Geometric Element Statistics by Polygon

The Geometric Element Statistics by Polygon process (Geometric / Statistics / Element Statistics by Polygon) computes statistics over polygonal areas in a destination geometric object from:

- points, lines, or polygons in a source geometric object, and/or
- numeric values in selected database fields associated with the source elements (minimum, maximum, mean, standard deviation, and others).

The destination and source objects can be vector, CAD, or shape objects. You can choose to save the statistics as tables added directly to the destination polygon object, as tables added to a copy of the destination object (leaving the original unchanged), or as text (CSV) files.

Statistics can be tabulated for the destination object using:

- all polygons or only those marked in the process's View window
- individual polygons and/or polygons grouped by value in a designated attribute field.

Element statistics for each destination polygon (or polygon group) can also be broken down (separated) by value in a designated source attribute field.

You also can choose to compile statistics using all source elements or only those marked in the View. (Destination and source elements can be marked for processing manually, by region, or by query.)

Destination Polygons Controls

Use the Object pushbutton in the Destination Polygons box to select a geometric object with polygons (see illustration to the right). The selected object is automatically displayed in the separate View window. Use the Output menu to choose how to save the statistics: Add table(s) to object, Copy object and add table(s), or Text file(s). The *Use* radiobuttons to the right of this menu set whether to use *All* destination polygons or only those *Marked* in the View.

You can choose one or both of the *By Polygon* and *By Attribute* options. The By Polygon option compiles statistics independently for each polygon. With this option you can choose an ID or Name to embed in the statistics table(s) to identify each polygon. The choices are None, Element Number, Polygon_ID.Current (if the object has a Polygon_ID table) and Choose; the latter option prompts you to select a database table and field associated with the polygons to provide the ID.

The By Attribute option tabulates statistics by grouping polygons that have the same value in a designated attribute field. When you select this option you are automatically prompted to choose the table and field to use. You can press the Choose pushbutton to reset this choice if needed. The selected attribute is included as a field in the resulting statistics table(s).

Source Controls

Use the Object pushbutton in the Source box to select the geometric object from which to compile the statistics; this object is automatically added to the View. Use the *Type* radiobuttons to choose the element type; if only one element type is present, this control is set automatically.

The *Use* radiobuttons to the right set whether to use *All* source elements or only those *Marked* in the View. Press the Separation Attribute pushbutton to choose a source table and field if you wish to compute statistics by source element attribute in addition to or instead of the summary statistics for all elements being used.

Statistics from Source Elements

The Statistics from Source Elements box provides controls for computing statistics directly from the source elements. The Statistics column on the right side of the box provides a choice of element statistics via a checkbox for each statistic that is available for the selected source element type. The Count option (available for all element types) counts the number of source elements within each destination polygon (or polygon group). Line source elements provide an additional Length option, while source polygon elements provide Area and Coverage % options.
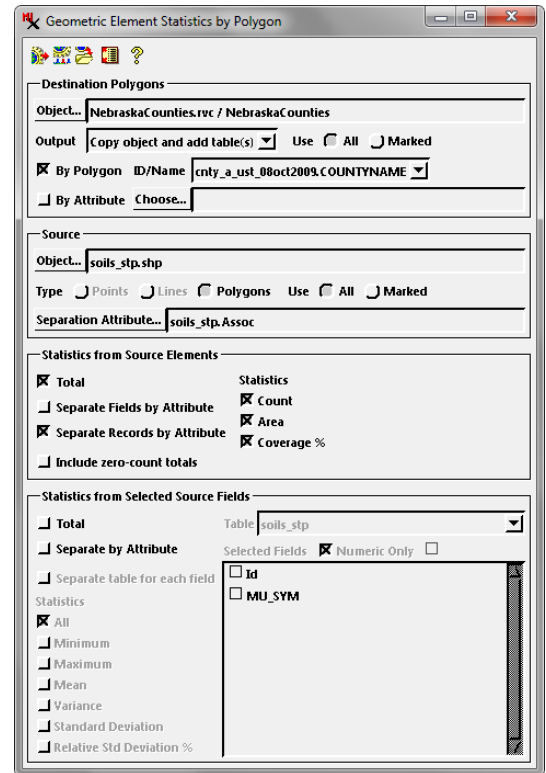
Geometric Element Statistics by Polygon window. In this example, the Destination object is a vector object with county polygons of the state of Nebraska (black boundary lines in illustration below). The Source object is a shapefile with polygons showing soil associations (colored polygon fills below). The separation attribute set for the source is a field with the soil association names. The process is set to compute summary element statistics for the destination polygons (Total checkbox) and a breakdown of those statistics by soil association, with a separate record for each association (results on next page).

