Creating Slope-Enhanced Shaded-Relief Using Global Mapper

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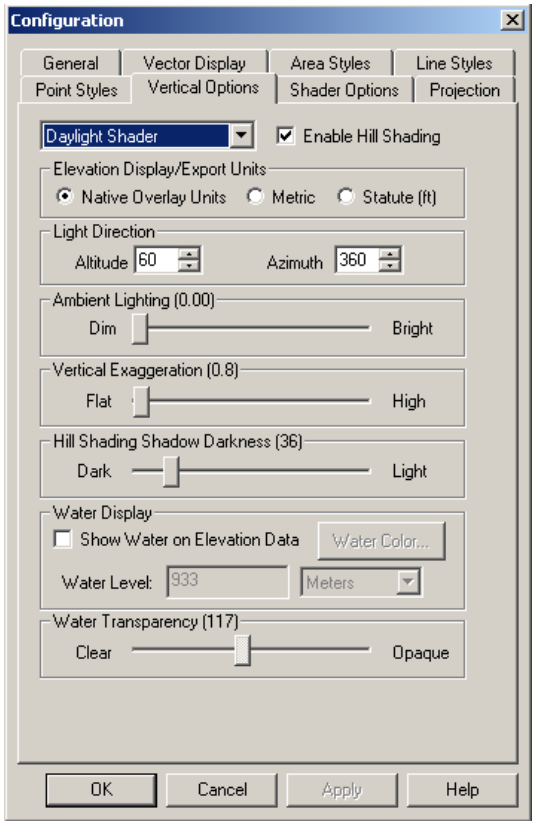
Introduction

The purpose of this document is to demonstrate that slope-enhanced hillshade, or shaded-relief maps, are superior to those created by traditional software methods using a simple sun angle and azimuth to show shadow detail in physical terrain models. The results shown here were achieved using Global Mapper software.

Methods

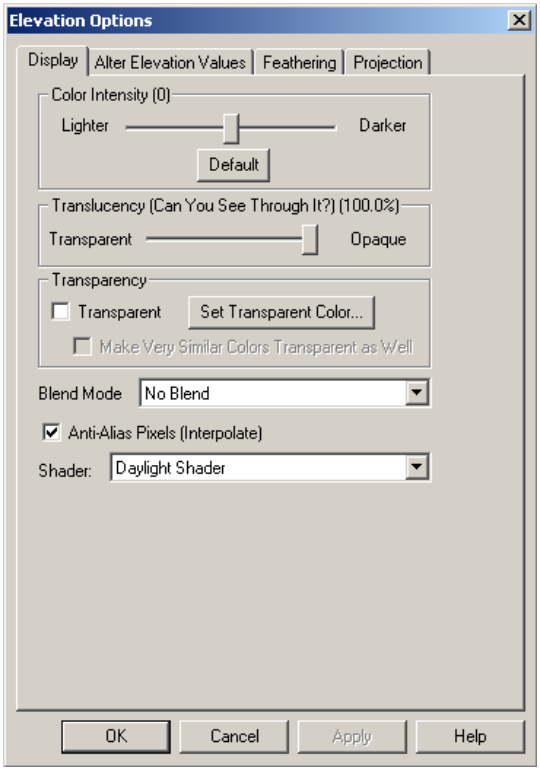
Import your elevation data and map boundary polygon into Global Mapper.

Use the **Tools→ Configuration→ Vertical Options** menu, or click on the **Configuration** icon, and choose the **Daylight Shader** and check the **Enable Hill Shading** box.



Set the **Light Direction** altitude and azimuth to your preferences. This will likely vary according to the physical geography of the map area. An altitude of 60° seems to work best, but the azimuth is the setting to experiment with the most!
The recommended **Ambient Lighting** is 0, **Vertical Exaggeration**, 0.8, and **Hill Shading Shadow Darkness**, 36.

