uniformly to achieve even use of vegetation. Even though this pasture was only 290 acres, had two livestock watering facilities, and no major topographical limitations, there was very little or no use in some parts and evident overgrazing in others. Proper quantity and distribution of salt go a long way toward controlling the grazing of livestock and obtaining satisfactory use and maintenance of the forage.

Topography, distance from water, direction of prevailing winds, the placement of salt, and selection of bedding grounds have all played a part in affecting the behavior of the cattle. This has resulted in scanty forage in places and overabundance in others.

The condition of a range almost wholly depends upon the management applied and climatic conditions. There is no control over climatic conditions. There can be a control of management. The proper use of a range cannot be accomplished by using all the current growth of a plant. To preserve the important species, much of the plant must remain unharvested. It is generally conceded that, in this area, not more than half of the current year’s growth should be removed by the end of the grazing season. Otherwise, there is usually a reduction in plant vigor and subsequent reduction in forage yield.

Conclusion
A followup study of plant communities was made in a 290-acre native pasture near Lincoln, Nebraska. The study compared the averages of 150 samples taken during the summers of 1949 and 1964.

The addition of a new livestock panel in 1951 improved the distribution of livestock grazing. This resulted in a reduction of big and little blue-stem (72% versus 57%) in the excellent condition area, which formerly had limited livestock use. The good condition area remained essentially the same with 45% versus 42%. Also, there was no major change in these two grasses in the fair condition.

The continued above average annual precipitation during the period 1949-64 favored the cool season grass—Kentucky bluegrass.

Culture and Mechanical Seed Harvest of Fourwing Saltbush Grown Under Irrigation

JAMES R. STROH AND ASHLEY A. THORNBURG

Highlight
The culture, management, and mechanical seed harvest of fourwing saltbush grown under irrigated farm crop conditions has been developed. The phenology and internal moisture regime of this plant bears directly on seed harvest operations and timing. Manipulation of plant growth habit from a branching shrub type to single upright stems is essential for adaptation to mechanical harvest. This is accomplished by cutting the plant to a two-inch stubble height and leaving decumbent branches intact on the plant, from which the erect branches arise the following year.

LITERATURE CITED
NEBRASKA CENTENNIAL COMMISSION. 1967. Common and scientific names of a selected list of native and introduced plants in Nebraska. 75 p.

The value of fourwing saltbush (Atriplex canescens (Pursh) Nutt.) as a range forage plant for livestock and game animals has been known for many years (Wilson, 1928). Despite its wide distribution, strong seedling vigor, abundant seed production, and the knowledge available on its culture and management for forage (Dayton, 1951; Judd, 1962; Plummer, Monsen and Christensen, 1966; Wilson, 1928) little use has been made of this plant in the range reseeding programs of Federal and State agencies and private individuals. An important reason is the lack of adequate quantities of high-quality seed. Most seed used in experimental work and in the limited range plantings have been harvested by hand stripping wild plants. Only recently have concerted efforts been made to develop machines to aid in harvesting and these, too, are for use on wild stands (Plummer et al., 1966).

The Bridger, Montana SCS Plant Materials Center has developed cultural and management methods for harvesting fourwing saltbush seed, using standard farming practices and commercially available farm machinery. The methods were developed using the low-growing northern desert shrub type as described by Judd (1962) and Plummer et al., (1966). The principles described here should also apply to the taller forms found in the southern regions of the West.

Culture and Management
Fourwing saltbush can be seeded as a farm crop with no difficulty in establishing adequate stands for seed production. Row spacings of 28 to 36 inches are recommended to allow for tractor cultivation and furrow irrigation. Seeding is done with cotton planters or bean and beet planters. Seeding should be done during late winter or early spring to meet the cool temperature requirements for germination of the seed (Plummer et al., 1966; Wilson, 1928). The seed should be placed between 0.5 and 1 inch deep (Plummer et al., 1966; Springfield and Bell, 1967). Seeding rate is determined from the percentage of filled utricles required to provide six seedlings/linear ft of row. High seeding rates are usually necessary because of normally low percentages of filled utricles (Plummer et al., 1966).
must be maintained near the soil surface by supplemental irrigation during the seedling year for maximum germination and growth.

The first seed crop is produced in the second growing season. This is 2 to 3 years earlier than reported by Plummer et al. (1966) on noncultivated plants. Irrigation of the established stand is not critical. Six acre-inches of supplemental water are adequate for maximum production at Bridger, Montana, under 10 inches of natural precipitation, falling mostly during the spring months. No growth response has been observed from applying 70 lb/acre actual N and 70 lb/acre P2O5 on the highly calcareous soils at Bridger.

The growth form of this highly-branching shrub must be manipulated to facilitate harvesting with a combine. Establishment of the proper growth form is initiated in the first crop year. The seedling stem produced during the first season forms the axis from which the lateral, seed-bearing branches arise the second year (Fig. 1a and 1b). The lower lateral branches may be decumbent for half their length. A cutting height of 2 to 4 inches above ground level established during harvest operations will leave these lower laterals intact for 6 to 10 inches. During the third year erect branches arise from the decumbent second-year laterals as well as the original crown (Fig. 1c). Continued harvesting at this established cutting height leaves sufficient plant material intact to produce a new set of seed-bearing shoots the following year. Three years of this treatment at the Bridger PMC has shown no adverse effect on plant vigor or seed production. It is not known how long a stand might be kept in production using this treatment. Unless the plant is managed in such a way to present only new shoots to the harvesting machine, the woody 2- or 3-year-old nonseed-bearing material becomes too large and coarse to go through a combine without damaging it. There is no machine developed to selectively harvest the seed-bearing branches and reject the nonseed-bearing ones. Thus, it is paramount with this harvesting method to keep the plants essentially "1-year old."

