the night, we kept a good fire burning; nevertheless, we were somewhat troubled with insomnia, even though dead tired. Breaking camp next morning, our first concern was to find a valve cap and screw it firmly on that open tire valve.

Predators—Coyotes, Friends or Foes?

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In recent years, considerable concern has been expressed, and rightly so, about “endangered species.” Environmentalists everywhere, fearful of the impact on the ecosystem, are seeking ways and means to halt this trend. Controversial predators common to the Jornada area—mountain lions, coyotes, bobcats, and eagles—have been trapped, poisoned, and shot throughout the West as a menace to livestock and game animals, and this in spite of population explosions of deer and other forage-consuming animals, such as the Kaibab deer herd—or our own excess of deer in the Jornada mountain pasture. All these predators were protected from hunting and trapping by the ban set up on the Jornada in 1926. After all, the predators help control rodents and maintain the biological balance. But in 1932, a serious, widespread rabies epidemic broke out. It got so severe that heavy pressure was brought to bear on the Jornada; “that coyote refuge had to be cleaned out.” We held the fort for some time, but an appeal to the Washington Office brought an order to lift the ban. We did so, and the war on predators (mostly coyotes) began. By that time, we really had coyotes; they ran in packs. Two months after, the Predatory Control people came in with poison, guns, and traps. A picture was taken at South Well—the pelts of over 135 coyotes on frames stood in a wide circle near the trappers’ camp. This went on for some time, after which an agreement was reached with the Predatory Control. This provided an annual foray, taking only the specified number, leaving sufficient coyotes to even up on the jackrabbits. This worked satisfactorily, with one exception: no more lordly and majestic mountain lions.

Of the predators native to the Jornada region named above, all could be included in the “endangered” category, except the wily coyote. He alone manages not only to survive, but to “be fruitful and multiply”—poison, traps, and guns notwithstanding. A number of ranches in this vicinity realize that rodents, prolific rabbits, and rats would, in the absence of their natural enemies (coyotes, mostly) eventually take over the range. They have therefore expressly forbidden indiscriminate killing of these small desert wolves on their land. As on the Jornada Range, to avoid threat of rabies and other ills of overpopulation, a certain quota of the animals is removed each year.

As to the coyote being a threat to young calves, divided opinion makes this a subject of enduring controversy. A rancher riding his range comes upon startling evidence that a very young calf has been literally torn into small pieces. Ergo, “the villain coyote has struck again.” Circumstantial evidence? Calves are sometimes stillborn, become separated from the mother cow by fences, death of the cow, or other means whereby dogies starve to death. This could be high-priced food for the scavenger coyote; it would cost him and others like him their lives.

Anyone out walking with his dog would be likely to come upon a cow with a very young calf lying close by. Action and plenty of it! The dog would quickly find himself full speed on the go with the cow snuffing and bawling at his heels. Even the man (in the case of Santa Gertrudis cows) would consider seeking higher ground. The mother cows in this case so definitely mean business that one can fail to see how a coyote could possibly get anywhere within snapping distance of her baby. Further evidence that one determined mother cow can safely handle any situation may be seen frequently, as in the case of the “babysitting cow” or “bovine daycare nurseries.” In this instance, several cows leave their babies in charge of a lone cow while they confidently set off to the nearest watering place. This is really intriguing, as well as interesting to observe; one hesitates afterward to refer to them as “poor dumb beasts.” Certainly there has to be communication; I have seen it displayed many, many times. A cow determined to save her calf from the branding ordeal will suddenly leave the

drive in a dead run; overtaken by the swifter cow pony, she will stop suddenly and nudge her calf. Immediately, it will take off in one direction; she in the opposite. Experienced cowhands know that to continue pursuit is to risk the loss of the calf.

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But to return to the question of predator responsibility. On most cattle ranches, a limited or controlled number of coyotes are deemed useful and necessary for rodent control and as such are protected. While this practice may safely be followed in cow country, just one of these varmints loose in a band of sheep can do incredible damage. It would seem that any and all safe measures to exterminate them would be justified and available to the beleaguered sheepman. However, an exception should be made to the deadly poisons, use of which is dangerous to the general ecosystem and may kill or destroy desirable species.

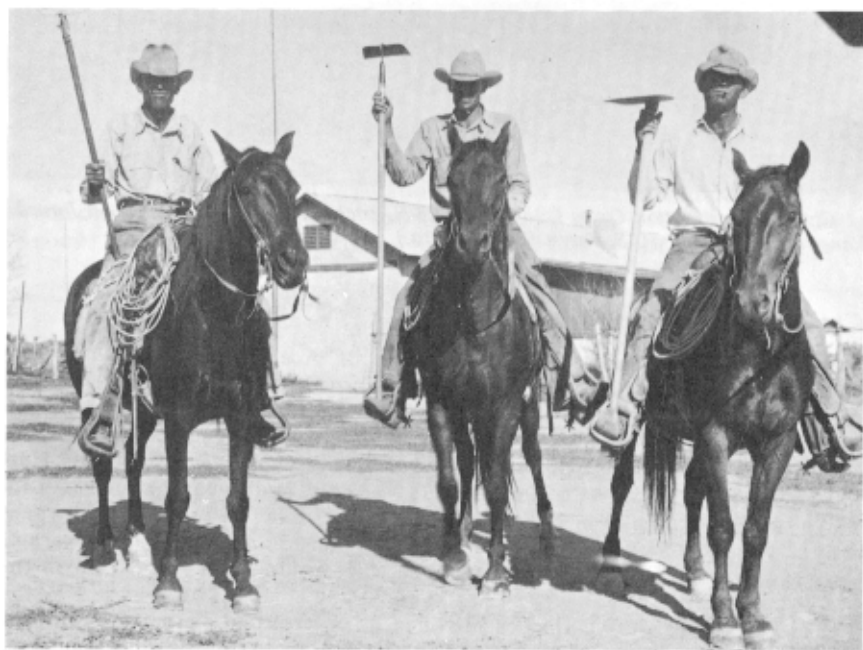
The golden eagles have had a hard time. They were indicted for threatening the existence of the small herd of mountain sheep. Incidentally, these sheep have occupied and held their own in this area since the memory of man runneth not to the contrary. Thank heaven, the new law protecting these lordly symbols of our nation's power was finally passed.

Turkey buzzards, once valued as scavengers and locators of dead animals, have lost favor. Due to scarcity of carcasses, they have turned predatory on newborn calves, pecking their eyes out. Also, they have been definitely proven to be carriers of disease, blackleg mostly.



Running the Gauntlet: 1933 - 58

B. A. ("Ace") Christmas hailed from eastern New Mexico, the oil-rich section of Lea County. He, like T-Hook Turney, was a typical old-time cowman. Rugged, tall, slim, and straight as a ramrod, he could, until his late sixties, outride and outwork any of the young cowpokes who helped him. Successful in the cattle business in Lea County, he also had an eagle eye on the oil development there. He got in on the ground floor, so to speak, and came up with a number of valuable leases. Later, he fell in with W. H. Waggoner and made a deal with him for the Jornada Range setup. Purchasing the best of the



Armed with hoes, extermination crew en route to grub poisonous weed, Drymaria (Inkweed). Cooperator B. A. Christmas at left with two cowboy helpers. (U.S. Forest Service photo, 1933.)

experimental cow herd, he took over as Waggoner's agent on the Jornada for the time required to liquidate the accumulated grazing credit. When this was accomplished in 1953, he became the actual Cooperator.

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Ace Christmas figured that 1933 was the low point of the depression and therefore proceeded to restock the range while he could get cattle cheap. He also assumed that the favorable range conditions would last. We was wrong on both counts. The year 1934 brought still lower prices and an outsized drought, a bad one, with barely 5 inches of rainfall in the entire year. Thus Ace learned the harsh facts of semi desert life the hard way.

He was caught with 1600 head total stocking, 1500 of which were breeding cows. It was a perfect setup for disaster, and disaster it certainly was! The herd was reduced in 1934 to 500 head. The older cows too weak to ship were disposed of by a herd reduction plan (shooting cows too ancient to move); others were shipped to the deep South for pasturage; some were "farmed" out to neighbors on shares. Ace readily acknowledged that he certainly would have been done-in had he not possessed the oil royalty income. No quitter though, he kept on bucking the line and very soon recouped his losses in the more favorable years following the drought. Christmas was thereafter a very earnest and sincere exponent of the flexible herd management plan. He talked about it constantly and helped greatly in selling the idea to other cattlemen.



Civilian Conservation Corps Camp No. F-27-N, established November 1933 on Jornada Range at Stuart Well. (U.S. Forest Service photo.)

Children of the Depression

Almost simultaneously with the coming of Ace Christmas, the Civilian Conservation Corps descended upon the Jornada in October, 1933, and deposited 200 hungry boys and one bewildered young lieutenant fresh out of West Point. Camp F27N was set up at Stuart Well. After a hectic period on work plans, Army regulations, equipment, and so on, the men were finally lined up and put to work. During the next 3 years, the CCC really managed to leave its mark behind: many new tanks, one new well, new fences (complete new boundary fence), roads, telephone lines, rodent control, planting, brush clearing, water holes, etc.—improvements that otherwise would never have been forthcoming.

The CCC boys of the thirties provided an interesting chapter for Jornada archives. They arrived under the control of the U. S. Army for encampments, discipline, and so on, but their field activities were directed by the official in charge of the Jornada. The enrollees were divided into work squads and placed in the charge of a foreman. The foremen, headed by the camp superintendent,



CCC crew excavating subsoil for strata analysis for chemical and organic composition of soil. F. N. Ares seated (of course) in background. (U.S. Forest Service photo, April 1936.)

formed a group labeled "facilitating personnel" and were selected from the political lists made up by the U. S. Senator from New Mexico. This produced a variety of personalities. Being on this list in depression days was considered quite an asset, but it posed somewhat of a problem for the Jornada official in charge. Some arrived expecting to take complete charge; others were stoned to the gills, belligerent, and wanted to whip everybody in camp. However, the majority, needing work so badly, got in line quickly, and after some training made good leaders.

