



Geographic Information System

Vector Data – Part II

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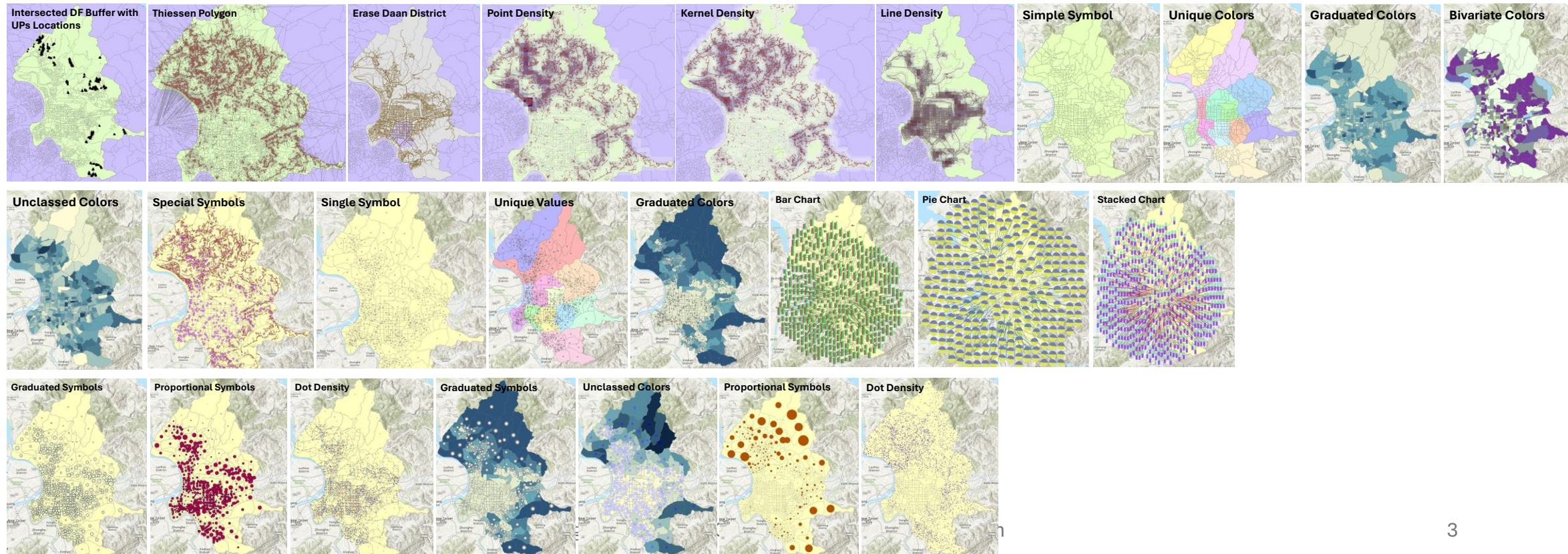
Outline

- **Extract** (Clip/ Select)
- **Overlay** (Union/ Intersect/ Identity/ Erase)
- **Proximity** (Buffer/ Near/ Create Thiessen Polygon)
- **Dissolve**
- **Density** (Point/ Kernel/ Line)
- **Polygon To Line/ Join Features/ Feature To Point**
- **Symbology**



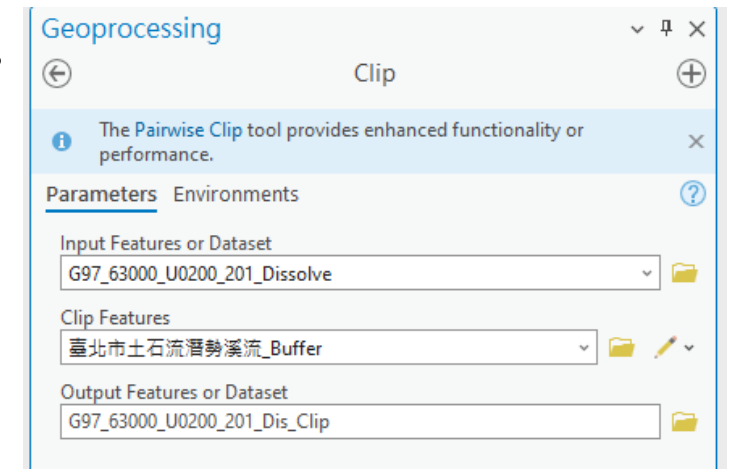
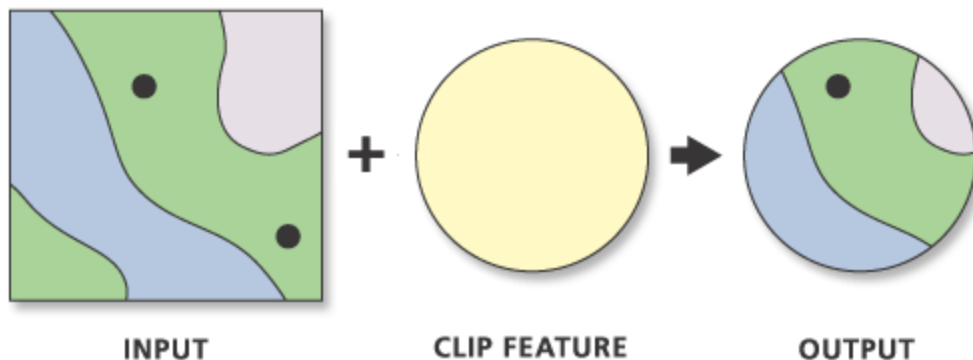
Objectives

- Today, we would like to demonstrate a case:
 - How does debris flow affect our electric infrastructure?
 - The spatial distribution of population in Taipei City



Extract :: Clip

- **Extracts input features that overlay the clip features.**
- Use this tool to cut out a piece of one dataset using one or more of the features in another dataset as a cookie cutter. This is particularly useful for creating a new dataset—also referred to as a study area or area of interest (AOI)—that contains a geographic subset of the features in another, larger dataset.

