Keeping the Peace: Migrating the Surficial Mapping Process from Paper to Digital Format

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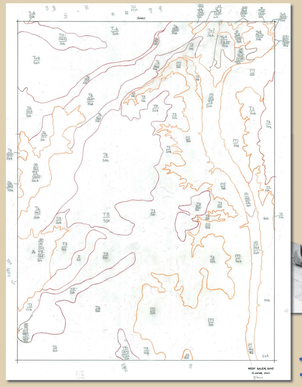
Old Mapping Methods

Previous to the 2008 STATEMAP grant, GIS was only used for the second half of the mapping process. The majority of mapping was done by hand on paper and mylar.



Example of 1:24,000-scale (24k) quadrangle surficial map hand drawn on mylar.

Ohio Geological Survey geologists mapping pre-GIS.

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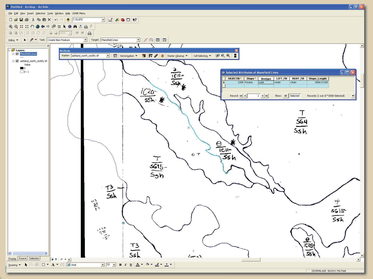
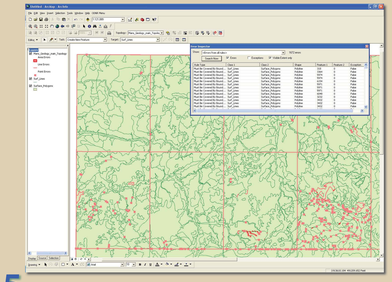
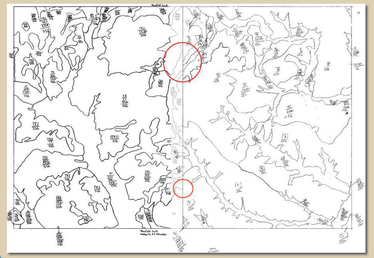
4 Surficial mappers having a boundary dispute.



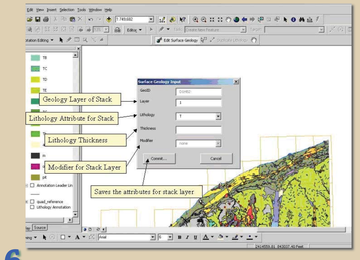
2 Each 24k quadrangle mylar was scanned and loaded into ArcMap to be georeferenced. The lines on the image were then digitized using the ArcScan extension. During digitization, each line was manually attributed as dashed or solid according to the uppermost lithology units.



5 After all boundary disputes had been negotiated, topology was run to resolve any issues with overlapping lines or lines that were not snapped to boundaries properly. Then the lines were converted to polygons and the appropriate topology rules were run to correct errors in this feature class.



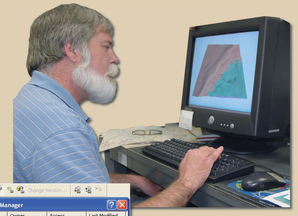
3 Example of bordering 24k quadrangles with boundary disputes. Problem areas are circled in red. Surficial mappers often have trouble agreeing on which materials exist along 24k quadrangle boundaries. Resolving these disputes was one of the largest time consumers of the mapping process.



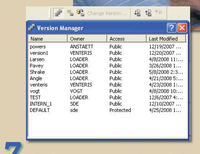
6 Each polygon had to be attributed with the appropriate lithology information. This was done using a tool created specifically for the Ohio Geological Survey's surficial mapping project. Generally, the work was done by interns and involved examining the mylar with the printed stack information and entering it layer by layer.

New and Improved Mapping Methods

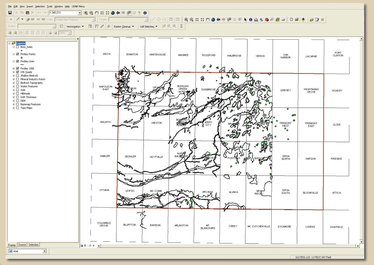
Beginning with the 2008 STATEMAP grant, all mapping for the surficial project is now done digitally. After several training sessions, the geologists were lean, mean, GIS-mapping machines! Well…not exactly. But they were able to learn the process quickly and are using it for this year's 30' x 60' quadrangle. Thus far, the reviews have been very positive!



