



Carleton College — Environmental and Technology Studies

*Intensive Workshop*

## Grid-based Map Analysis Techniques and GIS Modeling

<[click](#)> for printer-friendly version of this document (.pdf)

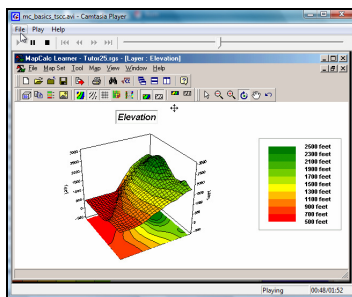
### Infusing Grid-based Map Analysis into Teaching

...participants will adapt/develop map analysis demonstrations and hands-on exercises for use in their own courses. **Friday, March 21, 2008, 9:00 am to 12:00 pm** (optional extension into the afternoon).

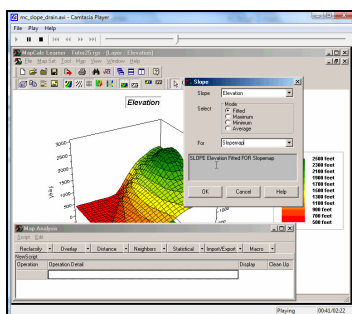
**Below are some ideas for projects** ...it is likely other ideas will surface during the presentations and discussions on Wednesday and Thursday; also, many of the projects could be implemented for local data sets. The examples are organized into two groups—*GeoExploration* emphasizing map visualization (more humanities-oriented) and *GeoScience* emphasizing map analysis (more science-oriented).

#### GeoExporation (map visualization emphasis)

1) Exercise to produce **Training Videos** of computer processing. Use *SnagIt* to produce videos of computer processing steps that can apply to any computer exercise (not GIS-specific). For example...



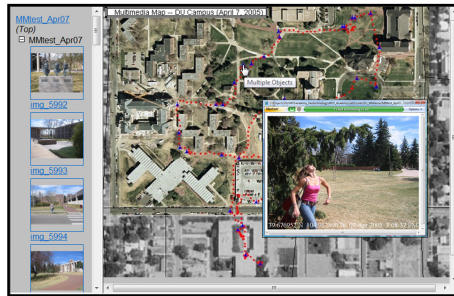
click [MapCalc Basics](#) to run a SnagIt video demonstrating some of the basic MapCalc display and map handling features.



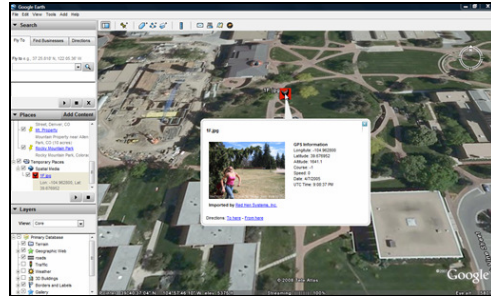
click [MapCalc Basics](#) to run a SnagIt video demonstrating some of the basic MapCalc display and map handling features.

2) Exercise to produce **Multimedia Maps** linking photos and maps. Carry a GPS and take field photos of campus and then use *MediaMapper* to automatically geo-register the photos to a HTML map and Google Earth display of the area.

[see <http://www.redhensystems.com/>]



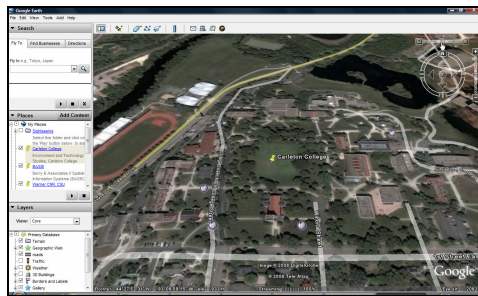
HTML Webpage



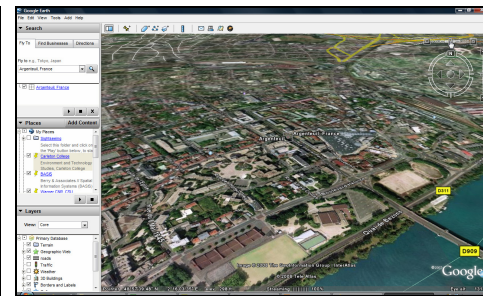
Google Earth Display

3) Exercise using **Google Earth** to visualize the globe and stars. Use Google Earth to develop “tours” that coincide with class lectures, such as locations where the French Impressionist painters practiced their craft.

