

**CHAPTER**

**14**

**SITE INDEX &  
CROWN CLASS**



# Site Index & Crown Class

We depend on soils. They support the systems that we count on to produce our food and natural resources. Soil type can determine how plants and animals grow and thrive, and they directly impact productivity of a forested site. This is called **site quality** in forestry. Site quality is the productive capacity of trees or other vegetation to grow on a site.

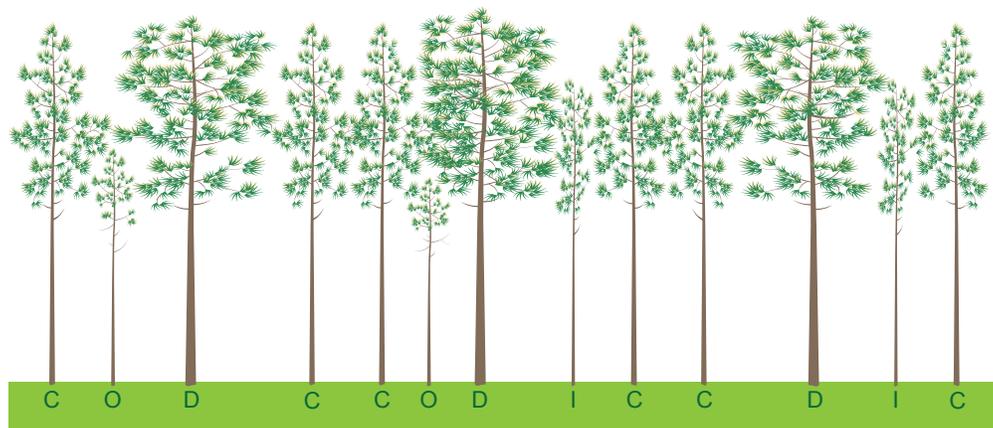
To estimate site quality in forestry, we often need to measure tree heights. This measure of site quality is called **site index**. Site index is the expected average total height to which dominant and codominant trees of a species will grow on a site at a given age (usually 25 or 50 years old). Following are facts to remember about site index:

- Areas of good site quality are also areas where tree height growth rates are high.
- Tree volume-production potential and tree height growth are positively correlated.
- Site index is usually considered most reliable when based on measurements of trees that are at least 20 years old.
- Site index can be considered for only one tree species at one time in one location.
- Site index may change over time based on silvicultural prescriptions.

## HOW TO KNOW WHICH TREES ARE DOMINANT OR CODOMINANT IN YOUR FOREST

Forests are composed of an overstory canopy of trees and often an understory of woody and herbaceous plants. A simple but subjective classification of the position of tree crowns in relation to other trees in the stand overstory is referred to as **crown class**. There are four crown classes generally recognized (figure 14.1). Sometimes there is a fifth class (dead). Crown classes are categorized as follows:

- Dominant (D). The crowns of dominant trees rise somewhat above the general level of the canopy. They receive full light from above and, to a certain degree, laterally (from the side).
- "Wolf trees" or open grown trees should have their own category and not included as dominant trees, even though they may be larger than other trees in the canopy.
- Codominant (C). These trees are not quite as tall as dominants. Their crowns receive overhead light but may be hemmed in laterally to a certain degree by dominants or other codominants. They are nearly as strong and healthy as dominants. Along with the dominants, they comprise the main canopy of the forest.



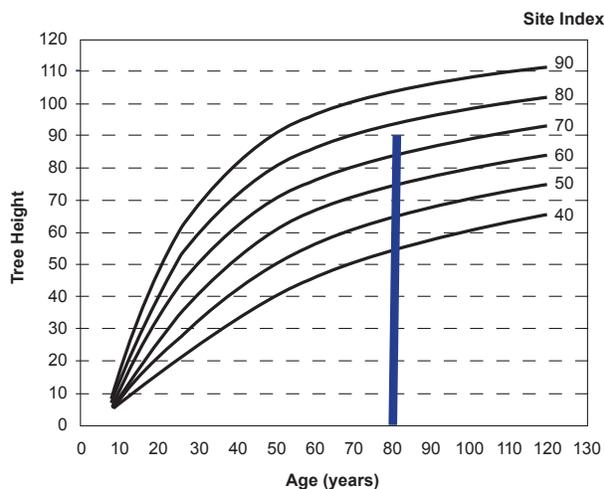
**Figure 14.1.** Example of trees representing primary forest crown class categories: dominant (D), codominant (C), intermediate (I), and overtopped (O).