The CCC's were engaged in a considerable variety of jobs. One was the control of kangaroo rats, which were very numerous on the range. Each den covers an area 7 to 8 feet in diameter, the surface of which is thoroughly divested of every trace of vegetation. The soil beneath is honey-combed with burrows to a depth of 4 or 5 feet. This provides a perfect trap for a racing cow pony with rider, or sometimes vehicles travelling off road. There is no



Truck convoy preparing to leave Jornada Headquarters for summer encampment on Carson National Forest. CCC Camp F-39-N. Captain Silverthorn, in charge of convoy, U.S. Army, and Fred Ares at lower left center. (U.S. Forest Service photo, May 1936.)

foundation underneath whatsoever. These little critters not only account for a lot of good range forage, but can also create a hazard for life, limb, and disposition.

Pushy Kangaroo Rats—The Plot That Failed

44 There was a certain scientist dedicated to his work, very meticulous and careful. In one study, he was determined to lay out and stake sample range plots “absolutely without bias.” He devised a plan to randomize the plots so thoroughly that the statistical brass could not question the work. He turned his vehicle off the road in the direction of the area to be sampled and moved forward in a straight line. To be sure there would be no temptation on his part to make area selections, he kept his eyes closed as he drove, at the same time counting off the required travel time between each plot to be staked. He had successfully located three plots in this manner and was on his way to the fourth location when suddenly the pickup yawed and swung; the engine bucked and died. His eyes now wide open, he assessed the situation. He had centered a rat den and was stalled proper. Confident that he could extricate himself, he started the engine and rocked the truck back and forth, which was the worst thing he could have done. Soon all traction was lost; the wheels were spinning free, and the chassis rested on the ground with nothing solid upon which to place a jack. Nevertheless, thinking of the long trek ahead on a hot day, he began to dig underneath the chassis probing for a firm spot. This was futile, but it stirred up a number of occupants of the den. These indignant little citizens hopped about on their long legs, beeping and squeaking. At last convinced his labor was in vain, our scientist set off afoot, calling down anathemas on all members of the rat family. As he trudged along, no doubt he reflected that one should never blindly undertake any proposition, plots, or otherwise.

A “Ratter” Learns About the Wild West

The CCC boys began work on the kangaroo rat project by walking and carrying bags of the poison grain, small quantities of which were sprinkled on each rat den. But the work progressed so slowly that it was decided to rent saddle horses from the cooperater and mount the boys. And thereby hangs a tale. The CCC boys, all hailing from east Texas farms, knew very little about the kind of horses used to work cattle in the West. And, too, they knew even less about the pestiferous cowhands who rode them.

The ranch hands delivered the horses and showed the boys how to saddle and handle them. They lightly referred to the boys assigned to this work as “them ratters.” Soon, very soon, a scheme was cooked up, one that would provide the miscreants with some “good clean fun.” One morning a horse was brought out which was not just an ordinary cow pony. This critter exuded mischief, had a strange look in his eyes, rollers in his nose, and a peculiar arch in his back. It was not advertised then, but this horse had the reputation of being able to “unload his pack” if things were not just right. He had already had a hard blow to his pride—a real insult. After he was saddled that morning, he was loaded with bags of the grain, one on each side. Zounds, this was a pack burro’s job, not one for a steed such as he! These harbingers of disaster would have been obvious to an experienced cow hand, but to the victim selected to ride him, he was just another horse. The victim failed to assess the significance of the signs, did not catch the meaning of the sly grins and covert looks of the impish group hanging around. The innocent “ratter” approached and mounted the nag with confidence born of ignorance. He sat in the saddle for a moment and then banged “Ole Hotshot” in the ribs with his heels. Immediate action followed. There was a loud snort as the horse “swallowed his head,” then another as he

soared to dizzy heights. At the same time, he executed a quick turn. After three more such gyrations, the "ratter," having already lost both stirrups and the reins, grabbed for the horn with both hands; instead, he came up with a handful of grass after describing a parabolic arc to mother earth. All this was accompanied by hysterical yells from his audience. Until he was roped and brought to a halt, "Ole Hotshot" continued to vent his wrath by bawling and bucking over a large area, scattering poison grain. The "ratter?" Unhurt, but shaken, he sat on the ground for quite a spell, no doubt pondering the stiff methods employed by that old teacher "experience."

Research Goes On

We have had our fun with rattlesnakes and "ratters"; now we must get back to the serious business of range studies, which were continued right along with the CCC program. R. H. Canfield (deceased) took over the charge of the Jornada in June 1934; later he transferred to the Director's office in Tucson. "Colonel" Canfield, as he was known, was reared in the West Virginia coal mine country, served with the infantry in France during World War I, and under the veterans' assistance program, gained his BS degree in forestry at the University of Montana in 1926. He took leave (in those days "without pay") to gain his MF degree at Yale in 1930.

Several of the NIRA crew were assigned individual studies, from which a number of articles were published. Cassady published results of work on range revegetation in 1940 (39). Little's first assignment was on poisonous drymaria; this and his wide interest in plant and animal life resulted in five scientific articles from 1934 to 1943 (76, 77, 78, 79, 81).

Canfield's contributions are many and varied. He will be remembered mostly for adapting the line transect method to measurement of range vegetation (37). The small area of meter-square quadrats was the principal objection to continued use: the inadequate sample they provided did not include a sufficient variety of plants. The line transect corrected this deficiency and was acceptable to the statisticians as a more satisfactory method of measuring vegetation.



Stone portals with signs erected by Civilian Conservation Corps (CCC) at south boundary entrance to Jornada Experimental Range, 1937. U.S. Forest Service photo.)

Another valuable contribution from Canfield was his report on clipping of black grama and tobosa grass (35). By simulating grazing on meter-square quadrats over a period of several years, the study removed proper use of forage from the field of speculation and "guess-estimate." By actual measurement and weighing of samples clipped from plants of the two species, not only the effects of height and frequency of grazing, but reaction to season of grazing was determined. Although the clipping studies had certain limitations, the value of the experiment was incalculable in providing guidelines for range management.

Several scientific and popular articles by Canfield came out of his work with stem structure of grasses, indicating drought resistance (32, 33); continuous grazing (34); conservative grazing (36); measuring utilization, atmospheric electricity (31); and others (38).

Fred Ares was placed in charge of the Jornada late in 1935. Arriving in 1931, he first conducted a range count of the Cooperator's cattle, and after shaping up the experimental herd, began work on reduction of overall stocking and improvement of herd and range management policies (15). In view of the lack of proper livestock distribution, steps were taken to secure a better and more uniform pattern of grazing use (6). A major problem this! The first setup in 1932 was a range salting plan with locations selected and marked for salt grounds where grazing was desired (2). With CCC help, about 70 small temporary watering places were built (1), located mostly on summer range so that, insofar as possible, all permanent water places were closed. This served to make possible deferment of black grama and other range for winter-spring grazing. To further implement better range use, shade structures, rubbing posts, and supplemental feed troughs were moved away from permanent water. Electric one-wire fences (4) were built to insure full grazing use of tobosa grass areas (5). Tobosa grass, cut and baled, provided emergency forage and also helped make possible fuller use of this grass (3). A supplemental feed mixture consisting of cottonseed meal, grain, and salt was found to be effective for open range feeding (11). Inasmuch as the salt regulated the amount of feed consumed, this made possible feeding away from corrals located at permanent water.

Drought—The Hidden, Unknown Factor

Throughout this account, I have made recurrent references to severe drought. In view of all the foregoing, it would seem in order to discuss fully the problem of drought on semidesert ranges of the Southwest similar to the Jornada. There is little doubt that drought is a major factor in herd and range management, and thus, demands a very high priority in range investigations. Certainly it has presented a continual challenge to researchers on the Jornada Range for the past 60 years. It is really very difficult to learn how to live with drought. As detailed in the foregoing chapters and Table 2, the problems were not long in presenting themselves after the experiment was set up in 1912. Summarizing T-Hook Turney's experience, for example, "old man" drought struck some hard blows. It hit first in mid-1916 and raged until mid-1919. After a short interval, it smote again from 1921 through 1925. Actually then, the first decade of the experiment from 1915 saw 8 years of drought and only 2 years classed as good years. This was a poor send-off; it required lots of planning and many difficult decisions on the part of T-Hook, as well as for the officer in charge of the station. The drought years, coupled with heavy stocking and declining postwar livestock prices, posed a situation well calculated to break something, and it finally did. Under such circumstances, anyone of lesser caliber than T-Hook would have "caved-in," financially speaking, long before he did.

At any event, from this and many subsequent reverses that will be discussed, it may be easily discerned that drought as an adversary should never be sold

short. It well behooves the individual who ventures into the ranching business anywhere in that part of the Southwest through which the Rio Grande flows to look well into his defenses and be prepared to do battle with the unpredictable vagaries of often hostile elements. A policy of economic as well as careful herd and range management is a must: plan as though a drought is expected every year. If it does not occur, a bonus may accrue; if it does, a reserve will be on hand, either as cash in the bank or at least as good credit with which to buy feed, ship cattle out, or lease pasture.

Fortunately, there is a compensating factor for these periodic onslaughts and that is the toughness and amazing recuperative power of the native grasses: black grama, the dropseeds, tobosa, and assorted other minor species of forage grasses. More than once these have shown the ability to rebound and make a comeback in short order. For example, the 1916-1919 drought was general over most of

Table 2. Headquarters precipitation, 58-year record.