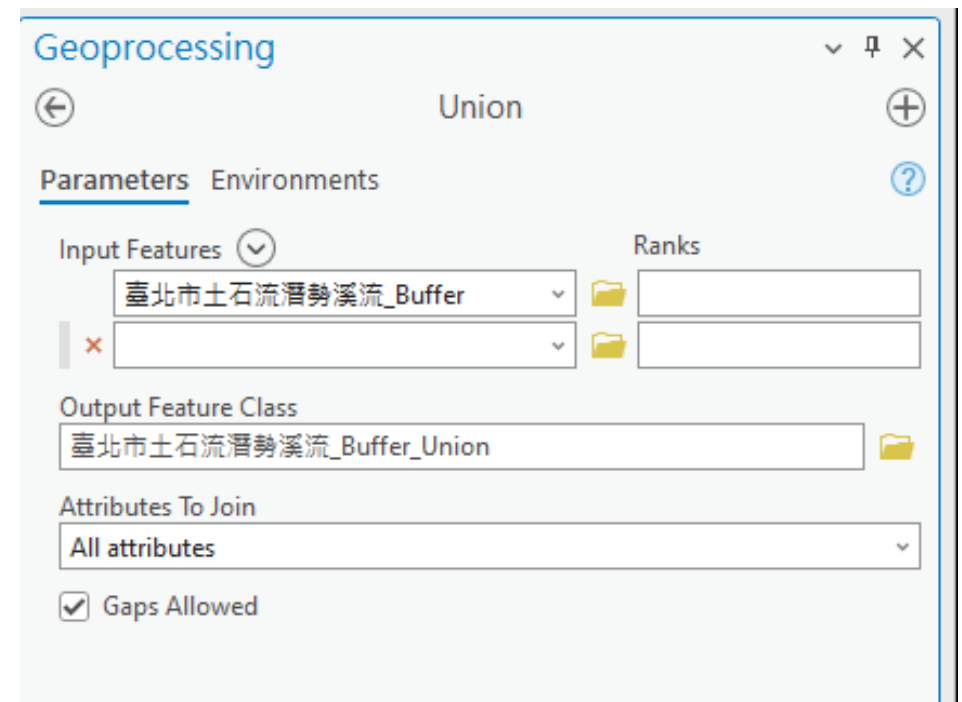
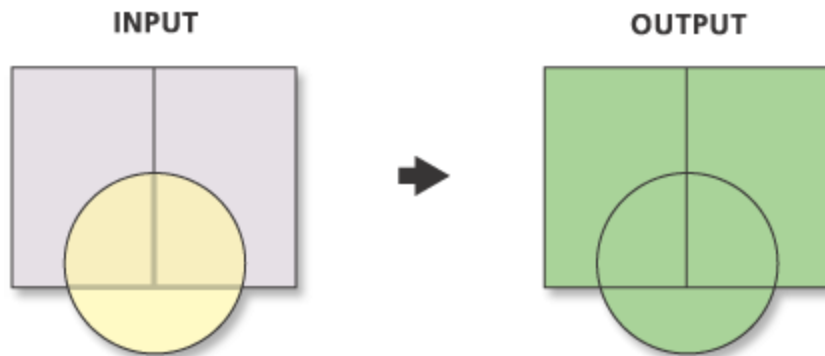


Extract :: Select

- Extracts features from an input feature class or input feature layer, typically using a select or **Structured Query Language (SQL) expression**, and stores them in an output feature class.
- The select or SQL expression is built with the Query Builder or is typed in. For details on the expression syntax, see Write a query in the query builder or SQL reference for query expressions used in ArcGIS.

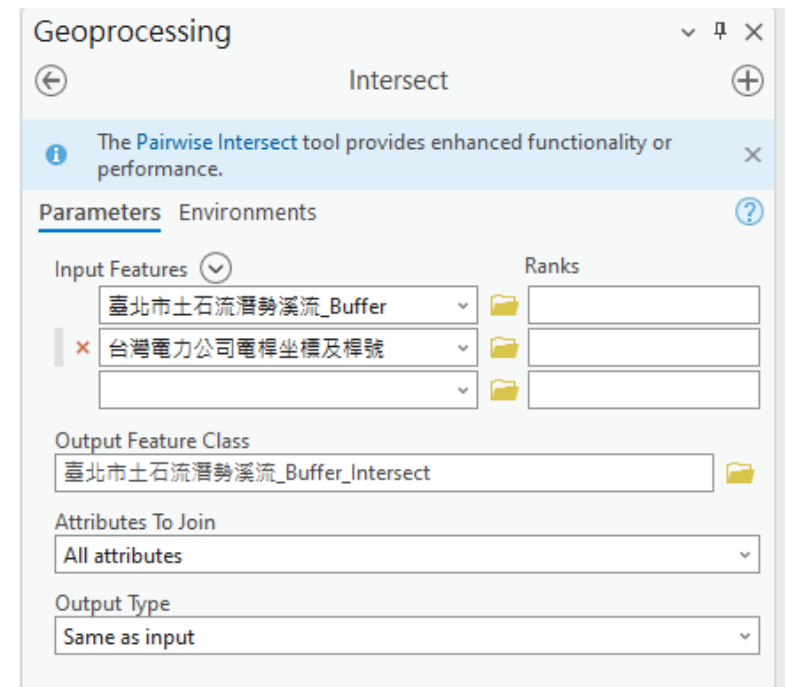
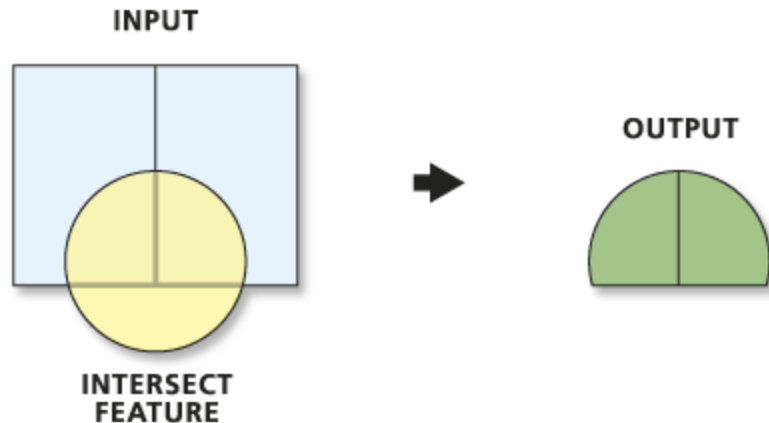
Overlay :: Union

- Computes a geometric union of the input features. All features and their attributes will be written to the output feature class.



