MapCalc Interface and Display *(design statement 7/00)*

The MapCalc system contains many capabilities that are not available in most desktop GIS packages. The following presentation will describe MapCalc from a variety of perspectives…

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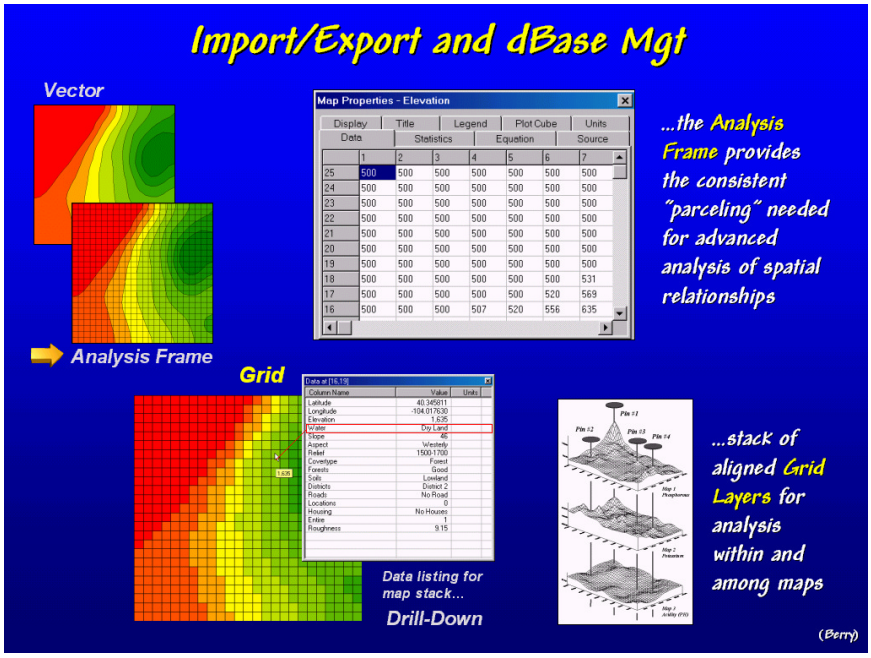
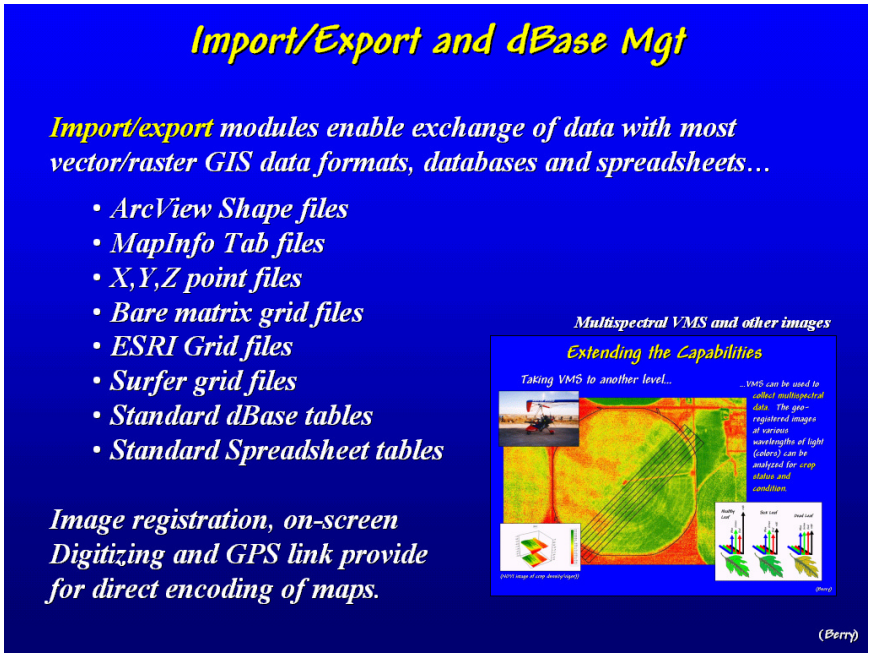
- ***Import/Export and dBase Mgt***
- ***Map Display and Summary***
- ***User Interface and Macro Builder***
- ***Spatial Statistics and Analysis Operations***
- ***Future Directions***

