

**BASIS FORESTRY SHORT COURSE  
SILVICULTURE MODULE  
(Handout)**

**STAND DEVELOPMENT AND CROWN DIFFERENTIATION**

For even-aged, single-species stands, there are typically 5 stages of stand development (Figure 1.):

**Stage A: (seedling stage)** The site was planted and trees are above competing vegetation. The trees are growing at their maximum. There is no direct competition between trees at this point. However, tree crowns are small and site resources are not fully utilized. Stand growth per acre is low (i.e., cubic or board feet per acre).

**Stage B: (crown closure stage)** The trees are larger and crowns begin to touch and shade one another and crown lift begins. The trees are beginning to compete with each other, but site resources are not fully utilized. Stand growth per acre is still low, but is increasing as trees increase in size.

**Stage C: (crown differentiation stage)** The trees continue to grow in height and diameter and crown size increases. However, some trees begin to exert dominance over others. Inter-tree competition is high and individual tree diameter growth is slowing. However, stand growth is at or near maximum. Crown lift is very apparent.

**Stage D: (self-thinning stage)** Competition between trees is at a maximum and self-thinning begins (competition related mortality). Suppressed trees die; dominant and codominant trees continue to grow. Intermediate trees will continue to fall behind and become suppressed and eventually die as the dominant and codominant trees out-compete them. Individual tree growth continues to decline, but per acre stand growth reaches its maximum at this stage and levels off.

**Stage E: (mature stage)** As the stand continues to develop and trees get large and intermediate and suppressed trees die, large gaps in the canopy are created. This frees up growing space and allows brush and shade-tolerant trees to establish in openings. This is the precursor to old-growth conditions and is the result of many decades of inter-tree competition.

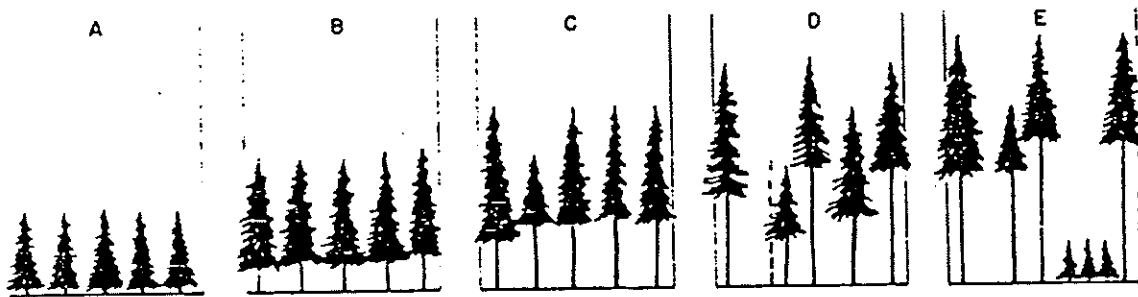


Fig. 1. Stages of development in an even-aged stand.

**BASIS FORESTRY SHORT COURSE  
SILVICULTURE MODULE  
(Handout)**

**CROWN CLASSIFICATION**

When competition occurs between trees in even-aged stands or even-aged groups, the trees begin to differentiate into crown classes: dominant, codominant, intermediate, suppressed, wolf and recent mortality (see Figure 2). Being able to recognize trees of various crown classes is important for selecting trees for retention in thinning and other harvest operations.

**Dominant:** Trees with the crowns extending above the general level of the canopy and receiving full sunlight from above and some from the sides. The sides of the crowns are well developed but can be crowded by other trees. Because the crowns are large, tree growth is good.

**Codominant:** Trees with crowns forming the main level of the canopy and receiving full sunlight from above but little from the sides. The crowns are medium sized and are more crowded on the sides. Tree growth is generally moderate to good.

**Intermediate:** These trees are shorter than dominant and codominant trees and have small crowns and intense crowding on all sides. The crown extends into the main canopy, but receives little direct light from above and none from the sides. The tree's crown is small and tree growth is poor.

**Suppressed (overtopped):** The crowns of these trees are below the main canopy. They receive no direct light from above or from the sides. The crown is very small and tree growth extremely poor.

**Wolf:** These trees develop and grow in the open portions of the stand. They have full crowns on all sides, with branches well below the canopy level. The crowns are uncrowded on two or more sides and receive full light from above and well down on two or more sides. Because of the large crown, tree growth is excellent, but because of the large branches tree quality (for lumber) is poor. Wolf trees may make excellent wildlife trees.

**Mortality:** These are dead trees within the stand. Suppressed trees usually die from competition from larger trees. However, trees from any crown class may die from disease or insect attack.

FIGURE 2.

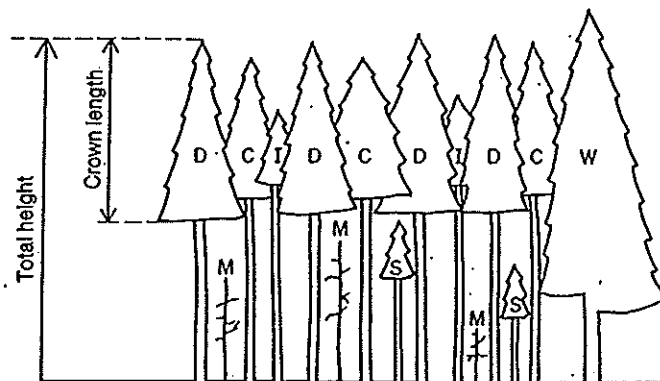


Figure 2.—Crowns of trees in even-aged stands are classified into crown types: D = Dominant, C = Codominant, I = Intermediate, W = Wolf, S = Suppressed, M = Mortality. The "crown ratio" is equal to the proportion of total tree height that is occupied by live crown. In this illustration, the dominants have a 50 percent crown ratio, while the wolf tree has an 80 percent crown ratio.