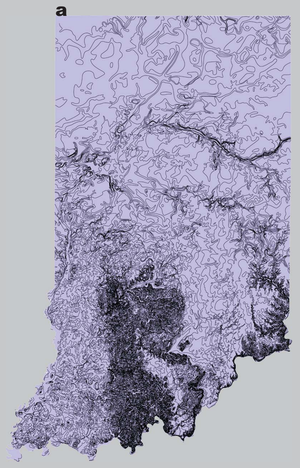
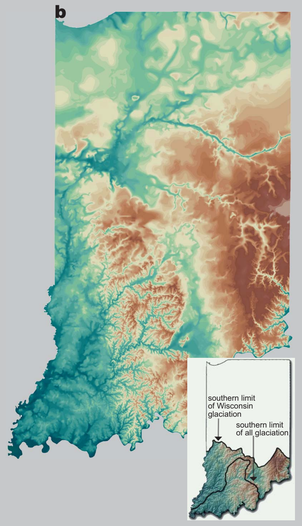
C. traditional interpretative mapping & computer statistical mapping
—bedrock topography and unconsolidated thickness

bedrock topopgraphy

traditional

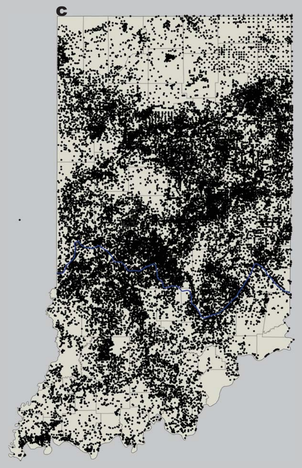


a - IGS Miscellaneous Map 36—topography of the bedrock surface by Henry H. Gray (1982)—displayed as vector contour lines.

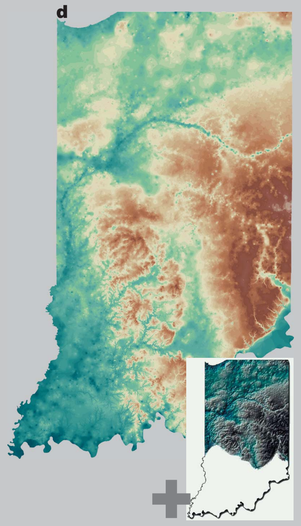


b - IGS Miscellaneous Map 36 displayed as an image of a grid created from map **a** with TOPOGRID. Minor corrections were made to this surface in ArcView Spatial Analyst by subtracting the grid from the surface DEM, and adjusting for the intersections of these two surfaces. The southern portion of this map was used in the final image—bedrock topography (map **f**).

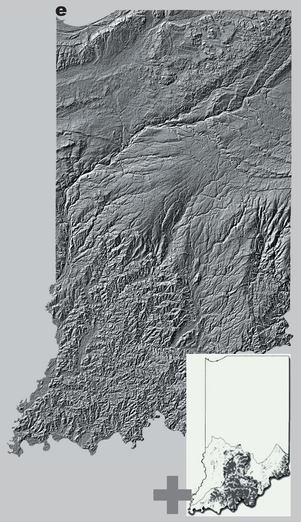
statistical



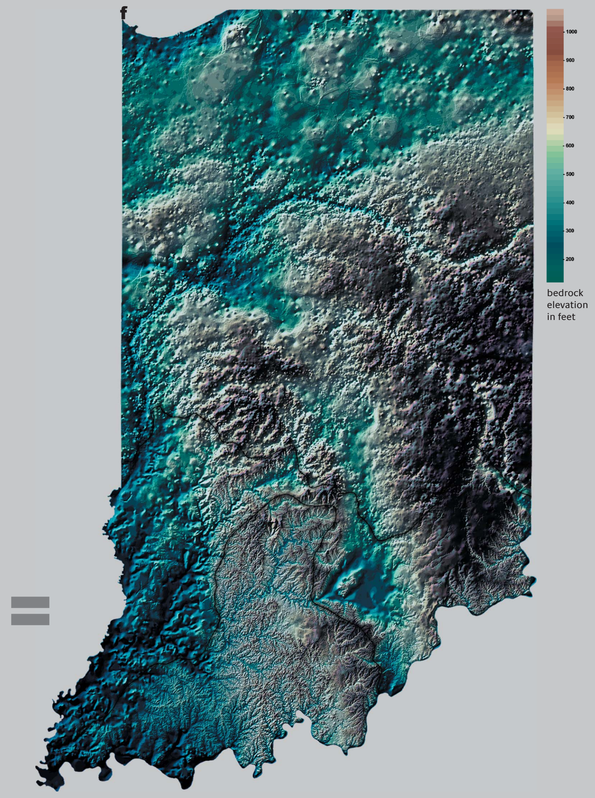
c - Digital bedrock elevation data collected from water well and petroleum and seismic refraction databases. These data were used to make map **d**. Data are less dense south of the Wisconsin limit of glaciation, where the landscape is also more variable, making statistical mapping difficult in this region.