- ***Import/Export and Database Management…***

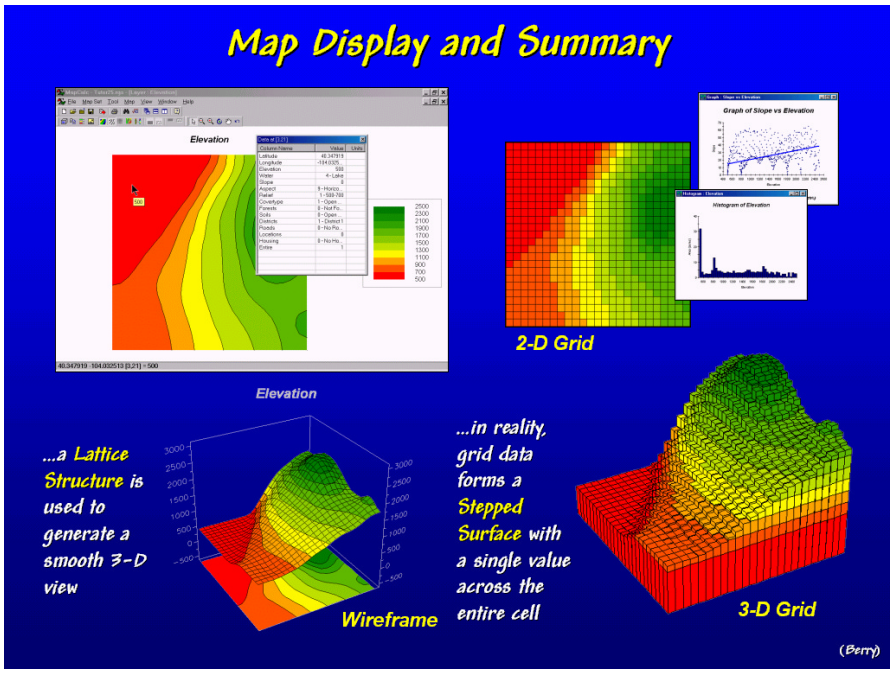


Import/Export and Database Management. Traditional *vector maps* contain irregular polygons (e.g., discrete terrain contours) that assume the same response everywhere within a polygon. For example, map locations within a 500-700 foot contour polygon cannot be identified by their actual elevation values within that broad range. An *analysis frame*, serves as a "spatial sampling design" that carries a value for each sample location, termed a grid cell. A *grid map* forms a continuous spatial distribution of a map variable, such as an elevation surface. The consistent grid reference provides a structure that facilitates advanced analytical capabilities that cannot be performed using traditional vector maps.



Import/Export and Database Management. MapCalc can exchange data in a variety of standard formats and contains tools for direct encoding of maps. Research into integrating Red Hen System's video mapping device (Multimedia Mapper) is underway. The device can be used to collect digital multispectral imagery that becomes additional grid layers for analysis in MapCalc.