[see <http://earth.google.com/>]



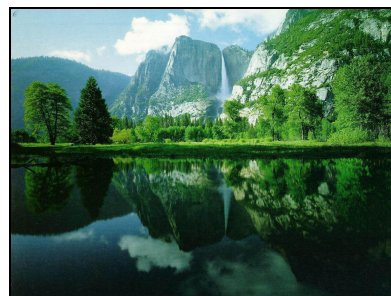
GE display of Carleton College



GE display of Argenteuil, France (Monet)

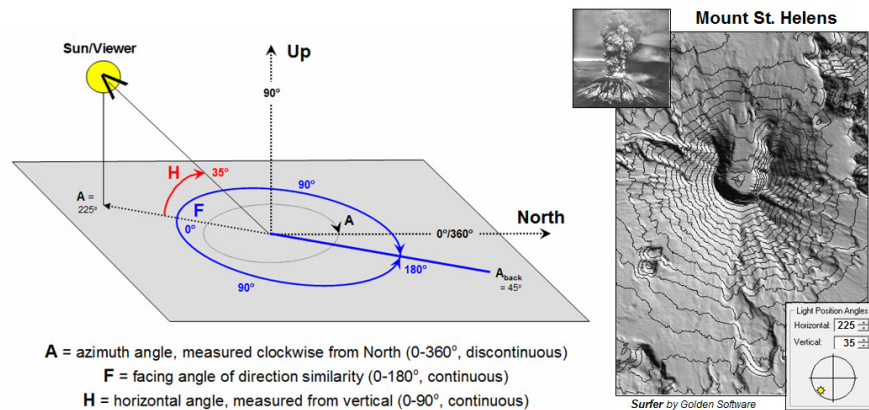
4) Exercise demonstrating **GIS-based Virtual Reality** to visualize landscapes. Investigate the applications gallery for 3D visualization of landscapes generated using 3D Nature’s *Visual Design Studio* software linked to GIS data bases. Prepare an exercise that illustrates the thin line between “Reality and Fantasy” and how spatial technology can be both a benefit and a curse for student discussion of the social, cultural and moral impacts of Geotechnology (cyber-liberation versus geo-slavery).

[see <http://3dnature.com/>]



5) Exercise investigating **Hillshade and Insolation Indices**. Use *Surfer* and terrain data (DEM) to demonstrate terrain effects on the amount of solar energy per unit area throughout a project area. One can download DEM data for anywhere in the continental U.S.

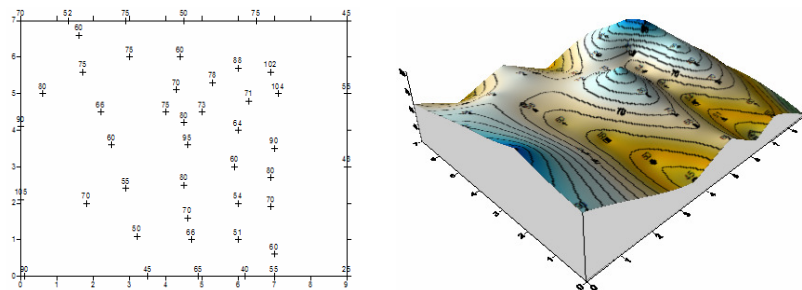
[see <http://www.innovativegis.com/basis/MapAnalysis/Topic11/Topic11.htm#Hillshade>]



## GeoScience (map analysis emphasis)

6) Exercise investigating **Spatial Interpolation and Surface Mapping**. Use *Surfer* and an inexpensive handheld GPS unit to collect spatially-aware data, such as elevation (Lat, Lon, Altitude) for an open space on campus with rolling terrain.