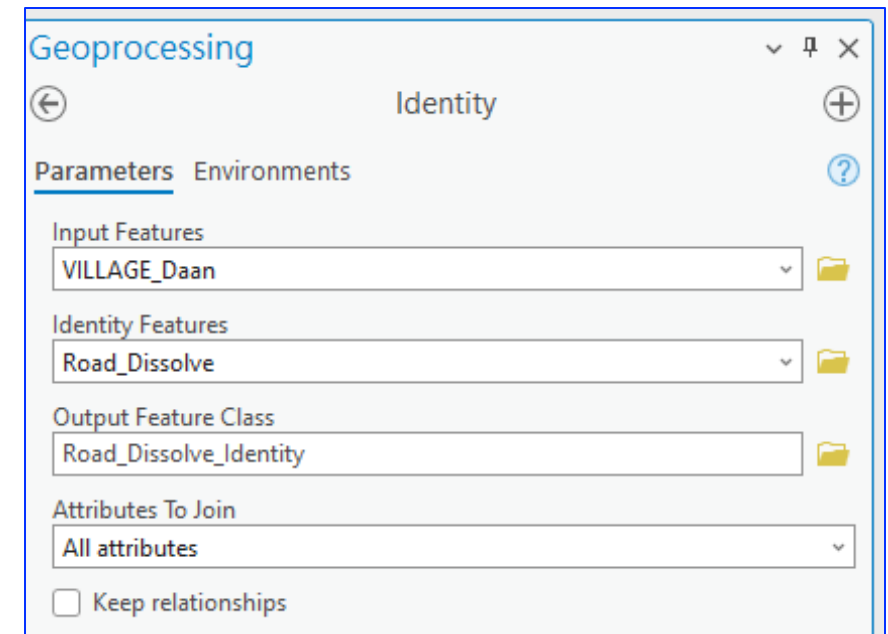
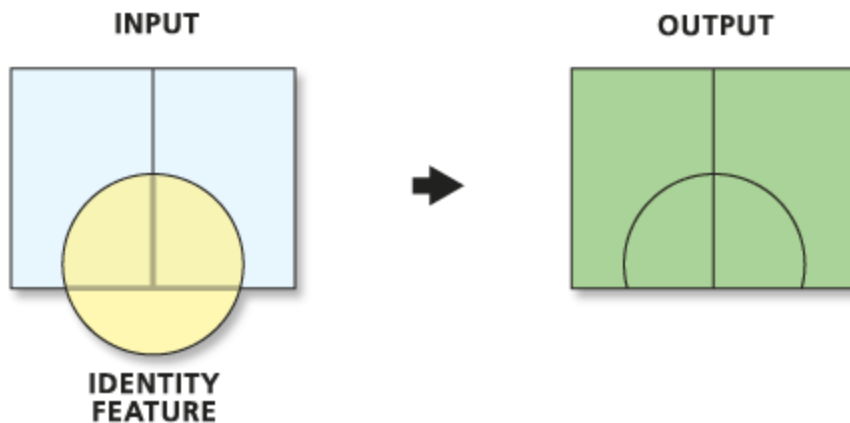
Overlay :: Intersect

- Computes a geometric intersection of the input features. Features or portions of features that overlap in all layers or feature classes will be written to the output feature class.



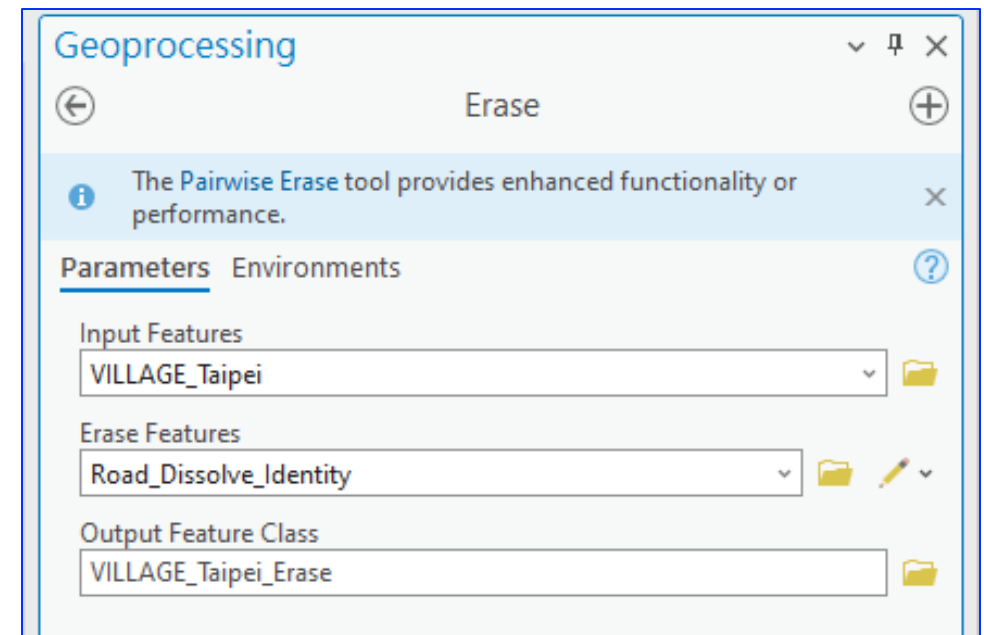
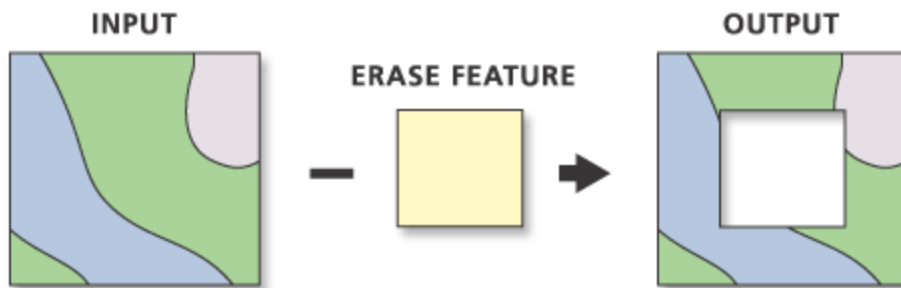
Overlay :: Identity

- Computes a geometric intersection of the input features and identity features. The input features or portions thereof that overlap identity features will get the attributes of those identity features.



