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Hand-Grubbing Mesquite in the Semidesert Grassland

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Honey mesquite (*Prosopis juliflora* var. *glandulosa* Torr.) has become an ever-increasing problem on the semidesert grassland. The semidesert grassland occupies an extensive area in southeastern Arizona, southern New Mexico, western Texas, and northern Mexico. On the Jornada Experimental Range in southern New Mexico, mesquite dominated land has increased from 13 percent of the total in 1915 to 36 percent of the total in 1946 and 49 percent in 1957. This has occurred on land that has a history of conservative grazing use and even on some large areas under complete protection. While heavy grazing use will accelerate the spread of mesquite,

the complete absence of grazing use will not prevent that spread.

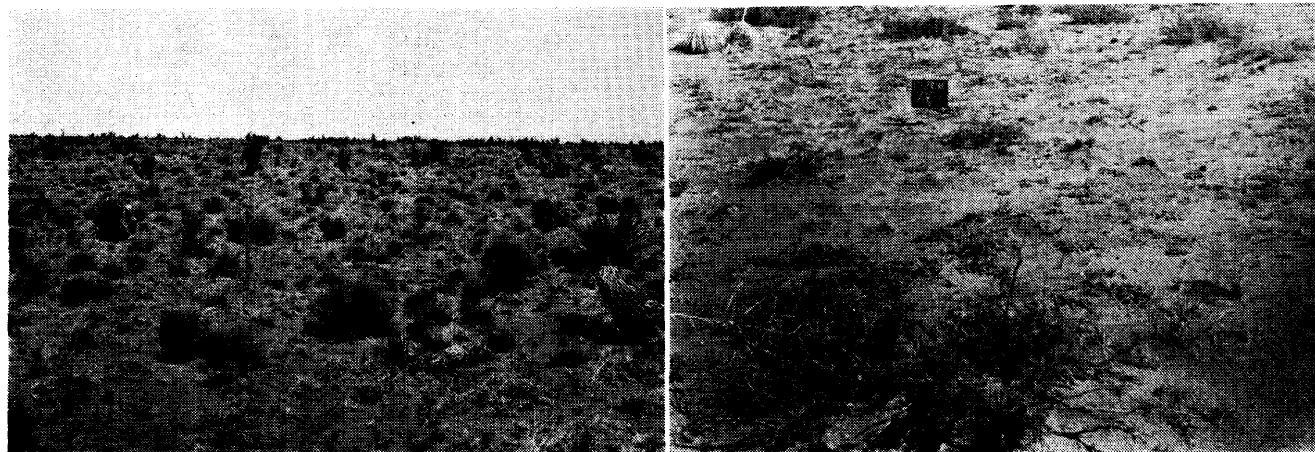
Mesquite invasion on the sandy soils of the area is characterized by: (1) young plants that are hidden among the grasses, (2) older mesquite plants with sand blow-outs around them, and (3) the disastrous mesquite sand dunes. Once mesquite invasion has reached the third stage, it is uneconomical by present standards to reclaim that land. The average carrying capacity of the range during normal years is reduced from 18 animal-unit-years of grazing per section in the first stage to 3 animal-unit-years or less of grazing per section in the third stage.

Grubbing light stands of young

mesquite plants is the most economical means of controlling mesquite. When plants become too large to grub, more expensive chemical control measures must be employed. In hand-grubbing care must be exercised to completely sever the plant below the budding area of the root. In plants not having sand piled around the base, the budding area is found about four inches below the surface of the ground.

A large scale mesquite control program was initiated on the Jornada Experimental Range early in 1958 to make information available to ranchers in the area on the costs and techniques of control measures. The area hand-grubbed was 4,265 acres located in three different pastures.

The contractor was a nearby farmer-rancher anxious to use his labor supply during an off-season. Thus if a rancher himself does not have a source of cheap labor for this purpose, it may be possible for him to make an arrangement with a neighbor to their mutual advantage.



Two views taken at the same location in 1933 (left) and in 1957 (right). Note the absence of mesquite in the aspect in 1933, whereas in 1957 the area is practically dominated by mesquite.