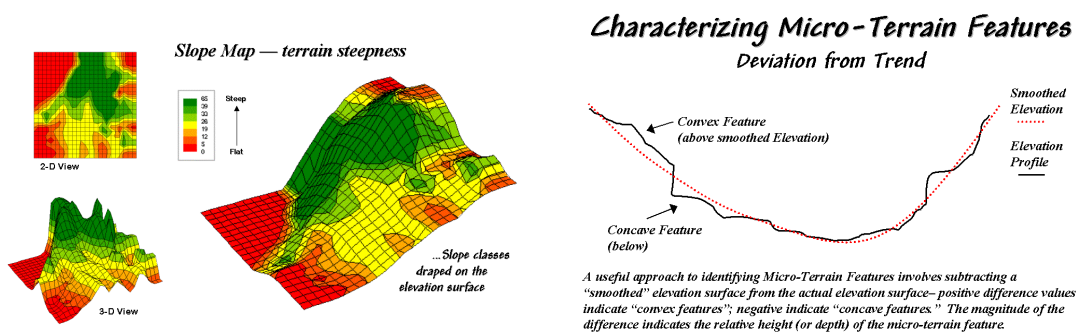
[see <http://www.innovativegis.com/basis/MapAnalysis/Topic2/Topic2.htm>]



Another possibility is to collect environmental data (Lat, Lon, Value) to create an abstract map surface, such as soil chemistry concentration or estimated vegetation density of forbs per meter plot sampling. Both exercises provide a good exposure to spatial sampling design concepts.

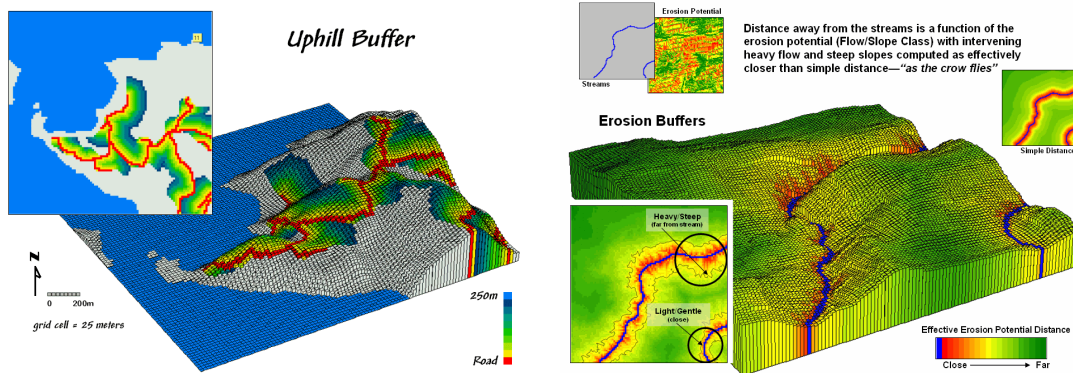
7) Exercise investigating **Micro-Terrain Configuration**. Use *MapCalc* to calculate slope, aspect, roughness, and configuration (convex/concave features). Terrain complexity has a significant effect on surface water flows and retention for vegetation use.

[see <http://www.innovativegis.com/basis/MapAnalysis/Topic11/Topic11.htm>]



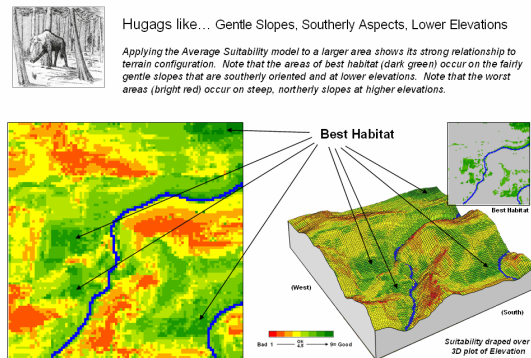
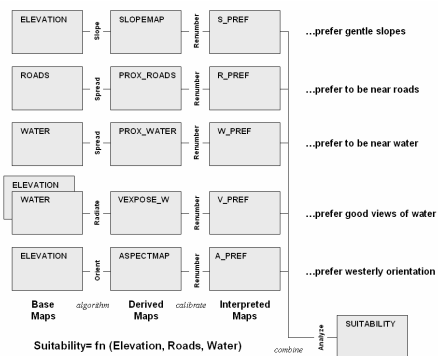
8) Exercise investigating **Variable-width Buffers based on Effective Proximity**. Use *MapCalc* to generate variable-width buffers, such as an uphill buffer from roads or a sediment loading buffer set around streams considering, slope, vegetative cover and soil type. The use of simple-distance buffers of a fixed reach is often too simple to be useful. For example, a fixed distance buffer around streams often fail to protect them in areas of high erosion potential and often over-reach in areas of minimal erosion potential—effectively accounting for both environmental and economic interests require resource