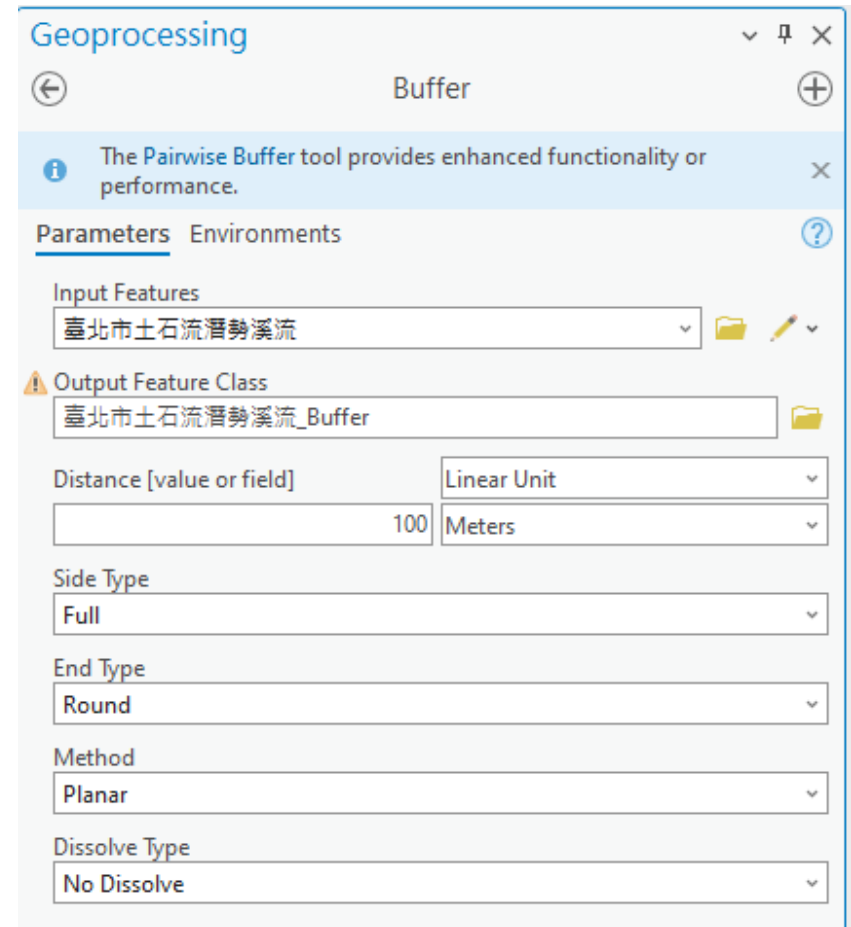
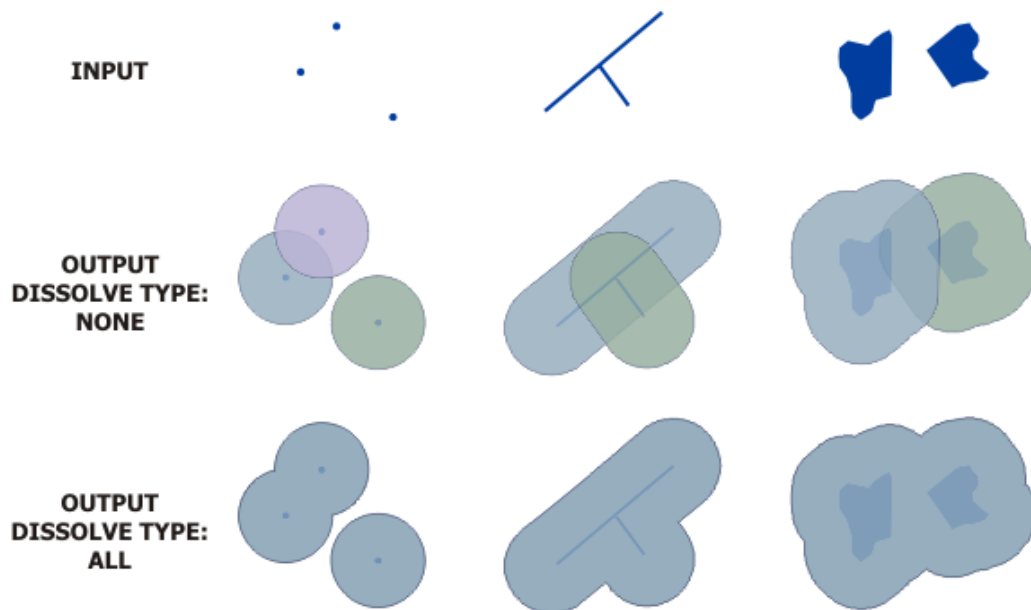
Overlay :: Erase

- Creates a feature class by overlaying the input features with the erase features. Only those portions of the input features falling outside the erase features are copied to the output feature class.



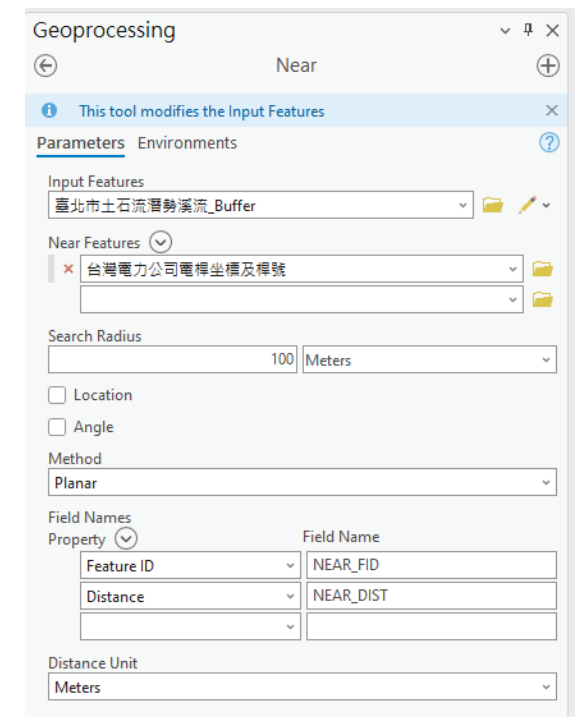
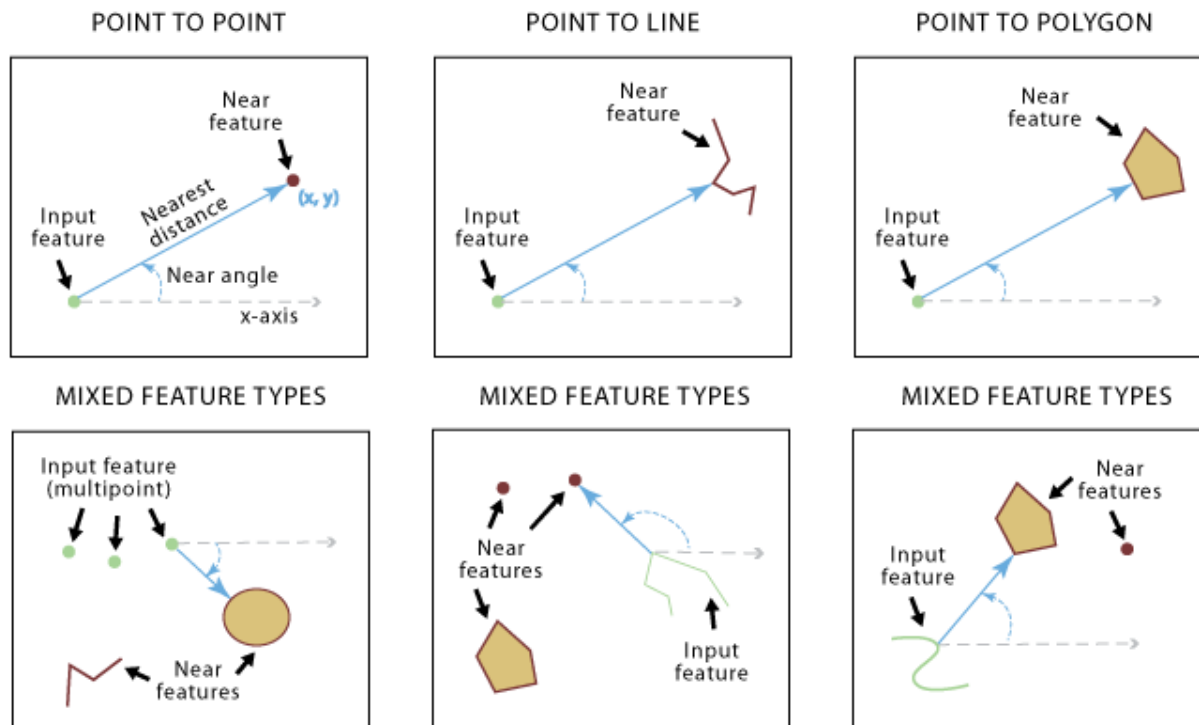
Proximity :: Buffer

- Creates buffer polygons around input features to a specified distance.