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soils_stp_By_Polygon \ Polygon ...

Table   Edit   Record   Field   Help
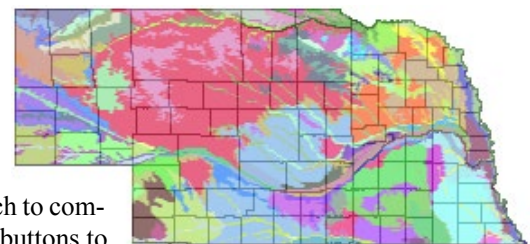
COUNTYNAME	Count	Area	CoveragePct
Adams	10	15721.7365	100.0000
Antelope	18	23918.4584	100.0000
Arthur	2	20011.7540	100.0000
Banner	7	20791.9317	99.9939
Blaine	9	19902.1316	100.0000
Boone	13	19146.3492	100.0000
Box Butte	8	30032.0925	100.0000
Boyd	10	15176.4872	99.9713
Brown	17	34138.3922	100.0000
Buffalo	10	27173.7671	100.0000
Burt	7	13845.1335	99.9707
Butler	10	16281.5186	100.0000
Cass	11	15770.1744	99.9641
Cedar	18	20768.2744	99.9183
Chase	6	25013.3141	99.9945
Cherry	19	167462.5963	99.9906
Cheyenne	13	33326.7983	99.9809

93 of 93 records shown

Tabular view of Total element statistics for the soil association example shown on the previous page. This table has one record per destination polygon (county), with Count, Area, and CoveragePct fields.

Right, single-record view of element statistics table resulting from setting *Total* and *Separate Fields by Attribute* options (see text).

soils_stp_By_Polygon \ Polygon \ Nebraska...

Table   Edit   Record

Name	Value	Units
COUNTYNAME	Cherry	
Count	19	
Area	167462.5963	km^2
CoveragePct	99.9906	
Albaton-Haynie-Sarpy_Count	0	
Albaton-Haynie-Sarpy_Area	0.0000	km^2
Albaton-Haynie-Sarpy_CoveragePct	0.0000	
Alliance-Rosebud-Kuma_Count	0	
Alliance-Rosebud-Kuma_Area	0.0000	km^2
Alliance-Rosebud-Kuma_CoveragePct	0.0000	
Almeria-Bolent-Calamus_Count	1	
Almeria-Bolent-Calamus_Area	1013.3553	km^2
Almeria-Bolent-Calamus_CoveragePct	0.6051	
Bazile-Thurman-Boelus_Count	0	
Bazile-Thurman-Boelus_Area	0.0000	km^2
Bazile-Thurman-Boelus_CoveragePct	0.0000	
Bridget-Tripp-McCook_Count	0	
Bridget-Tripp-McCook_Area	0.0000	km^2
Bridget-Tripp-McCook_CoveragePct	0.0000	
Brunswick-Paka-Simeon_Count	0	
Brunswick-Paka-Simeon_Area	0.0000	km^2
Brunswick-Paka-Simeon_CoveragePct	0.0000	
Bufton-Orella-Norrest_Count	0	
Bufton-Orella-Norrest_Area	0.0000	km^2
Bufton-Orella-Norrest_CoveragePct	0.0000	
Busher-Sarben-Tassel_Count	0	
Busher-Sarben-Tassel_Area	0.0000	km^2
Busher-Sarben-Tassel_CoveragePct	0.0000	
Canyon-Alliance-Rosebud_Count	0	
Canyon-Alliance-Rosebud_Area	0.0000	km^2
Canyon-Alliance-Rosebud_CoveragePct	0.0000	

1 polygon attached   66/93 records in table

soils_stp_By_Polygon_By_Assoc \ Polygon \ NebraskaCounties...

Table   Edit   Record   Field   Help

COUNTYNAME	Assoc	Count	Area	CoveragePct
Adams	Crete-Hastings-Butler	1	1530.9774	9.7380
Adams	Gibbon-Gothenburg-Platte	1	42.8521	0.2726
Adams	Hastings-Fillmore	1	1522.1621	9.6819
Adams	Hastings-Holder	2	7550.7685	48.0276
Adams	Hersh-Valentine	1	253.3845	1.6117
Adams	Hobbs-Hord	1	667.8951	4.2482
Adams	Holder-Uly-Coly	1	1374.5856	8.7432
Adams	Kenesaw-Hersh	1	2401.1400	15.2727
Adams	Valentine	1	377.9711	2.4041
Antelope	Almeria-Bolent-Calamus	1	364.5757	1.5242
Antelope	Bazile-Thurman-Boelus	2	2489.5837	10.4086
Antelope	Brunswick-Paka-Simeon	1	1291.0339	5.3976
Antelope	Elsmere-Ipage-Loup	3	861.9644	3.6038
Antelope	Hord-Cozad-Boel	1	508.7594	2.1271
Antelope	Nora-Crofton-Moody	2	5188.0883	21.6907
Antelope	Thurman-Boelus-Nora	3	10448.3870	43.6834
Antelope	Valentine	1	178.6648	0.7470
Antelope	Valentine-Thurman	4	2587.4013	10.8176
Arthur	Valentine	1	17762.5267	88.7605

