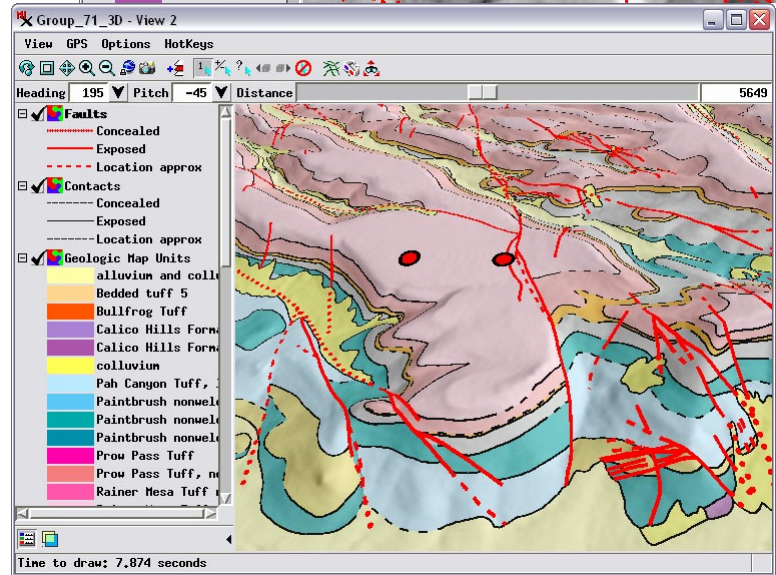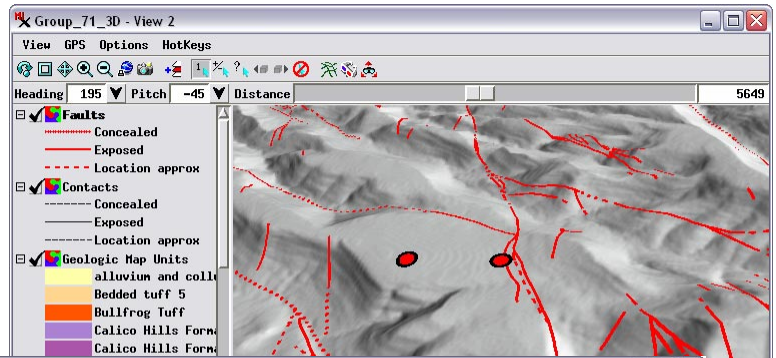# Perspective Rendering of Geometric Layers

All layers in a 3D group are rendered separately into the 3D view. As a result, the 3D view can be updated and redrawn quickly when one or more of these layers is toggled on or off using the view's sidebar layer controls or the Display Manager.

In addition, each graphical element (line, polygon, and so on) in a geometric object layer (vector, CAD, or shape object) is rendered individually into the 3D view. The mode of rendering varies between objects with 3D (x,y,z) and 2D (x,y) coordinates. Elements in 3D vector objects are rendered into the 3D view as 3D shapes (see the Technical Guide entitled *3D Display: Render 3D Elements as 3D Shapes*). Elements in 2D geometric layers are individually rendered onto the terrain surface and constrained to conform to and lie on top of the terrain. (Vector points and polygons alternatively can be set to extrude above or below the surface.) These 2D elements are rendered with screen-pixel resolution, providing high detail for patterns and symbols in the scene foreground. If styles have been set to size the elements to a design or map scale, the 3D view provides faithful perspective-scaled rendering, with large foreground elements diminishing in size to the vanishing point in the background.

Geometric layers can be turned on or off individually as illustrated in the view above, which includes four separate vector layers overlaying a shading raster layer. Individual rendering of geometric layers and elements ensures better rendering quality and fast 3D view updates in response to layer changes.
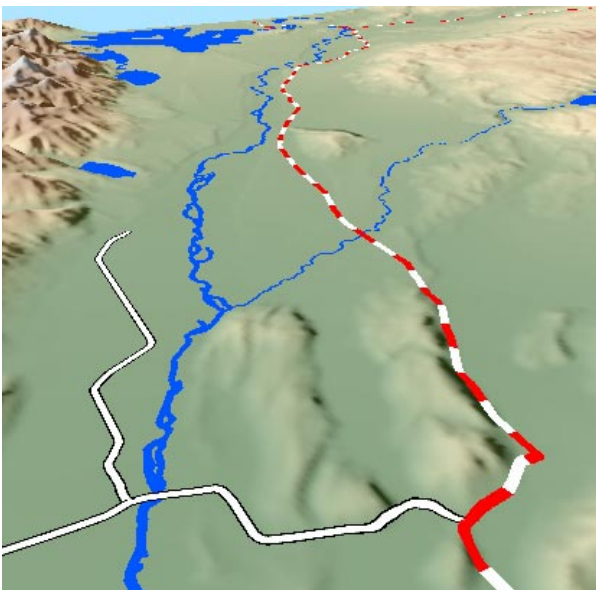
Line patterns are rendered crisply and with proper perspective effect.
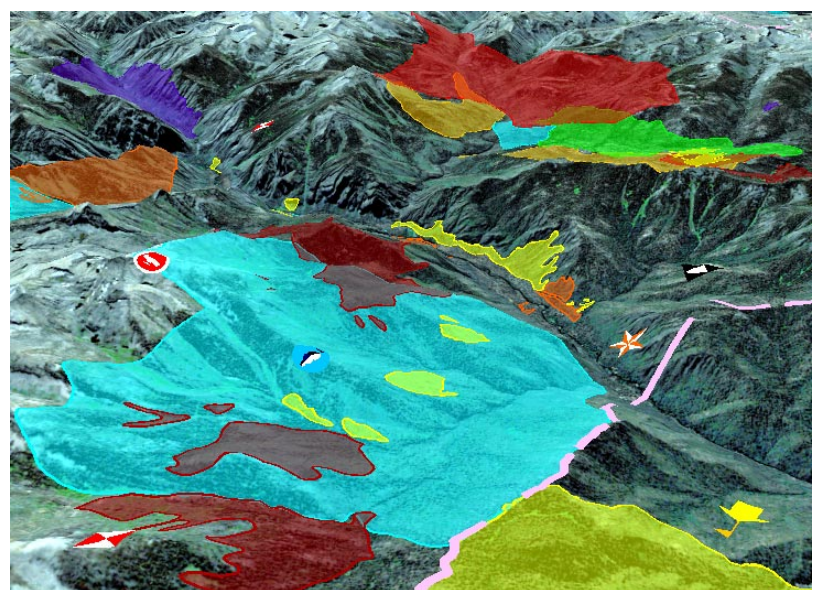
Graphic elements in 2D geometric objects, such as the polygons and points shown here, are draped over the terrain surface.