Year	July-Sept.	Annual	Year	July-Sept.	Annual
1915	4.86	7.51	1944	4.72	9.46
1916	2.58	8.88	1945	2.17	4.77
1917	2.34	3.38	1946	7.57	10.75
1918	4.41	8.76	1947	3.75	7.30
1919	8.20	12.54	1948	1.17	6.39
1920	5.67	12.02	1949	6.52	11.81
1921	3.49	5.86	1950	5.34	8.00
1922	3.18	6.69	1951	1.37	4.34
1923	3.95	9.48	1952	3.13	7.79
1924	3.87	5.97	1953	.87	3.03
1925	3.76	6.93	1954	4.38	7.38
1926	8.53	17.73	1955	4.15	7.25
1927	6.33	7.69	1956	2.90	3.60
1928	3.92	9.78	1957	6.22	10.24
1929	6.18	11.04	1958	6.48	13.44
1930	3.03	5.73	1959	7.88	8.97
1931	4.66	12.41	1960	2.97	6.98
1932	8.00	12.75	1961	9.08	12.78
1933	4.56	8.59	1962	10.68	14.89
1934	1.74	5.18	1963	3.72	5.52
1935	6.79	10.98	1964	6.62	7.92
1936	5.67	9.65	1965	2.81	6.96
1937	4.47	8.69	1966	3.97	6.52
1938	9.02	12.77	1967	3.90	8.58
1939	4.16	8.26	1968	5.28	9.74
1940	4.56	11.35	1969	5.30	9.80
1941	8.51	17.74	1970	4.01	6.23
1942	5.12	8.48	1971	4.09	8.22
1943	5.52	8.67	1972	6.52	13.57

58-year seasonal (July-Sept.) average = 4.91
58-year annual average = 8.93

the Southwest and caused cattle losses ranging from 17% to 25% in New Mexico, mostly on the uncontrolled public domain. (Supplemental feeding on the Jornada held the death losses to less than 2%.) After rains came in late 1919, within 2 years black grama completely recovered its former density in two of the Jornada pastures (89). This demonstrates the ability of this valuable native grass to endure and survive ordinary droughts. If the spell turns out to be successive (goes beyond 3 years), then "*Quedado!*" These stalwarts will begin to fail even under greatly reduced stocking. This was certainly proved in the Great Drought of the early fifties.

"The Monkey"—Why and How of Range Depletion

Drought has its helpers in causing range damage, as indicated in the discussion below.

In 1963, a fortunate circumstance enabled Dr. Carlton Herbel to unearth priceless data from New Mexico Public Land Office records. These data were obtained from a survey made in 1858—105 years before! Field notes made on all section and township lines included soil and vegetation, and topographic observations were a part of these original records (16). The survey, fortunately, covered all the Jornada mesa. Overlay vegetation types were sketched and measured with planimeter to show the acreage dominated by shrubs in 1858, as compared with three vegetation maps of the Jornada made in 1915, 1928, and 1963. The mesquite-dominated area was 50.3% in 1963, compared to an original 4.8%. In 1858, good grass was present on more than 90% of the present mesquite area; by 1963, less than 25% (a decline of 65%) remained. Chiefly responsible for the loss of "good grass" was the rapid spread of mesquite, not exclusively drought nor overgrazing (57, 58). In recent years, the spread of mesquite has been accelerated by heavy seed dispersal by livestock.

The "vegetation changes" paper emanating from this study by Herbel may well have chronicled a most outstanding discovery. It spotlighted a bad actor: shrub (mesquite) invasion, another real but insidious cause of range deterioration and one extremely difficult to control.

The spectacular dust storms of the early thirties stirred up a tremendous public outcry. Congress, smoked out by the dust and commotion, demanded action. The order went out: "Find the culprit!" The dry farmers' plow came in for some unfavorable publicity. Farms were abandoned by the hundreds; dust clouds filled the atmosphere, even extending to the east coast of the United States.

The U. S. Forest Service immediately rushed through a widespread survey of all the Western range areas. The results were published in 1936 in a voluminous tome labeled Senate Document, No. 199 (44). From this source, several separate articles were published. The principal cause of Southwest range deterioration? Mismanagement of the public range, overstocking and overgrazing by domestic livestock, cattle and sheep. Ergo, the culprits, cattle and sheep growers!³ These

³ *Editor's Note:* This description accurately portrays a common reaction to the Range Report by those who have not studied it carefully. Actually, the report was an attempt to analyze and find solutions for unsatisfactory range conditions. A separate chapter is devoted to each of six causes: climatic fluctuations, excessive stocking, rule-of-thumb management, lag in research and extension, financial handicaps, and unsuitable land policy. Special discussion was devoted to case examples of stockmen who had been able to work out good management on their own privately owned ranges. Nor was the range report exactly "rushed" through. Forest Service information on range lands in other ownerships dates back to the Public Domain Commission study ordered by President Theodore Roosevelt in 1905, the Barnes and Jardine analysis in 1916, successive range appraisals, and other surveys. The need for the report was envisioned as early as 1926, and collection of special necessary information was started in 1932. There was a real push, of course, to complete examination of some 20,000 field plots, analyze the data, and write the report in 1935-36. — R.S.C.

reacted wrathfully, blaming instead low rainfall, homesteaders, and prejudice on the part of the range examiners, whose stock, incidentally, dropped to an all-time low. In 1936, I was almost thrown out of a fishing boat off the coast of California. In a conversation with a companion, who turned out to be an Arizona cattleman, I revealed my identity as an employee of the U. S. Forest Service and a member of the field crew who had made the Bulletin 199 survey. There was certainly no doubt in his mind (but plenty of resentment) that the above publication marked livestock growers as the guilty ones. He was really riled about it, too. I discerned this very definitely all the way and was quite glad to get out safely back to the shore.

Carlton Herbel's "Vegetative Changes" paper should be of special interest to the livestock grower because, to a certain extent at least, it removes the "monkey" from the rancher's back.

It is anticipated that the above statements will evoke an immediate and vigorous challenge by many who place drought at the top of the list of range deteriorating factors. However, consider this: on semidesert range lands, drought is a natural phenomenon, always has been, and ever will be. Down through the centuries before civilized man came on the scene and "messed up" the environment, the range could and did overcome the effects of recurring drought and recovered. But place overstocking and drought in juxtaposition and you have something! Keep this up and even the most heroic efforts of the tough and resistant native forages species will have been in vain. Drought should be recognized as not being subject to adjustment (as of now, anyhow), while range stocking may be manipulated at will. Enter here the plan of flexible herd management. If anyone dares to enter the lists, knowing his opponent and his power, and takes no steps to cope with him, who is to blame if he loses the battle?

The term *semidesert* shelters a household of provocative characters, including recurring drought. A close relative is the errant, capricious, often scanty, "spotty," or ill-timed and poorly distributed rainfall, averaging not more than 10 inches per year. Along with this, is the tremendous evaporation rate, nearly 8 feet per year from open water surface. The effects are intensified by the strong southwesterly spring winds blowing steadily at gale force for weeks at a time. The drying effect of this treatment guarantees that the last vestige of moisture will be extracted from the soil just when it is needed most. This in turn engenders those "playful" sandstorms, which fill the atmosphere with dust, rearrange the landscape, and bury fences and roads beneath a tangle of sand and tumbleweeds. Worst of all, the blasting effect of these winds covers and destroys good forage plants at one location, while at another spot, the plants are blown out of the ground—roots and all. Next, consider the abundance of aggressive shrubs such as mesquite, a near-worthless shrub well armed with inch-long thorns, conducting a silent, creeping invasion of the range and displacing the more valuable plants. Lastly, add to the above a plentiful supply of rattlesnakes, and a picture with a built-in gauntlet of challenge is presented.

Would it be possible for an individual taking full cognizance of all these obstacles before him to circumvent natural forces and make a go of ranching on semidesert range under such circumstances? Surely an experienced, wary operator moving with utmost caution ought to be able to do so. Otherwise, perhaps semidesert range should be declared submarginal for grazing and relegated to its natural function as watershed or habitat for game animals or other wildlife. Whenever the term *drought* is used, it is generally understood in these discussions that the rare, prolonged, catastrophic drought is not included.

Range depletion and its cause is a ticklish subject and has triggered plenty of argument, some acrimonious, and a lot of buck passing. Who and what are to

blame chiefly anyhow? An article by Pearse (96) suggests some answers:

A new chapter is being written in the history of the West. It concerns the restoration of 80,000,000 acres of range land to proper productivity.... By 1935, it was estimated that of the 728,000,000 acres of Western range lands, 87% were producing much less forage than they should. 589,000,000 acres were seriously eroded because of reduced plant cover.

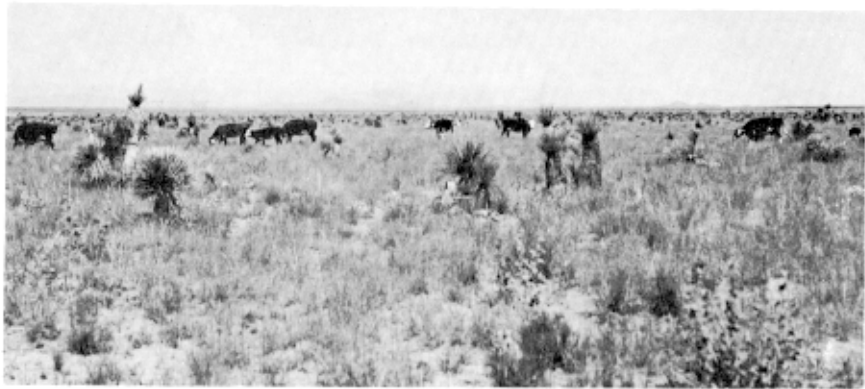
50 From personal observation I can relate how the bitter fruits of unwise management, mostly overstocking, were reaped on my father's ranch. He was, beyond a doubt, every inch a cowman and had in less than 30 years built up a large cattle ranch which was one of the largest in southern New Mexico. He really knew cattle, but alas, to him the limitations and requirements of that splendid range he handled were a closed book.