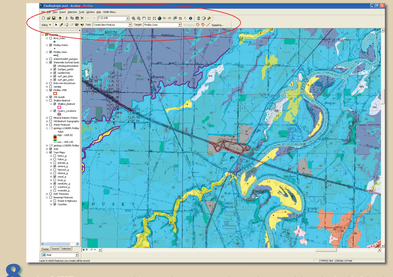
Ohio Geological Survey geologist mapping with GIS.



7 Each mapper was given their own version of a geodatabase. There are two available feature classes: one for lines and one for points.



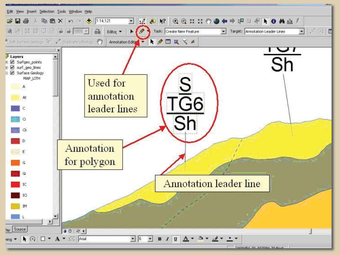
9 All the surficial mapping units are drawn on screen as lines and the stack labels are stored in a text field in the point feature class. Each mapper edits his own version of the geodatabase and then reconciles it with the default. Once per week, the database administrator posts all the versions back to the main database. Once they have been posted, each user can see the entire database and all the work of the other mappers. This helps highlight problem areas during mapping rather than after it is complete.



8 An MXD was created for each mapper where they could make individual customizations. The number of available tools was minimized and commonly used tools were added to the layout. For example, the trace tool, snapping menu, streaming shortcut, and start and stop editing functions. Additionally, the following base and geologic maps were made available as layers:

- New line and point feature classes
- Water well boreholes
- Mineral industry points (sand and gravel pits only)
- Bedrock topography
- Soils
- Hillshade
- Drift thickness
- Digital Elevation Model
- Digital Raster Graphics
- Basemap features: water, roads, counties, 24k quadrangles

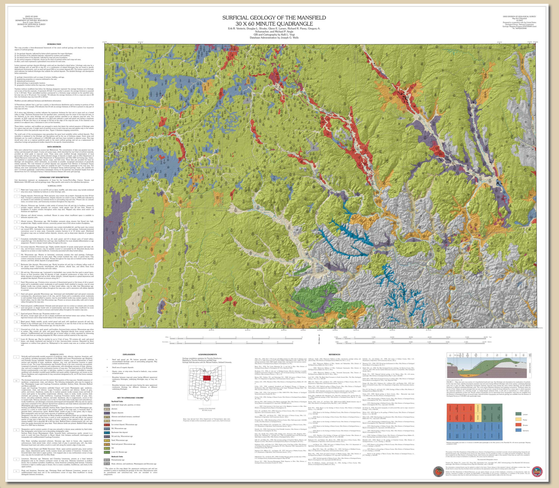
10 Once the geologists' mapping is complete, topology, similar to that of the old mapping method, is run on the lines. Polygons are created from the lines and topology is run again. Rather than having interns enter each unit's lithology, the database administrator extracts the information from the point labels and adds them to the general lithology table.



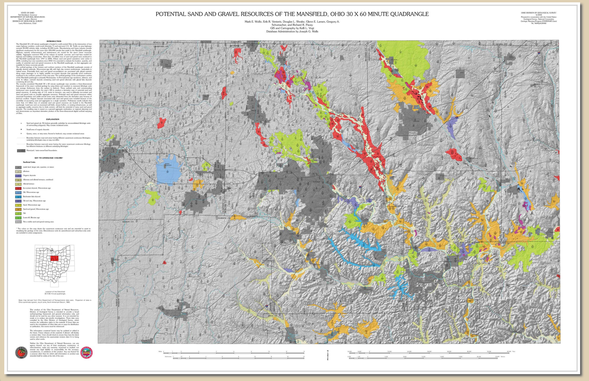
11 Annotation/stack labels are manually entered using a tool designed specifically for the Ohio Geological Survey's surficial maps.

Advantages of the New Digital Surficial Mapping Process

- **With just a click of the mouse, all information necessary for mapping is available on screen.**
- **Mapping can be done more quickly resulting in greater cost efficiency.**
- **The entire process, from digitizing lines to generating a published map, can be finished in a timely fashion.**
- **There are no more mylars or printed paper maps, so less waste is generated.**
- **Mappers can see boundary issues that arise while they are mapping rather than later.**
- **Lithology information can be extracted via Access rather than having interns manually enter the information.**



12 Finished 30' x 60' surficial map.



13 Surficial geology data can also be used to create derivative products. In this map, the surficial units and corresponding thicknesses were queried to extract areas with viable sand and gravel resources. A 1:4 waste to resource ratio was used to determine potential aggregate mining areas.

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