

Wildfires in the Great Plains Grasslands

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HISTORICALLY, fire and the Great Plains flora are old associates. Topography, climate, and vegetation combined to favor occurrence of wide-spreading prairie fires. Before their continuity was interrupted by the plow, the plains had no firebreaks other than a few wide rivers crossing them at long intervals. The plains climate is characterized by intermittent drouth when grass browns and dries and will burn at almost any time. Autumn and early spring months are generally periods of dry, windy weather, and these are times when today's ranchers most dread prairie fires. The plains are notorious for winds which sometimes blow for days on end. The violence of plains lightning storms was early noted; trail-driving cowboys especially dreaded electrical storms because they frequently caused stampedes. Lightning is still a cause of prairie fires. During the summer of 1964 a "dry" thunderstorm started fires in three ranches in a single Texas Panhandle County. Finally, dry grass is a highly flammable fuel. The front of a fire burning in thick dry grass travels almost as fast as the wind behind it.

FIRES BEFORE SETTLEMENT OF THE GREAT PLAINS

References to prairie fires are numerous throughout the records of early plains exploration and travel. The casual off-hand manner of many of the references are the best indication that the fires were not unusual. Gregg (1954) prefaces an account of allowing a cooking fire to escape control with the remark that the old grass of the valley where camp was made "had not been burned off." On the other

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hand, there is evidence that a grass fire well under way was not to be taken lightly. In another instance, having permitted their fire to "communicate" with the prairie grass, Gregg's party easily escaped the flames because a headwind was blowing, but the next day, the wind having changed, they found the fire overtaking them at a fast rate. This time, the caravan was able to reach a spot of short-grass prairie in time to escape disaster by a narrow margin. Gregg concluded his account of this fire thus: ". . . and all those who have crossed the prairies have had more or less experience as to the danger which threatens the caravans from these sweeping visitations."

In yet other references to prairie fires, Gregg attributed the generally stunted and tangled undergrowth of the Cross Timbers to the continual inroads of prairie fires and expressed belief that the streams west of the Cross Timbers were nearly timberless for the same reason.

The diary of Sam P. Newcomb (1958) contains the daily log of a horseback trip from the Clear Fork of the Brazos in Stephens County, Texas, to the San Saba River and return. On March 30, 1864, the party encountered many buffaloes on grazed-off range, and from 3:00 P.M. until 9:00 P.M. the men traveled on burned-off range searching for grass for their horses. On April 3 he writes: "There was a very hard sand storm blowing from the plains and we could not see much over a hundred yards."

The Newcomb party was traveling at the time on the extreme western edge of Texas settlement and the High Plains escarpment at its nearest point was 150 miles farther to the west. A sandstorm in the Texas plains as early as 1864 cannot be attributed to misuse of the plow. The logical explanation would seem to be that extensive areas of burned-off soils were being wind-blown. There would have been no new growth of grass as early as April 3.

The nomadic plains Indians could have hardly been ignorant of the fact that the grass which followed burning held great attraction for buffaloes and wild mustangs. Indians also used fire on occasion to discomfit an enemy. On the other hand, it was not in keeping with the Indian character to expend much energy to control a prairie fire, nor could the Indian have seen any reason to do so. The plains Indian could live with grass fires just as do the pastoral natives of certain parts of Africa today.

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A news item in the *Galveston Daily News* (1879a) quotes an exchange from the *Pilot Point Post* (Texas):

We learn from a gentleman late from the west. . . . (buffalo) hunting has not been good, owing to the Indians having burned off the prairies. The hunters have quit and gone to trapping. The principal hunting has been for wolf. Perhaps 45,000 hides have been shipped.

PRAIRIE FIRES DURING EARLY SETTLEMENT

Initial stages of settlement of the Great Plains may have been accompanied by an increase in occurrence of sweeping prairie fires. There were people traveling and camping in greater numbers. Many would-be settlers were in reality adrift and restless and had little proprietary interest in the land. In Texas, hostility between ranchers using the public domain and homesteaders was suspect in the case of some prairie fires.

Scott (1960) relates how Leola, South Dakota and Sykeston, North Dakota were nearly leveled by prairie fires. The fire of 1889 which destroyed all but 12 of the 100 buildings in Leola was said to have traveled 40 miles in the 4 hours following its first appearance. According to Scott, Mt. Vernon in Davison County, South Dakota, was entirely destroyed the same year. Another fire in 1888 threatened Jamestown, North Dakota, and was reported to have been 40 miles in width.