d - Bedrock surface created using the Inverse Distance Weighting interpolation method. Corrections for grid intersections of the DEM with the bedrock surface were made in ArcView Spatial Analyst. The northern portion of this map was used in the final bedrock image (map **f**).



e - Hillshaded grid of surface DEM. IGS Miscellaneous Map 49 (1989)—Quaternary Geologic Map of Indiana by Henry H. Gray—was used as a template to designate areas of shallow bedrock. These areas were replaced with a transparent hillshade in the upper layer in the final image (map **f**).



f - Final image of the bedrock topography of the state of Indiana using both traditional and statistical mapping methods. The image is a combination of map **d** in the north and maps **b** and **e** in the south. Photoshop enhancements include adjustment layers with various contrast and color corrections applied.

Traditional mapping:

-highly interpretive
-irreproducible
-requires a single geologic model of several possible

Maps **a, b, g, h,** are traditional contour maps shown first as shapefiles and then as 200 meter grids that were made using ArcInfo and the TOPOGRID module.

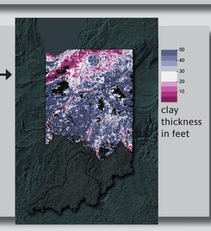
Statistical mapping:

-elucidates uncertainty
-illustrates variation
-provides context for furthur exploration
-completely reproducible

Maps **d** (above) and **j** (below) were made using digital databases and ESRI's Spatial Analyst. Several statistical methods are available in Spatial Analysis to interpolate the data and make a grid. Inverse Distance Weighting is an interpolation method which allows several simple variables to be set. These maps were made using 12 neighbors, power 2 and a grid cell size of 200 meters.

Statistical mapping provides a mechanism to describe digital subsurface data sets. Other statistical maps that may be created using this method are clay/sand ratio maps (dark red = 100% sand, dark blue = 100% clay).

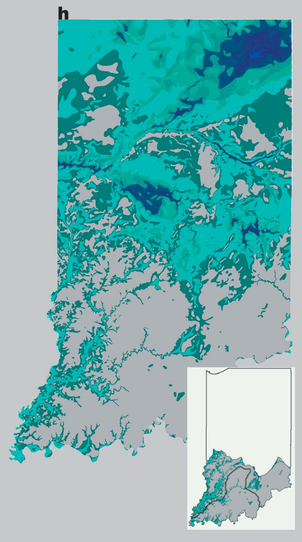
Clay/sand ratio maps:
0–25 ft
0–50 ft →
0–100 ft
0–200 ft
25–50 ft
50–100 ft
100–200 ft
(all depths calculated from the surface)



unconsolidated thickness

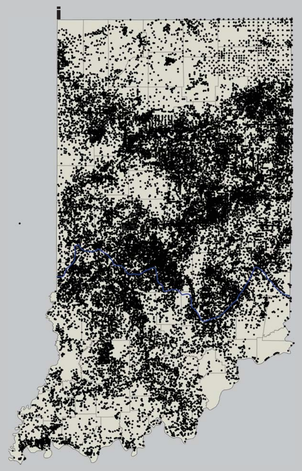
traditional

g - IGS Miscellaneous Map 37—thickness of unconsolidated deposits by Henry H. Gray (1983)—displayed as vector contour lines.