professionals to toss out the Euclidian distance paradigm along with their straightedge rulers.  
[see <http://www.innovativegis.com/basis/MapAnalysis/Topic13/Topic13.htm> and <http://www.innovativegis.com/basis/MapAnalysis/Topic24/Topic24.htm>]



9) Exercise investigating **Campground Suitability Modeling**. Use *MapCalc* to create, implement and refine a suitability model assuming that the most preferred areas for a campground are Gently Sloped, Westerly Oriented, Near Roads, Close to Water and have Good Views of water. Extend the analysis to include a preference to be In or Near Forests, as well as generating and comparing three separate scenarios that reflect the relative weighting of different recreation groups. A related exercise might investigate Habitat Suitability modeling—people and animals, we all have our preferences.

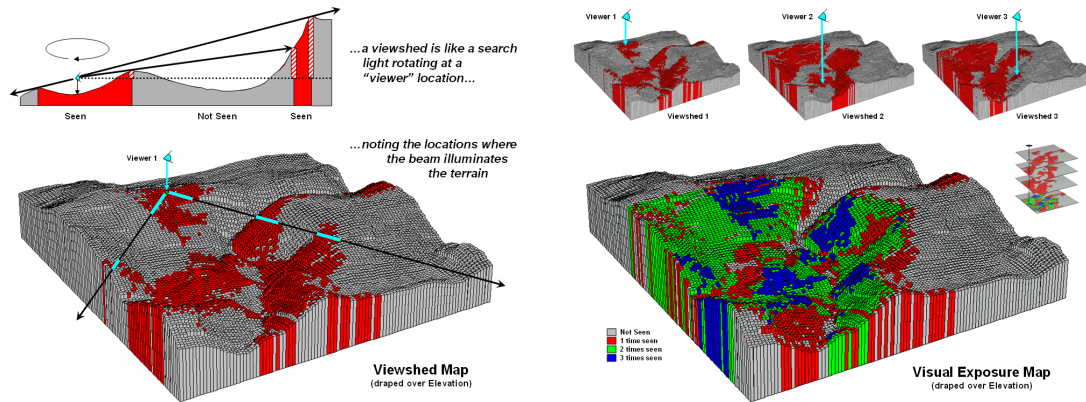
[see <http://www.innovativegis.com/basis/MapAnalysis/Topic23/Topic23.htm>]



10) Exercise investigating **Viewshed and Visual Exposure Analysis**. Use *MapCalc* to generate Viewshed, Visual Exposure, Weighted Visual Exposure and Visual Vulnerability maps. Use these maps to assess the visual impact of proposed development alternatives.

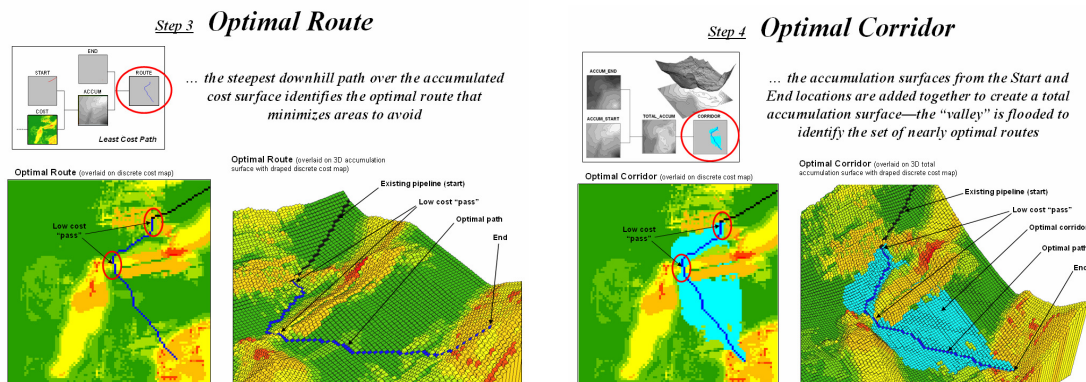
[see <http://www.innovativegis.com/basis/MapAnalysis/Topic15/Topic15.htm>]