During the 1930's I undertook to investigate in what ways the early settlers of Texas were influenced by the great abundance and variety of wildlife the State afforded. A considerable number of the early settlers of the western half of Texas was interviewed. In addition, journals, diaries, and books about early Texas were searched. The files of 88 early-day newspapers were scanned. Notes were made of references to prairie fires because of their close relation to wildlife habitat. The notes are far too numerous to cite in this paper and would be repetitious in any case. Suffice to say, the picture which emerged was one of incredibly abundant wildlife in an environment which seemed to be on fire, somewhere, all of the time.

One of the earliest of the newspapers checked was the *Colorado Tribune*. In an issue (1852) a sketch was given from an interview

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with one of the members of Austin's first colony. Discussing a crop failure due to drouth in 1822, the colonist was quoted as saying:

But for the game with which the country abounded, the inhabitants would have perished from hunger. At this period, it was no uncommon sight to behold from four to six hundred deer *on the newly burnt patches* of the prairie.

The *Galveston Daily News* (1878) quoted an exchange item from the *Rockport Transcript*:

The prairie is on fire for miles north of Victoria along the telegraph line, hundreds of poles burned to the ground, and the wire burned in two in many places. The fire extends from Victoria 20 miles north to the Aransas Creek, the worst raging between the Aransas and the Garcitas. The flames were in billows ten to twenty feet in height. Mr. Martin, operator at St. Mary's, says he expects almost any day to experience a fire on his northern section of line, where for many miles the grass is very high, and the rosin weed stands ten feet high and so thick that a horseman can scarcely force a way through.

Up in North Texas on the eastern border of the buffalo range, the *Frontier Echo* (1876) made mention in a column of local news:

Prairie fires plenty and in every direction.

The item which followed, stated:

A large flock of wild pigeons passed over town last Sunday.

By 1879, the editor of the *Frontier Echo* had followed the edge of settlement westward to Fort Griffin and changed the name of his paper to *Fort Griffin Echo*. He was quoted by the *Galveston Daily News* (1879b) in a column titled "Texas State News":

For several days the whole country has been burning, as well as the greater part of Throckmorton County.

Many of the ranches which were established in the Texas High Plains following extirpation of the buffalo were financed by eastern or foreign capital. Large-scale ranching got to the Great Plains before barbwire and private ownership of the grazing range. In the Texas Panhandle, ranches like the Matador and the XIT were under distant ownership and were supervised, albeit loosely, through re-

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ports and correspondence between local managers and distant owners. Prairie fires, because they caused loss of immediate pastureage and necessitated costly roundups and movement of cattle to unburned range, found a prominent place in ranch records.

The largest of the Texas ranches was the XIT, the 3,050,000-acre parcel of State land in exchange for which a Chicago syndicate built the State Capitol building. The XIT sprawled for over 200 miles north and south parallel to the Texas-New Mexico line. Haley (1929) describes several great grass fires in his well-documented history of the XIT. Brief details of two of these fires are pertinent here because the extent of the areas burned off was probably reported with a relative degree of accuracy. There is no reason to assume that such fires were limited to this one holding. Rather it should be noted that at least these two fires traveled great distances before reaching the XIT boundaries, and thus burned off vastly more acres than shown by ranch records.

Late in November, 1894, smoke from a fire burning in eastern New Mexico hung over the Panhandle South Plains. Driven by a brisk west wind, the grass fire struck the XIT Ranch line south of Farwell on a 20-mile front. Despite round-the-clock efforts of cowboys to halt the flames, the fire was not extinguished for four days and after a wind change had driven it into sand dune country far to the south where it died for want of fuel.

When cowboys were sent out to assess the damage, it was found that a strip 20 miles wide and 60 miles long was burned clean.

In the fall of 1895 another great fire broke out in the Arkansas River country near the Colorado-Kansas line, swept south, jumped the Cimarron, and struck along a wide front of the Texas northwest Panhandle. An observer said that it looked as if all the Oklahoma Strip and the Texas Panhandle were on fire. The flames burned out in the breaks of the South Canadian. All of the 470,000 acres of the Buffalo Springs division of the XIT ranch was burned off, and a greater part of two other divisions.

Each of these prairie fires may well have burned off several millions acres of grassland. Neither was brought under control by the scores of cowboys who fought them, but were only stopped when confronted with natural barriers. In that respect they may have been among the last of the great "natural" grassland fires, raging uncon-

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trolled until blocked by river channels or extinguished by rain or lack of fuel.