- Intermediate (I). The crowns of these trees occupy a subordinated position in the canopy and are subjected to side competition for light from crowns of the two previous classes. These trees receive some direct overhead light through holes in the canopy.
- Overtopped (O). These trees are submerged members of the forest community. They have little free overhead light. They exist by the sunlight that filters through the canopy. They are typically weak and slow growing and are sometimes also called suppressed trees.
- Dead. This crown class can be desirable in some cases for wildlife management.

## USING A GRAPH TO ESTIMATE SITE INDEX

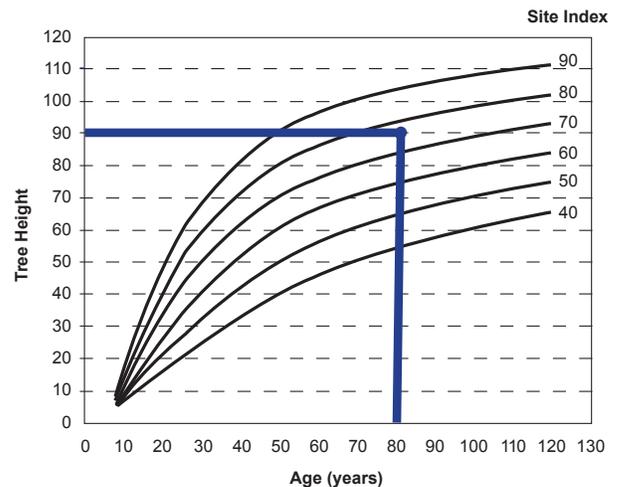
Site index curves exist for most common tree species in the United States. When using a curve to estimate site index, it is important to select one suited to your species of interest and location. The United States Forest Service has a publication, "Site Index Curves for Forest Tree Species in the Eastern United States," that contains 127 site index curves. It can be downloaded for free on the USDA Forest Service website.

Using the site index curve for naturally regenerated longleaf pine, we will estimate the site index for a longleaf pine stand that is 80 years old with dominant and codominate trees averaging 90 feet tall. First, we draw a line up from the point on the graph that represents the approximate age of the stand, in this case 80 years (figure 14.2).



**Figure 14.2.** Site index curve for naturally regenerated, even-aged longleaf pine. Source: Lauer, D.K., and J.S. Kush. 2010. *Dynamic site index equation for thinned stands of even-aged natural longleaf pine.* *South. J. Appl. For.* 34:28-37.

Next, we draw a line from the estimated average height of the dominant and codominant trees (in this case 90 feet) to meet the line drawn from the age on the X axis (figure 14.3). The meeting point of these lines is where we read the site index value. Since the point falls between the 70 and 80 site index curves, we would estimate that the site index for this stand is approximately 75 feet.



**Figure 14.3.** Site index curve for naturally regenerated, even-aged longleaf pine. Source: Lauer, D.K., and J.S. Kush. 2010. *Dynamic site index equation for thinned stands of even-aged natural longleaf pine.* *South. J. Appl. For.* 34:28-37.

Site index is a measure of how well trees will grow in a given forested area.



Tree height growth rates are high in areas where the site quality is good.

## YOUR TURN

Using the site index curve in figure 14.4, estimate the site index for a longleaf pine stand that is 60 years old, and the dominant and codominant trees average 90 feet tall.

