TECHNICAL NOTES

Using a Grid to Estimate Production and Utilization of Shrubs

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Highlight: *Production of fourwing saltbush plants was estimated from photographs against a 1-inch grid. All squares partially or completely obscured by plant material were counted. Utilization of several shrub species was estimated from photos taken before and after browsing by deer. With modification, the technique could be used for other species and situations.*

The most accurate method for determining production and utilization of shrubs is clipping and weighing, but this method is costly, time consuming, and affects the physiology of the plant. Visual estimates also are used, especially for extensive surveys. The most common procedure, however, involves determining (1) production by measuring the length and/or weight of the current year's twigs, and (2) utilization from counts or lengths of twigs before and after browsing (Schuster, 1965; Shafer, 1963; Smith and Urness, 1962; and Stickney, 1966).

Occasionally the problems are rather unique in that only a few plants of a species are available; plants may be in the ground or in containers; or the main concern may be with growth over a

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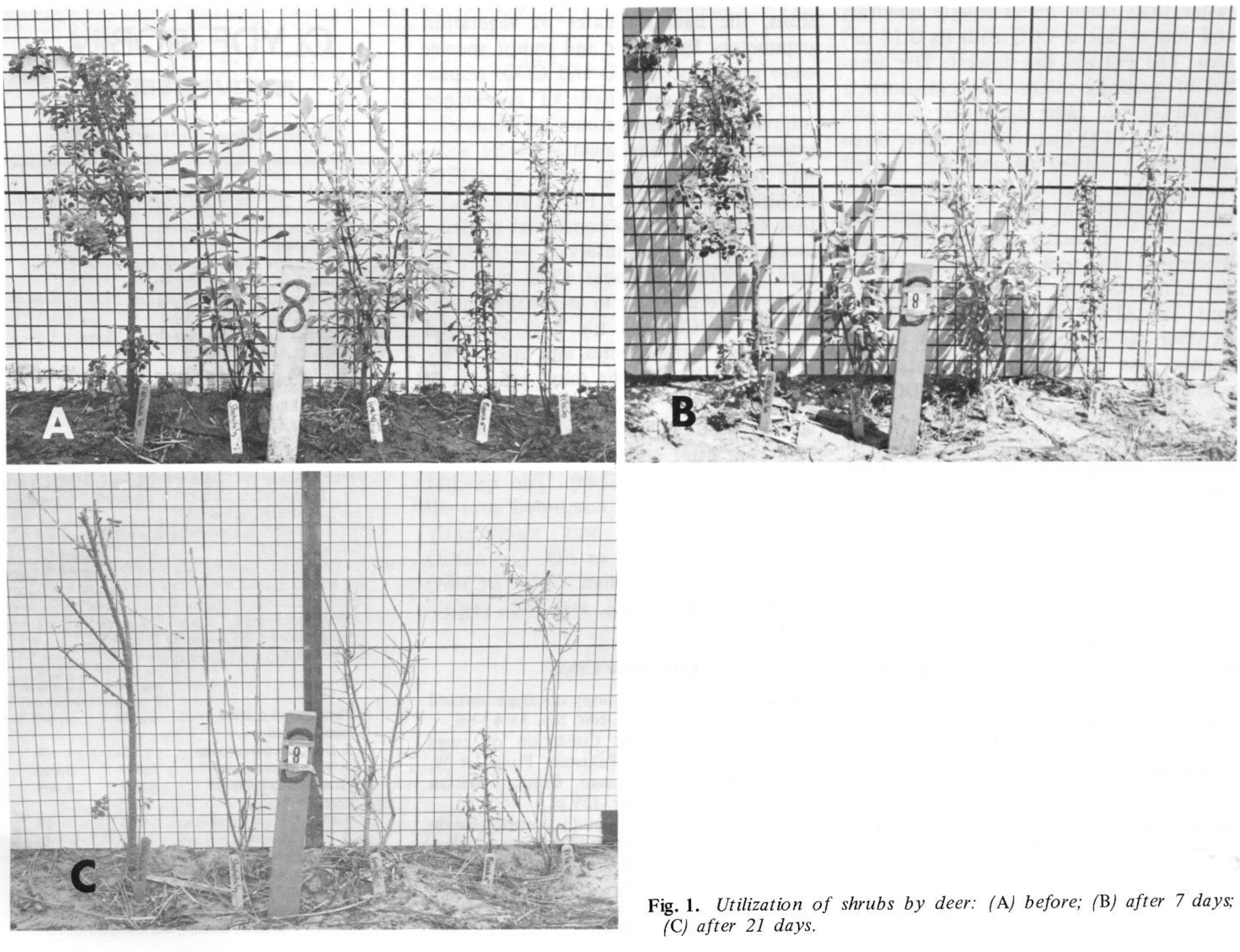

Fig. 1. *Utilization of shrubs by deer: (A) before; (B) after 7 days; (C) after 21 days.*

period of years, from seedling to mature plant. Moreover, the size or weight of the whole plant (above ground) may be needed, not just the current year's growth. In these situations, it is not feasible to clip the whole plant, or even a few twigs, for fear of inducing undesirable physiological changes.