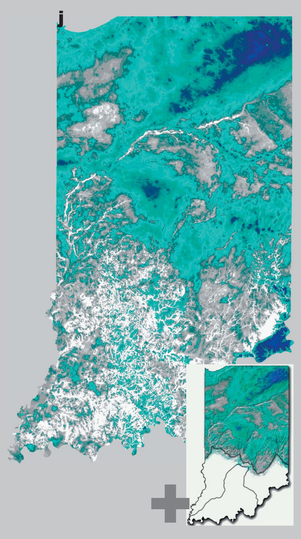


h - IGS Miscellaneous Map 37 displayed as an image of a grid created from map **g** with TOPOGRID. The southern portion of the state has both areas of shallow bedrock and thick valley deposits. The southern portion of this map was used in the final image—thickness of the unconsolidated deposits (map **l**).

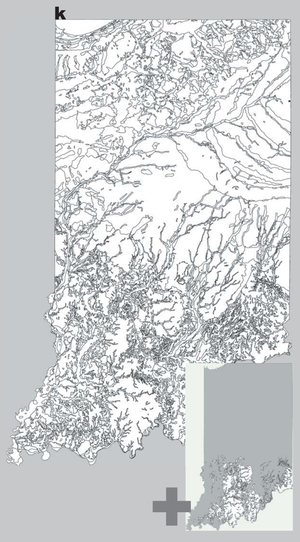
statistical



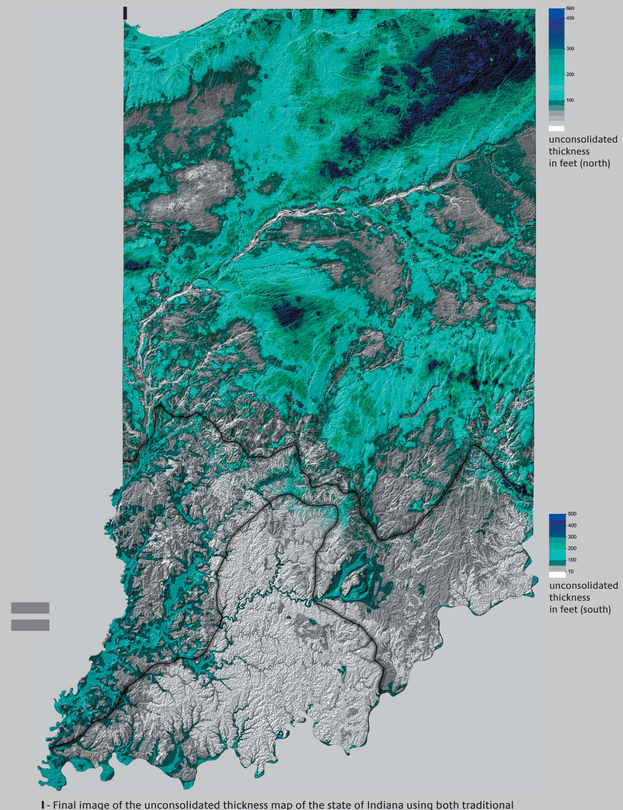
i - Digital bedrock elevation data collected from water well and petroleum and seismic refraction databases. These data were used to make map **j**. Data are less dense south of the Wisconsin limit of glaciation, where the landscape is also more variable, making statistical mapping difficult in this region.



j - Thickness of the unconsolidated deposits created by subtracting the bedrock surface (map **d**) from the surface DEM in Spatial Analyst. The northern portion of this map was used in the final image (map **l**).



IGS Miscellaneous Map 49—Quaternary Geologic Map of Indiana by Henry H. Gray (1989)—displayed as vector contour lines. Areas designated as shallow bedrock were used as the upper layer in the final thickness of the unconsolidated deposits map (map **l**).



l - Final image of the unconsolidated thickness map of the state of Indiana using both traditional and statistical mapping methods. The image is a combination of map **j** in the north and maps **h** and **k** in the south. Photoshop enhancements include adjustment layers with various contrast and color corrections applied.

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References:
H.H. Gray, 1989, Quaternary Geologic Map of Indiana. Indiana Geological Survey Miscellaneous Map, MM49.
H.H. Gray, 1983, Map of Indiana Showing Thickness of Unconsolidated Deposits. Indiana Geological Survey Miscellaneous Map, MM37.
H.H. Gray, 1982, Map of Indiana Showing Topography of the Bedrock Surface. Indiana Geological Survey Miscellaneous Map, MM36.