

## FACT SHEET: CANOPY COVER and CANOPY CLOSURE

Canopy cover and canopy closure are the two basic ways of measuring forest canopies.

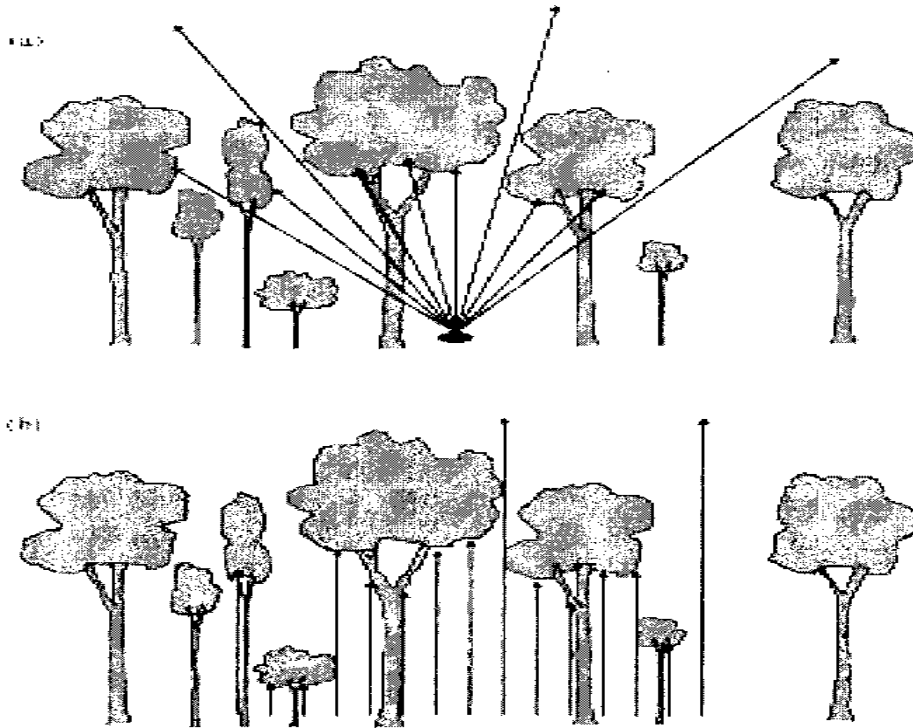


Figure 1. An example of a measure of canopy closure (a) and canopy cover (b).

### Definitions of canopy closure

“Canopy closure measurements integrate information over a segment of the sky hemisphere above one point on the ground. Ideally the entire sky should be assessed, although the segment measured varied with the instrument used.” Jennings, S.B., N.D. Brown, and D. Sheil. 1999. Assessing forest canopies and understorey illumination: Canopy closure, canopy cover and other measures. *Forestry* 72(1):59-73.

“Canopy closure is the proportion of the sky hemisphere obscured by vegetation when viewed by a single point. Closure is affected by tree heights and canopy widths and takes into account light interception and other factors that influence microhabitat.” Sierra Nevada Adaptive Management Project web site <http://snamp.cnr.berkeley.edu/about/snamp-glossary/>

### Definitions of canopy cover

“Canopy Cover: The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included.” Source: USDA Forest Service, Natural Resource Information Service, Field Sampled Vegetation

(FSVeg), Common Stand Exam Users Guide, Appendix M, Glossary of Terms, 2010.  
<http://www.fs.fed.us/emc/nris/products/fsveg/index.shtml>.

“Canopy cover refers to the proportion of the forest floor covered by the vertical projection of the tree crowns....Measurements of canopy cover assess the presence or absence of canopy vertically above a sample of points across an area of forest.” Jennings, S.B., N.D. Brown, and D. Sheil. 1999. Assessing forest canopies and understorey illumination: Canopy closure, canopy cover and other measures. *Forestry* 72(1):59-73.

“Canopy cover is a measure of the percentage of ground covered by a vertical projection of the tree canopy. In SNAMP, it is collected using point measurements (yes/no canopy cover).” Sierra Nevada Adaptive Management Project web site <http://snamp.cnr.berkeley.edu/about/snamp-glossary/>

“...canopy cover, in Northern Goshawk Management Recommendations, RM-217, is defined on page 87 as: ‘The percentage of a fixed area covered by the crowns of plants delimited by a vertical projection of the outermost perimeter of the spread of the foliage.’ The context in which this definition is written is based upon the group or clump of trees. Canopy cover is measured from the outermost edge of tree crowns within a group or clump of trees. It is not measured as percentage of cover across a stand or project area.” Pp. 8-9 of Implementation Guide Region 3: Northern Goshawk Standards and Guidelines (April 6, 2007). (emphasis added)

#### Analysis

“Mean canopy closure (or openness) over an area of forest is not necessarily correlated with the canopy cover of the same area. Tree height does not affect canopy cover as the vertical projection of the crown alone is assessed. Canopy closure will increase beneath progressively taller trees as more and more of the sky hemisphere is obscured. Canopy closure is likely a better to be a measure of greater utility to foresters, as it will be directly related to the light regime and microclimate and will, therefore, be linked to plant survival and growth at the point of measurement. Canopy cover is a measurement that reflects the dominance of a site by trees or a particular species of tree. Canopy cover can also be used to predict stand volume. This is because, for a particular species of tree, there is a nearly linear relationship between the area occupied by its crown and the basal area of its trunk.” Jennings, S.B., N.D. Brown, and D. Sheil. 1999. Assessing forest canopies and understorey illumination: Canopy closure, canopy cover and other measures. *Forestry* 72(1):59-73.

“The ecological relevance of each (cover being important to stand-level microclimate and prey protection while closure directly influences understory light and temperature at a given point) measurement is needed to interpret their biological importance.” Stephenson, S.L., D.L. Fry, E. Franco-Vizcaino, B.M. Collins, and J.M. Moghaddas. 2007. Coarse wood debris and canopy cover in an old-growth Jeffrey pine-mixed conifer forest from the Sierra San Pedro Martir, Mexico. *Forest Ecology and Management* 240:87-95.

Note: The glossary for the Forest Service Field Sampled Vegetation Common Stand Exam Users Guide does not contain a definition for canopy closure (although it does contain definitions for canopy closure for herbs, non-trees, and shrubs). Nor is there any discussion of canopy closure in the Implementation Guide Region 3: Northern Goshawk Standards and Guidelines (2007) or in the Management Recommendations for the Northern Goshawk in the Southwestern United States (1992).