

ArcGIS - Buffering

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Introduction

Creating a “buffer” around a given point, line, or area allows researchers to identify what might be affected by an event or activity. It can help identify neighbors for spatial analysis (see Resource Documents 02-03, 02-06, and 02-07), illustrate points about segregation and spatial patterning, or aid in grouping multiple observations. Using ArcGIS 8.x, the user can create buffers at a specific distance or use an attribute value to create variable width buffers.

(From the “Using ArcMap” manual from ESRI, Corp.): “Creating a buffer provides a visual representation on your map of the area within a certain distance of one or more features. You can also use the buffer to select features in other layers that fall within the buffered area.” (p. 384)

Creating and Using Buffers

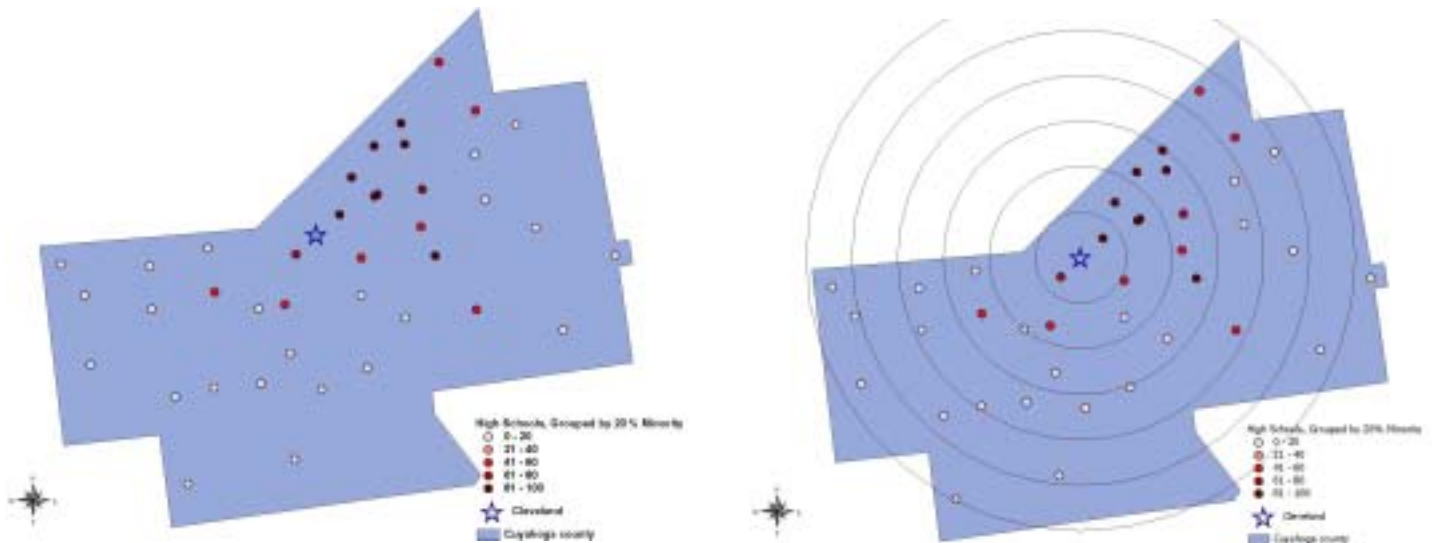
The creation of buffers in ArcGIS 8.x is very easy and streamlined, using a wizard interface to specify the parameters the user wants to define the buffers. Access to the Buffer Wizard is found under the Tools menu. The number of desired buffers to be drawn, the distance at which they should be drawn, and the unit of distance to be used are all selectable through this wizard, as well as the basis on which draw them, such as at a specified distance, or based on the distance from an attribute. A buffer can be drawn around a point, such as a city, a particular street address, or crime scene; a line, such as a road or river; or an area, such as a county, school district, or country.

For example, one could have a map of a county in the United States containing a large metropolitan area or city, as well as the high schools within that county. Using a particular point within the city as the reference point, such as industrial areas or the downtown Central Business District, buffers could be drawn to illustrate the pattern of racial distribution of the schools within that county: where are the schools with high minority enrollments? With mostly white student bodies?

Using this idea, maps of Cuyahoga County, OH were constructed (see next page). The map on the left shows the locations of the high schools in the county, color-coded by the percent minority (non-white) of their student body (deeper red colors have higher percents of minority students.) The star represents the centroid point of the city of Cleveland. The map on the right adds buffer rings every 2.5 miles, beginning at the centroid point and radiating outward.

Without the buffers it is clear there is a spatial pattern to where minority students attend school; with the buffers it is more readily apparent just how close to the city center the minority-dominated schools really are, and how the suburban schools, particularly those suburbs not immediately around Cleveland proper, are predominantly white. All of the minority-dominated

(>60% non-white students) schools are within 7.5 miles of the city center (13 schools), while only 4 primarily white schools are within this range. The other 18 “white” schools are all outside of this range.



We could next use these buffers to group the schools into “inner-“ and “outer-ring” schools based on these buffers, or create other buffers around each school to analyze them based on the racial breakdown of the other schools nearest to them.

We could also draw multiple buffers, one around each school. Given adequate distance to the buffers, some of them will overlap. We can dissolve the overlapping sections, making a single buffer out of the two (or more) that overlapped.

ArcGIS 8.x also allows the user to save the buffers as a new data source (usually as a shapefile) so that the buffers can be added easily to another map.

Resources

Helpful information, including definitions, exercises, and examples, can be found in the following manuals from ESRI (These (and other) materials can be found in the GIA Core Library in 801 Oswald Tower.):

“Getting to know ArcGIS Desktop: Basics of ArcView, ArcEditor, ArcInfo” by Tim Ormsby, Eileen Napoleon, Robert Burke, Carolyn Groessl, and Laura Feaster.

“Using ArcMap” by Michael Minami.

Additional Information can also be found on the ESRI website at www.esri.com

The GIA Core website can be found at www.pop.psu.edu/gia-core/