Area Grubbed

The area grubbed on the Jornada Range was parts of three pastures. Pasture 8 has a total area of 5,512 acres. The northern part of that pasture is covered with mesquite dunes. South of the dunes is an area with a dense stand of mesquite. The southern part of the pasture, 1,951 acres altogether, had a thinner stand of mesquite, mixed younger and older plants. The younger plants, those with a crown diameter of 30 inches or less, were grubbed in this latter area. If those younger plants were allowed to remain, in a few years that grassland area would have been dominated by mesquite.

Pasture 13 has a total area of 942 acres, a small part of which is in sand dunes. A total of 813 acres was grubbed. None of pasture 11, with 3,610 acres, is sand dunes, but only 1,501 acres were grubbed this year. Thus, a total of 4,265 acres was grubbed.

Methods Grubbing

In the grubbing program it was decided to grub plants of a 30-inch crown diameter or less.

Table 1. Mesquite plants grubbed, plants missed, and plants ungrubbable per acre on the experimental pastures as determined from belt-transect data (transects 104x208 feet).

Pasture No.	No. of transects	Av. No. plants grubbed	0.95 Fiducial interval	Av. No. plants missed	0.95 Fiducial interval	No. of plants ungrubbable	0.95 Fiducial interval
		per acre		per acre		per acre	
8	141	61.66	16.70	4.70	1.70	33.26	10.60
11	95	41.88	17.46	2.78	1.28	25.20	8.98
13	52	40.46	22.00	2.34	1.84	17.38	8.58
Weighted average		51.30	5.46*	3.64	0.50*	27.74	3.13*

*Calculated on the total.

Plants that are much larger require too much time to grub. However, if the mesquite stand is such that there are only occasional larger plants, they should also be grubbed. The maximum concentration of plants, on sites to be grubbed, was set at 150 plants per acre. Here again if a localized area has a denser stand, it should be grubbed. In the grubbing program this year, 11 men were used most of the time.

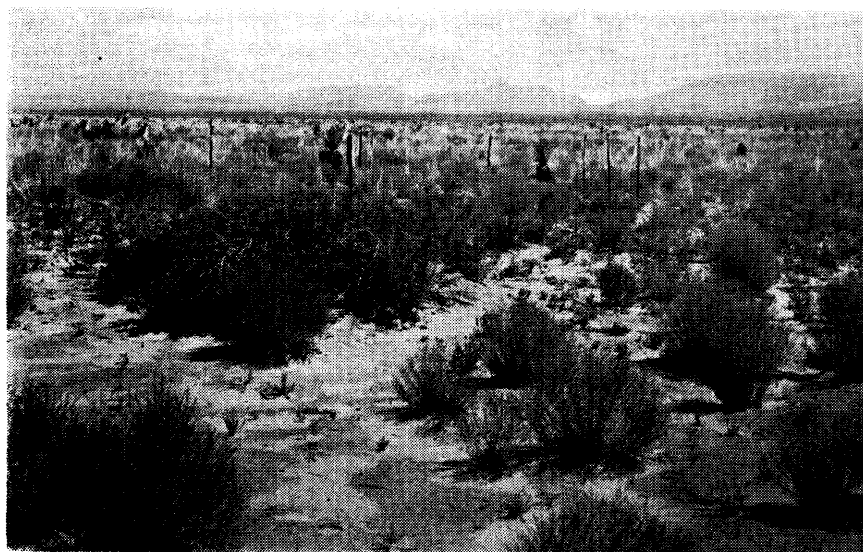
The grubbers were spaced at 30-foot intervals. They were kept in line and spaced by a system of flagging. The flags were spaced 30 feet apart. Several different colors of flagging material were fastened to lath stakes so that each individual was not con-

fused as to which flag was to be his guide. The rows of flags were placed about ¼ mile apart. The distance will vary somewhat according to topography. As the grubbers passed a row of these flags they were moved over so that they would be in place for the return swath. Changing the flags proved to be a full-time job for one man with a pick-up truck.