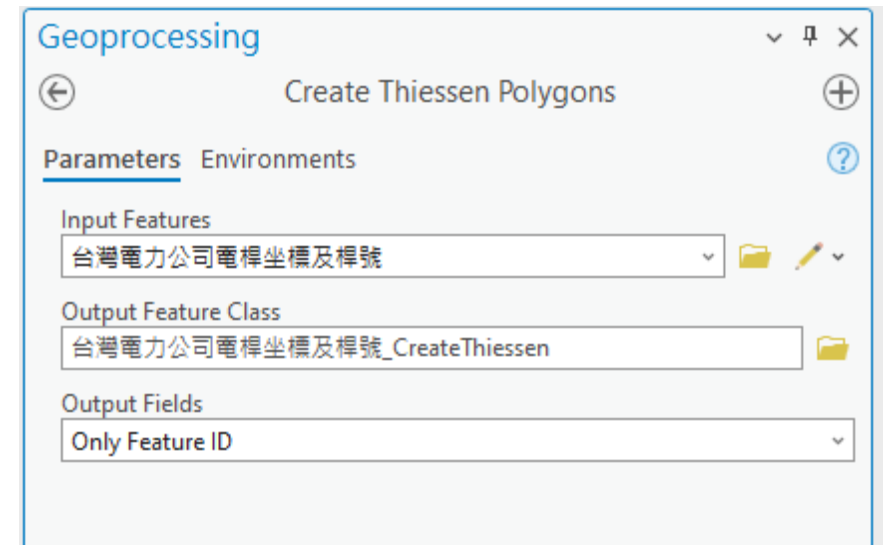
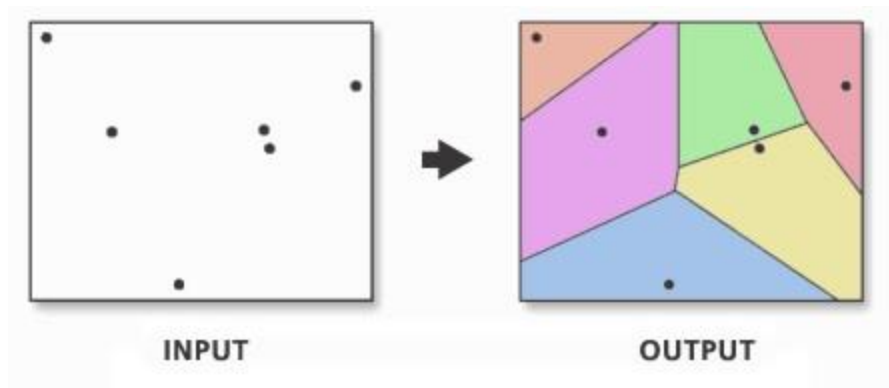
Proximity :: Near

- Calculates distance and additional proximity information between the input features and the closest feature in another layer or



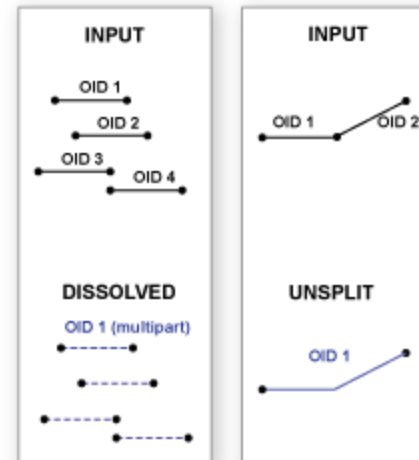
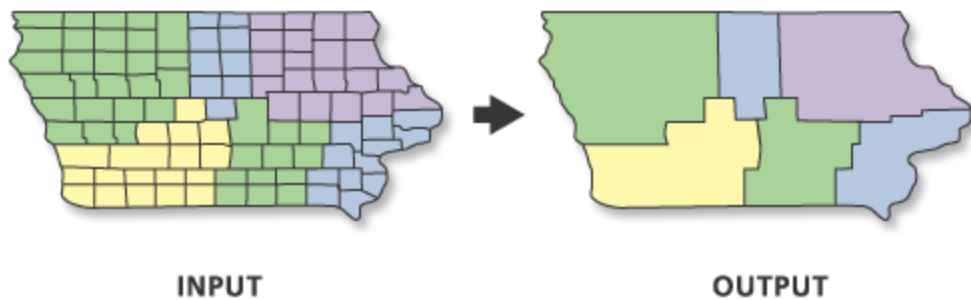
Proximity :: Create Thiessen Polygon

- **Creates Thiessen polygons from point features.**
- Each Thiessen polygon contains only a single point input feature. Any location within a Thiessen polygon is closer to its associated point than to any other point input feature.



Dissolve

- Aggregates features based on specified attributes.
- An alternate tool is available for dissolve operations. See the Pairwise Dissolve tool documentation for details.



Geoprocessing

Dissolve

The Pairwise Dissolve tool provides enhanced functionality or performance.

Parameters Environments

Input Features
G97_63000_U0200_2015

Output Feature Class
G97_63000_U0200_201_Dissolve

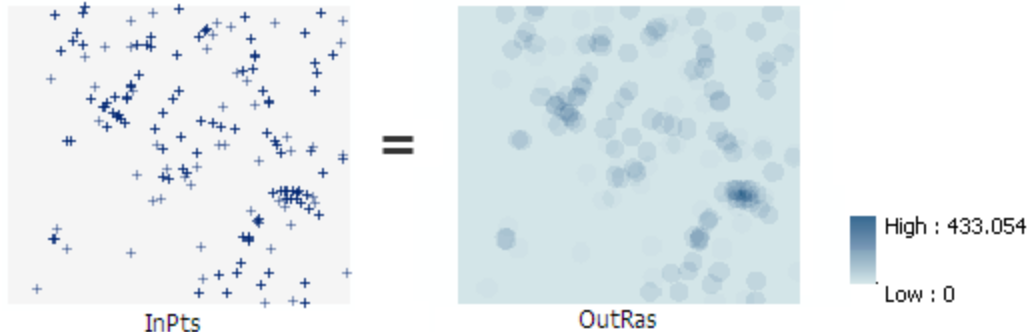
Dissolve Fields
CODE2

Statistics Fields
Field
Statistic Type

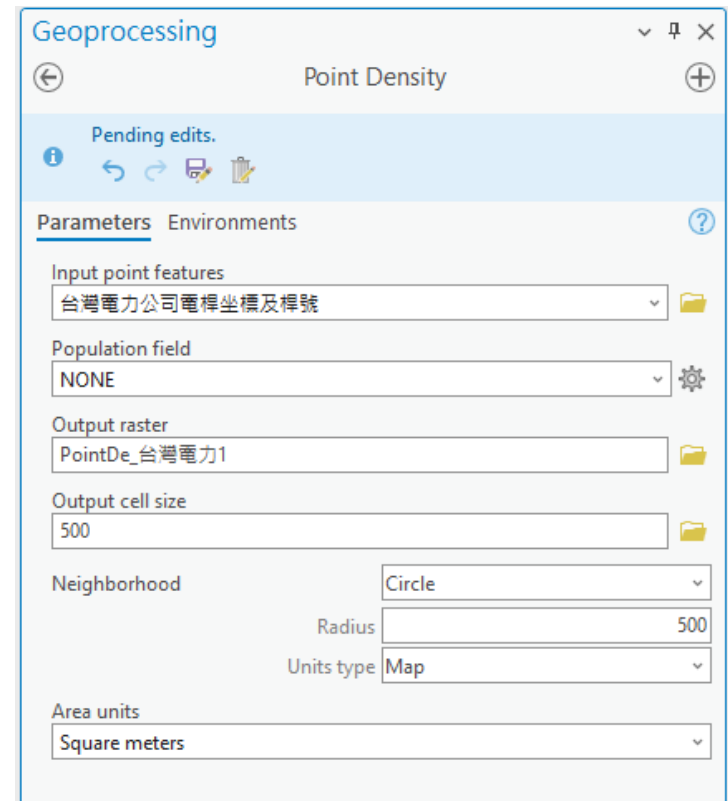
☒ Create multipart features
☐ Unsplit lines