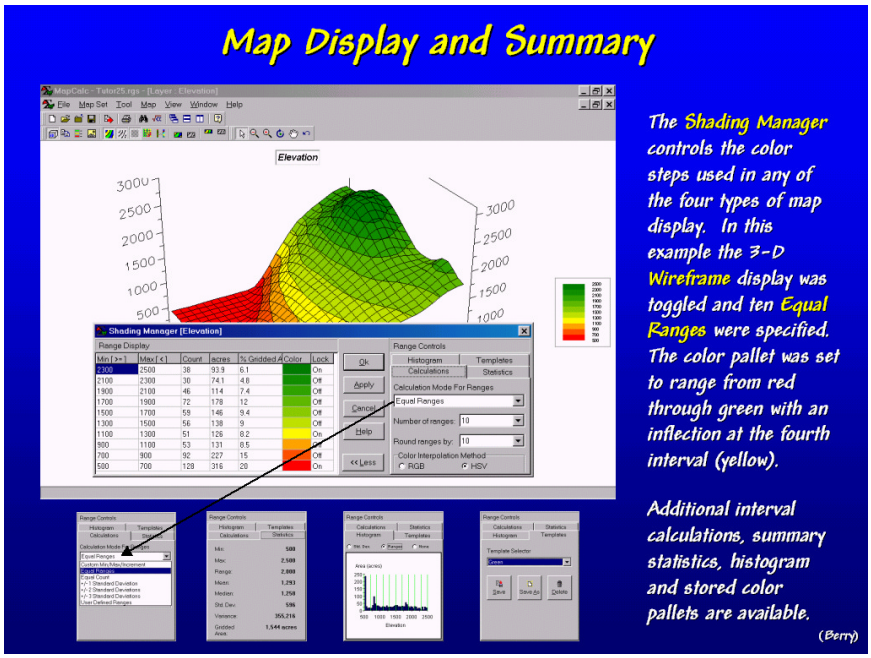
- ***Map Display and Summary…***



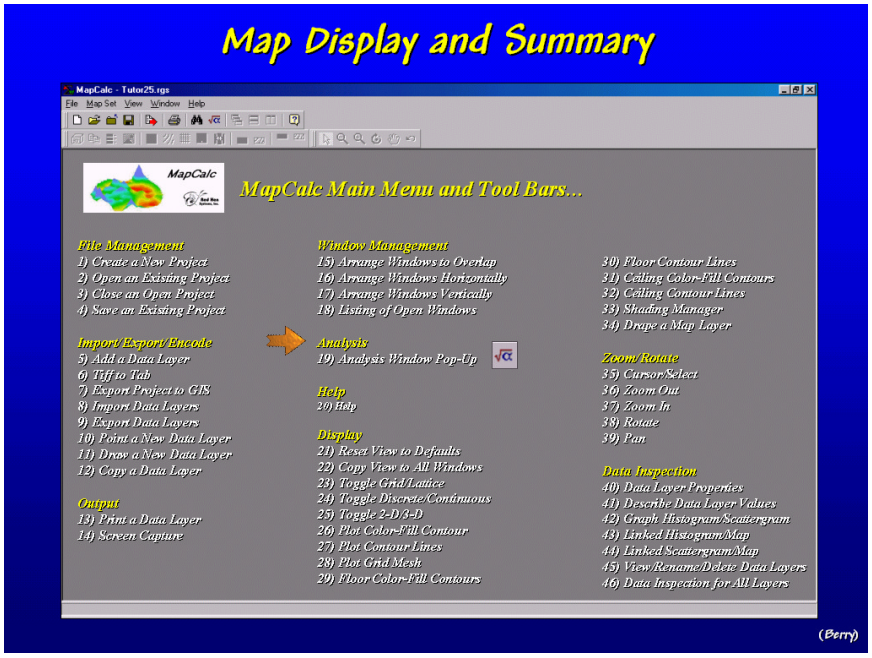
Map Display and Summary. MapCalc provides four types of map display for grid surfaces…

- ü ***2-D Vector*** – traditional "color-fill contour" maps composed of line segments defining boundaries,
- ü ***2-D Grid*** – each grid cell is assigned a color that corresponds to its stored value (interval range),
- ü ***3-D Vector*** – commonly referred to as "wireframe maps" that connect lines to the center of each cell raised to the height of its stored value, and
- ü ***3-D Grid*** – each grid cell is raised to the height of its stored value (extruded).

Vector displays provide smoothed renderings of map surfaces while grid displays show the actual appearance of the stored data. Summary statistics and charts, such as histograms and scatterplots, are easily generated from grid data.