Harvesting

The utricles of fourwing saltbush appear mature in late summer, but the rest of the plant contains too high a moisture content to lend itself to machine harvest until late October. The seeds, or utricles, do not abscise easily during this drying period. Moisture contents of seed-bearing branches during the period from August 1 to October 18 are shown in Fig. 2. The moisture contents of the utricles, stems and branches, and leaves at the time of harvest are shown in Fig. 3. The wide differences in moisture content of the different plant parts are the causes of most of the difficulties encountered in direct combining. The very dry utricles are easily removed from the stems. In fact, considerable shatter loss may occur at the pickup reel. The stems and branches are moist enough to prevent their breaking up into fine pieces and contaminating the clean seed, but they present some problems by lodging in cracks and holes in the separator and preventing an even flow of incoming material. This is not serious, however.

The high moisture content of the leaves causes the greatest problems in threshing and storing the harvested product. The leaves are effectively stripped off the stems in the cylinder of the combine. They are separated from the stems along with the utricles. The specific gravity of the moist leaves is so close to the specific gravity of the dry utricles that air separation is not possible. Serious problems arise from this combination of utricles and leaves in the sacking and return elevators of the combine. An even flow of material within the capacity of the elevators is essential to prevent their plugging. When plugging occurs the moist leaves form a tightly compressed cake which is very difficult to remove and can damage the combine.

Once harvested, the utricle-leaf material must be spread out to dry. Molding of sacked material can begin within 12 hr in warm weather. The leaves give up their moisture slowly and provisions for a 10-day drying period should be made. A 4-inch thick layer of material requires turning and mixing every 12 hr. Artificial drying rooms or bins are helpful in drying this material.

Two methods of harvesting fourwing saltbush have been used at the Bridger...
PMC—windrow-combining and direct combining. The windrow-combining method is the least satisfactory. Windrowing leaves, the stems tangled and intertwined with each other. The pickup reel on the combine shakes the windrow for 2 to 4 ft in front of the machine causing up to 50% shatter loss. On the other hand, the dry windrowed material allows better air separation of utricles and leaves and reduced plugging of the elevators.

The direct combining method reduces shatter loss on the pickup reel to less than 20%. The critical factor in reduction of shatter loss is the ground speed/pickup reel speed ratio. The closer this ratio is to 1 the lower the shatter loss will be. High moisture content of the leaves is the singular disadvantage of this method.

Internal adjustments of the combine are not critical. Slow rub bar cylinder speeds of 3000-4000 fpm are used. A cylinder spacing of ¾ inch is sufficient to remove all utricles from the stems and will leave up to 50% of the leaves intact.

Data from observational studies at the Bridger PMC show that fourwing saltbush grown under the culture and management described here, has a seed production potential of $600 lb/acre of utricles. These utricles were hand stripped from 3-year-old plants without cutting the plants back to a 2-inch height. Yields from a quarter-acre seed production field were 748, 740, and 804 lb/acre in 1965, 1966, and 1967, respectively. The harvesting procedures described above were used on this seed production field.

The use potential of this range forage plant has been described (Dayton, 1931; Judd, 1962; Plummer et al., 1966; Wilson, 1928). This potential can be realized providing sufficient quantities of high quality seed is commercially available at reasonable prices. The seed production potential of this plant has been examined and its suitability for culture, management, and harvest as a domesticated farm crop has been established. There remains now the task of selecting and developing ecotypes and varietics which will be best suited to regions, soils, climates, and uses where it is needed.

A Gate Latch for Electric Fences

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Crossfencing is important for subdividing pasture units of one species or to separate improved pastures from native range. One type of crossfencing that has been effective at the Noble Foundation is a 2-strand barbwire electric semi-suspension fence. However, there was dissatisfaction with the commercial electric fence gate latches. The commercial latches would not expand sufficiently for easy gate opening and closing. The latch springs were very susceptible to over-expansion and the insulator material was prone to cracking and breaking (Fig. 1a). These characteristics rendered the handle ineffective for live wires. To correct this general dissatisfaction, a homemade gate latch and handle was assembled.

Few materials are needed for simple and rapid assembly of the gate latch and handle with nominal cost of approximately 45¢ or less for each completed latch (Figure 2a and Table 1).

Table 1. Materials and approximate retail cost for electric fence gate latch and handle.

<table>
<thead>
<tr>
<th>Item</th>
<th>Size (inches)</th>
<th>Number needed</th>
<th>Cost each ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen door spring (galvanized or painted)</td>
<td>¾&quot; × 16&quot;</td>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td>Flat washer</td>
<td>½&quot; ID</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Steel key ring</td>
<td>1&quot; to 1.5&quot;</td>
<td>1</td>
<td>0.10</td>
</tr>
<tr>
<td>Insulator material (rubber or plastic hose)</td>
<td>½&quot; ID × 8&quot;</td>
<td>1</td>
<td>0.10</td>
</tr>
<tr>
<td>Total cost of material per latch</td>
<td></td>
<td></td>
<td>0.45</td>
</tr>
</tbody>
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Fig. 1. (a) Broken and overexpanded commercial latch. (b) A completed homemade latch with overexpansion preventative.