PRAIRIE FIRES IN PRESENT-DAY RANCHING COUNTRY

Wildfire in today's ranch country is regarded as somewhat of a calamity and considerable effort is devoted to preventing its occurrence. Many town fire departments have equipment especially modified for range use. Fire guards are maintained along roadside fences. Often this is done with county-owned machinery. The control of grass fires is made easier by the many roads which enable backfiring with greater safety. Practically all ranches now have networks of graded or gravelled roads which provide swift access with motorized equipment to a beginning fire. Often firefighters and equipment are rushed from other centers of population when the local populace cannot cope with a grass fire.

Nevertheless, wildfires occur frequently in plains grasslands. They are started along roadsides by careless travelers, by railroad equipment, and by lightning. With more people to fight them and better equipment available, few fires burn for as long as a day, and the acres burned-off are proportionately less. However, there are still large unbroken blocks of grassland in the plains, and if the grass is thick and dry and the wind high, a grass fire can be difficult and dangerous to control. Under such conditions a grass fire will leap paved highways and the smaller streams. Then the front can only be stopped by backfiring at roads; if there are no convenient roads, as sometimes happens, all the effort is concentrated on preventing the flanks of the advancing fire from spreading. In the meantime, fences must be cut ahead of the fire to prevent cattle from being trapped.

In addition to causing loss of pastureage for an indefinite time, grass fires destroy fences which are costly to replace. Trucks and tractors are sometimes damaged when they stall or become stuck and have to be abandoned. Less frequently, prairie fires may threaten ranch buildings and even human lives. Only recently a man lost his life fighting a grass fire on a Texas Panhandle ranch.

On the whole, few present-day ranchers have had experience with grass fires other than the accidental and out-of-control kind. All the education has been toward prevention of grass fires. In the ranching

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country where I live a person would be callous to public opinion, indeed, to start a grass fire for any reason in an area surrounded by privately owned ranches. He would also be chancing that the fickleness of plains weather might make it impossible to control his fire.

WILDFIRES ON GAME MANAGEMENT AREAS IN THE TEXAS PANHANDLE¹

The Texas Parks and Wildlife Department has game management areas located at each end of the Panhandle. The Gene Howe Wildlife Management Area in the north Panhandle lies along the north side of the Canadian River in Hemphill County and comprises approximately 6,000 acres of grassland. A large part of the area consists of upland sandhill pastures. There is enough sandsage (*Artemisia filifolia*), chickasaw plum (*Prunus angustifolia*), and aromatic sumac (*Rhus aromatica*) to make these sandhills excellent Bobwhite Quail habitat, provided the herbaceous vegetation is maintained in a proper balance between forbs and grasses. Efforts are being made to maintain this balance by manipulating grazing by a herd of cattle. The bottomland adjacent to the Canadian River is comprised of natural meadows, interspersed with rough pastureage and brushy sloughs. These areas are intensively managed with plantings of cover where needed, spring disking, and mowed clearings. The Gene Howe Area is surrounded on three sides by a vast acreage devoted wholly to cattle ranching.

The Matador Game Management Area is located on the middle fork of the Pease River at the southern end of the Texas Panhandle. It consists of 28,000 acres of grazing land. In its infestation with Mesquite (*Prosopis juliflora*) it is typical of the eastern extension of the Great Plains known as the West Texas Rolling Plains. In 1952 the Matador Area, while privately owned, was dragged or "cabled" for mesquite control. The method involved dragging the mesquite out of the ground with a ship's anchor chain pulled by crawler-type tractors at each end. This method works only on mesquite of a true tree-form with brittle trunk and rough bark. Since treatment, root-sprouting has produced thickets of switch-growth mesquite which are

¹ This part a contribution from Federal Aid Projects, Nos. W-55-D, W-87-D, and W-88-R.

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probably more dense than the parent growth and more competitive with the ground cover.

The Matador Area is currently being used for research into the dynamics of Bobwhite Quail populations as they occur at the western periphery of their range.

Wildfires invaded parts of both management areas in 1962-63. Fires burned off parts of the Gene Howe Area both years, and a fire burned across the corner of the Matador Area in 1963. The three fires all occurred in March under very dry conditions, and all originated on adjacent ranches.