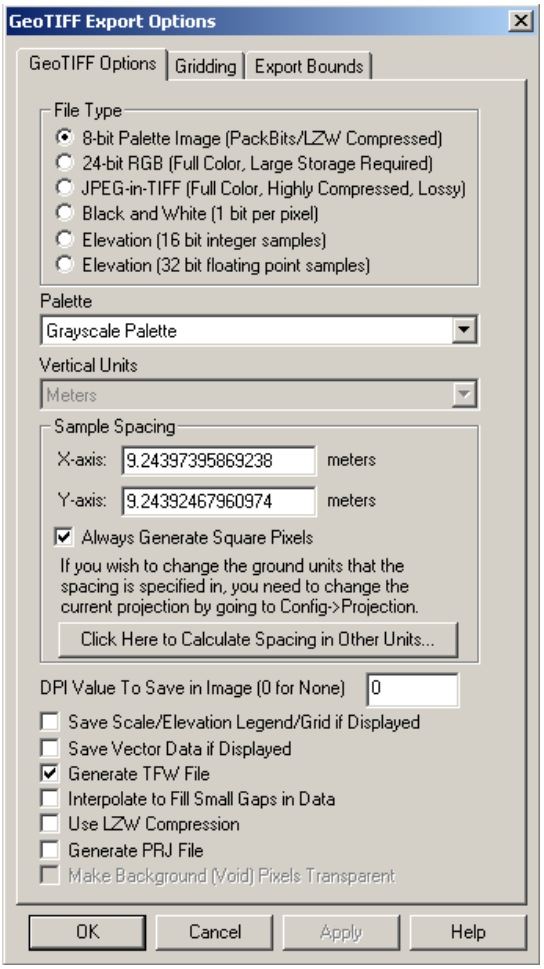
Now use the **Tools→ Configuration→ Control Center** menu, or click on the **Control Center** icon, click on your elevation layer and then click the options button, which will open the **Elevation Options** dialog box. From the pull-down list, set the display shader option to **Daylight Shader** and check the box for **Anti-Alias Pixels**; that will make your hillshade look nice and smooth!



Now click on the **Feature Info Tool** icon and then click on the map area to select the boundary

polygon, which allows you to clip the hillshade to the map boundary. Export your hillshade with the **File→ Export Raster and Elevation Data** menu, and choose one of the many raster file types.

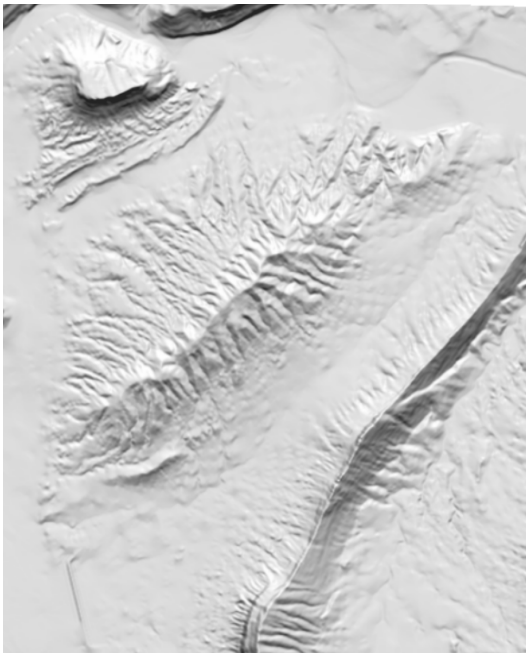
This will open a dialog box to select your output options. In this example the export file is GeoTIFF. Set the file type to **8-bit Palette Image** and select **Grayscale Palette** from the palette options pull-down.