He was made aware of limitations on several occasions, one of which I well remember. A young range examiner of the Forest Service came through checking on range improvements, stocking, and general problems of the rancher. His name was Merle W. Talbot and he was an expert in his line with plenty of practical know-how. He was so courteous and agreeable that my father, usually suspicious of all technical men, took an instant liking for him and even went so far as to ask is advice on a certain problem. The dirt tanks, built to impound flood water, were all filling with silt. Not only was the water capacity dwindling but the tanks had also become dangerous bog areas when the water was low. "Talley's" solution to this was short and simple: "Build another dam upstream to create a settling basin" (100). I wondered why nobody had thought of it before. Then he looked my father squarely in the face and said, "Paul Ares, the very fact that you need this settling basin tells me something. You have far too many cattle on this range and have had for too long. My advice, if you want to keep this ranch, is to cut the stocking by half." My father struggled to control himself as he replied: "That's what the damned forest ranger has been telling me. What does he know about the cow business? Why I was in this business way back when he was still wearing three-cornered pants." He also said a great deal more.

To make a long story short, within 5 years, the ranch went into receivership, and my father was completely bankrupted. How come? *Too many cattle*, sudden and protracted drought, scant forage, 50% drop in cattle prices, widespread lack of pastures in this country within shipping distance, and cattle shipped to northern Mexico from whence they never returned. My father's attitude, I believe, pretty well reflected that of most of the "rugged individuals" making up the band of pioneer ranchmen. During the three score and ten plus years of my own lifetime, I have known and talked with many of these old-timers, and nearly all were of the same pattern. They countered with, "Naw, the range it jest aint as good as it uster be; it don't rain no more, that's why, dang it" or "that old bresh is takin' over all the good grazing land," or "them dryland farmers plowed up the best lands and then went off and left them." Alibis all, but in too many once-lovely valleys, wooded hillsides, and undulating plains, barren land and eroded soil write a grim epitaph, which cannot be gainsaid: "Somebody goofed."

Flexible Herd Management

Convinced by records of recurrent drought that this presented the most expensive and risky aspect of ranching, cattlemen sought some method of insurance against these losses. Thus, the plan of flexible herd management was implemented and tested (10). The breeding herd was reduced to 50% of the stocking of poorer years. This ensures at least sufficient forage in the dry years to prevent sacrifice of breeding cows (94). Negotiable stock, mostly yearlings, used surplus forage in good years. Incidentally, total stocking of the Jornada Range had been gradually reduced from 1,512 cattle in 1933 to 805 head



Cattle grazing black grama range, Jornada Experimental Range.

yearlong in 1949.

Since the breeding herd was reduced, efforts now appeared necessary to better the herd, striving to develop quality rather than quantity. More and better calves had to be produced per cow. This sparked the herd improvement work with "weight-for-age" as the objective to be gained by selective breeding. Providing a background to these activities, Ares published cost analyses of ranch operations, a two-phase study of production costs per calf (8, 9, 14, 15). A study of comparative costs of ranching on level mesa range and on rough mountain ranges was requested by the Regional Office of the Forest Service to be used for appraisal of grazing fees on forest ranges (12). Reduction of death losses of livestock from all causes was set up as an objective to be achieved by control of disease and poisonous plants (6, 13).

A departmental bulletin published in 1962 by Paulsen and Ares describes and sums up the foregoing activities and results of the various studies conducted (95). Rainfall conditions, vegetation types, response to grazing use of principal grasses, and seasonal grazing are considered. Then the previous cow-calf operation is compared with the flexible herd cow-yearling policy limiting the breeding herd to 50% or 60% of total stocking. The latter not only provided drought insurance, but it also increased beef yield from 377 lb per animal unit to 495 lb per unit annually. Other features described were: better distribution of livestock; improvement in livestock grade by deep herd culling; selection of good quality cows and bulls; supplemental feeding, especially preceding the breeding season; and need of sufficient water developments.

Cowpunching in the 20th Century

Cowhands' methods of handling cattle on the range were mostly those used traditionally on round-ups years before and after I came to the Jornada. The horse-drawn chuck wagon, complete with cook, bedrolls, and the all-important chuck box, was directed to a certain well or tank. The remuda (herd of extra horses) would also be driven to this spot by the wrangler. The men under the direction of the herd boss would then make a "drive" of the nearby country, and if no corrals were available, hold the herd collected near the selected spot. This meant "standing guard" all night by riders selected for each shift of 3 hours until daybreak. The herd would be "worked" by cutting out animals to be left, separating them from those forming the "day herd." This herd would eventually wind up at headquarters, where the calves would be branded, marked, castrated,



Jornada Cooperator B. A. Christmas, left, with cowboy, views his herd; fall round-up, 1933. Headquarters is in the background. (U.S. Forest Service photo.)

dehorned, and vaccinated, or, in the fall, be weaned and put on feed.

The introduction of the pick-up truck put the old chuck wagon out of business; the horse trailers put an end to the long drives, the day herd, remuda, and the cook, traditionally a man known to be short tempered. He got that way, anyhow, handling the cow pokes. These modern ways are more efficient and are time and laborsaving, but they have surely removed the most nostalgic and romantic features of cowboy lore.

The Annual Pow-Wow—with Loud Speaker

The annual "Ranch Day" beginning in October 1938, became an important publicity outlet for the Forest Service in New Mexico. This continued until the outbreak of World War II, and was not resumed until 1945. This annual meeting served the purpose of demonstrating both the Jornada and the New Mexico



United States Senator Clinton Anderson, New Mexico, lectures to Ranch Day audience on Southwestern ranch economics, October 8, 1955, at Jornada Range Headquarters. (U.S. Forest Service photo.)

State University experimental procedures and the results. It owed its existence to Dr. John H. Knox, now Professor Emeritus, Animal Science Department of the New Mexico State University. In the summer of 1938, he proposed that the two adjoining experimental ranges (one majoring in animal science, the other in range management) set up a cooperative annual "Ranch Day." Invited were all other government agencies interested in livestock and range management, ranchers, farmers, and all students majoring in the appropriate courses. A very attractive feature of the program was the barbecue lunch. On alternate years, each party had the principal share of the demonstration and of the accompanying tour over the respective range. The agenda consisted of lectures and displays at scheduled stops along the tour route. Judging from the large attendance from the beginning, the project was highly successful and very much appreciated. One of the casualties of the Great Drought, it was terminated in 1956. After that date, there was nothing much left to talk about—except drought!

Every Dog Has His Day

The Ranch Day Program for October 11, 1954, was considered one of the most important because a high-ranking ARS official, Dr. A. H. Moseman from Beltsville, Maryland, would be present. The transfer of the Jornada to the Agricultural Research Service, USDA, had taken place January 1 of the previous year. Director Ray Price and his staff from the Rocky Mountain Forest and Range Experimental Station and an upper echelon of the brass from Region 3 Forest Service Headquarters at Albuquerque were scheduled to be on hand, as well as a large group of students from the New Mexico State University, with the NMSU president and his staff. Mr. Price and Dr. Moseman were scheduled to make welcoming addresses at the noon period. Altogether, a very large crowd was expected for the occasion. In view of this and the prestigious nature of the attendance, I felt a pretty heavy sense of responsibility. During the forenoon, I had a part in the field lectures and demonstration program, and it fell to my lot to oversee the spade work incidental to the noon session, the barbecue lunch, the display racks, seating, and other conveniences for a large crowd.

I was congratulating myself on the smooth way everything had so far progressed. The barbecue prepared by the Jornada distaff was declared most delicious, the exhibits were well received, the speeches were good, and everything was well timed. Just as I was beginning to relax, fate decreed otherwise. Ray had just finished his address and was on his way to answer a long-distance telephone call. And then, it happened! The range cooperator, J. A. Brown, owned a large airedale dog prophetically, for me anyhow, named "Trouble." The dog had been around the station for years and never had shown hostile tendencies toward anyone. But on this particular day, something must have happened to "Trouble" which triggered an urge to finally live up to his



Typical crowd attending annual Ranch Day on Jornada Range. The day was sponsored jointly by the U.S. Department of Agriculture (Forest Service and Agricultural Research Service) and New Mexico State University. Superintendent Ares of the Jornada lectures on range management, October 14, 1946. (U.S. Forest Service photo.)



"Chow time," Ranch Day barbecue at Jornada Headquarters, October 14, 1946. Jornada personnel (distaff) are serving. U.S. Forest Service photo.)

name. Perhaps some in the large crowd milling around may have shoved him out of the way or trod on his toes, or perhaps he was miffed at not getting his fair share of the barbecue and other attentions and favors. Didn't they know he was a dog with a pedigree? Anyhow, Trouble must have been upset from some abrasion to his ego, and his wrath smouldered.