Density :: Point Density

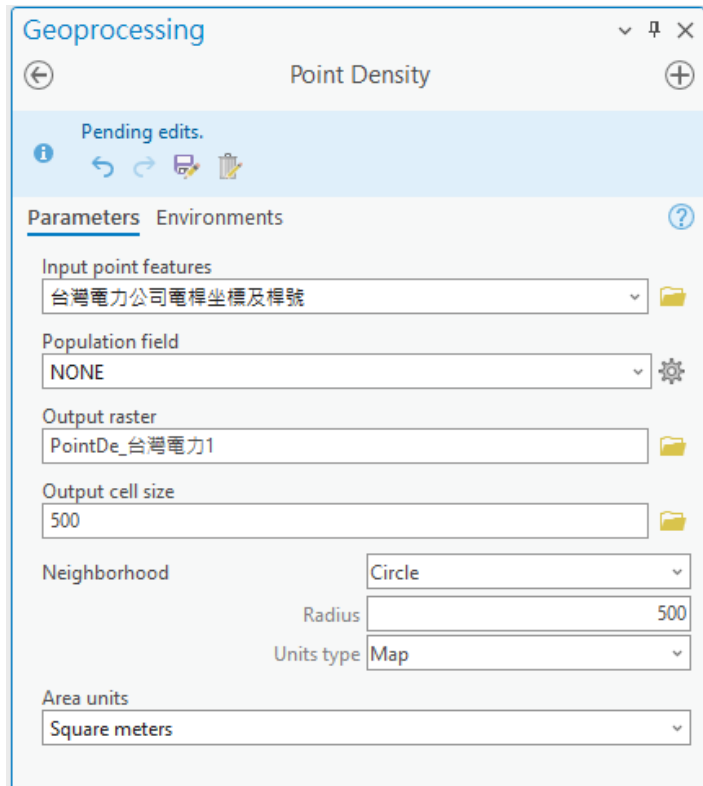
- Calculates a magnitude-per-unit area from point features that fall within a neighborhood around each cell.



`OutRas = PointDensity(InPts, None, 30)`



Density :: Point Density



Annulus

A torus (donut shaped) neighborhood defined by an inner and outer radius.

Circle

A torus (donut shaped) neighborhood defined by an inner and outer radius.

Rectangle

A rectangular neighborhood with the given height and width.

Wedge

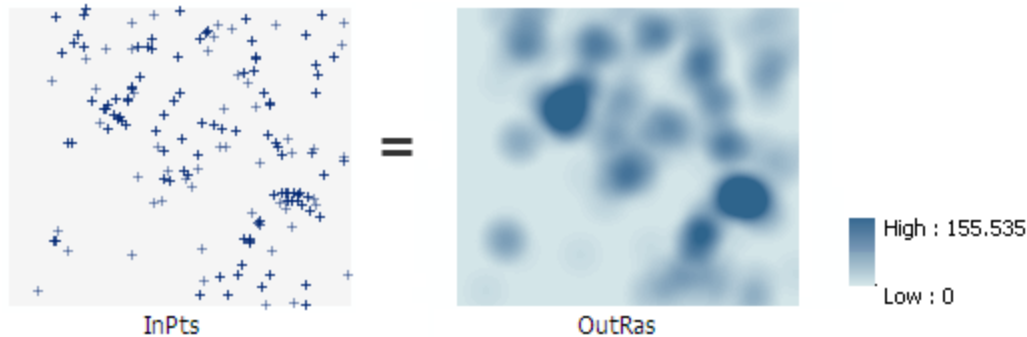
A wedge-shaped neighborhood. A wedge is specified by a start angle, an end angle and a radius. The wedge extends counterclockwise from the starting angle to the ending angle. Angles are specified in arithmetic degrees (counterclockwise from the positive x-axis). Negative angles may be used.

Cell | Map

Defines the units of the selected neighborhood measurements in either cells or map units (based on the linear unit of the projection of the output spatial reference).

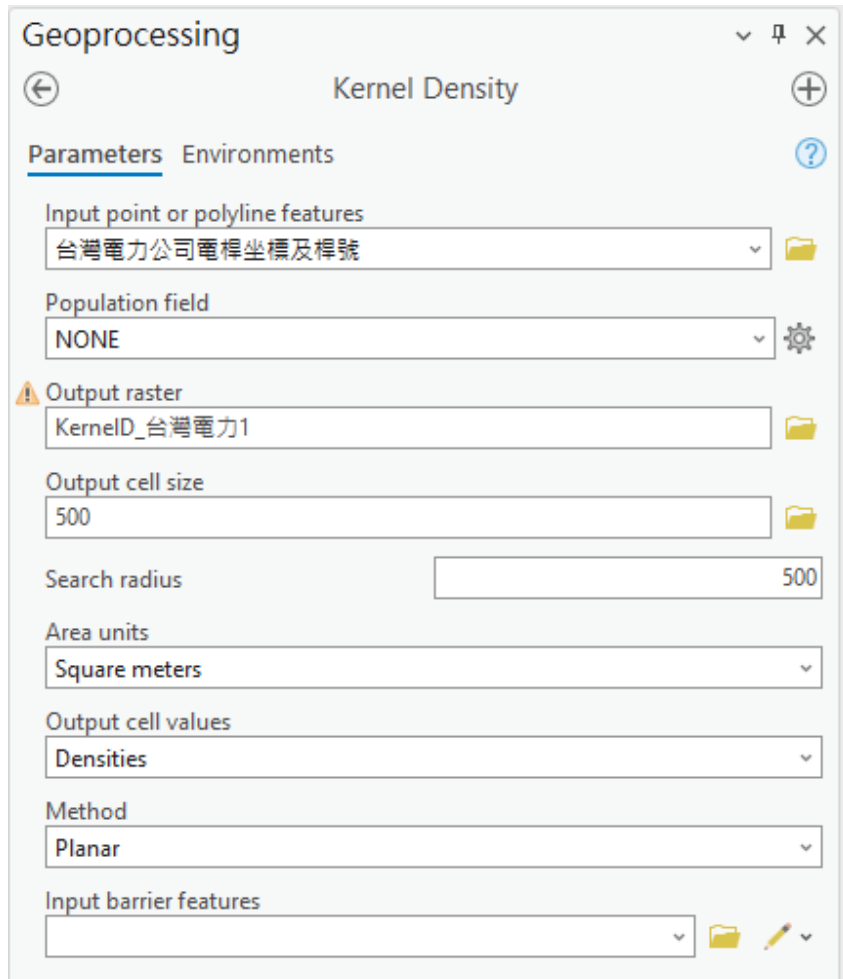
Density :: Kernel Density

- Calculates a magnitude-per-unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline. A barrier can be used to alter the influence of a feature while calculating kernel density.



```
OutRas = KernelDensity(InPts, None, 30)
```