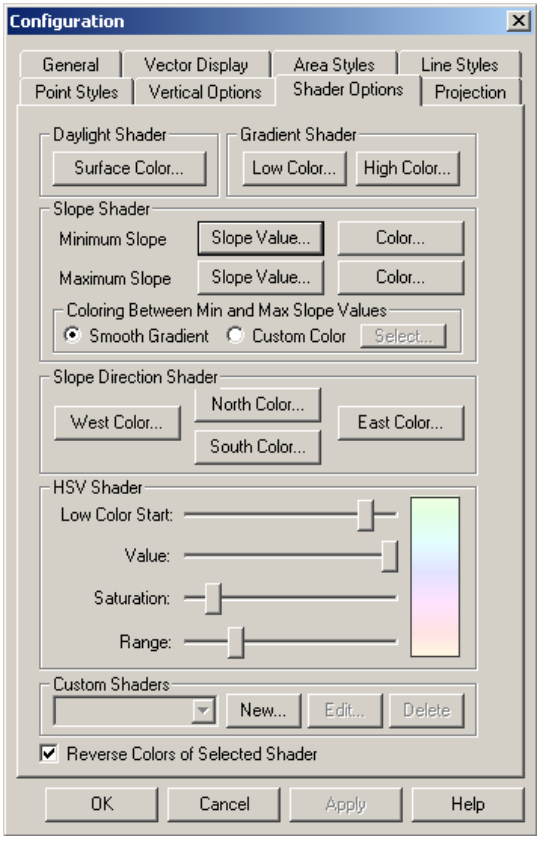
The **Export Bounds** tab offers a choice to crop the output to a selected area feature, click it.

When you are finished with choosing export options you will be prompted for a filename and destination for the output; save your raster file.

Import your new hillshade as another layer in Global Mapper.

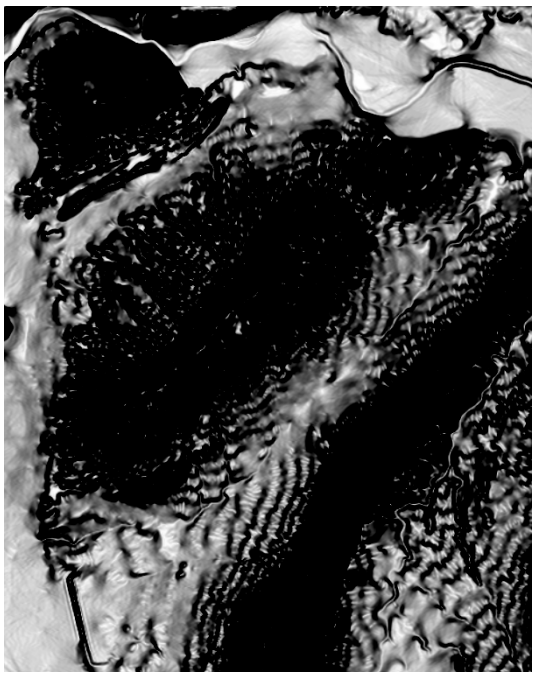


Your hillshade will look similar to this one, a traditional result.



Next, you'll create a slope map from your elevation data layer, so you need to set new options for it. Once again, click on the

Configuration icon and on the **Shader Options** tab, set the **Slope Shader Minimum Slope** value to 0, and set the color to white. Now set the **Maximum Slope** value to 5, and set the color to black. Click on the **Smooth Gradient** option so all slope values will display in shades of gray instead of just black or white.
These settings will turn all slopes of 0° white, and any slope over 5°, black; anything in between as various shades of gray.
Now to see the result you'll need to change the display options for the elevation data. Once again, from the **Control Center**, click on your elevation layer and then click the options button to change the display shader to **Slope Shader**. After accepting the changes your elevation data layer should display a slope map similar to this one.



