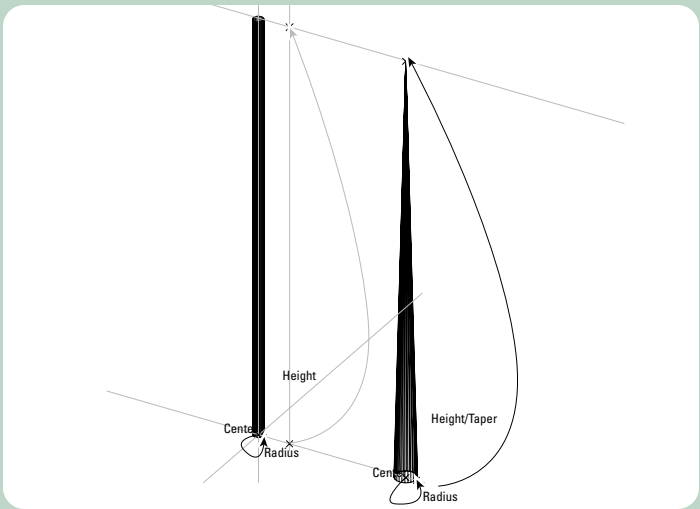
PARAMETRIC SOLIDS – SIMPLE

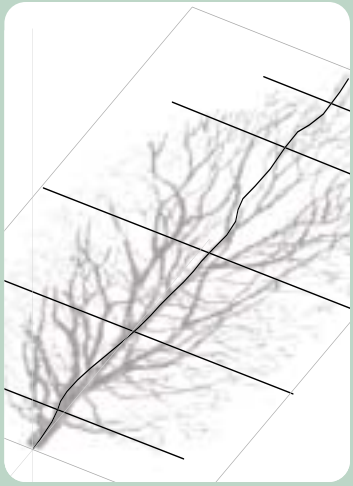
Objectives: *To illustrate the procedure for constructing 3D representations of vegetation using simple parametric solids.*
Inputs: *Simple parametric solids or geometric primitives.*
High resolution image of plant material to be modeled/rendered (.tif, *.tga, *.jpg). For accurate branching and habit consult a reference such as Hightshoe's "Native Trees Shrubs and Vines for Urban and Rural America."*
Note: *When generating or scanning the image of the plant material to be represented, take note of whether or not the image or plant is symmetrical. Trees with a central leader, are more successfully represented in this manner when compared to the multistemmed forms of understory trees.*
Overview: *These simple lollipop forms can be generated in a multitude of ways. The most common would be the definition of simple geometric primitives or solids derived from extruded, swept , or revolved shapes.*

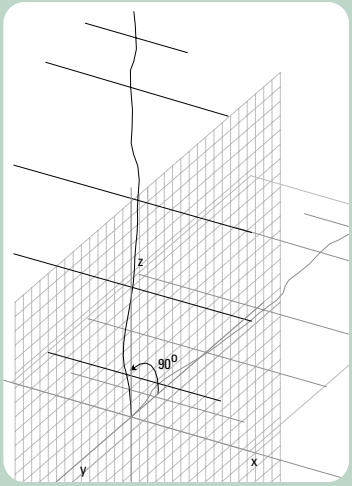
Process:

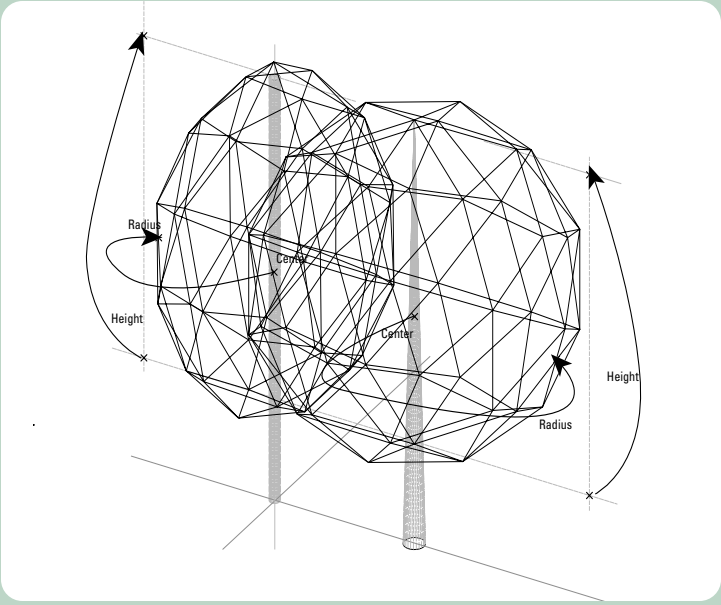
1. The Trunk:
With careful attention to the trunk height and form select the appropriate geometric primitive for the trunk (cylinder or cone), and either generate directly or through coordinate input. Using a strategy similar to the "Layered Canopy", sweep a shape along a path to represent the central leader or trunk of the tree.