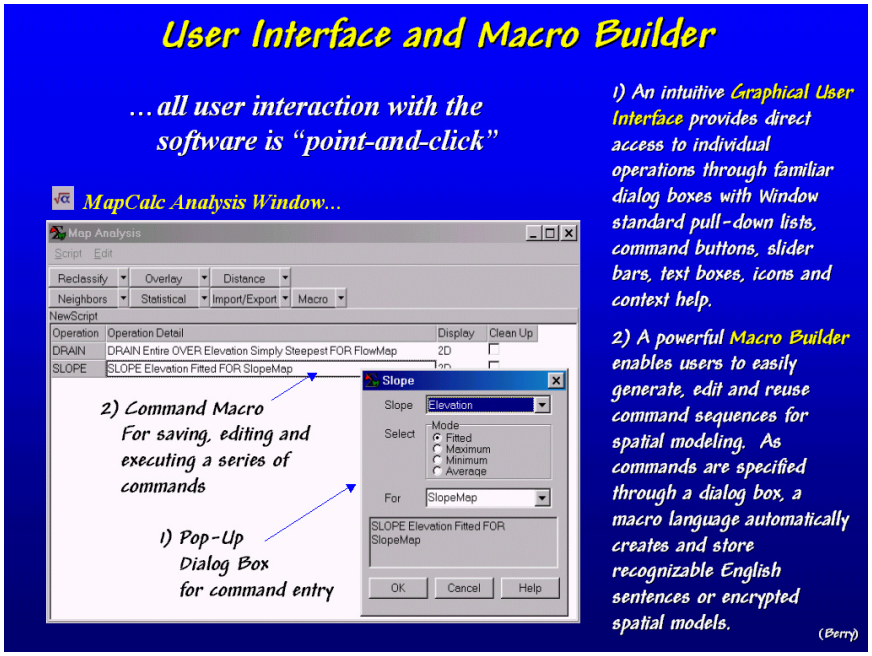


Map Display and Summary. MapCalc's Shading Manager sets the contour intervals and color pallet for all four of the display types.



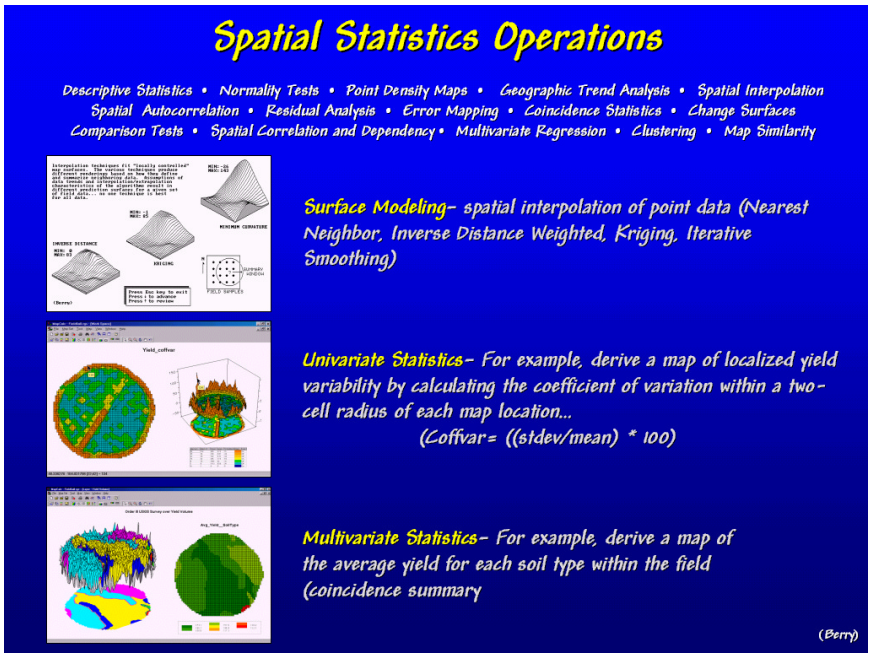
Map Display and Summary. An extensive set of data handling, map display and summary tools are available… all within a "point-and-click" interface. Comprehensive "online help" is available for each operation.