It was destined that the hound vent his wrath just at this time and on one of the most important men present. Just as Director Price started to mount the ranch steps on his way to the phone, "Trouble" charged him. Unable to dodge him, Ray took the impact on his right leg. His Forest Service tweeds were shredded as the dog took a small chunk out of the leg. Adding insult to injury, the mutt then spat it out on the ground. Horror-stricken, I got bandages and safety pins to bind up the wound and splice the rips in Ray's tweeds, and also tried in some measure to assuage his shattered dignity. Then I very securely tied "Trouble," fearful lest, with his apparent yen for the upper ranks, he might charge Dr. Moseman next. Meanwhile, the scene had drawn a crowd, some inclined to regard the whole thing as a good joke on Ray and make light of the incident. This mood rapidly cooled after they sized up Ray, his height over 6 feet, weight some 190 pounds, and a past as an All-American football player. Needless to say, I was dismayed, desiring very much to make a favorable impression and then having it fouled up by a wire-whiskered dog! I looked at Dr. Moseman and thought, there goes my efficiency record! However, Ray and Moseman let me down easy with a mild lecture on the kind of dogs one should have around a public station. I countered, of course, with a history of the dog's docile nature as long as our neighbors had owned him. However, my emphasis on the dog's behavior proved to be the wrong approach. Ray immediately concluded that the change in the dog's peaceable behavior could indicate the dog was rabid, that being one of the symptoms of rabies. Now the fat was really in the fire! I knew that Brown, the owner of the dog, would declare war at any suggestion of doing away with his pet. Finally, it was agreed that the suspect should be tied or confined for a certain period to definitely determine if he had the disease, and then the appropriate action could be taken. Ray agreed to this

only after exacting a solemn promise from me to keep the dog under observation and to wire him immediately if any more erratic behavior appeared on the dog's part. The story ends happily: "Trouble" showed no further symptoms and was freed; Director Price was not compelled to take the painful anti-rabies shots, and my efficiency records remained intact. But it was a Ranch Day to be long remembered.

Feast and Famine—Dollars and Centimes

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During the last year of the war, in 1945, the military took over 85,000 acres of the Jornada in the process of establishing the White Sands Missile Range. This had a bright side, however, as the Army was induced to make a grant of \$130,000 to replace the improvements, buildings, fences, wells, and tanks lost on the area taken over. This windfall was used to make some long-desired changes in the Jornada map. In place of only nine pastures, the Jornada emerged with 18; three new wells were drilled and fully equipped with windmills, tanks, and troughs. One old well was rehabilitated, complete with pump, windmill, tank, and tub. Five miles of pipeline were laid to new troughs at strategic locations. All in all, the remaining area of 107,000 acres on the Jornada at last was prepared and well equipped to carry on some real research work.

Unfortunately, as the oft-dreamed-of facilities were finally completed, Mother Nature, as if in spite, threw a king-sized monkey wrench into the works. There began in the early fifties, the worst drought that the Southwest had experienced in three centuries. It lasted 6 years and 6 months until mid-1957—a drought calculated to end all discussion about the subject. It killed 70 to 80% of the perennial grasses on the Range and reduced the experimental herd from 950 head to 56 head! The postdrought grazing capacity has since been set at about half the predrought number. It was heartbreaking and frustrating to watch those stands of splendid black grama, the top forage species on the Range, together with other associated grasses, gradually thin out and die as year after year passed with way below-average rainfall. For so many years these areas, so carefully managed and nurtured, had been proudly displayed to both local and foreign visitors as the results of our management. This management, too, was proclaimed in many publications as the best and only means by which the loss of these valuable perennial grasses could be avoided. Reluctantly, it had to be admitted that nature's savage onslaught had taught some more lessons. Something else, other than overstocking and mismanagement, could and did occur that was capable of wiping out even climax range, and doing so quickly. Lightly stocked pastures appeared to suffer the greater losses in turf density—almost 100%. It would appear that in a drought of such intensity and severity as this, one would be justified in "throwing the book away" and going into a period of economic hibernation, at least as far as livestock grazing is concerned. No amount of management, planning, and preparation can cope with a situation such as that presented by a 7-year drought. Fortunately, as climatic records show, such a long succession of drought years is a rarity.

The road back has been a difficult one. Long stretches of fences, covered with the blown sand and rolling tumbleweeds, had to be excavated; roads blocked by the drifting sand became impassable. Throughout the drought period, sand and dust were in the air so much of the time that housecleaning at Headquarters became a major project and a frequent one. The distaff personnel of the Jornada were in open revolt. A great seal or coat of arms for the Jornada at that time was "housewife rampant with crossed brooms!"

Other postdrought problems included heavy losses from increased poison weeds; aggressive, militant mesquite, seizing its opportunity, began in earnest its march to take over all grasslands on the Jornada.

A Successful Change of Horses in Midstream

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Right in the middle of the Great Drought, at its nadir, occurred an event, perhaps the most important in Jornada history. Effective January 1, 1954, a departmental reorganization in the USDA created the "Agricultural Research Service." This new bureau, absorbing all range research and investigative activities in the USDA except those associated with forested lands, took over the Jornada, lock, stock, and barrel: personnel, land, and improvements.

Thus ended the long era of management under the aegis of the Pine Tree Badge, a saga of 39 years. Perhaps it was to the advantage of both parties. Most foresters took a very dim view of claims that at least a part of the Jornada was typical of the verdant national forests. It was also vigorously questioned whether all the research results could apply to their vast nondesert domain. The other Forest Service experimental range, the Santa Rita in Arizona, was preferred to the Jornada since it covered range much more typical of the national forest grazing lands. The Jornada had thereby acquired, with its august sponsor, the status of a "redheaded stepchild." There were perhaps some reasons for this attitude. During the writer's long tour as superintendent of the Range, he had observed visitors grazing at the treeless expanse and had heard many, many times, the question: "What in the world, may I ask, is the Forest Service doing in a place like this?" The answer led off to a very long dissertation indeed; mostly adaptation of management plans to the large area of grazing lands within the boundaries of the national forest in the Southwest. Also discussed were effects of grazing livestock on the environment, plant composition, plant physiology, growth habits of plants, forage types, altitude, climate, and so forth. However, it is believed the most satisfactory answer was the simple statement that any plan of management that would succeed on the Jornada would surely work anywhere!

A short time before the take-over of the Jornada by the ARS, an edict went forth from the mighty in Washington, D. C. regarding the names of the branches and divisions in the various Departments. Wherever possible, *service* was to be the terminal word in every branch or division name. This was commendable inasmuch as it softened the bogey image of *bureaucracy*. It also conveyed the fact that all bureaus and agencies of the government are, in truth, the servants of the public and not the other way around as some people would have it.

Thus, there are the "Internal Revenue Service"—IRS, and "Agricultural Research Service"—ARS, the last three letters representing for convenience, the abbreviation of the name. The giant presses of the Government Printing Office in Washington immediately began the herculean task of printing new stationery, letterheads, addresses, envelopes, and many other necessary items for the bureaus affected.

In carrying out this edict, an event occurred, which set off a shockwave of hilarity. This reverberated throughout the entire bureaucratic structure, from the wageboard employee to the staid, august Halls of Justice—the U. S. Supreme Court. A certain branch chief sat at his office desk pondering the impact of the new labeling order: would it cause confusion? would he have to contribute to the cost of the changeover from his already slim budget? As he mentally assessed these and other items, he idly traced the new abbreviation of his branch on a pad. To his utter consternation and dismay, it spelled out "ASS!" In his haste to reach the telephone, he almost fell out of his chair!

It is the general impression of people everywhere that the U. S. Government, under no circumstances, will do anything quickly. But there are exceptions to all rules. In response to a frantic telephone call, an urgent order was quickly dispatched, "Stop the presses; repeat, stop the presses! Hold everything!" The great presses of the Washington printing plant ceased to hum. A folder was

pulled out of the line and returned to one very anxious branch chief. A conference was then called; the branch name was duly adjusted to provide a more dignified symbol. The matter did not cease there, however; twitters and chuckles have sounded all the way up the line about this fiasco, even up to the present. The branch chief⁴ was teased thoroughly; he was the target of quips and so-called witty remarks about his "Donkey Domain," as it was called. These came from high and low—with the exception of his own personnel.

Under the Agricultural Research Service, the Jornada Range at last found a niche into which it fitted perfectly. A line of the new research was labeled "Arid Pasture and Range Investigations." At any rate, there certainly was no question as to whether this label was appropriate in the minds of the first two Beltsville researchers who showed up at the Jornada Headquarters a few months after the ARS took over.

Mason Hein and Dr. Robert Wagner spent a day looking the place over. It was in May, 1954, midway in the Great Drought. After shoveling sand all day, pushing vehicles stuck in the dunes blown across roads, and viewing fences covered with sand and tumbleweeds, Bob Wagner had "had it!" He sized up the situation with his historic remark: "I think this place ought to be given back to the Indians; that is, if the Indians will have it!"

Bob resigned from the Agricultural Research Service less than a year later. It is not known whether the magnitude of the problem presented by the Jornada had any bearing on his action, but he did move to a more attractive position.

Dr. Wesley Keller in 1956 succeeded Wagner as Project Leader of the Arid Pasture and Range Investigations. Wes, who had grown up in the West, knew from observation how quickly desert range could recover under favorable weather conditions and so was more optimistic about the Jornada outlook. With all its drawbacks, it was, after all, typical of a great expanse of Southwest range. He reasoned that the Jornada had a real potential; all research findings and developments could be applied to millions of acres outside the national forest. He therefore brought in Dr. Carlton Herbel, who organized and has carried out a very comprehensive research program on the Jornada. This step, almost from the beginning, yielded significant results in both herd and range management and in noxious shrub control and many other projects.

In 1958 the long tenure (25 years) of Ace Christmas finally came to an end. Since Ace had been incapacitated by illness some years earlier, his son-in-law, J. A. Brown, assumed control of the experimental cattle. Brown (who preferred to be called just plain "Brown" by his friends) was noted for his love of horses and this love provided one memorable incident on the range. All the horses in his mount received the very best care. His favorite was a beautiful palomino named "Goldie," which was kept in a separate pasture so that a special ration could be given to him daily. If Brown, or anyone else, parked his pick-up anywhere in that area during the day, Goldie, from his vantage point, would see him and come running full speed for sugar lumps.

