

METHODS OF STUDYING SHRUBBY PLANTS IN RELATION TO GRAZING¹

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OBJECTIVES IN STUDYING SHRUBBY PLANTS

The development of methods for studying shrubby plants in relation to grazing are of importance principally because of the value of shrubs as a vegetative cover for watersheds on western range lands and because many species rank high in forage value for livestock.

The development of detailed methods for studying shrubs was started in 1925 and 1926 at the Great Basin Range Experiment Station near Ephraim, Utah. The objectives were as follows: (1) to determine methods of mapping shrub plants on a larger area because of the inadequacy of the meter quadrat methods for such purposes, (2) to determine a method for study of individual plants when it is desirable to secure a growth and plant development record throughout the growing season, (3) to determine the effect of different degrees of clipping the current growth of individual plants upon subsequent yield and vigor and (4) to determine a method of measurement of the current twig growth on which a more exact record of utilization by livestock may be based.

METHODS OF MAPPING SHRUB PLANTS

The purpose of mapping each shrub plant was to determine the number of plants by species on a given area and the crown spread of the individual plants up to a height of 5 feet. The sample plots (Fig. 1) varied in size from 5.0 meters square to 15.39 meters square, and were selected in different climatic zones, as well as for different sites both on grazed range and on protected areas. The plan is to remap these sample plots at approximately 5-year intervals to determine the rate of increase or decline in area of the various shrub species.

Two methods have been developed for mapping the shrubs. One of these is the traverse board method (Fig. 2). From 1 to 3 set-ups of the board are made on a sample plot, depending upon its size. Each set-up is made directly over a permanently set wooden stake (see Fig. 1), and the point on the map sheet located by a plumbing arm. A steel surveyor's tape is attached to a nail in the top of the wooden stake for obtaining distances to the various shrub

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plants. The direction of any point to be located from a set-up station is secured by sighting with an alidade on a surveyor's rod or similar rod held on the point to be located. A pencil line is projected from the known set-up point on the map to the sighted point, then the distance is scaled off with an



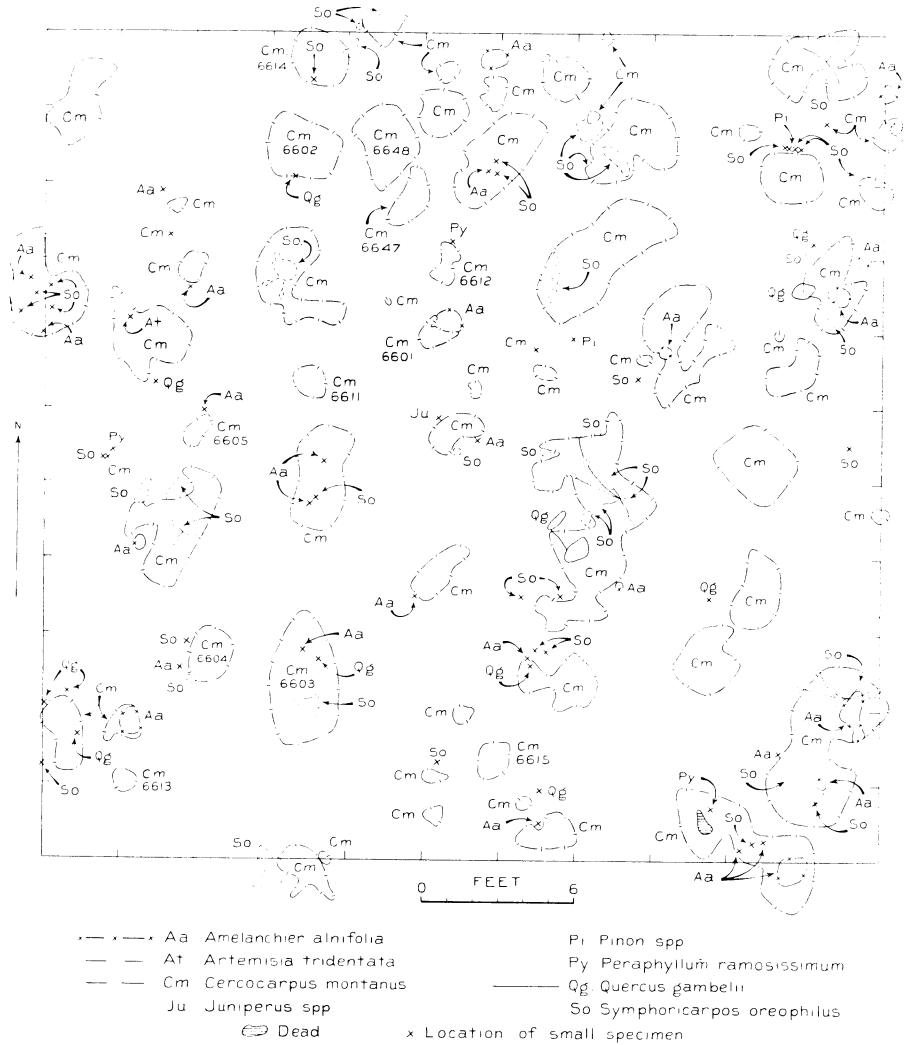
FIG. 1. Occurrence of *Artemisia tridentata*, *Sambucus caerulea* and *Symphoricarpos oreophilus* in mixture on a shrub major plot. Permanent white wooden stake with nail driven in top in lower left foreground used for set-up station for mapping.