Density :: Kernel Density



The screenshot shows the 'Kernel Density' tool in the QGIS Geoprocessing panel. The 'Parameters' tab is active. The 'Input point or polyline features' dropdown is set to '台灣電力公司電桿坐標及桿號'. The 'Population field' is set to 'NONE'. The 'Output raster' is 'KernelD_台灣電力1'. The 'Output cell size' is '500'. The 'Search radius' is '500'. The 'Area units' are 'Square meters'. The 'Output cell values' are 'Densities'. The 'Method' is 'Planar'. The 'Input barrier features' field is empty.

Geoprocessing

Kernel Density

Parameters Environments

Input point or polyline features
台灣電力公司電桿坐標及桿號

Population field
NONE

Output raster
KernelD_台灣電力1

Output cell size
500

Search radius
500

Area units
Square meters

Output cell values
Densities

Method
Planar

Input barrier features

Densities The output values represent the calculated density value per unit area for each cell. This is the default.

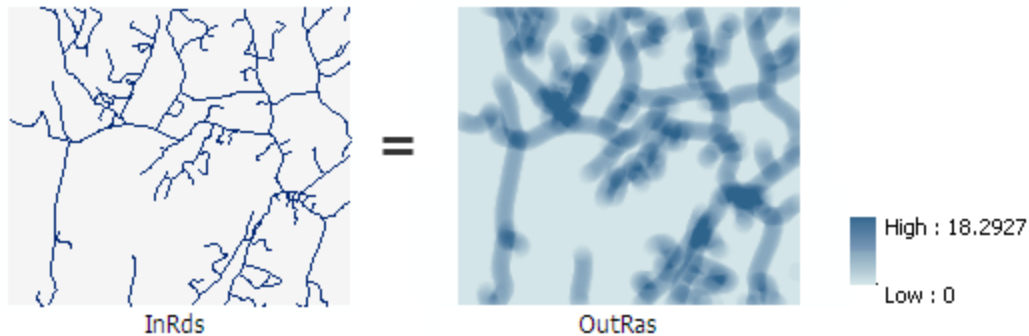
Expected counts The output values represent the calculated density value per cell area.

Planar The planar distance between features will be used. This is the default.

Geodesic The geodesic distance between features will be used.

Density :: Line Density

- Calculates a magnitude-per-unit area from polyline features that fall within a radius around each cell.



`OutRas = LineDensity(InRds, None, 30)`

Geoprocessing

Line Density

Parameters Environments

Input polyline features
Road_Dissolve_PolygonToLine

Population field
NONE

Output raster
LineDen_Road1

Output cell size
500


Search radius
500

Area units
Square meters

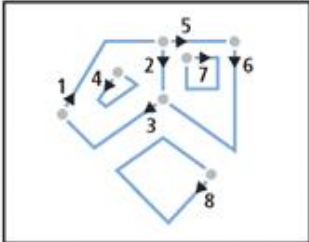
Polygon To Line

- Creates a feature class containing lines that are converted from polygon boundaries with or without considering neighboring polygons.

POLYGON INPUT



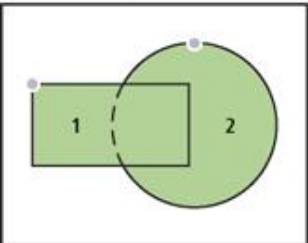
LINE OUTPUT



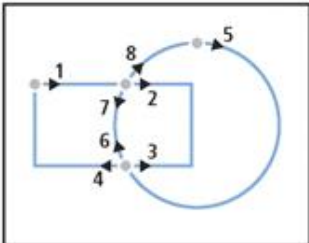
OUTPUT FIELDS

OBJECT_ID	LEFT_FID	RIGHT_FID
1	-1	1
2	2	1
3	-1	1
4	-1	1
5	-1	2
6	-1	2
7	2	3
8	-1	4

POLYGON INPUT



LINE OUTPUT



OUTPUT FIELDS

OBJECT_ID	LEFT_FID	RIGHT_FID
1	-1	1
2	2	1
3	2	2
4	-1	1
5	-1	2
6	1	2
7	1	1
8	-1	2

Geoprocessing

Polygon To Line

Parameters Environments

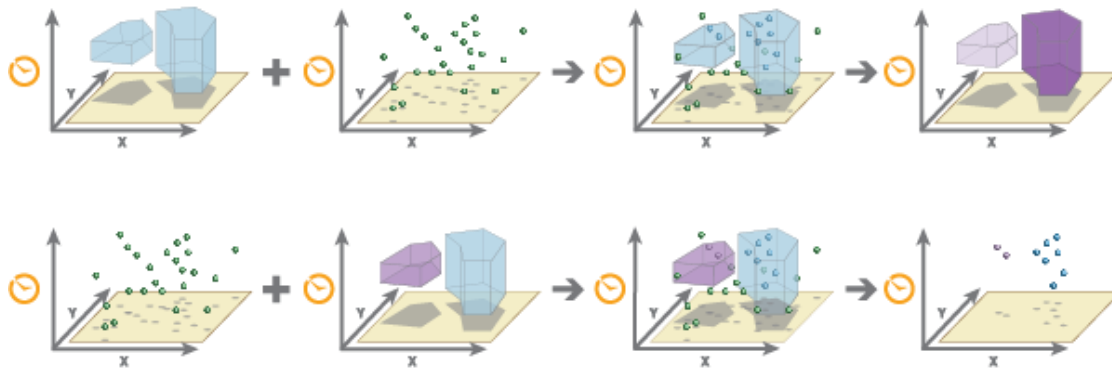
Input Features
Road_Dissolve

Output Feature Class
Road_Dissolve_PolygonToLine

☒ Identify and store polygon neighboring information

Join Features

- Joins attributes from one layer to another based on spatial, temporal, or attribute relationships, or a combination of those relationships.



