

## DAUBENMIRE METHOD

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**1. General Description** The Daubenmire method consists of systematically placing a 20- x 50-cm quadrat frame along a tape on permanently located [transects](#). The following vegetation attributes are monitored using the Daubenmire method-

- A. Canopy cover
- B. Frequency
- C. Composition by canopy cover

It is important to establish a [photo plot](#) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

**2. Areas of Use** This method is applicable to a wide variety of vegetation types as long as the plants do not exceed waist height. It tends to be inexpensive. Estimates can be made very quickly. It is necessary for the plants' canopies to be distinct.

**3. Advantages and Limitations** This method is relatively simple and rapid to use. A limitation is that there can be large changes in canopy cover of herbaceous species between years because of climatic conditions, with no relationship to the effects of management. In general, quadrats are not recommended for estimating cover. This method cannot be used to calculate rooted frequency.

This method can be moderately accurate. Where greater accuracy is required, [Line Intercept](#) or Point Intercept techniques can be used.

**4. Equipment** The following equipment is needed.

- A. [Study Location and Documentation Data form](#)
- B. Daubenmire forms ([Daubenmire](#) form and [Daubenmire Summary](#) form).
- C. Hammer
- D. Permanent yellow or orange spray paint
- E. Two stakes: 3/4 - or 1 -inch angle iron not less than 16 inches long
- F. Tape: 100- or 200-foot, delineated in tenths and hundreds, or a metric tape of the desired length.
- G. Steel pins (reinforcement bar) for marking zero, mid, and end points of the transect
- H. [Frame to delineate the 20- x 50-cm quadrats](#)
- I. Compass
- J. Steel post and driver

**5. Training** The accuracy of data depends on the training and ability of the examiners. Error arises simple from inadequate training, but can be minimized by making quantitative measurements of cover using other techniques (e.g., [line intercept](#)). Examiners must be able to identify the plant species. They must receive adequate and consistent training in laying out transects and making canopy coverage estimates using the frame.

**6. Establishing Studies** [Careful establishment of studies](#) is a critical element in obtaining meaningful data.

A. **Site Selection** The most important factor in obtaining usable data is selecting [representative areas](#) (critical or key areas) in which to run the study. Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

B. **Pilot Studies** Collect data on several [pilot studies](#) to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample.

C. **Number of Studies** Establish a minimum of one study on each study site; establish more if needed (see Section II.D and III.B).

D. **Study Layout** Data can be collected using the baseline, macroplot, or linear study designs. The [linear technique](#) is the one most often used.

(1) Align a tape (100-, or 200-foot, or metric equivalent) in a straight line by stretching it between the transect location and

the transect bearing stakes. Do not allow vegetation to deflect the alignment of the tape. A spring and pulley may be useful to maintain a straight line. The tape should be aligned as close to the ground as possible.

(2) Drive steel pins almost to the ground surface at the zero point on the tape and at the end of the transect. A pin may also be driven into the ground at the [midpoint of the transect](#).

E. **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake.

F. **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground.

G. **Study Documentation** Document pertinent information concerning the study on the [Study Location and Documentation Data form](#).

7. **Taking Photographs** Establish [photo plots](#).

8. **Sampling** Process In addition to collecting the specific studies data, general observations should be made of the study sites.

A. **Cover Classes** This method uses six separate cover classes. The cover classes are:

Cover Class	Range of Coverage	Midpoint of Range
1	- 5%	2.5%
2	5- 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

B. **Ten Cover Classes** Where narrower and more numerous classes are preferred, a ten-cover class system can be used.

C. **Collecting Cover Data** As the quadrat frame is placed along the tape at the specified intervals, estimate the canopy coverage of each plant species. Record the data by quadrat, by species, and by cover class on the [Daubenmire form](#). Canopy coverage estimates can be made for both perennial and annual plant species.

(1) Observe the quadrat frame from directly above and estimate the cover class for all individuals of a plant species in the quadrat as a unit. All other kinds of plants are ignored as each plant species is considered separately.

(2) Imagine a line drawn about the leaf tips of the undisturbed canopies (ignoring inflorescence) and project these polygonal images onto the ground. This projection is considered "[canopy coverage](#)." Decide which of the classes the canopy coverage of the species falls into and record on the form.

(3) Canopies extending over the quadrat are estimated even if the plants are not rooted in the quadrat.

(4) Collect the data at a time of maximum growth of the key species.

(5) For tiny annuals, it is helpful to estimate the number of individuals that would be required to fill 5% of the frame (the 71 - x 71 -mm area). A quick estimate of the numbers of individuals in each frame will then provide an estimate as to whether the aggregate coverage falls in Class 1 or 2, etc.

(6) Overlapping canopy cover is included in the cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

9. **Calculations** Make the calculations and record the results in the appropriate columns on the [Daubenmire](#) and [Daubenmire Summary](#) forms.

A. **Canopy Cover** Calculate the percent canopy cover by species as follows:

- (1) On the [Daubenmire form](#) count the number of quadrats in each of the six cover class (by species) and record in the Number column on the [Daubenmire Summary form](#).
- (2) Multiply this value times the midpoint of the appropriate cover class.
- (3) Total the products for all cover classes by species.
- (4) Divide the sum by the total number of quadrats sampled on the transect.
- (5) Record the percent cover by species on the form.

**B. Frequency** Calculate the percent frequency for each plant species by dividing the number of occurrences of a plant species (the number of quadrats in which a plant species was observed) by the total number of quadrats sampled along the transect. Multiply the resulting value by 100. Record the percent frequency on the [form](#).

**C. Species Composition** With this method, species composition is based on canopy cover of the various species. It is determined by dividing the percent canopy cover of each plant species by the total canopy cover of all plant species. Record the percent composition on the [form](#).

**10. Data Analysis** Tests should be directed at detecting changes in cover of the species and/or in major ground cover classes. Tests for changes in minor species will have low power to detect change. If quadrats are spaced far enough apart on each transect so as to be considered independent, the quadrat can be analyzed as the sampling unit. Otherwise, the transects should be considered the sampling units. If the transects are treated as the sampling unit, and given that the transects are permanent, either the paired t-test or the nonparametric Wilcoxon signed rank test should be used to test for change between two years. Repeated measures ANOVA can be used to test for differences between 3 or more years. If the quadrats are treated as the sampling units, care must be taken to ensure they are positioned the same along each transect in each year of measurement. A paired t-test, Wilcoxon signed rank test, or ANOVA is then used as described above for transects.

**11. Cost** About 5-25 min/10 quadrats.