- ***User Interface and Macro Builder…***



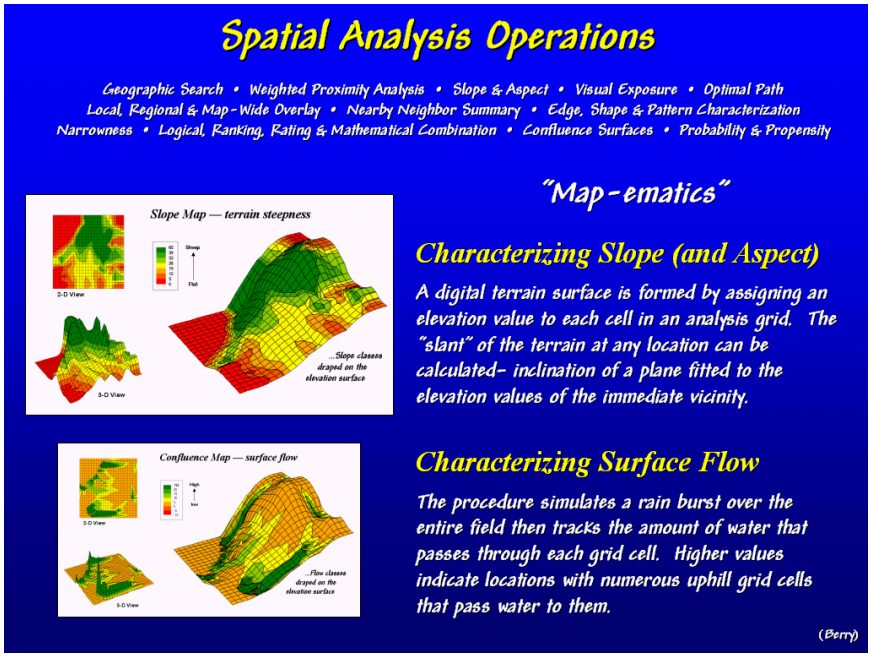
User Interface and Macro Builder. The analytical operations are specified through interactive ***Dialog Boxes***. Completed commands are written to a ***Macro Builder*** that provides storage, editing and reuse of command sequences (scripts). The easy to use interface enables the development of GIS models that address a wide variety of applications.

- ***Spatial Statistics Operations…***



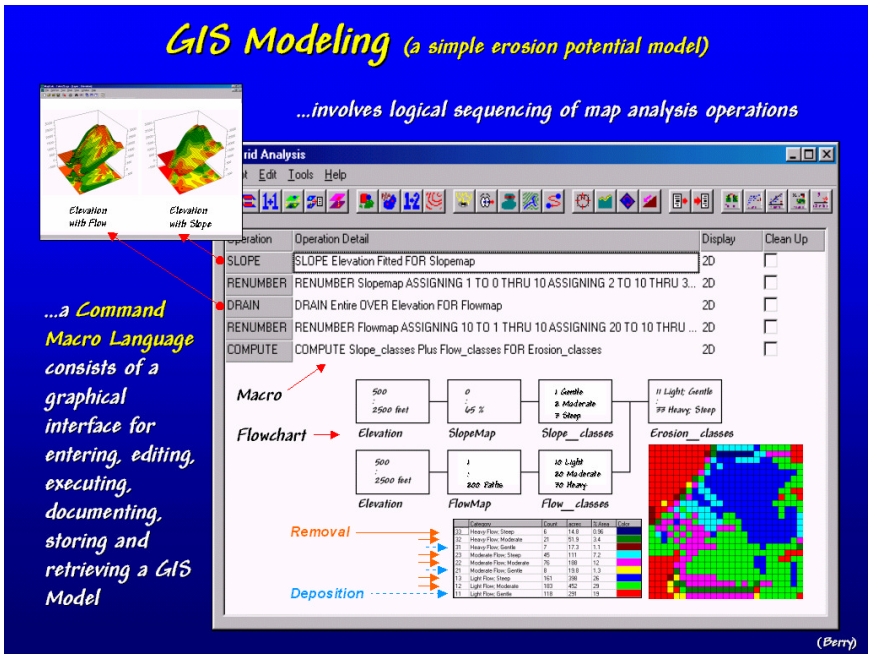
Spatial Statistics Operations. MapCalc analytical operations can be divided in Spatial Statistics and Spatial Analysis. ***Spatial Statistics*** involves techniques that mathematically summarize the spatial distribution of data and the relationships among maps…

- ü ***Surface Modeling*** – interpolation of point samples for continuous map surfaces
- ü ***Univariate Statistics*** – summarize patterns within a single map
- ü ***Multivariate Statistics*** – summarize the coincidence and relationships among two or more maps.



