



BASAL AREA

A guide for understanding the relationships between pine forests and wildlife habitat



Basal area is the common term used to describe the average amount of an area (usually an acre) occupied by tree stems. It is defined as the total cross-sectional area of all stems in a stand measured at breast height, and expressed as per unit of land area (typically square feet per acre). To standardize measurements, tree diameter is typically measured at 4.5 feet from the ground, or approximately breast height. This is referred to as diameter at breast height (DBH).

Basal area is a useful index for understanding forest-wildlife habitat relationships and making timber harvest decisions. For example, percent canopy cover is correlated with basal area in pine forests. Greater pine basal area equals greater tree canopy cover; thus, as both increase, less sunlight reaches the ground. This lack of sunlight impedes growth of grasses, forbs (non-woody, broadleaf plants), and shrubs that provide important food and cover for some species of wildlife. Also, high basal area may lead to a decrease in tree growth and vigor from the increased competition for crown space, nutrients, and moisture.

Typically, basal area greater than 100 square feet per acre markedly decreases ground cover and slows timber growth. Thins should be planned when basal area reaches this level or when canopy closure occurs. In stands with a residual basal area of greater than 80 square feet per acre, ground cover will be dominated by shade-tolerant vines, shrubs, and hardwoods. These conditions will retain more timber volume, but will not provide the desired wildlife habitat conditions.

Conversely, stands with 60 square feet per acre or less of basal area provide optimal herbaceous (grasses and forbs) cover. These stands provide excellent food and cover bobwhite quail, wild turkeys, rabbits and increased deer forage. However, this may compromise timber objectives. **Thus, a basal area range of 60–70 square feet per acre may provide an appropriate balance.** Landowner objectives and site productivity vary, so consulting with a wildlife biologist and/or registered forester can help balance timber and wildlife management objectives.

Early successional plant communities are characterized by annual forbs and grasses, and are typically first to colonize a site following some form of soil disturbance. However, without frequent fire or disking, these areas will be dominated by perennial grasses and shrubs after several years. Frequent fire (every 2 to 3 years) reduces fuel loads, exposes mineral soil, recycles nutrients, controls woody stem encroachment, and stimulates germination of desirable plants. *Note: Consult a professional experienced in the application of prescribed fire before conducting burns.*

How is basal area calculated?

Per tree:

$$\text{Basal area per tree (square feet)} = 0.005454 \times (\text{DBH})^2$$

** 0.005454 is called the "foresters constant", which converts inches into square feet*

Example: The basal area of a 10-inch tree is:

$$0.005454 \times (10)^2 = 0.5454 \text{ square feet}$$

Per acre:

- 1) First, create a gauge by gluing a 1-inch wide object to the end of a 33-inch stick.
- 2) Stand in a randomly selected point in a timber stand.
- 3) Hold the stick under your eye (gauge at opposite end) and look at each nearby tree at breast height while rotating in a full circle.
- 4) If the stem of any tree is wider than the object, tally the tree as "in".

- 5) After completing the circle, multiply the number of "in" trees by



10 to determine basal area for that point.

- 6) Repeat this count in several, randomly selected points throughout the timber stand.
- 7) Average the basal area of all points to estimate the average basal area per acre.

Example:

Point 1 basal area = 70
Point 2 basal area = 90
Point 3 basal area = 100
Point 4 basal area = 80
Point 5 basal area = 110

$$\begin{aligned} \text{Average basal area per acre} &= 450 / 5 \\ &= 90 \text{ square feet per acre} \end{aligned}$$

**To more accurately estimate basal area, purchase a commercially available glass prism to use in the above example or estimate basal area for all trees within fixed-radius plots.*



1. Burned pine stand with a basal area of 110 square feet per acre and little herbaceous ground cover.



2. Burned pine stand with a basal area of 90 square feet per acre.



3. Burned pine stand with a basal area of 70 square feet per acre.



4. Burned pine stand with a basal area of 50 square feet per acre.



5. Pine stand with a basal area of 70 square feet per acre 2 years post-fire with ample herbaceous ground cover.