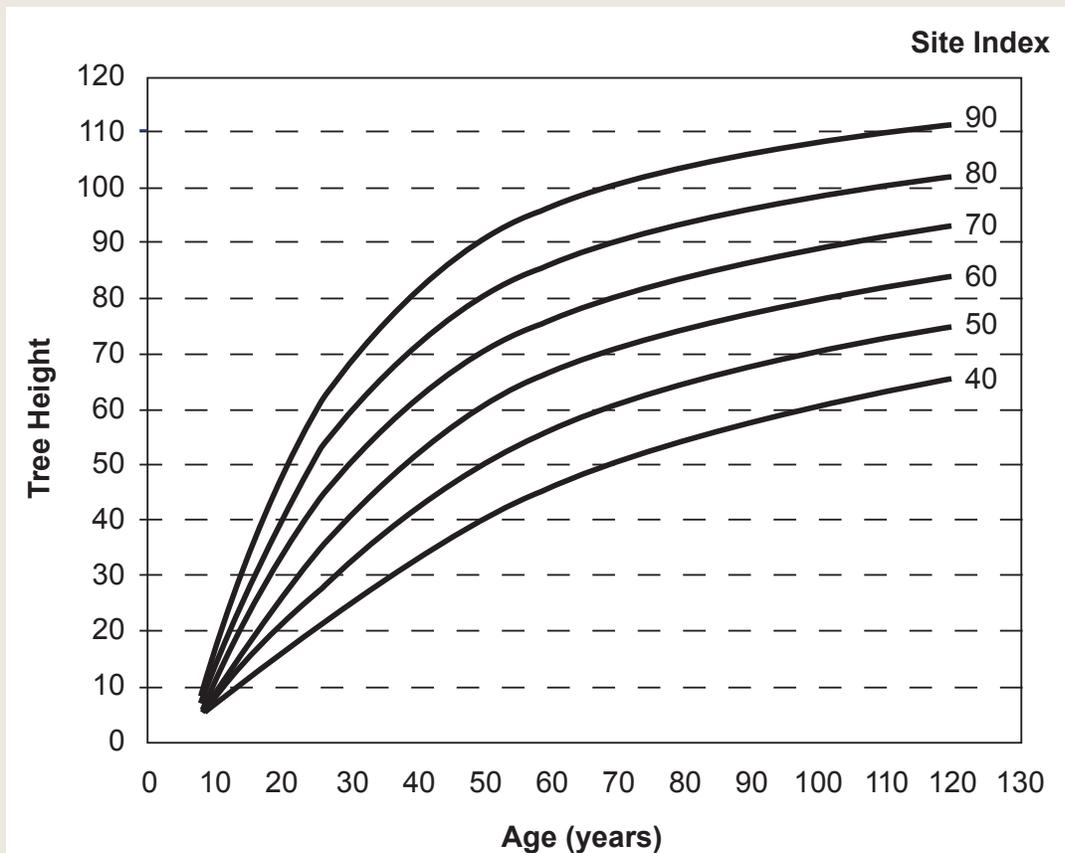
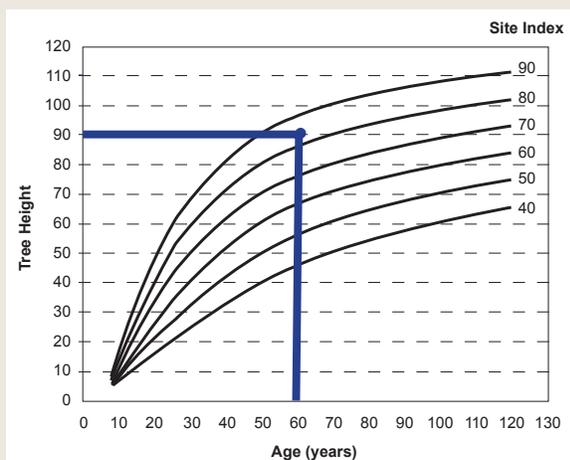


Figure 14.4. Sample form to calculate site index.



Answers to site index exercise. Draw a line up from the age 60 point. Then draw a line over from the 90 feet point. The site index is 82 to 83 feet at a base age of 60 years.