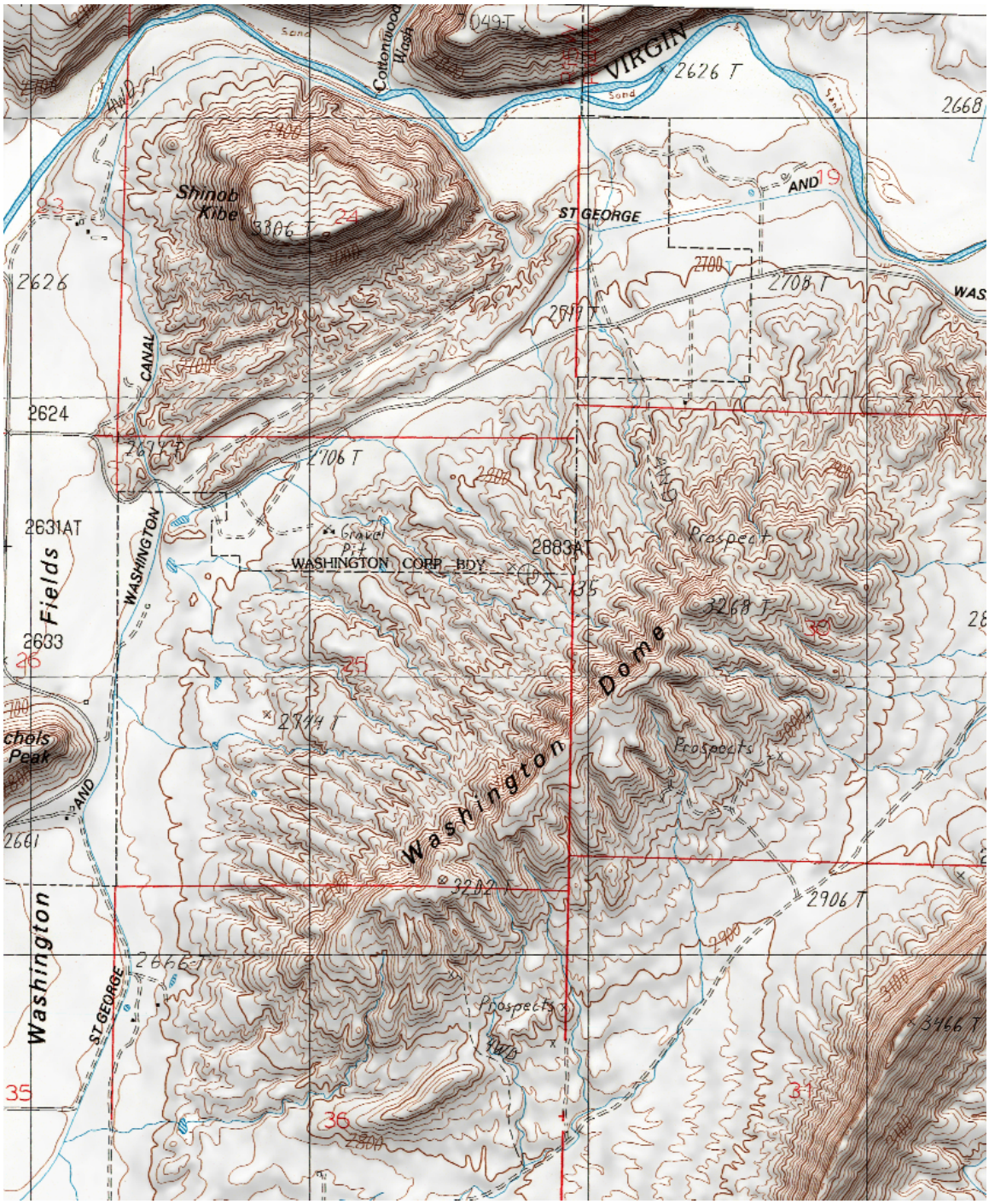
Differently from ArcMap, Global Mapper draws the overlay layers from the bottom up; so in the **Control Center** set the position of the elevation data layer to the top of the list and the hillshade just under that. Change the display options on the hillshade layer so the **Blend Mode** is set to **Screen** and then check the option for **Anti-Alias Pixels**. Make sure both the elevation data and hillshade overlays are turned on.