engineer's scale and the point located. Sufficient points on the perimeter of the crown of an individual shrub are located by this process, so that the crown can readily be drawn in. The map should show the location of seedlings and of new plants from root stocks as well as of the older shrubs (Fig. 2).

Since the mapping shows only the spread of the crown, the maximum, minimum and average heights of each shrub should be indicated within the outline of each. If this is not possible the data should be entered on the map sheet to the left of each located plant. These height measurements will be of value in determining rate of growth, overgrazing, and the recovery of badly grazed shrubs.

The other method of mapping is known as the gridiron method. In it the sample plot is subdivided into small units by the aid of cord, surveyor's pins and a steel measuring tape. Various points are located by measuring out from the intersections of the cord and then shown on a map sheet which has been ruled off into small units to correspond to the subdivisions of the plot. Cross-section paper may be used to good advantage in this method.

In computing the total area of each shrub species on the sample plot, the planimeter is used on the map sheet or where cross-section paper is used ; or



BIRCHLEAF MAJOR PLOT NO. 26

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FIG. 2. Traverse board map of a shrub major plot laid out to show the relative occurrence of the various shrub species.

the square and parts of squares enclosed by the perimeter of the crown may be counted.

A METHOD OF STUDYING INDIVIDUAL SHRUB PLANTS FOR GROWTH RECORDS

In the study of the rate of growth and the different stages of development of individual shrub plants, careful field observations and measurements are taken and recorded on a field form² at 5-day intervals throughout the growing season. Five representative plants of each important shrub species are selected and marked at different elevations in the main climatic zones on grazed and ungrazed areas. With such records it is possible to make a detailed comparison of the rate of growth and development for a given species in different climatic zones as influenced by elevation and exposure and for different conditions of grazing use.

METHODS TO DETERMINE THE EFFECT OF DIFFERENT DEGREES OF CLIPPING ON THE GROWTH OF INDIVIDUAL SHRUBS

A study of methods to determine the effect of various frequencies and degrees of grazing upon subsequent yield and vigor of shrub species was begun in 1926. In order to have a definite measure of control, various methods of clipping have been developed.

The twig growth of shrubs occurs mainly from the terminal and lateral buds. Previous observations indicated that there is a relationship between the extent of grazing of the current season's growth and the subsequent plant vigor. It appeared that if the total twig growth accessible to livestock is grazed year after year, ultimately the plant will lose its vigor and slowly die. But if a portion of a twig remains there will be several buds left from which new growth may start the following year.