The first of these grass fires was followed by ample rainfall during the warm-months growing season. Conversely, the two 1963 fires were followed by drouth which has continued into the winter of 1964-65.

Work loads already assigned did not permit intensive investigation of the effects of these grass fires on range vegetation and wildlife. Consequently, this is not presented as a research paper. Fortunately, on both management areas studies of the composition and growth of the vegetation had been under way for several years prior to the fires. The belt and line transects which were used in these studies were such that comparative data could be recorded for burned and unburned areas following regrowth of the vegetation.

Some implications of these data for burned-off grassland under extremes of growing season rainfall are summarized here.

EFFECTS OF FIRE ON SANDHILLS QUAIL HABITAT WHEN FOLLOWED BY ADEQUATE RAINFALL

The grass fire which started north of the Gene Howe Area March 3, 1962 burned off an estimated 30,000 acres in 4 holdings. This was a very hot fire which consumed all but the larger trees and it left sandy soils loose and blowing (Fig. 1). Winds shifting to the north brought the fire across the Gene Howe Area and approximately 2,000 acres of sandhills range were burned clean. All fences in the path of the fire were destroyed and 10 cows were killed when trapped in a fence corner before the wires could be cut.

The burned-off Persimmon Pasture of the management area comprises 576 acres and after the fire was at the center of a burned-off

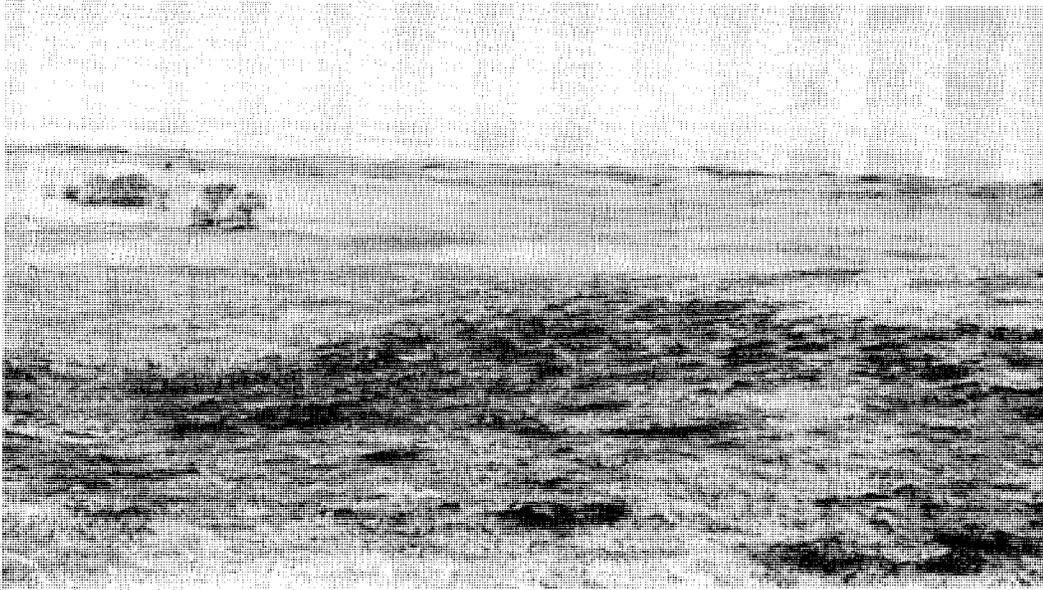


FIG. 1. A view of the I-V Ranch sandhills range 23 days after a wildfire on March 3, 1962. A few green shoots are appearing and fence builders reported sighting a few quail. Location: Hemphill County, Texas Panhandle.

buffer zone $1\frac{1}{2}$ to 2 miles in depth. Six Bobwhite Quail were found near a water-hole in the pasture 16 days after the fire and tracks of 8 bobwhites were found nearly a mile distant. These were believed to be the only quail left in the pasture after the fire. There was a complete absence of cover and no visible source of food (Fig. 2).

Little rain had fallen during the first three months of 1962 and none occurred after the fire until April 27 when a series of showers brought less than an inch. No rains fell during May and the burned-off soils blew in the winds until June. Then the rainfall pattern was reversed to permit a short but moist growing season. Rains totaling 5.50 inches fell on 13 occasions during June. July, normally a dry month, had 4.50 inches, August 1.40 inches, and September 3.20 inches. Although 1962's total of 17.71 inches of rain is suggestive of drouth, it nearly all fell during the warm-months growing season. It is important to note this, for it is quite the reverse of the rainfall trend following fires on the management areas in 1963.