The technique briefly described and illustrated here was developed in response to a special need. Six plants each of 16 different species were planted in an enclosure to determine browsing preferences by adult deer. A method was needed that was easy to use, yet sufficiently precise to detect daily utilization by the deer. The technique, which was used for several weeks in 1966, and again in 1967, gave reasonably reliable estimates of utilization (Lamb, 1968). During subsequent years essentially the same technique has been used for estimating production of different sizes and species of shrubs.

The principal feature of the technique is a 3-ft-square piece of 3/8-inch masonite painted white and marked off in 1-inch squares (Fig. 1). Though not necessary, a hinged brace fastened to the back of the board makes it convenient for one person to set up the grid and take photos. To facilitate handling, the board can be cut in to two 1-1/2- by 3-ft pieces joined by a piano hinge.

In the deer preference tests, all 1-inch squares even slightly obscured or intercepted by plant material were counted. Utilization estimates determined from grid counts compared favorably with visual estimates. No data comparing the grid technique against ocular-estimate methods were analyzed, however.

The photos (Fig. 1) illustrate how the grid was used to estimate utilization. The first photo taken before deer had a chance to browse the shrubs gave us a base count. Photos taken at intervals thereafter with the grid the same distance behind all plants furnished grid counts from which utilization was estimated. Here is an hypothetical example:

	1-inch squares obscured (number)	Plant material missing (1-inch squares) (number)	Utilization (%)
First day	200	0	0
Second day	184	16	8
Third day	176	24	12
Fifth day	150	50	25

During the past 4 years, the grid also has been used for estimating production. Pot tests with fourwing saltbush (*Atriplex canescens*), involving different ecotypic strains grown in different soils, provide an example. Twenty-eight saltbush plants were photographed against the grid (Fig. 2), then harvested and weighed air-dry. All plants were less than 2 years old and less than 3 ft tall.

Three methods of estimating production from grid counts were compared:

(a) Total number of 1-inch squares obscured or intercepted by plant material, even if only slightly.
(b) Number of squares intercepted by main stem plus squares 1/2 or more obscured.
(c) Number of squares intercepted by main stem plus squares 1/4 or more obscured.

Analyses showed the correlations were highest for methods (a) and (c). The regression equations (Fig. 3) proved useful, not only for estimating yields of plants in the pot tests but also for the yields of other fourwing saltbush plants growing in field plots or in containers.

Certain precautions need to be mentioned. The grid should be placed the same distance behind all plants in a particular study, and the distance from the camera lens to the plants should be approximately

Fig. 2. *Fourwing saltbush plants photographed against grid for estimates of production.*

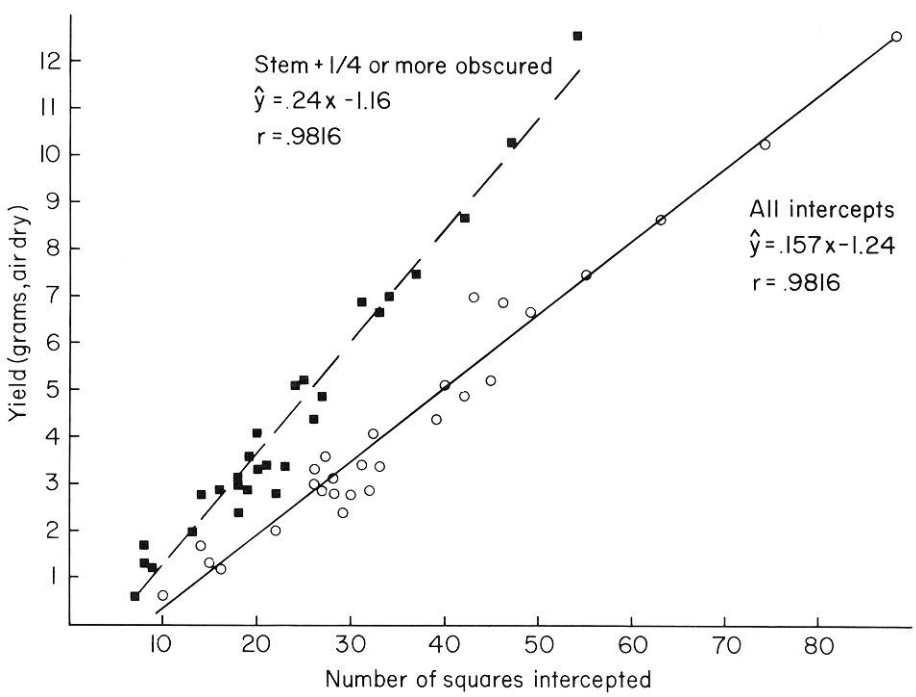

Fig. 3. *Relationships between grid counts and weights of fourwing saltbush plants.*

the same. Photographs should be taken when no strong shadows are cast on the board.

An obvious limitation is the size of the board. This limitation could easily be overcome by using a larger board together with correlation analyses developed from larger plants. Differences in growth form—particularly short, compact plants or those with considerable horizontal spread—might cause complications. The technique could be modified, however, to fit many different species and situations.

Literature Cited

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