

Creating a Shaded-Relief Geologic Map Using World Construction Set and Adobe Illustrator Software

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INTRODUCTION

One of the continuing goals of geologic mappers and map makers is to find better ways to show geology on a map. Shaded terrain, when combined with colored geology polygons, makes a geologic map more visually appealing and easier to use. This poster demonstrates one approach to creating such a map.

WORLD CONSTRUCTION SET

The shadedrelief for the *Surficial Geologic Map of the Wood River Valley Area, Blaine County, Idaho*, was created in the visualization software World Construction Set 5. World Construction Set (WCS) uses fractal geometry and material controls to aid in the creation of 3D landscapes. Geometric features that look similar, no matter the scale, have fractal properties. A coastline has fractal properties and so does the topography of the earth's surface. When combined with digital elevation data, the fractal math applied by WCS "fillsin" or adds detail as the scale of the scene gets larger, or as you zoom in. WCS also allows the user to manipulate the color and texture of the ground, water, vegetation, and sky. In addition, geographic information system (GIS) data (polygons and lines) can be imported. For example, any number of ecosystems or rock exposure effects can be applied to imported map polygons, resulting in visually stunning recreations and visualizations. For even more fun, WCS is designed to output animations in a variety of formats. Stereo images can also be created.

CREATING THE SHADED-RELIEF IMAGE

For the purposes of the map shown here, a rather simple shaded-relief image was created. First, 30-meter

digital elevation models (DEMs) were imported (11 in all). WCS then joined the DEMs in its own native format and processed the quadrangle edges to make them as seamless as possible. The resulting digital landscape was vertically exaggerated 1.5 times to help emphasize the surficial terrain (the theme of the geologic map). Texture and color were applied to the terrain to make it look more interesting. Ambient light, light reflected from the sky and ground, was used to add light to the shadows. Quadrangle corner tics were draped on the scene. The scene was then rendered (the equivalent of taking a photograph). While WCS can import GIS data in both geographic (latitude and longitude) and Universal Transverse Mercator coordinate systems, it works with scenes only in geographic coordinates. To reduce the effects of the curved earth on the resulting image, the shadedrelief was computed or shown as if the camera were 300 kilometers above the earth. The final image was then geo-rectified to Idaho State Coordinate System coordinates in ArcGIS using the previously imported corner tics. Finally, the image was saved for layout.

LAYOUT

Adobe Illustrator 10 was used to lay out the map seen here. Like other layout programs, Illustrator handles text and imports multiple formats well. Illustrator excels at dealing with transparency or opacity of images. Taking advantage of the opacity function in Illustrator allows the user to drape a shaded image onto colored polygons. Illustrator also makes it easy to modify colors or add patterns to one or more geologic units throughout the map. For this map, opacity was set at 45 percent. Once the base map layers were registered and opacity was set, only basic map layout tasks remained to complete the map.

"Flattening" by Illustrator was required before generating the print file because of the shaded-relief geology in this map. In other words, the map layers were raster-

ized before plotting. This resulted in rather large (about 300MB) plot files.

FOLLOWUP INFORMATION

Although World Construction Set has a steep learning curve and the expected pitfalls that come with complex software, it is well worth exploring if you have a need to create geologic visualizations or stunning digital landscapes.

More information about World Construction Set is available online at <http://www.3dnature.com>. This site has many great examples of visualizations from a variety of disciplines, including geology. There are numerous web sites devoted to fractal geometry. I have included just two here: <http://www.ics.uci.edu/~eppstein/junkyard/>

[fractal.html](#)> and <http://math.rice.edu/~lanius/frac/>>.

SOFTWARE CITED

Adobe Illustrator—Adobe Systems, Inc. 345 Park Ave., San Jose, CA 95110-2704 USA, (800) 833-668, [http://www/adobe.com](http://www.adobe.com).

World Construction Set—3D Nature, LLC, 5740 Olde Wadworth, Suite C, Arvada, CO USA 80002, <http://www.3dnature.com>.

REFERENCES

Breckenridge, R.M. and Othberg, K.L., Surficial geologic map of the Wood River Valley area, Blaine County, Idaho: Idaho Geological Survey Surficial Geologic Map Series (in progress).