Dove call-counts were run along two sides of the block of burned-off range in June. At the time the range was green with emerging vegetation. Bobwhites were heard calling from the interior of the pastures at every stop.

A bobwhite's nest was found July 24 near the location where 6 bobwhites had been found after the fire. Despite a total absence of



FIG. 2. Burned-out valley of Persimmon Creek 16 days after fire. Note stumps of sadsage and chickasaw plum in foreground.

past-year dead grasses, the nest was well hidden by a canopy of sadsage. It was open-topped similar to a dove's nest and the shallow cavity was lined with dead twigs from the sparse vegetation which had sprouted and died during a dry May (Figs. 3, 4).

By late August the burned-off range appeared to casual observation to have recovered from effects of the fire (Figs. 5, 6, 7, 8). Only the diminished woody cover of chickasaw plum and aromatic sumac showed much contrast with that of the unburned range.

At the close of the growing season, Morse (1963) inventoried the vegetation growing on a total of 2,970 square feet of belt transects in burned and unburned areas and compared the data with those for the year previous to the fire. His report compared two-year trends in the vegetation of burned areas and their adjacent unburned areas. He concluded that the grass fire had little effect on vegetation with respect to its value for grazing. The number of plants of perennial grasses was found to have decreased 13% in burned areas and 6% in unburned areas. On the other hand, a group of plants rated as key sources of winter quail food averaged a 15% increase in burned areas but decreased 30% in unburned areas.

Fringeleaf paspalum (*Paspalum ciliatifolium*) increased 16% in frequency of occurrence in burned areas but decreased 24% from the previous year's count on unburned areas. Erect dayflower (*Commelina erecta*) increased 58% on burned areas but decreased 14% in un-



FIG. 3. Bobwhite Quail nest containing 11 eggs found July 27. Location was on benchland, Persimmon Creek Pasture, and nest was made approximately 4½ months after area was swept by wildfire.

FIG. 4. General view of immediate area surrounding nest shown in Fig. 3. Note quality of ground cover and Texas croton plant in left foreground.



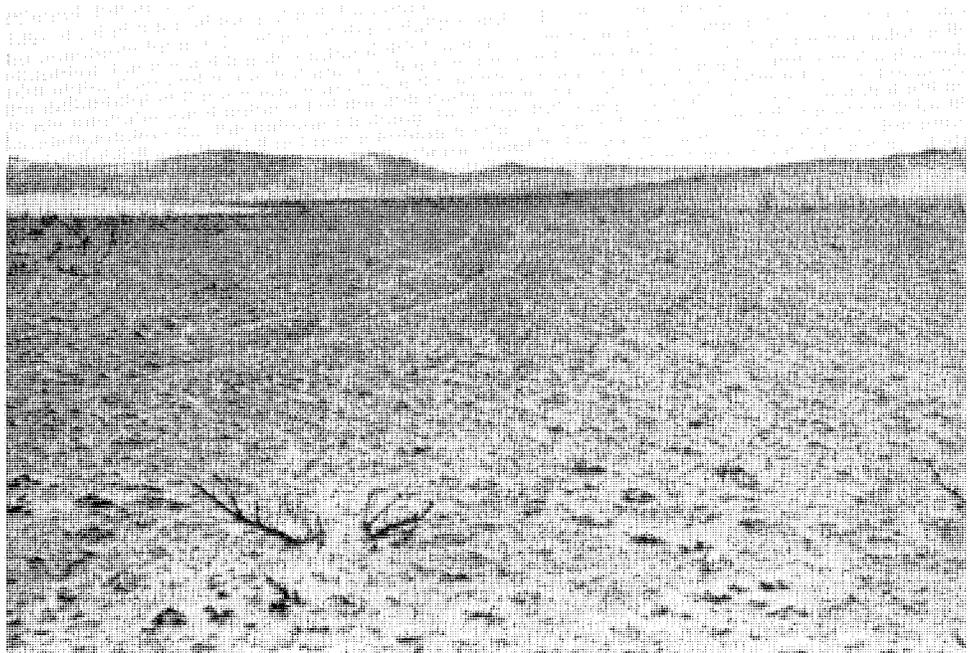


FIG. 5. Burned off in a hot grassfire March 3. Photographed March 16.

FIG. 6. Same location as in Fig. 5. Photographed August 27. Grass-forb association includes sandsage, Texas croton, sandlily, sand dropseed, western ragweed, and sand bluestem.