605 of 605 records shown

Above, tabular view of source element statistics table created by the *Separate Records by Attribute* option for the soil association example. This table has one record for each unique combination of destination polygon (county) and value of the designated source element separation attribute (soil association). Zero-count records are automatically excluded from this table.

Turn on the Total checkbox in the Statistics from Source Elements box to compute the selected element statistics by destination polygon (and/or polygon attribute). This option produces a table with one record for each destination polygon (see illustration above left). If the *Include zero-count totals* checkbox is turned off, records for polygons with no source elements are not included in the result.

When you wish to break down the element statistics by source element attribute, you have two mutually exclusive options: *Separate Fields by Attribute* and *Separate Records by Attribute*. With the Separate Fields option, the statistics for each attribute value are added as fields to the table with the Total polygon statistics (see illustration above middle). If there are many attribute values, this option results in a table with a very large number of fields, as there may be one to three fields per attribute value, depending on the source element type and the statistics you have selected. In some cases (such as the soil association example illustrated), many of the attribute statistic fields may be zero-valued. However, this table structure is well-suited to use in a spreadsheet.
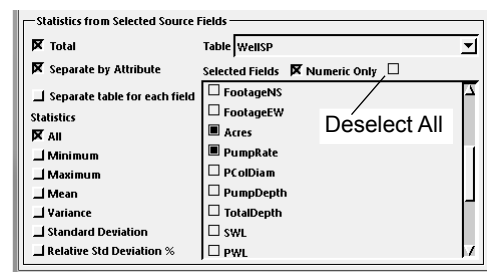
The Separate Records option creates a table with a separate record for each combination of 1) destination polygon or polygon group and 2) value of the source element separation attribute (see illustration above right). Thus there are multiple records per destination polygon. Zero-count records are automatically excluded from this table, providing a more compact presentation of the data than the Separate Fields by Attribute option. If the Total option is used in combination with Separate Records by Attribute, the Total and By Attribute statistics are created in separate tables (due to the required difference in table structure).

Statistics from Selected Source Fields

The Statistics from Selected Source Fields box provides controls for computing statistics from numeric fields in an attribute table associated with the source elements. Use the Table menu at the top right of the box to choose the table. The fields in the table are then shown in the picklist below the menu; turning on the Numeric Only checkbox filters the field list to show only fields with numeric values. Click in the square to the left of a field to select it. You can clear these selections if needed by pressing the Deselect All iconbutton (see illustration below).

The available field statistics are listed in the lower left portion of the Statistics from Selected Source Fields box. They include Minimum, Maximum, Mean, Variance, Standard Deviation, and Relative Std Deviation %*. Choose any combination of the individual measures by turning on their checkboxes, or choose All.

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Statistics from Selected Source Fields

Table WellSP

Selected Fields   ☒ Numeric Only

☒ Total
☒ Separate by Attribute
▱ Separate table for each field

Statistics
☒ All
▱ Minimum
▱ Maximum
▱ Mean
▱ Variance
▱ Standard Deviation
▱ Relative Std Deviation %

☐ FootageNS
☐ FootageEW
▣ Acres
▣ PumpRate
☐ PColDiam
☐ PumpDepth
☐ TotalDepth
☐ SWL
☐ PWL

Deselect All

* Relative Standard Dev % expresses the standard deviation as a percentage of the mean: 100 x Standard Deviation / Mean. This statistic allows comparison between measurements in different units.

Turn on the Total checkbox in the Statistics from Source Fields box to compute field statistics by destination polygon (and/or polygon attribute). The result is a tabulation with one record for each destination polygon ("by polygon" structure). If the Total option is also used in the Statistics from Source Elements box, the element statistics and source field statistics are combined in a single "by polygon" table as illustrated below (unless the *Separate table for each field* toggle is turned on; see below).