Frequently, parties hunting Indian artifacts in the sand hills came to the Jornada. On a particular day, a party of six on their way to the diggings stalled their vehicle in a deep sand dune. They dug, pushed, and sweat, but without success. Suddenly, in the midst of their labors, they heard a succession of loud neighs. Looking up, they beheld Goldie in a cloud of dust bearing down on them at top speed. He must have been expecting that sugar. The party paused not to figure out the situation. They dropped everything and made for a barbed wire fence not far from the road. With Goldie close behind, this fence was negotiated quickly by every member going either through, over, or under the wire with

⁴ Name of branch chief will *not* be furnished upon request.

scant regard to clothes and skin. They reformed ranks on the safe side of the fence and bound up the wounds. Following the fence about a quarter mile north brought them to the ranch house at Headquarters. The perplexed Goldie kept pace on the opposite side of the fence as far as he could go.

58 The party approached an occupied house and knocked on a back door. But before the knock could be answered, a dog came dashing at high speed around the house. He was a large bulldog, harmless as a rabbit but possessing a most ferocious countenance complete with underslung jaw and protruding teeth. Again, they did not linger to assess, but scattered to points of safety: a ladder, roof top, trees, etc. Hearing the commotion, the lady of the house appeared and asked what they wanted. From a tree-fork vantage, one earnestly replied, "Lady, please, all we want is for you to tell us how to get away from this damned place while we are still alive." On being advised of the true state of affairs, the party still not fully assured, said, "Well anyhow, we hope we don't meet a bull before we get out; there aint no trees out there to climb." Brown on his part, wondered why this particular party never returned to the Jornada.

The Space Age: 1958-72

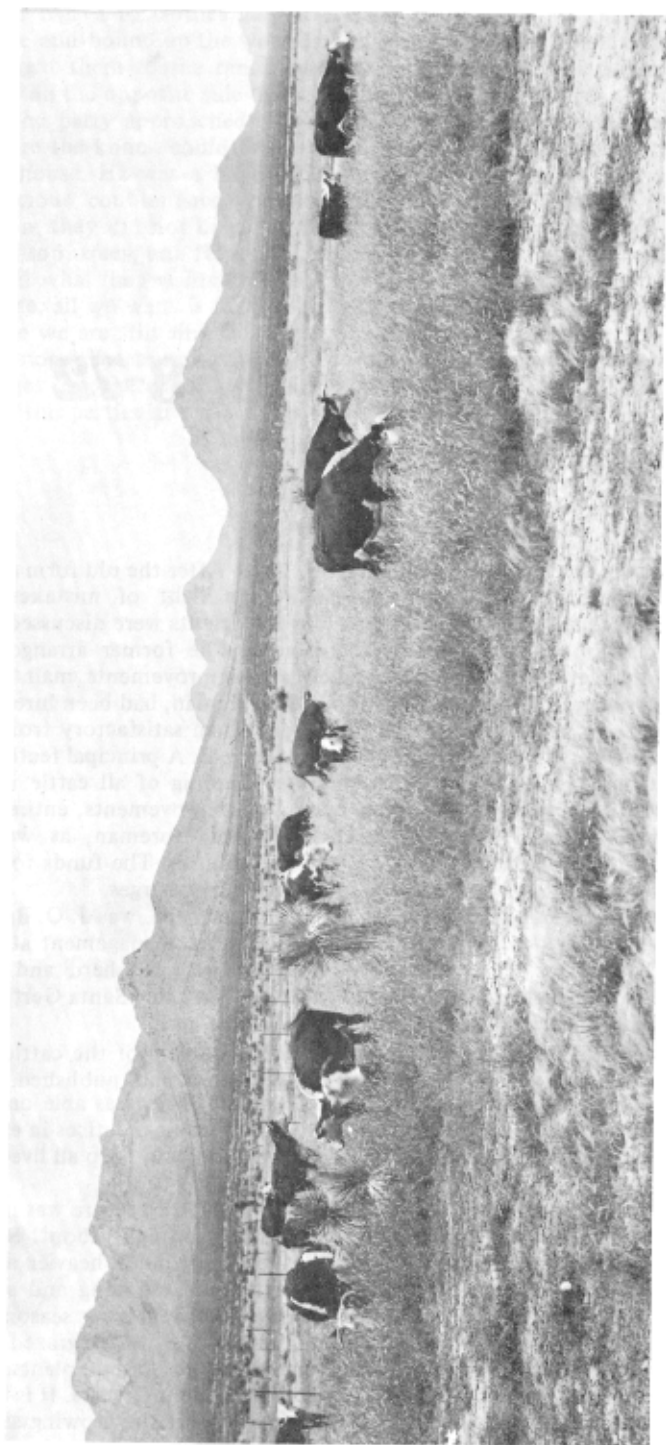
The Cooperative Agreement expired June 30, 1958. After the old form of the cooperative arrangement had been assessed in the light of mistakes and shortcomings of the past 46 years, other possible agreements were discussed long before the expiration date of the old agreement. The former arrangement specified that the cattle were to be handled and improvements maintained entirely by the cooperator. All help, including the foreman, had been hired and paid by him also. To say this setup had proven less than satisfactory from the viewpoint of researchers is the understatement of the year. A principal feature of the proposed new agreement was to commit the handling of all cattle in the experimental herd, together with maintenance of all improvements, entirely to the government. This involved hiring and paying the foreman, as well as necessary help, to manage the cattle and maintain facilities. The funds for this were obtained by setting up a much higher rate for grazing charges.

The fourth cooperator, the first under the new agreement, was J. O. Bridges of Las Cruces, New Mexico, formerly professor of range management at New Mexico State University. He acquired most of the original herd and later supplemented it with purchase of some outside cattle, including Santa Gertrudis, the first cattle other than Herefords to be included in the herd.

Under the new method of operation, with agency control of the cattle and facilities, many research projects have been completed and published. The superintendent alone, with only temporary help since 1942, was able only to maintain research facilities; keep range and herd management practices in effect; collect records on climate, forage growth, and utilization; and keep all livestock records up to date.

The year 1958 marked the end of the "Great Drought." So severe was it that an adjustment of time-honored management plans was brought about. Severe drought kill of splendid black grama grass made necessary much heavier use of the more resistant tobosa type. Tobosa grass withstood the long and severe drought with little loss (54). The usual 4-month summer grazing season was therefore extended, together with an increase in number of livestock grazed.

Postdrought rainfall brought with it an increase of poisonous plants. The worst was whorled milkweed, which killed over 100 cattle in 2 years. It is being controlled by continuous spraying with 2,4,5-T throughout the growing season (54, 60).



Cattle grazing tobox range on Jornada Experimental Range, August 4, 1938.



Aerially spraying mesquite sand dunes, Jornada Experimental Range.

The Fight Against Brush Invasion

At long last (too late perhaps), the challenge of invading mesquite was taken up by Carlton Herbel. To begin with, large areas of the infested range were hand-grubbed to destroy seedlings (61). Then followed annual aerial spraying, ground spraying, hand application of fenuron pellets, and mechanical grubbing.

Spectacular results followed the 1958 aerial spraying, especially in Pasture 8 (47, 48). Kill of mesquite was so effective that perennial grasses began an immediate comeback (51). This appears to be permanent inasmuch as the grass cover continues to increase. It suggests what can be done if finances are provided for large-scale spraying, especially during favorable rainfall years (53). The hand-applied, delayed-action fenuron pellets are effective, as indicated by the slowly dying mesquite on the treated areas. Herbage yields, mesa dropseed mostly, on many sprayed areas were 7 to 8 times greater than on untreated areas. Ground spraying of mesquite with broadcast sprayer gave approximately the same results as those obtained by aerial spraying (60).

Control of creosotebush and tarbush has also been underway by Herbel and Dr. Walter Gould since 1962. Preliminary results indicate that spraying with herbicide (dicamba) in late summer is most effective (49). However, applications of many other herbicides in spray granules, powder, and in pellet form, proved to be effective on these shrubs (50). Creosotebush and tarbush were both effectively controlled by applications of fenuron pellets (64).

Seeding tests with various grass species were made simultaneously with rootplowing of creosotebush and tarbush areas. Only a few seedlings emerged on the tarbush area, but an excellent stand was noted on the creosotebush area.

Ranchers have long insisted that creosotebush "poisons the soil," giving off a substance which inhibits growth of nearby grass. In a series of laboratory tests, Herbel and a graduate student determined that growth of black grama and bush muhly was significantly reduced by extracts of various creosotebush plant parts (75). In a pot test, creosotebush extracts also created a crust on the soil surface,

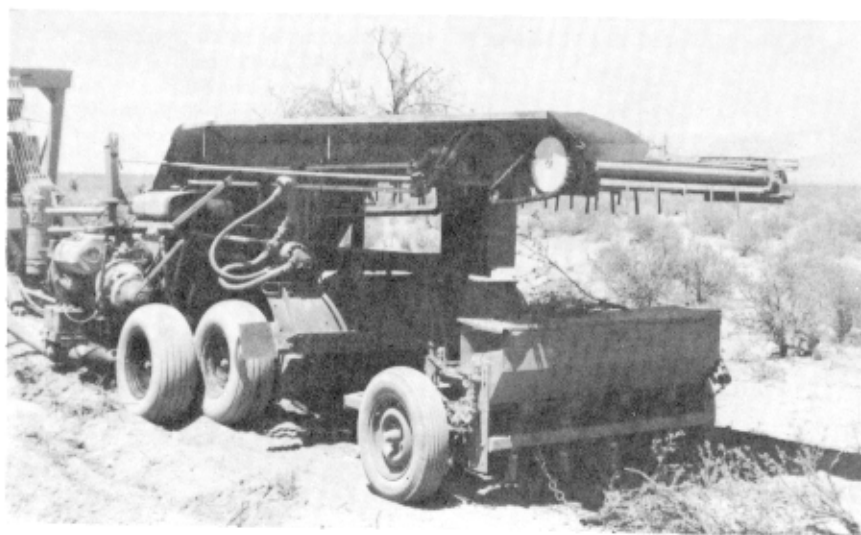
which reduced the infiltration rate of water.