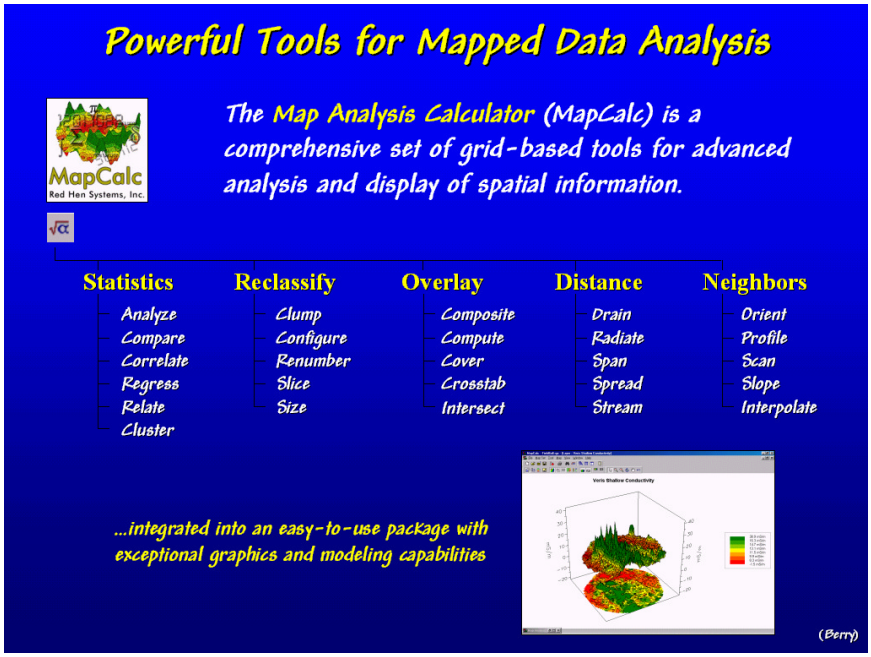
Spatial Analysis Operations. Operations involving ***Spatial Analysis*** characterize the geographic context

of map features, such as distance, optimal paths, visibility, shape/pattern, and slope/aspect. In this example, terrain analysis is used to characterize the slope and surface flow for an area.



GIS Modeling. A ***GIS Model*** can be thought of as a "big button" involving a logical sequence of operations. For example, the model in this figure uses the SlopeMap (terrain inclination) and FlowMap (relative water volume) to identify areas that surface materials (e.g., fine soil particles, organic matter, applied chemicals, etc.) are removed and subsequently deposited. While common sense suggests materials on steep slopes and heavy flows are transported to areas that have flat slopes and moderate to heavy flows, spatial science is needed to properly calibrate the model. Grid-based map analysis serves both the researcher's development of GIS models and the land manager's operational implementation.

- ***Powerful Tools for Mapped Data Analysis…***



Powerful Tools for Mapped Data Analysis. MapCalc contains basic and advanced analytical tools. While most desktop GIS packages contain procedures for viewing and querying mapped data, few can analyze spatial relationships without adding expensive and complex extensions with minimal integration with the basic system. MapCalc provides these capabilities in an easy to use environment. Future capabilities under consideration include…

- ***…enhanced and extended features for existing data handling, analysis and display capabilities***
- ***…interactive links between spatial (maps) and numerical (scattergram) distributions***
- ***…integrated project manger and database design***
- ***…integrated model flowcharts and command macro builder***
- ***…enhanced remote sensing data links and image analysis capabilities***
- ***…integrated data mining module***