To break down the source field statistics by source element attribute, turn on the Separate by Attribute checkbox. The result is a tabulation with one record for each combination of 1) destination polygon and 2) value of the source element separation attribute ("by polygon by attribute" structure; see illustration at the bottom of page). In the example on this page, this table contains only source field statistics and no element statistics, because the Separate Records by Attribute option was not selected in the Statistics from Source Elements box (see illustration to the right); only the Total element statistics option was selected. If Separate Records by Attribute (for source elements) and Separate by Attribute (for source fields) are both selected, the element and field statistics are saved to a single table with the "by polygon by attribute" structure.

Turning on the *Separate table for each field* toggle in the Statistics from Selected Source Fields box causes the statistics for the each of the selected source fields to be saved in different tables. This option applies to both Total (by polygon or polygon attribute) field statistics and field statistics separated by source attribute. In the example on this page, this choice would result in creation of five tables: one "by polygon" table for the *Total* element statistics, a "by polygon" table with the *Total* field statistics for each of the two selected fields, and a "by polygon by attribute" table for each of the two selected fields from the Separate by Attribute setting.

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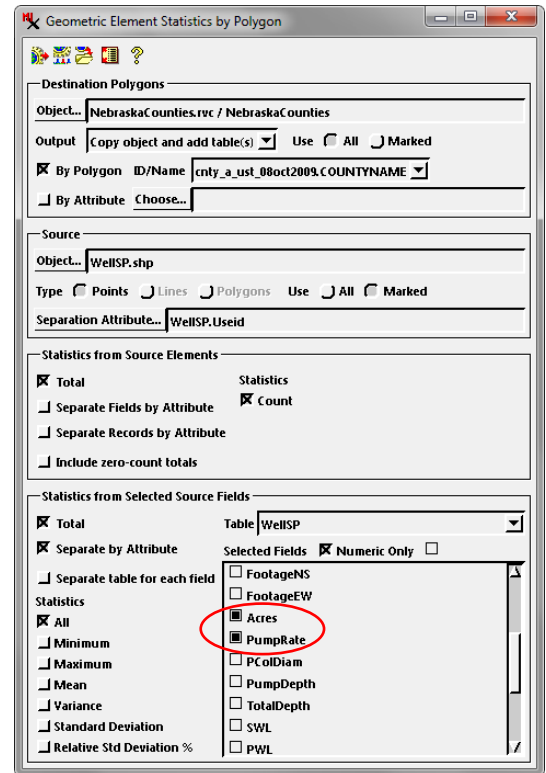
Settings producing the tables illustrated below. The Source object is a shapefile with points representing water well locations. The source Separation Attribute is a field with codes indicating well use (e.g. irrigation, domestic, etc.)


Tabular view of table with statistics by polygon from point elements (Count field) and from the Acres and PumpRate fields.

Tabular view of table with statistics by source point attribute from the Acres and PumpRate fields. This table has one record for each unique combination of destination polygon (county) and value of the designated source element separation attribute (well use ID).

Running the Process

When you have selected the desired settings, press the Run icon button to run the process immediately. Standard Queue Job and Save Job icon buttons are also provided to allow you to execute the process using the TNT Job Processing system (see the Technical Guide entitled *System: TNTmips Job Processing System*).   If you have chosen to *Copy Object and add tables*, a *Select output* window then appears to allow you to designate a Project File and a name for the result object. A *Select tables for output* window then appears so you can save the output table or tables. The Object column in the *Selected* box in the lower part of this window lists partial default names for each of the output tables. These names indicate the structure of the table (e.g., "By Polygon", "By Polygon By Useid"). If you have chosen to produce separate tables for each field for source field statistics, those default table names are prepended with the field name (see illustration). You can press the Auto-Name button on the window to accept the default table names. If you do so, each of the default names is prepended with the name of the source object and shown in the Name column. Press OK to accept the names and begin processing.

Queue Run Job Save Job
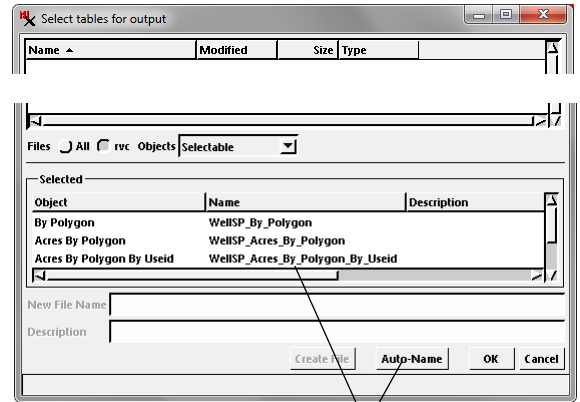
Press the Auto-Name button on the *Select tables for output* window to assign default names for the output statistics tables. These names include the name of the source object, a descriptor of the table structure (e.g. By_Polygon_By_Useid), and the field name if producing a separate table for each set of attribute field statistics.