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The soils of the test areas were different: the tarbush occurred on silt loam; the creosotebush on sandy loam. Soil temperatures under varying degrees of ground cover were observed. This cover was provided by scattering the brush uprooted in the process. Average maximum temperatures at the 0.5-inch depth on loamy sand were 20° lower under heavy plant cover than under no cover. The heavy cover at the tarbush and creosotebush sites reduced maximum soil temperatures 30° and 10°, respectively. This points out the desirability of scattering brush uprooted in the clearing operation instead of piling and burning, as was the usual method of disposal (56). Benefits of scattering the brush are: it provides ground cover and protection from erosion; decay of the material produces valuable humus; and lastly, the lower soil temperatures of the shaded areas insure a much greater survival and growth of seedlings of desired forage plants. Unshaded desert areas in midsummer can register temperatures which are terrific, often in excess of 130° F at 0.5-in. depths. Such heat is fatal to most seedlings.



Clyde Yarbrough applying fenwron pellets to control mesquite. This is a very effective and economical method to control sparse stands of mesquite. Yarbrough became ranch manager of the Jornada in 1968.



Rootplow seeding of an area infested with tarbush. In a simultaneous operation the competing vegetation is killed; the grass seed is placed in a firm seedbed; the dead brush is used to partially shade the seeded area, thereby substantially reducing summer soil temperatures; and water is concentrated in basin pits. Brush conveyor was designed and built by Dr. George Abernathy, New Mexico State University agricultural engineer.

Laboratory studies showed that high temperatures were detrimental to initial growth of 13 grass species, but not to black grama and sideoats grama (98, 99).

Laboratory studies were made of effects of both temperature and moisture on emergence and initial growth of two range grasses—black grama and Boer lovegrass (68). Black grama, a native, came out winner: its seedlings emerged and survived the higher temperature level. Shoot lengths and weights of surviving black grama were always greater than those of Boer lovegrass. It required 2.75 inches of water for either species to survive in the low-temperature zone and about 9.09 inches in the high-temperature zone. Survival and growth of all seeded grass species in the Southwest would be enhanced if soil temperatures and evaporation from soil surface were reduced.

The effect of limited moisture on germination of six common range grasses was laboratory tested (74). Black grama and bush muhly appeared to be best adapted to survival under these typical semidesert conditions.

Herbel and student assistants conducted basic annual microclimate studies of soil moisture and precipitation, infiltration rates, soil and air temperatures, evaporation, humidity, and wind movement near the surface. Manipulating the microclimate by paving strips with asphalt or plastic material, for example, allowed much greater emergence of seedlings than on untreated areas. (Seeding should be undertaken during the cooler periods following seasonal rainfall.)

The effect of fertilization on tobosa grass on the flood plains of the Southwest was determined in a 5-year study by Herbel (52). Yield of forage for 1957 was reduced by the previous year's drought, but yields of the 2 consecutive above-average years (1958 and 1959) were phenomenal. In 1959, 90 lb/acre N increased the forage yield by over 2 tons per acre. Yield in 1958 also was above average. The drought year of 1960 was a blank, except where plots received run-in. Even with above-average rainfall in 1961, yield was not affected by fertilization because of the previous drought year.



Grass response on an area sprayed for mesquite control on the Jornada in 1958 and again in 1961. Photo was taken in 1963. The dunes have begun to level out, and the grass and forb cover greatly reduced wind erosion.

A very interesting study of the effects of drought on different soil types was conducted by Herbel et al. (63). It behooves a prospective ranch buyer to make a few random soil tests of the grazing land, in addition to studying the forage supply, topography, and other features. Then he will have "grass root facts" to show how each portion of his range should be handled, especially during severe drought. Data were obtained from annual forage crop surveys of yield and cover composition on seven soil types made by Ares over a 17-year period, 1941-1957. Six years, 1951 to 1956, are appropriately known as the "Great Drought," one of catastrophic proportions (58). Average annual and seasonal rainfall for the period was only 56% of the predrought average. Cover and yield of all forage species on the upland sandy soils, including black grama, were greatly reduced. However, damage was much more severe on the deep sands than on shallow sands. This was due to the fact that all the scanty moisture was made available to the plants on the shallow soils. The "hard pan," or impermeable layer of caliche in this case, held the moisture in the top 12 inches of soil, well within the reach of the grass roots. Incidentally, rainfall was uniform for the several soil types.

Improving Livestock Management

With the new cooperative setup for livestock in effect since 1958, research on livestock management was facilitated. For some years, I entertained hopes that a breeds and classes study could be conducted on the Jornada. No positive or actual proof existed as to whether or not the traditional Herefords were, after all, the top and only grade of cattle for semidesert grazing. From the standpoint of drought resistance, beef production, adaptability to climate, and various forms of desert forage, I believed that some of the new crossbred cattle might

equal or excel those of the reigning favorite, the "white face." For example, the Hereford-Angus cross, if it contained, as claimed, the best qualities of each breed, might even prove to be superior.

However, the new cooperating cattleman was not amenable and vetoed the plan. The new agreement specifically provided for crossbreed studies.

Herbel nevertheless drew plans for an extensive breeds and classes study, using Santa Gertrudis and Herefords. An animal scientist, (Dr. Arnold Nelson), a nutritionist, and a geneticist from New Mexico State University Department of Animal Science, were invited to participate.

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The experiment, conducted over a period of 8 years (1958-1966), yielded a vast amount of information and answered many questions concerning management and environment. Three scientific articles regarding the grazing habits, activities, and preferences of both breeds were forthcoming. An additional Jornada Range Report was issued on performance of both breeds.

The first paper (65) is a record of the daily habits, grazing periods, wandering, standing, lying down, salting, watering, and so on. It showed one major difference: the Santa Gertrudis spent more time walking (12.1% vs. 6.5%) and travelled farther (7.8 mi. vs. 4.9 mi.) than the Herefords. The latter spent more time grazing, of course. The tendency of the Santa Gertrudis to wander and explore suggests that this breed might develop more uniform patterns of grazing and also less trampling, especially on sandy soil.

The second paper (83), a study of the forage preferences, revealed that both breeds ate all species of forage plants to some extent. The Santa Gertrudis consumed more of the coarse grasses, while the Herefords ate more of the yucca and russianthistle plants. Incidentally, this study blasted a pet theory entertained since the memory of man. Blandly proclaimed in conversations, lectures, and publications, was the theory that no ruminant would graze the lowly burrograss after it matured and developed its characteristic awns. The very definite conclusion had been drawn after trial and error. The error was an attempt by a researcher to chew a handful of the dry grass. The test backfired; the effects of this simulated grazing were startling! Efforts to dislodge the sharp awns by retching, probing, gagging, and drooling only served to drive them deeper and deeper into said researcher's maw. Relief was finally obtained through the use of tweezers and forceps. The species preference paper thus revealed the cow's brute ability to devour and assimilate all kinds of roughage had been grossly underestimated. Burrograss is actually grazed at all seasons of the year, although preference is shown in summer growth stage. This happened to be a very valuable disclosure, inasmuch as burrograss, an associate of tobosa grass, is a very common plant and is even dominant on many of the low flood plains of the Southwest.

The species preference data (66) and other published and unpublished information, were combined to develop the "Best Pasture" grazing system (67). Because of drought, overgrazing, and brush invasion, a large variety of plants are available for grazing. Poor distribution of rainfall may produce green forbs and grasses on part of a ranch, while the other part remains dry. To some extent, the "Best Pasture" system encourages "following the rainfall," or the nomad's method of grazing. The practice permits maximum use of ephemerals and thereby maximum rest for the perennial grasses.

The third paper (62) noted very little difference in the grazing pattern of the two breeds. However, indications are that in larger pastures than those used in the test, the Santa Gertrudis would develop better patterns because of their far-ranging tendencies.

A paper by Kiesling, Nelson, and Herbel showed the effects of the esophageal fistula on chemical composition of feeds (72).

The cooperative Jornada Range Report No. 2 of the 8-year study showed, among other things, that calf crop percentages of the two breeds were approximately equal: 71.5% for Hereford and 70.4% for the Santa Gertrudis (87).

66

On December 31, 1966, J. O. Bridges sold the cattle on the Jornada and had the Memorandum of Understanding transferred to Dick Davis, a cattleman from Las Cruces. After 5 years, Mr. Davis has shown himself to be very cooperative, congenial, and progressive. It is hoped that this atmosphere will continue. For after all, the cooperators themselves and the quality and performance of the cattle they furnish represent a very important part of the Jornada program. They are, in fact, the showcase of the research project. It is also essential, therefore, that they themselves prosper in the enterprise, this being the label of success with other cattlemen. Otherwise, the methods developed and recommended would not find general acceptance, and might fall into the category of the hospital bulletin: "The operation was a success, but the patient died!"

Mention here must be made of some very important improvements added to the Jornada in November 1967. At long last, a power line was built, and amid great rejoicing, electrical connections made for lights and power. Another priceless boon, providing for the first time an all-weather route, was the grading, drainage, and surfacing of the road out to the pavement of Highway 70, a distance of 17 miles. Dona Ana County road maintenance section helped greatly in this project by supplying all the equipment together with operating crews.

