Geospatial Analysis
Buffer Zone Generation

The Buffer Zone process in TNTmips (Geometric/Compute/Buffer Zones) has been redesigned to use shape, CAD, region, and pinmap objects in addition to vector objects as input. The buffer zones generated can be saved as a polygonal vector, CAD, or region object. The options presented in the process depend on the object type selected for input and the elements it contains and the target object type. The newly added Accurate method makes it possible to generate very small buffer zones.

Buffer zones can be used for a wide variety of management and planning activities, such as proximity analysis and defining sensitive areas. They can be used in vector or region combinations for a variety of analyses. The Buffer Zone process in TNTmips allows you to generate multiple interior or exterior buffer zones in a single pass with the same or different setback distances. When generating multiple buffer zones, you can choose whether to save them in a single vector or CAD object or in separate objects. When the target object type is a region, multiple buffer zones are always saved to separate region objects.

Source Tabbed Panel

The Source panel for a vector object that contains points, lines, and polygons is shown above. If a vector object lacks one or more of these element types, the corresponding tabbed panel is inactive. Shape, CAD, and pinmap objects have the same input and processing options as vector objects but all element types are treated the same because of their similar object structures so there are no tabs on the Source panel. You also have the option to merge the buffer zones generated or Separate them By Attribute or By Element. A region is a single polygon or multi-polygon without attributes so there are no choices on the Source tabbed panel if the input is a region. The choices on the Parameters and Preferences tabbed panels are the same for all geometric object types.

Process. The choices for which vector elements to process are None, All, Selected, and By Query. The None choice is provided in case you do not want to buffer all element types in a vector object, such as both lines and polygons. This choice is not available for other geometric object types because, as mentioned above, all element types are treated the same. If you want to limit the number of elements buffered, select them with the mouse, using a region in the GeoToolbox, or By Query.

Distance. The Distance choices are All Same or By Script. The desired buffer distance is set on the Parameters tabbed panel. The distance set on the Parameters panel applies to all vector element types unless they have a separate distance assigned by script. You can assign a distance using a script for one element type, as illustrated at the right, and the other element types will use the distance set on the Parameters panel if they have their Distance choices set to All Same. The simplest distance script would set a distance that was the same for all vector elements of the designated type and was different than that set on the Parameters panel. Such a script would take the form "return 400"; if 400 was your desired buffer distance. You can also use this feature to set different buffer distances based on element attributes for vector, CAD, and shape input. Only elements with attributes named in the script are buffered, so it is not necessary to enter both a selection query and a distance script if you want a limited number of elements buffered using attributes.

Separate None. All buffer zones generated are merged together. If transferring attributes, buffer zone polygons will have records attached for all elements that contributed to the polygon generated (see back).

Separate By Attribute. The results acheived when the Separate By Attribute toggle is on vary with the target object type. When the target is a vector object, polygonal topology is built. The table and field that specify the attribute you want to use to buffer separately is specified by clicking on the Specfy button (pencil icon), which becomes active when the Separate By Attribute toggle is on. The illustration at the top right on the back shows a simple CAD input: two overlapping circles, each with a different
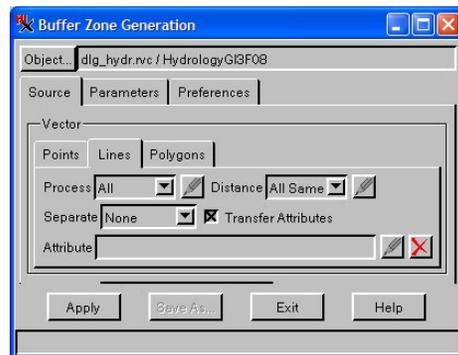
Settings:
Points: Process All, Distance All Same
Lines: Process By Query, Distance All Same
Polygons: None
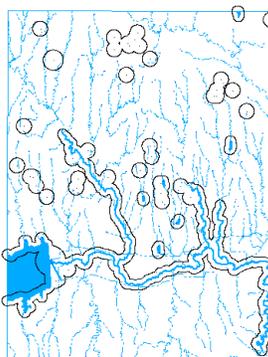
Settings:
Points: Process By Query, Distance By Script
Lines: Process By Query, Distance All Same
Polygons: None

(over)

attribute. When Separate By Attribute is off, the buffer zone produced, regardless of the target object type, is shown at the right (top AB). When Separate By Attribute is on, the buffer zone results differ in number of elements and objects depending on the target object type as shown. If you want to generate a separate buffer zone for every element in an object, use the Separate By Element option. If you choose Separate By Attribute for any vector element type, the buffer zones for element types not separated by attribute are still combined if they overlap.

Separate By Element. This option generates a separate buffer zone for each element in an object. For more information on this option see the Technical Guide entitled *Vector Analysis: Buffer Zone Options*.

