Lidar-derived bare-earth digital elevation models (also known as digital terrain models) are useful to geoscientists because they provide a clear view of the Earth’s surface—above ground elements, such as vegetation and structures, have been removed. Digital elevation models (DEMs) are especially advantageous in areas where extreme vegetation makes performing geologic or geomorphic investigations difficult.

Creating an REM

REMs can be created using a number of different methods. Two of these techniques, the Cross-Section and DWM methods, are described briefly in the above simplified model diagram. These two methods along with the Kernel Density method (not shown) are described in detail by Olson and others (2014). All three methods use point or line GIS data that possess elevations corresponding to the river’s surface. The data are then interpolated to create a new raster surface and then subtracted from the original DEM raster to create the REM.

Often, more than one iteration of the model is needed to accurately represent the water surface at D elevation. Some common factors that reduce model accuracy are (1) years with a steep elevation gradient and (or) high sinuosity and (2) models that incorporate more than one stream.

REM Cartography

When used for analysis, multi-color gradients can be applied to the REM to show the subtle elevation changes necessary for scientific interpretation. When used for cartographic purposes, however, a monochromatic gradient produces a more aesthetically pleasing effect. Using graphics software such as Adobe Illustrator or Photoshop, the REM can be enhanced and combined with other raster or vector data to produce maps and imagery such as in Figures 5 and 6 above. The REM can also be visualized in perspective view (Figure 7) using GIS applications such as ArcGlobe or Global Mapper.

REMs are also useful in visualizing other kinds of geomorphic features. REMs were used to create enhanced views of ice-age glacial outwash plains in Figure 8A below, and of Mount St. Helens’ lava flows in Figure 8B.