A Desert Water Windfall

In 1963, an event occurred which has gravitated to the general benefit of the experiments on the Jornada Range. The National Aeronautics and Space Administration asked for and obtained permission to drill a water well 6 miles south of Headquarters, just inside the Jornada Range south boundary. I saw to it that the agreement drawn up provided the Jornada with the right to tap this water supply for experimental livestock use if and when the well came in. It was drilled to a depth of more than 1600 feet, finally striking a large underground reservoir of good water. Pumped by large electric motors, the water was conveyed by pipeline to NASA Headquarters, 4 miles east.

The estimated water demand of the Manned Space program, designated the "Apollo Project," was tremendous, running as high as 30,000 gallons per day. Alarmed lest this drain lower the water level and thus diminish the output of the Jornada wells, provision was also made requiring NASA to supply whatever deficiency resulted. Three years after the Apollo project got under way, it was noticed that the supply of water from Taylor Well, 3 miles north of NASA well, seemed to be failing. The tanks at the well and a 3-mile pipeline proved to be more than the well could supply. The NASA people quickly responded to my request that we tap their supply. A concrete trough with float valve was installed about 300 feet north of their well. This greatly relieved the pressure on the watering facilities at Taylor Well by providing another source of water in Pasture 7. This watering place is unique in that it requires very little or no maintenance.

Additional scientific papers were submitted from data collected on the Jornada study. The first by Nelson and Herbel was on blood composition of range beef cows (84). The second was on chemical composition of tobosa grass (73). The third was on recovery of chromic oxide in steers (71). A fourth paper, "Chemical Composition of the Diet of Cows Grazing on Arid Range," was by Nelson et al. (85). New Mexico Bulletin 561 by Nelson et al., further indicated the wisdom of "Best Pasture" grazing. The protein content of composite samples of cow diets was much higher on a mixture of grasses, forbs, and shrub-like plants than if grasses alone were grazed.

In order to answer further questions concerning crossbreed cattle, "Operation Mix-up," designed in 1967, is presently under way. Hereford cows are bred to Brangus and Santa Gertrudis bulls; Santa Gertrudis cows are bred to Hereford bulls. The progeny will be tested for adaptation to droughty conditions, grazing habits, production, etc. This is a cooperative project between Nelson of the New Mexico State University, Herbel, and Clyde Yarbrough, Superintendent of the Jornada. Yarbrough succeeded Fred Ares, who retired October 1, 1968.

On June 30, 1972, Wesley Keller was relieved of supervision of the Jornada, which was assigned to the newly organized Western Region of ARS. The present line-up of ARS personnel for the Jornada now consists of: Clyde Yarbrough, ranch manager; Dr. Carlton H. Herbel, technical advisor, range management, Western Region, and research leader, Jornada Experimental Range; Dr. E. L. Kendrick, area director, Tucson, Arizona; Dr. H. R. Thomas, deputy administrator, Berkeley, California; and Dr. T. W. Edminster, administrator, Washington, D. C.

CONCLUSION

And so the story is told. It embraces ups and downs, the many setbacks as well as the accomplishments. These have kept pace with the gradual development of a cattle ranch in 1912 to what is now the Jornada Experimental Range. It began with competent observers taking selected records such as stocking of the separate pastures by the experimental cattle, height measurements of forage production, vegetation response on meter-square quadrats, and climatic records. From this status, the Jornada has advanced to an experimental ranch under complete control of the range scientist with competent ecological training and facilities. It also includes access to modern biometric and statistical methods. How "Topsy has grown!"

The foregoing narrative is chiefly centered on plans, events, personalities (the cooperators' mostly), and results, all dealing with the establishment and development of an experimental ranch. Certainly, such a project was sorely needed in the tumultuous days around the turn of the century. Then, public lands were unappropriated and ranches were set up by the men "who gits thar fustest with the mostest," to quote General Nathan Forrest of Civil War fame.

The Jornada Experimental Range has really played an important role in Southwestern range science. Range management, as a science, had its beginning in the early 1900's. Thus, by following the progress of research on the Jornada, one may trace the development of the science. Many of the pioneers in range research spent some time on the Jornada during their careers.

Appropriate tribute is due the researchers—the principal actors on the stage. These men truly have borne the heat, toil, and burden of the day. They strove to get at the root of knotty problems and apply corrective measures. Often caught in a cross fire between administration and research, they endured ridicule, the sometimes erratic behavior of the Cooperator, and the frequently perverse rainfall. Sadly, they watched hopes and plans knocked into a cocked hat. Jupiter Pluviosus, or, "No, I don't want my cattle choused around like that!"; and so on. They salvaged the wreckage, improvised, pieced together, and pushed on so on. They salvaged the wreckage, improvised, pieced together, and pushed on in spite of obstacles. Men of vision, their efforts and thinking were far beyond their time. They saw the need of changes planned decades before implementation. Their predictions based on scientific observations all too often were as the "voice of one crying in the wilderness."

Help! Help!—A Timely Lift

It is certainly appropriate here to record the tremendous value of the Jornada

Range experiments and the help it provided the new Bureau of Land Management (Department of the Interior). Throughout the mid-thirties, the staff of the Jornada was busy lecturing, advising, and demonstrating range management. Frequently, groups of trainees came to be introduced to the elementaries of managing both livestock and grazing as they were escorted on field trips over the range. Incidentally, the cadre of the BLM organization was made up largely of Forest Service employees trained in such management, either transferred or on detail to the Grazing Service (BLM). (The Grazing Service and the former U. S. Land Office were combined to form the Bureau of Land Management in 1946.)

The newly formed Soil Conservation Service organized at about that time also made good use of the data collected and experienced gain during the then 23 years of investigative work on the Jornada. ~~Bush~~ loads of their trainees were escorted on field trips and initiated into the mysteries of quadrat density measurement, plant characteristics, seasonal use, clipping studies, plant cover, and sample collecting.

Thus were made available, for instant application, data backed by several years of study and experimentation on the Jornada. At a time when immediate action was desperately needed, the Jornada fully justified its existence as an experimental area. Consider the timely value of data obtained by such investigative projects as range stocking, herd management, procedures for making range surveys, the actual measurement of range forage production and its utilization by livestock, and concepts of proper use for all chief forage plants, to mention only some. Anyhow, the newly organized Grazing Service could and did quickly accept and apply the remedial measures suggested. Within a comparatively short time, considering the magnitude of the job, the long-standing control problems of the "open range" were well on the way to a proper solution.

Finally, I must conclude that having visitors to an experiment station is a two-way deal. Both the host and the visitor can learn during the exchange of information and ideas. Throughout the past 60 years, visitors (famous and otherwise) have come to the Jornada Range from the four corners of the world. I like to think that some study result or idea from the Jornada is helping to improve range management in many far-off lands. I know that the visitors from all the continents of the globe have been an inspiration and help to us on the Jornada.





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About the Author

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Fred Ares was raised on a cattle ranch southwest of Carlsbad, N. Mex. Thus, he had early experience with the boom and bust of ranching—a boom during years with good cattle prices and favorable rainfall, and a bust in years with unfavorable conditions. With the exception of some formal training at New Mexico Military Institute at Roswell, all of Fred's education has been at the school of hard knocks and the university of experience. While at the Jornada he completed Forest Service extension courses in range management, ecology, and watershed management.

In 1922, when he was nearly 24 years old, Fred Ares left his father's ranch near Carlsbad to take a job with the Forest Service at Luna, N. Mex. He wanted to get in on the "easy life." As a condition of employment, he had to furnish two horses. So he set out on horseback, leaving his wife and small son at Carlsbad, and proceeded to ride to Luna. It was about a 450-mile journey. About half way there, his horses became travel-weary, and he made camp at Mockingbird Gap in the San Andres Mountains, just a short distance north of the Jornada Experimental Range. He got to Luna about 8 days after he left Carlsbad

to begin the "easy life."

74 Fred Ares served as a forest ranger in the Luna District until 1931, when he moved to the Jornada on a "temporary" assignment and never left. There was an excellent group of researchers working on the Jornada at the time, but they needed assistance with day-to-day management of the Range. Fred's job was to study ways to obtain better livestock distribution over the vast, under-improved range areas in the Southwest. He has a number of publications on the use of salt-cottonseed meal mixes, temporary water tanks, and electric fences to obtain better livestock distribution on the range. Fred handled things so capably that by the early 1940's he was the only researcher left on the Jornada. Even though he had little assistance, he had the foresight and determination to continue to collect the vegetation, stocking, and weather data so important to future generations of researchers on the Jornada. Thanks to Fred Ares, these data are more complete than those for any other experimental range of which the author is aware. In fact, therein lies one of the primary benefits in having an experimental range. These year-to-year records dating back to 1915 make it possible to study soil-plant-animal-weather relations through a variety of weather conditions and form an excellent base for future studies.

Some of Fred Ares' other research accomplishments had to do with obtaining better livestock utilization of tobosa by cutting it for hay or by spraying the dormant grass with molasses. He developed grazing management plans for black grama and tobosa ranges. He has a keen appreciation for proper use standards. In 1939 he began taking an annual forage weight inventory over the entire grassland portions of the Jornada. This inventory, accomplished by clipping and weighing samples from randomized plots, was used to develop stocking plans for the next winter-spring period. Then he would take a utilization survey the next June to see how that stocking plan worked out and to develop a current stocking rate. Fred is an exponent of the flexible plan of herd management and studied the economics of this plan.

I consider myself very fortunate to have had Fred as a colleague since 1956. Since his retirement in 1968, he has served as a collaborator on the Jornada Experimental Range and continues to make significant contributions to the research program.

The Jornada Experimental Range has indeed had an important role in Southwestern range management. Range management as a science had its beginnings in the early 1900's. By following the progress of research on the Jornada, one may follow the development of the science. Because of his long tenure on the Jornada, Fred Ares is admirably qualified to bring these developments to you in a very readable form.

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