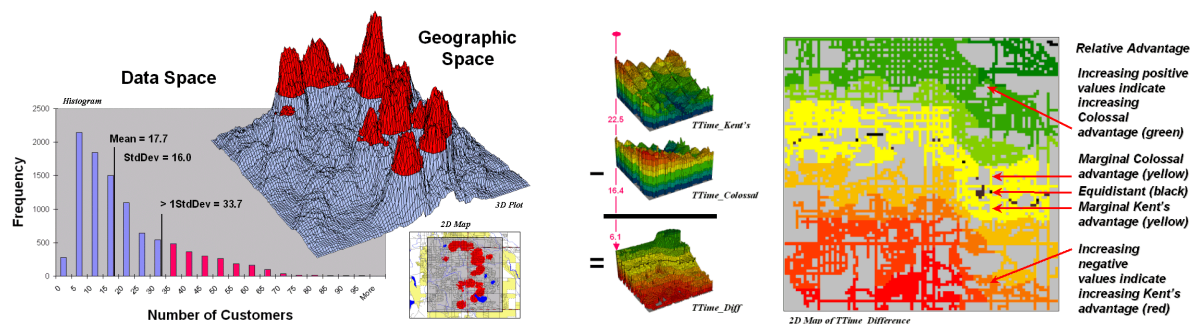
11) Exercise investigating **Optimal Routing**. Use *MapCalc* to determine the optimal route and corridor for a power line considering relative preferences of avoiding areas of High Housing Density, Far from Roads, In or Near Sensitive areas and have High Visual Exposure to Houses. Extend the analysis to include a preference to be in Open Areas or along Forest edges, as well as generating and comparing three separate scenarios that reflect the relative weighting of different recreation groups.

[see <http://www.innovativegis.com/basis/MapAnalysis/Topic15/Topic15.htm>]



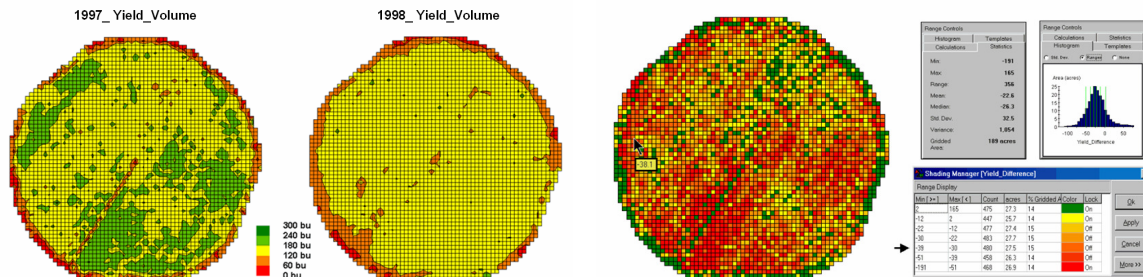
12) Exercise investigating **Retail Competition Analysis**. Use *MapCalc* to generate customer density surface and isolate pockets of unusually high concentrations. Extend the analysis to determine relative travel-time from two stores and derive their combat zone" with minimal travel-time advantage for either store.

[see <http://www.innovativegis.com/basis/MapAnalysis/Topic17/Topic17.htm>]



13) Exercise investigating **Crop Yield Mapping and Analysis**. Use *MapCalc* to analyze the spatial patterns and relationships of crop yield that occur throughout a farmer's field focusing on procedures for map surface normalization and comparison of relative yield within a field (univariate/descriptive statistics focus).

[see <http://www.innovativegis.com/basis/MapAnalysis/Topic16/Topic16.htm>]



14) Exercise investigating **Map Similarity and Field Clustering**. Use *MapCalc* to analyze the spatial patterns and relationships among mapped data layers focusing on procedures for map similarity and grouping of similar data patterns (multivariate/prescriptive statistics focus).

[see <http://www.innovativegis.com/basis/MapAnalysis/Topic16/Topic16.htm>]