Geoprocessing

Join Features

Parameters Environments

Target Layer
VILLAGE_Taipei

Join Layer
113年6月行政區人口統計_村里_臺北市.csv

Output Dataset
VILLAGE_Taipei_JoinFeatures

Join Operation
Join one to one

☐ Keep All Target Features

Temporal Relationship

Attribute Relationship

Target Field	Join Field
TOWNNAME	TOWN
VILLNAME	VILLAGE

Summary Fields

Field	Statistic
P_CNT	Sum
M_CNT	Sum
F_CNT	Sum

> Advanced Options

Join Features

Spatial Relationship

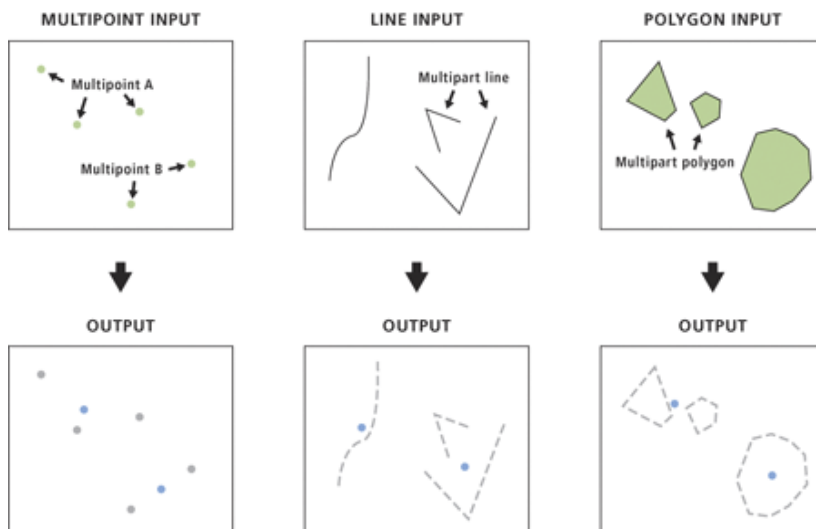
- Intersects
- Equals
- Planar Near—Uses planar distances.
- Geodesic Near—Uses geodesic distances.
- Contains
- Within
- Touches
- Crosses
- Overlaps

Temporal Relationship

- Meets
- Met by
- Overlaps
- Overlapped by
- During
- Contains
- Equals
- Finishes
- Finished by
- Starts
- Started by
- Intersects
- Near
- Near Before
- Near After

Feature To Point

- Creates a feature class containing points generated from the centroids of the input features or placed within the input features.



Symbolology :: Polygon (example)

Primary symbology

Graduated Colors

Symbolize your layer using one symbol



Single Symbol

Draw using single symbol.

Symbolize your layer by category



Unique Values

Draw categories using unique values of one or multiple fields.

Symbolize your layer by quantity



Graduated Colors

Draw quantities using graduated colors.



Bivariate Colors

Draw quantities using bivariate colors.



Unclassed Colors

Draw quantities using an unclassified color gradient.



Graduated Symbols

Draw quantities using graduated symbols.



Proportional Symbols

Draw quantities using proportional symbols.



Dot Density

Draw quantities using dot density.



Charts

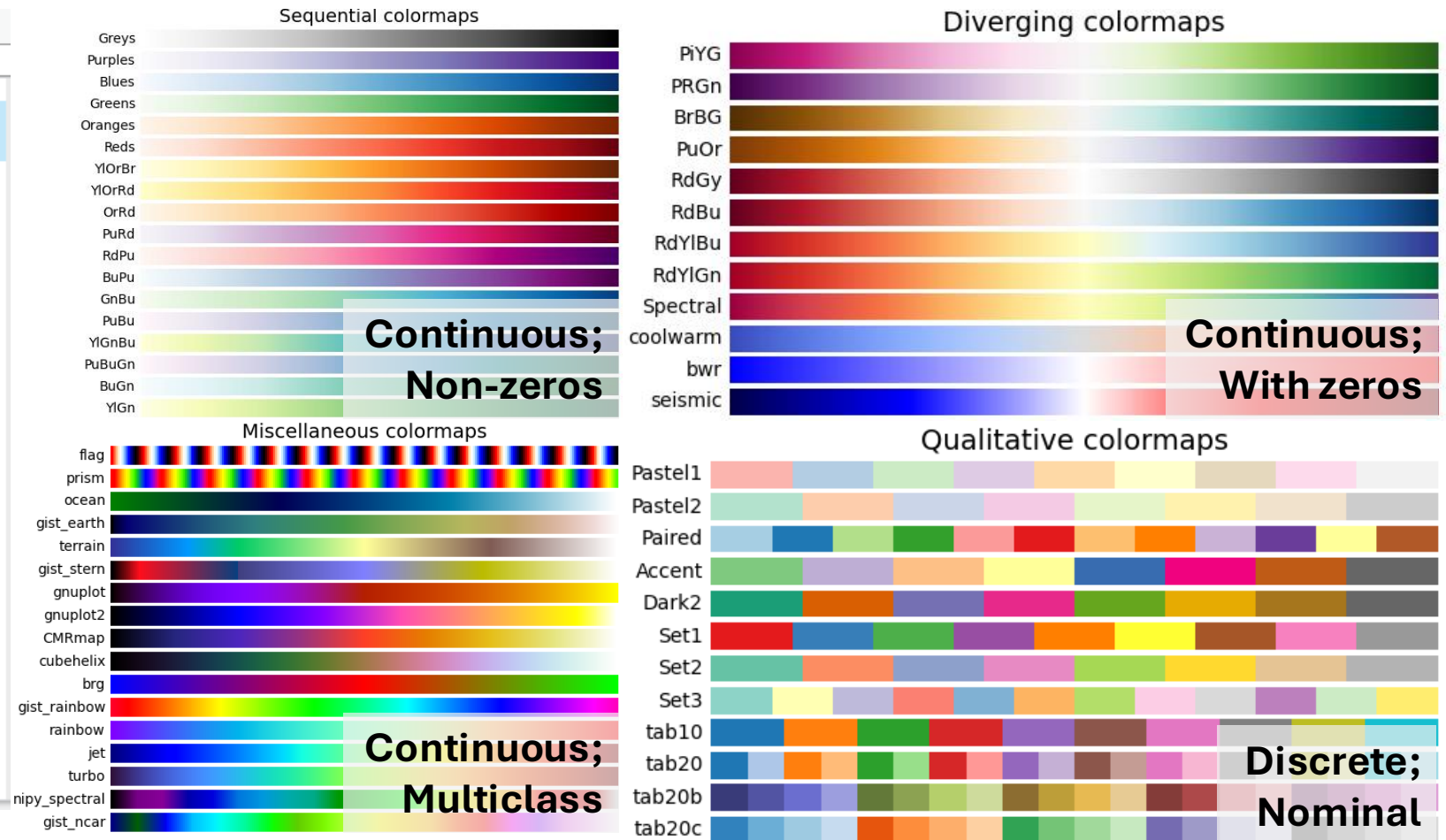
Draw quantities using chart symbols.

Symbolize your layer using symbol attributes



Dictionary

Draw features using a symbol dictionary and rule set.



A satellite night view of Earth, showing a dense network of city lights and connections across the continents, primarily North and South America. The lights form a complex web, with major hubs and numerous smaller nodes. The background is the dark blue of the oceans.

The End

Thank you for your attention!

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