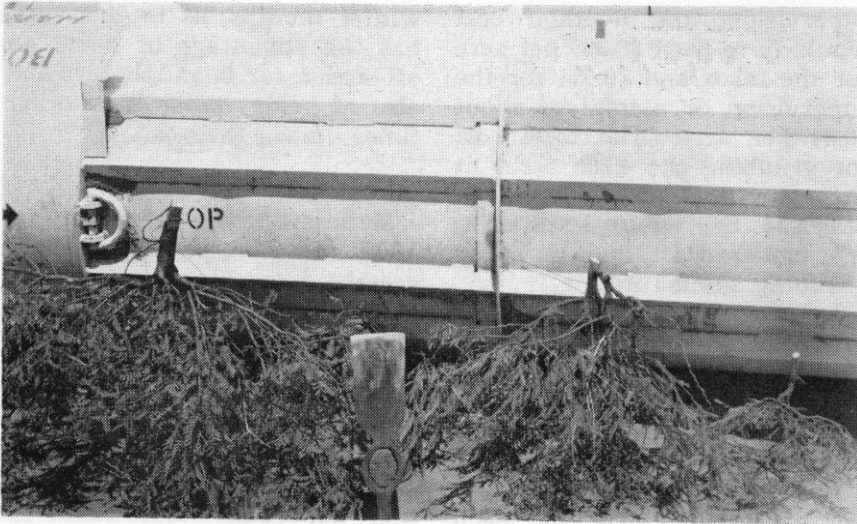
A supervisor followed closely behind the grubbers to check on their work and to grub occasional plants they had missed. Accurate records of time were kept.

Checking

To obtain information on numbers of plants, checks were made by randomly located belt-transects. A belt-transect measuring 104 x 208 feet, ½ acre, was used at each location. A spot was randomly selected near the fence and sampled. Succeeding samples were taken at 0.1 mile intervals in a cardinal direction. Two men in a vehicle required an average time of 15 minutes per sample including moving to the next sampling location. When a sampling location was reached, one man paced 208 feet from the right edge of the front bumper and placed a stake. The other man noted the location on a map and prepared the field sheet. A string 52 feet long with a rag in the center was used with a man on each side. One of the men was lined up with the right edge of the vehicle and the stake. As the men moved parallel towards the stake they collected the fol-



Lath stakes placed near inconspicuous mesquite plants that are grubbable within a distance of 75 feet from the camera. The large mesquite plant in the foreground is too large to hand-grub. Note the relatively bare soil around the large mesquite plant. Forage plants cannot successfully compete with mesquite for soil moisture. The bushy plants in the foreground are broom snakeweed.



Three grubbed mesquite plants with a mattock used for grubbing. The plant on the left has a crown diameter of 30 inches, the one in the center 20 inches, and the plant on the right a crown diameter of 10 inches. The plants were severed about 4 inches below the surface of the ground to get the entire budding zone. Note that the center plant branched below the surface of the ground. This is common in honey mesquite.

lowing plant data: (1) mesquite plants grubbed, (2) plants missed that should have been grubbed, and (3) those too large for grubbing. As they moved along, each man noted the plants along the string up to the rag marker in the center. Thus, each man observed 26 feet. When the stake was reached, the men changed to the other side and moving back toward the vehicle repeated the process. Since $\frac{1}{2}$ acre was the sampling unit, the results are doubled to give a per acre value. Approximately 40 observations were taken per section.

Results and Conclusions

Belt-transect data in pasture 8 showed an average of 99.62 mesquite plants per acre on the 1,951 acres that were grubbed. Of the 99.62 plants, an average of 66.36 plants had a crown diameter of 30 inches or less. These were the grubbable plants. An average of 4.70 plants, or 7.08 percent, were missed per acre; that is, they had a crown diameter of less than 30 inches and should have been grubbed. The number of plants too large to grub averaged 33.26 per acre. To grub the mesquite on the 1,951 acres required 1,360

man-hours for the grubbers and 96 man-hours for supervision. Included with the time for the grubbers is the time of one man whose job was to change the flags as the grubbers passed. The average time for the grubbers was 0.697 man-hours per acre and for the supervisor 0.049 man-hours per acre. As an example, if labor were \$0.65 per hour and supervisory labor \$1.25 per hour, the average cost of clearing would have been \$0.45 per acre for the labor and \$0.06 for the supervision or a total of \$0.51 per acre.