FIG. 7. Location and established markers for Vegetative Transect No. 1716, northwest corner of Persimmon Pasture, Gene Howe Wildlife Management Area. Photographed March 19, 1962.

FIG. 8. Same location as in Fig. 7, photographed August 27 near close of growing season. Spring-steel marker wires are at right of center.





FIG. 9. General view across valley of Persimmon Pasture August 27. Compare with Fig. 2.

burned areas. Western ragweed (*Ambrosia psilostachya*) was unchanged from the previous year's occurrence on burned areas, but decreased 35% in unburned areas. Texas croton (*Croton texensis*) increased on both burned and unburned areas, but the rate of increase was double on burned areas.

EFFECTS OF BURNING ON COVEY DISTRIBUTION

During September, roost call-counts were carried out in the sand-hills burn-area. A total of 10 stations at 1-mile intervals was manned at dawn on two successive days. Thirty-one coveys were counted, of which number, 7 were in the 576-acre Persimmon Pasture. Re-checks of Persimmon Pasture with bird dogs on the same dates resulted in locating 9 coveys, or approximately 150 bobwhites. A surprising density of 1 bobwhite per 3.8 acres had been attained in 6 months following a sweeping grass fire which had erased all semblance of quail habitat.

During the December-January hunting season, a series of controlled hunts were permitted on the Gene Howe Area for research purposes. The hunters found quail most abundant in those pastures which had been burned off in the March fire. The previous season,

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bobwhites had been few in the sandhills, but concentrated in bottomland habitats. In the case of privately-owned ranches which had been involved in the grass fire, hunters reported finding the most coveys in those areas which had been burned off.

WINTER QUAIL FOODS FOLLOWING FIRE

Analysis of quail crops which were collected in the course of public hunts showed effects of the increased food production in burned-off pastures. Unfortunately, under public hunt conditions it was not possible to know with certainty where hunters killed a given bobwhite. Analysis of crops from sandhills range, burned and unburned, showed seeds of fringed leaf paspalum moving up from fifth rank in 1961 quail foods to third rank following the fire, or from 4.16% of the total volume of food to 16.79%. Erect dayflower comprised only a trace of total quail food in 1961, but ranked first in volume in 1962 and comprised 24.44% of total foods. Seeds of Texas croton were present in only trace amounts in 1961 quail foods, but ranked fourth by volume and comprised 13.01% of the total volume of 1962 food. The year before the fire, seeds of western ragweed were the ranking quail food and comprised 40% of the total volume. The winter following the fire, ragweed seed occupied second place among quail foods and comprised 22% of the total volume.

The changing food habits indicated by the above figures are probably as much a result of the quail population shifting to sandhills following the grass fire as they are of increased food production.

FIRE INFLUENCES UNDER DROUGHT CONDITIONS

A second grass fire, March 25, 1962, burned across a different part of the Gene Howe Area. This time a 400-acre sandhills pasture was burned over and a part of a sub-irrigated bottomland meadow. Effects of this fire on sandhills vegetation, followed as the fire was by a near-rainless summer, differed greatly from effects of the earlier fire. The results were also vastly different between burned-off sandhills and burned-off wetlands.

Sandhills vegetation in this case remains thin and has made little recovery in two growing seasons. Woody cover of plum and sumac

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appears to have been permanently thinned. The dune-tops show wind erosion and ground cover is composed of a very few species of forbs and grasses. This was a very hot fire, feeding on tall dry grasses and sagebrush. When rains come again, this burned-off pasture may grow a rich association of plants comprising good quail habitat. At the present time, the vegetation apparently is the worse for having been burned off at the onset of a drouth.

On the other hand, the path of the fire across wetlands was marked in the fall by thickets of tall weeds which earlier had been a thick mat of grasses shunned by quail. The weeds increased in density and height the nearer the river they grew and one of these thickets was so dense as almost to be impenetrable. Not more than 10 acres in area, it was composed of a mixed stand of common sunflowers (*Helianthus annuus*), giant ragweeds (*Ambrosia trifida*), and rag sumpweed (*Iva xanthifolia*). The ground beneath was clean and a perfect feeding situation for quail. Using a bird dog on a leash, it was determined during November that this weed thicket held 9 coveys of Bobwhite Quail. The remainder of the quail population on the management area was largely concentrated in the riverbottom habitat. The sandhills population was low.