When these options are set, the display should look like this.

Here you can see how adding the slope map has modified the hillshade to display a better representation of the physical terrain, and the very low angle slopes are now devoid of any shading. Now you can save a new slope-enhanced hillshade from this combined effect, clipping it to the map boundary.

Taking further advantage of the Global Mapper display blending modes, a very nice shaded-relief base map can be created using this slope-enhanced hillshade and a topographic base map image.
Perhaps the most useful of all of the available blending modes is the **Multiple** mode. The multiple mode allows you to blend any layer into another so the features of both can be seen clearly without the need to set layer transparency to any of them; an outstanding feature for map creation. These "mashups" can be used to create any number of thematic map variations and maintain excellent graphic quality.

The next page shows an example of a shaded-relief and topographic base map mash-up created using Global Mapper.

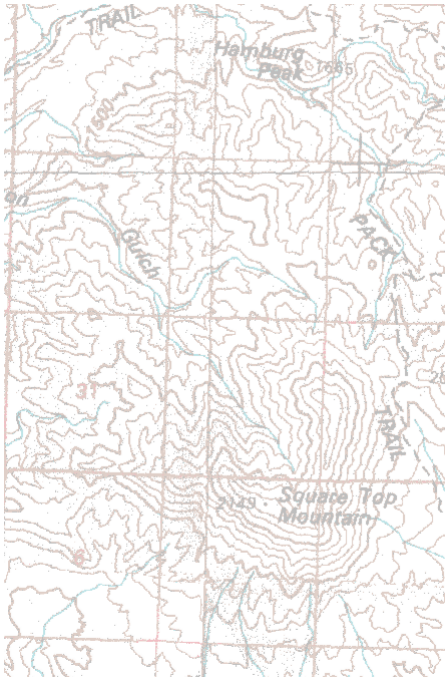


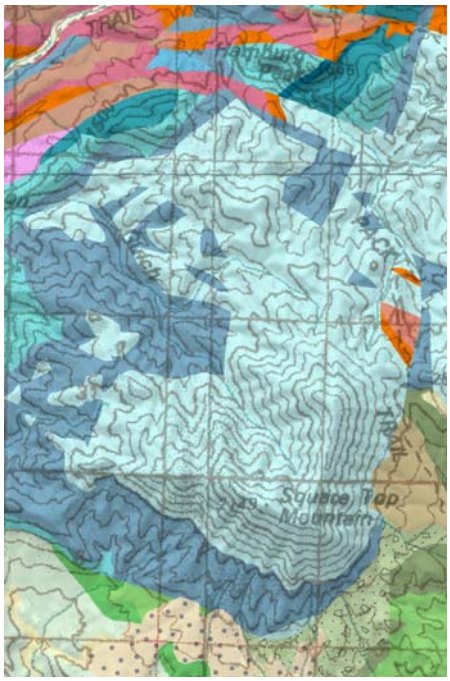
High-quality mashup created using a topograghic basemap and slope-enhanced shaded relief.

Global Mapper Mash-ups

Create high-quality mash-ups from scanned topographic maps, slope-enhanced shaded-relief maps, and high-resolution images of geologic map unit colors and patterns.