Transfer Attributes. When this option is toggled on, all tables are transferred to the output object with records attached to the appropriate elements. In the simple case illustrated at the right, when Separate by Attribute is not turned on, the resulting vector and CAD buffer zones will have attributes from both input elements attached. When separate by attribute

A

B

input CAD, 2 circles

A B

without separating by attribute

buffer zone vector, CAD, region

A

A B

B

vector
1 object, 3 polygons
1 table

A

B

CAD
1 object, 2 circles
1 table

region
2 objects each with one region
no attributes

separated by attribute with attributes transfered

is turned on the vector output has one polygon with A's attributes, one with B's, and one with both. The resulting CAD object has the attributes from the one input circle it was generated from. Regions do not have attributes.
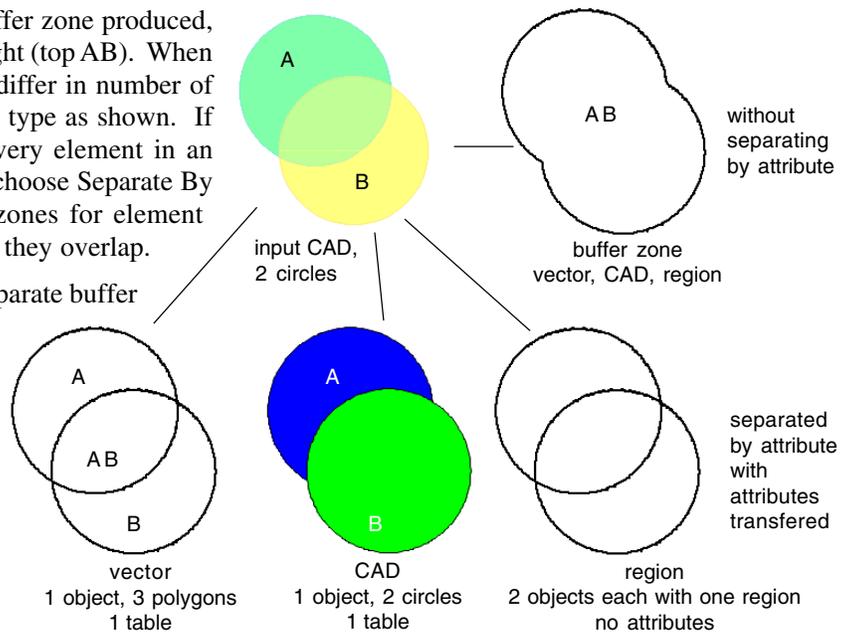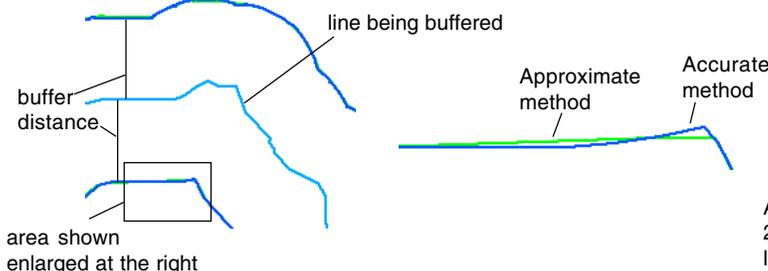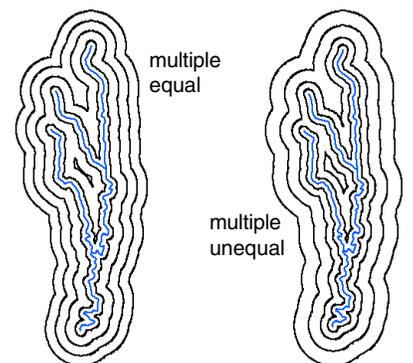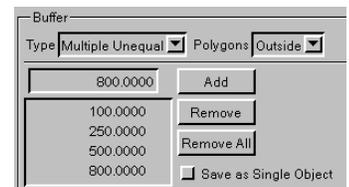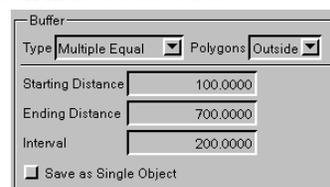
Parameters Tabbed Panel

The Parameters tabbed panel lets you specify the Target object type, change from the default Single buffer zone to Multiple Equal or Multiple Unequal buffer zones, choose to save multiple buffer zones in a single or separate objects (for vector and CAD targets), and specify whether the buffer zones should be inside or outside polygons. The Save as Single Object toggle that is present when generating multiple buffer zones in a single pass is disabled if the target object type is a region because each must be saved to a separate object, which can be auto-named. The Use Polygons as Region toggle determines how island polygons are handled.
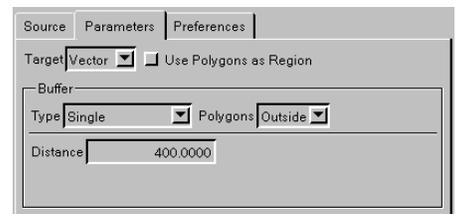
Preferences Tabbed Panel

The Preferences panel lets you choose between Approximate and Accurate methods for calculating buffer zones, choose your prefered units, indicate whether you want to keep saved results in the view, and determine the drawing order of the input and result. The Accurate method for generating buffer zones is new for 2008:74. This method generates buffer zones geometrically. Point buffers are generated as circles and line and polygon buffers are generated as offsets for each segment of the line. All of these are then intersected unless Separate by Attribute is on. The Approximate method is generally faster, but slows as buffer distances become small. The Accurate method is not sensitive to buffer size and can readily compute very small buffer zones. Differences between the two methods are generally small and appear where there are abrupt changes in the direction of the line being buffered.

line being buffered

buffer distance

area shown enlarged at the right

The difference between Accurate and Approximate methods is shown where the line being buffered abruptly changes direction.

Approximate method

Accurate method

Accurate method: a 2-meter buffer (black lines) around a stream line appears like a line pattern with flanking lines.

multiple equal

multiple unequal
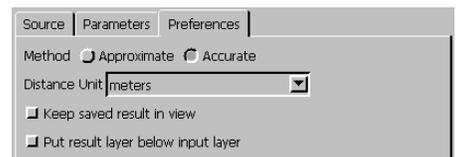
The result is drawn on top of the input by default (toggle off).