The grass fire which occurred on the Matador Game Management Area March 8, 1963 burned off several sections of the mesquite brush shin oak grassland. According to Parsons (1964), no significant changes in the amount or composition of grass were found in the burned area at the end of the growing season. There were 1.08 grass plants per square foot on the burned side of the line, and 1.10 grass plants per square foot on the unburned area alongside. Due to decreasing rainfall, less by 8.33 inches than for the previous year, and deferred grazing for several years, forbs were phasing out of the plant succession. Nevertheless, forbs, mostly western ragweeds, increased 70.41% as a result of the fire. Forbs appeared at the rate of 6.05 per square foot in the burned area and 1.79 per square foot in the unburned area.

The fall bird dog census showed no differences in quail populations which could be credited to the burn-off. The stand of ragweeds was so dense in the burned area that growth was stunted during the dry summer, and most plants died without fruiting. Ragweeds were distributed throughout the Matador Area in varying amounts, but under

the dry conditions seed production was somewhat inversely proportional to the density.

It would appear from available data that the 1962 burn-off of the Gene Howe Area was beneficial to Bobwhite Quail in that it increased the occurrence of plants which are key sources of quail food in the sandhills habitat. Other than the temporary curtailment of grazing and loss of fences, there were no serious effects to the grazing potential.

In the case of the two fires which occurred on the management areas in 1963, conditions were different. Only 10.97 inches of rain fell on the Gene Howe Area during 1963, and the year's total for the Matador Area was 17.78 inches. The drouth continued for a second year. Any beneficial effects of the fires have been off-set or masked by the influences of drouth and sandhills range, especially, has deteriorated. Bobwhite populations have declined and most of the coveys are again found in riverbottom habitat. It remains to be seen whether the vegetation of the burned pastures will undergo successional changes when rainfall increases.

During 30 years in the West Texas Rolling Plains, I have had opportunity more than once to observe that disturbance by accidental grass fires set back plant successions in much the same manner as does the depletion grazing which occurs throughout much of the region during prolonged drouth. The fact that burn-offs and depletion grazing of Rolling Plains grassland cause similar set-backs in plant successions has interesting implications. Bobwhite populations in the region reach peak numbers with about the second year of increased rainfall following breaking of drouth. They decline sharply when the weedy successions give way to grasses. If the seasons of above-average rainfall continue for several years, pastures which would be rated in excellent condition, grasswise, become sterile habitats indeed for Bobwhite Quail.

When this happens, prescribed burning might well be used to set plant successions back to provide habitat more favorable to quail. Aside from the difficult wind and humidity factors involved, there are a number of reasons which make it unlikely that fire will become a management tool in the foreseeable future. Foremost of these is the bias against range fires, coupled with a lack of interest in quail management on the part of most ranchers. The lack of interest in man-

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agement does not necessarily mean that the ranchers do not hunt or allow hunting; they simply have enough acres to provide a relatively small harvest of quail under unmanaged conditions.

Again, the type of ranch operation conducted precludes any large-scale extensive burning. The type of ranching practiced, with few exceptions, lacks the flexibility in stocking rates which range burn-offs would require. Ranches are commonly stocked at a cow-acres ratio which operators consider practical for years of average rainfall. Since years of average rainfall are the exception in the plains, the grazing load tends to crowd forage production most of the time. If wet seasons occur, the resulting surplus of grass is kept in reserve as a buffer against an eventual dry year.

My own studies in the Rolling Plains (1959) have traced oscillations in bobwhite populations from low points during time of drouth and bare ranges to peaks when certain plant successions prosper briefly following the rains. Just as rainfall is the key factor in that interaction, so would it be the key factor in the use of fire as a management tool in semi-arid grasslands. Its use in the Rolling Plains would have to be predicated on the probability of adequate rainfall to follow. If drouth set in before new growth occurred, one agency of disturbance would have been superimposed upon another. The adverse effects upon vegetation might be intensified for an indefinite time. Wind erosion in sandy soils would likely be serious.

I suspect that under primitive conditions these things did not matter. There was time and space aplenty in the Great Plains, and if sweeping prairie fires harmed the prairie flora in one time and place, they stirred it up and set it moving in another. Seen in their proper light, the wildfires of the unbroken plains were part of a team of natural checks on development of climax vegetation. They may have been as effective in that capacity and as wide in scope as prolonged drouth, floods, late spring freezes, and all the other natural influences.

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