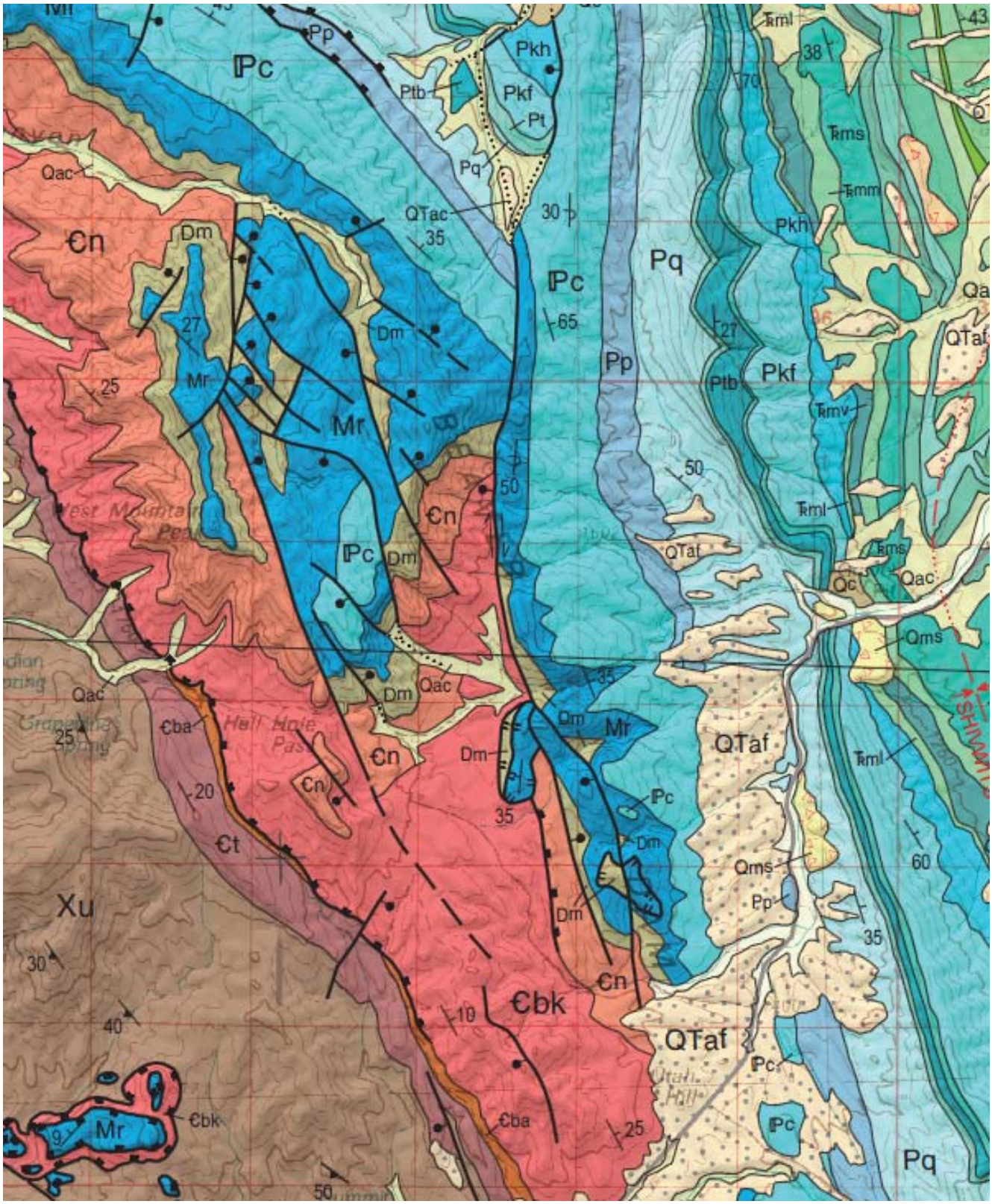
Global Mapper Stack Order	Transparency %	Blend Mode
DRG or Scanned Topo Map	30	None
Slope-enhanced Shaded Relief	40	Multiple
Raster Image of Map Colors and Patterns	100	Multiple





The above shows the elements and settings used in Global Mapper to create a high-quality mash-up used in the publication of the Geologic Map of the St. George and east part of the Clover Mountains 30'x60' Quadrangles, Washington and Iron Counties, Utah. Note the blend modes used. Since ArcMap cannot blend layers together, this is the only way that the topographic base, the shaded-relief, and the polygon colors can be combined without using a transparency on the polygons; which diminishes the original polygon colors to undesirable colors.

Following is a screenshot of a portion of this published geologic map.



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