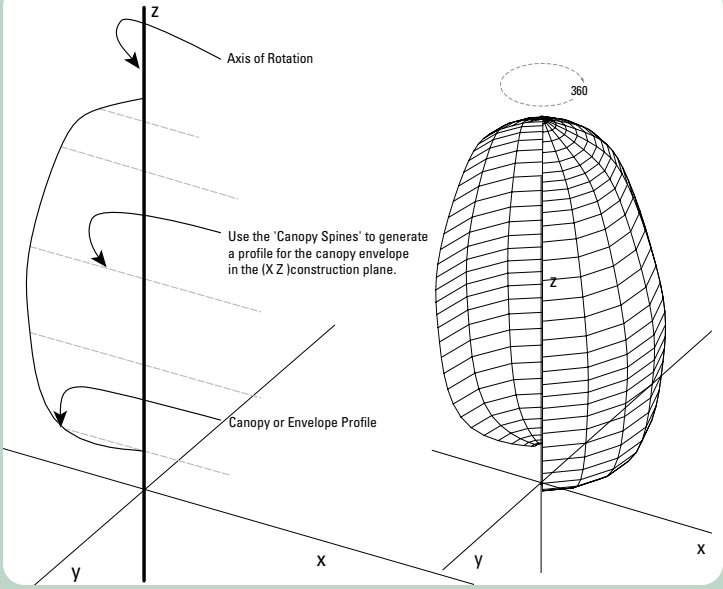
The procedure to make a swept form for the trunk follows the procedure outlined in the "Layered Canopy" tutorial.
a. Trace the central leader in the XY construction plane. This is now the path.
b. Rotate the path around the YZ construction plane so that it is perpendicular to the XY construction plane.



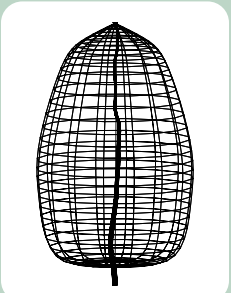


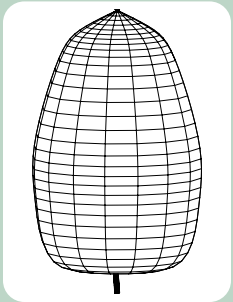


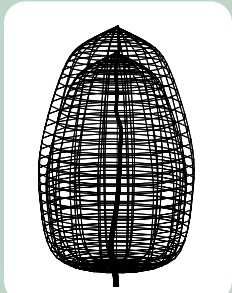
2. The canopy:
With knowledge of the canopy's width and height determine whether it would be best represented with a sphere or a 3-dimensional ellipse. The solid canopy form might be best constructed through coordinate input rather than snapping to the trunk geometry.



If you wish to define canopy with revolved or lofted entities, it is suggested but not necessary to use the underlay as a method for generating true-to-habit tree volumes. Using the procedure outlined in the "Layered Canopy" tutorial, the profile of the tree envelope can be generated from either tracing the tree profile or snapping to geometry that suggests the limits of the tree envelope.

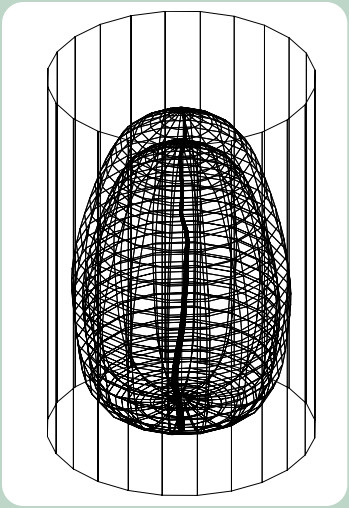


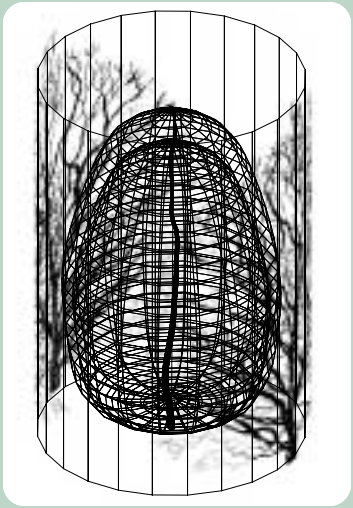




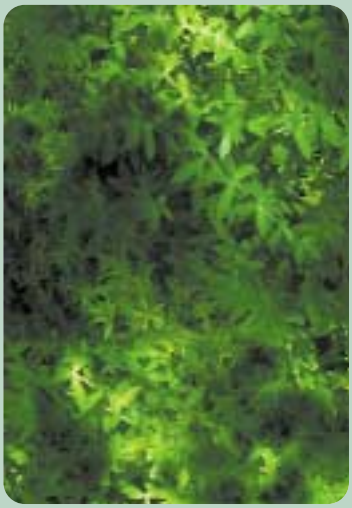
In anticipation of applying rendering materials to the solid canopy forms, you can make a double layer canopy. The double layer canopy will allow you to assign two materials: one to suggest branching structure, the other the canopy texture.

When applying complex textures to the tree canopy, use the cylindrical mapping with a cap. Depending upon whether you use a double layer, the mapping parameters can be tiled in the "u-axis" to adjust density of the canopy material.





a. This is an example of the type of bitmap used to define the diffuse color of the branching structure layer. For the purposes of the rendering it is usually coupled with a transparency map
b. This is an example of a type of bitmap that could be used to suggest the texture of the tree's envelope. At the time of rendering it is coupled with a transparency map, so that the interior branching layer is visible.



Rendered examples of the double layer canopy from eye level and from above. Note that the shadows include visual information about both branching structure and canopy volume.