Two shrub species, namely, birchleaf mahogany (*Cercocarpus montanus*) and snowberry (*Symphoricarpos orcophilus*) are being treated under the following methods of clipping:

Species—Birchleaf mahogany (Cercocarpus montanus)

No. of method	Clipping treatment	Approximate date of clipping	Number of plants
1.	All current growth removed.	Sept. 1	3
2.	1 inch of current growth left.	Sept. 1	3
3.	2-1/2 inches of current growth left.	Sept. 1	3

Species—Snowberry (Symphoricarpos orcophilus)

No. of method	Clipping treatment	Approximate date of clipping	Number of plants
4.	50% current growth removed.	July 10 } Sept. 1	3 (2 clippings during the season)
5.	2 inches current growth left.	Sept. 1	
6.	All current growth removed.	Sept. 1	3
	2-1/2 inches of current growth left.	Sept. 1	3

² Copies of this field form may be secured on request to the Forester, Washington, D. C., or the Director, Great Basin Experiment Station, Ogden, Utah.

In each method of clipping, 1 small, 1 medium sized and one large plant of each species is being used.

In addition to the clipping, the following information has been secured: (a) Total length of each new twig and number of buds on it. (b) Number of buds left on the remaining portion of new twigs after clipping. (c) Green and air dry weights of leaves. (d) Green and air dry weights of twigs. (e) Each spring after clipping a record is made of where new twig and leaf growth takes place as well as of the number of buds that show any indication of putting forth new growth.

To supplement the clipping studies, a hurdle plot to be open to grazing was established on each area where these 2 species were under study. The plots are grazed throughout each grazing season in a manner to approximate as nearly as possible the various clipping methods used.

A METHOD OF MEASUREMENT OF THE CURRENT TWIG GROWTH FOR A MORE EXACT BASIS OF UTILIZATION BY LIVESTOCK

Current growth data are being obtained at the close of each growing season by lineal measurements of the new twigs on 5 selected shrubs of each important species on grazed and protected areas in the different climatic zones in the vicinity of the Great Basin Experiment Station. The study was started in 1925 by tagging 10 individual new twigs by attaching small aluminum tags with stove pipe wire and measuring each twig. This method did not prove very satisfactory because many of the smaller tagged twigs died. In 1926 the method of identifying twigs was changed to using 1 numbered tag on each of 1 to 3 large representative stems depending upon the size of the shrub, and taking the measurements of all the new growth on the larger tagged stems. Although a much larger number of twigs were measured than with the former method, a better average of current growth was ascertained. On grazed areas where there is heavy utilization of the new growth during the growing season, it has proven difficult to secure accurate measurements. In such instances measurements taken on the grazed plots must be checked against growth measurements secured on plants formerly grazed but now protected against grazing during the ensuing growing season. Under this method a new set of representative check plants must be selected each year on the otherwise grazed range and protected against grazing for that season.

SUMMARY

During the past five years methods for studying shrubby vegetation in range management and watershed protection investigations have been developed at the Great Basin Experiment Station near Ephraim, Utah. The methods are used to obtain detailed data in the field on the character and extent of shrub cover, plant succession in the brush type, rate and period of growth of shrub species, and the influence of grazing and other factors on these plants.

The methods involve (1) mapping the shrubby plants by species on selected areas; (2) recording the stages of development and measuring the growth throughout the growing season; (3) observing and measuring the degree of utilization by livestock at intervals during the grazing season, and (4) clipping the shrubs to determine empirically the influence of various intensities of grazing upon their yield and vigor. The controlled clipping studies were supplemented by hurdle plots to be opened and closed to grazing at certain intervals during the grazing season.

It is expected that the data developed by these methods may indicate the value of various shrub species for grazing, and will be of value as a basis for developing adequate range management and watershed conservation on brush lands.