

GIS: Spatial Analyst: Flooding Florida

Summary

This project uses Spatial Analyst to look at the question of how many people would be affected in Florida, and where, if the sea level were to rise just two meters. This download contains a 17-minute ScreenCam movie showing the entire exploration in operation. It also contains special files used in the project. (Anyone using Windows can watch the movie using just the Lotus ScreenCam player, available as free download from www.lotus.com/screencam.)

Materials

AV 3x Spatial Analyst software

Data files from the attached zipped file: ["lsn_safl.zip"](#).

Background for Teachers

If global warming is a real phenomenon and sea-level rise does occur, would people be affected? This is a problem that calls for ArcView and Spatial Analyst. By exploring elevation data and integrating this information with the location and population of cities in Florida, we can begin to see some of the possible impact.

This package of files includes a ScreenCam video showing ArcView and Spatial Analyst in operation. The movie contains a series of captions, showing groups of steps. The steps are listed below. You should be able to follow the basic operation and duplicate the procedure on your computer, if you have ArcView and Spatial Analyst. The video shows accessing some data that had been copied to the hard drive from the Spatial Analyst CD and from the ArcUSA CD. The data file of Florida cities (from the 1990 Census) and the elevation legend shown in the video are included in this package of files.

Use the ScreenCam player (freely available from <http://www.lotus.com/screencam/>) to display the video. Use the video control panel buttons to rewind, pause, play, and fast forward as needed.

Instructional Procedures

To complete this activity get the data files from the attached zipped file: ["lsn_safl.zip"](#).

Engage ArcView and load the Spatial Analyst extension for Windows 95/NT. (This video uses Spatial Analyst version 1.1, so the menus may look slightly different from your version.)

Create a new view.

Add North America elevation data from the Spatial Analyst CD.

Apply the "nam_elev.avl" legend accompanying this exercise.

Set the projection as "Lambert Equal Area Azimuthal", centered at 100-west, 45-north.

Set the distance measurements as miles.

Add ArcUSA "2mg" (stored in decimal degree) counties.

Isolate the counties layer on Florida.

Zoom to Florida and display, then save project.

Set grid analysis properties.

Create Florida base grid from the county shapefile.

Subset the North America elevation data using the Florida base grid as a mask.

Change the legend for the Florida elevation grid, then save project.

Reclassify the Florida elevation grid into 2 classes, breaking at 2 meters.

Convert the reclassified Florida grid into a new shape.

Query the Florida shape to highlight the area under 2 meters.

Add "fl90city.txt" table to project.

Add "fl90city.txt" table as an event theme in the view.

Select cities that are within 3 miles of the selected portion of Florida -- the shape representing the area of 0-2m elevation. (This step will take some time.)

Open the cities table, highlight the population field, sort the field from high to low, and show field statistics.

Now that you have seen the operation at work, see if you can duplicate the process. You may want to move the North America DEM data from the Spatial Analyst CD to your hard drive, as well as the ArcUSA decimal degree 1:2,000,000 scale county data, to speed up the data display process. Then, be sure to navigate to where you have the data stored, at the appropriate steps.

The original exercise shows one way to accomplish the task. There is another way, starting at Step#14. See if you can follow these directions to accomplish a similar result.

Make active the Florida elevation grid theme and use the query builder to select areas in the theme that are less than 3 meters.

From the Florida elevation grid, convert the selected data to a shapefile called "flunder3.shp"

Open the table for "flunder3.shp" and select all items in the table.

Continue as above, at number 17.

(Finally, if you want to try this and don't have access to the source data from the Spatial Analyst CD, included in the "Isn_safl" directory is the Florida elevation subset, as a grid called "fl_elev." This will let you shortcut the original steps 3-8.)

DISCUSSION: The Spatial Analyst extension to ArcView allows you to conduct some very powerful analyses. You might find other ways to explore similar information in other parts of the U.S., or the world. It is important to recognize that the data being used will affect the quality of decisions that can be made. This specific example uses fairly coarse elevation data -- 1 kilometer resolution. Finer scale data is available for local areas, and is vastly preferable if decisions actually affecting lives are being made. Similarly, the cities are shown here only by "internal center," rather than extent of populated area. The query was set to identify city centers within 3 miles of the flooded zone, which might miss some important areas of impact. Still, the process shows, quickly and roughly, that a large number of people would be directly affected by such flooding. This should be sufficient to inspire further analysis, using more detailed data, if more exact implications are needed.

The activity easily could be replicated to provide a look at localized flooding in river valleys. Similar procedures might permit the exploration of numbers of people affected by dispersion of various contaminants, or exploring the impact of airport noise on different neighborhoods. There are many opportunities to expand these concepts and skills!

TECHNICAL NOTE: The movie demonstrates a technique that can speed up procedures in ArcView. When the user is comfortable with the tasks and data, many operations can be performed without having to display all the changes. The movie doesn't actually show the display of data until Step#9. This saved a number of "display changes," which can mean a significant time saving when using large data sets. This is only a savings, though, when the user knows for sure what would be displayed.

Bibliography

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