In pasture 13, belt-transect data gave an average of 60.18 mesquite plants per acre on the

813 acres that were grubbed. Of the 60.18 plants, an average of 42.80 had a crown diameter of 30 inches or less and were deemed grubbable. An average of 2.34 plants per acre, or 5.47 percent, were missed. The number of plants too large to grub averaged 17.38 plants per acre. To grub the mesquite on the 813 acres required 504 man-hours for the grubbers and flagger, and 41 man-hours of supervision. The average time for the grubbers (and flagger) was 0.62 man-hours per acre and for the supervisor 0.05 man-hours per acre. Again using \$0.65 an hour for labor and \$1.25 per hour for supervision as an example, the average cost of clearing would have been \$0.40 per acre for the labor and \$0.06 for the supervisor or a total of \$0.46 per acre.

In pasture 11, belt-transect data gave an average of 69.86 mesquite plants on the 1,501 acres that were grubbed. Of the 69.86 plants, an average of 44.66 were grubbable. An average of 2.78 plants or 6.22 percent were missed. The number of plants too large to grub averaged 25.20 plants per acre. To grub the mesquite on the 1,501 acres required 667 man-hours for the grubbers and flagger, and 47 man-hours of supervision. The average time for the grubbers (and flagger) was 0.444 man-hours per acre and for the supervisor 0.031 man-hours per acre. At \$0.65 an hour for labor and \$1.25 per hour for supervision, the average cost of

Table 2. Summary of man-hour requirements and costs for grubbing honey mesquite on the experimental pastures.

Pasture No.	Area grubbed Acres	Grubbers			Supervisor			
		Total time	Time per acre	Cost per acre ¹	Total time	Time per acre	Cost per acre ²	Total cost per acre
		man-hours	man-hours		man-hours	man-hours		
8	1951	1360	0.697	\$0.45	96	0.049	\$0.06	\$0.51
11	1501	667	0.444	0.29	47	0.031	0.04	0.33
13	813	504	0.620	0.40	41	0.050	0.06	0.46
Total	4265	2531	.....	.....	184	.....	.....	.....
Average	.....	.....	0.593	0.385	.....	0.043	0.054	0.439

¹ Based on \$0.65 per hour.

² Based on \$1.25 per hour.

clearing would have been \$0.29 per acre for the labor and \$0.04 for the supervisor or a total of \$0.33 per acre.

On the total 4,265 acres grubbed there was an average of 82.68 mesquite plants per acre. Of these, 54.94 plants were grubbable. Of the 54.94 grubbable plants an average of 51.30 were grubbed. An average of 3.64 plants or 6.63 percent were missed. The number of plants too large to grub averaged 27.74 plants per acre. To grub the mesquite on the 4,265 acres required 2,531 man-hours for the grubbers and flagger, and 184 man-hours of supervision. The average time for the grubbers (and flagger) was 0.593 man-hours per acre and for the supervisor 0.043 man-hours per acre. At \$0.65 per hour for labor and \$1.25 per hour for

supervision, the average cost would have been \$0.385 per acre for the labor and \$0.054 for the supervision or a total of about \$0.44 per acre. The total cost for grubbing the 4,265 acres at the rates used above would be \$1,872.34. See Tables 1 and 2 for the belt-transect and mesquite grubbing summations.

It was noted that after the grubbers had been working for a week, they became accustomed to their spacing of 30 feet. After the first week, it is believed that it would be unnecessary to have a flag for each individual grubber. Having a flag for each fourth or fifth man would be sufficient to keep them in line. The grubbers themselves, accustomed to working on a cotton farm felt that the work was comparatively easy. Grubbing in the

winter months, as in this case, has the advantage of being an off-season for farm laborers and also of being cooler than other times during the year.

Summary

Hand-grubbing mesquite on 4,265 acres of typical semidesert grassland is reported. A method of laying out the grubbing area and a method of checking are explained in detail. An average of 0.593 man-hours per acre was required for grubbing and flagging; an average of 0.043 man-hours per acre for the combination supervisor and clean-up man. It is proposed that more attention be given to this economical method of controlling light stands of small mesquite plants to avoid further loss of valuable grassland.