

Planning a GIS Project

Steps in a GIS Project

- Identify you objectives
- Create a project database
- Analyze the data
- Present the result

Identify Your Objectives

- Problem statement
 - Greenvalley is growing and needs a new wastewater treatment and recycling plant...
- Identify the spatial components in the problem statement
 - Siting or routing
 - Location-allocation
 - Spatial modeling (prediction)
 - System control and data acquisition (SCADA)
 - AM/FM

Regional Equity Atlas Project

(http://www.cfuture.org/projects/atlas/index_html)

- How fair is our regional development approach?
How can we make it more fair?
 - Can workers in every community afford to live **near** their jobs?
 - Which communities have ample **access** to parks and natural areas?
 - What neighborhoods in our region lack **access** to grocery stores?
 - Which cities have sufficient resources to provide public **services** to residents?

What information do you need?

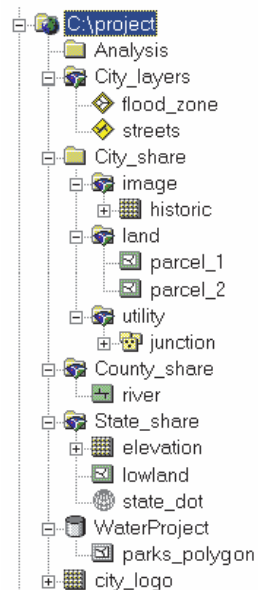
- Decision criteria
- Scenarios
- Assumptions/estimates
- Intended audience/users

Create a Project Database

- Designing
- Automating
- Managing

CRITERIA	DATASET	ATTRIBUTES
LESS THAN 365 METERS ELEVATION	ELEVATION	ELEVATION IN METERS
OUTSIDE THE FLOODPLAIN	FLOODPLAIN	N/A
WITHIN 1,000 METERS OF THE RIVER	RIVER	N/A
AT LEAST 150 METERS FROM RESIDENTIAL PROPERTY	PARCELS	LAND USE
AT LEAST 150 METERS FROM PARKS	PARKS	N/A
ON VACANT LAND	PARCELS	LAND USE
WITHIN 1,000 METERS OF THE WASTEWATER JUNCTION	WASTEWATER JUNCTION	N/A
WITHIN 50 METERS OF A ROAD	ROADS	N/A
AT LEAST 150,000 SQ. METERS	PARCELS	AREA IN SQUARE METERS

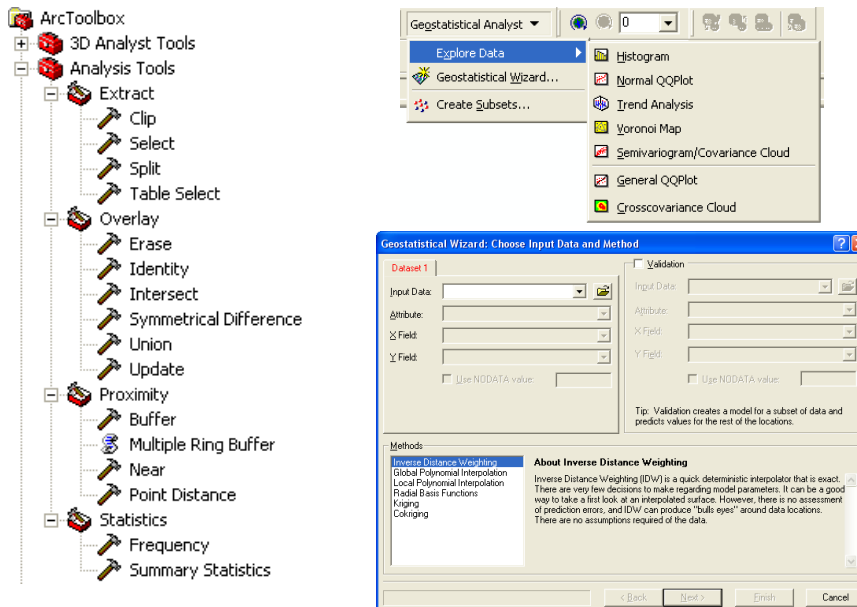
Hooray!



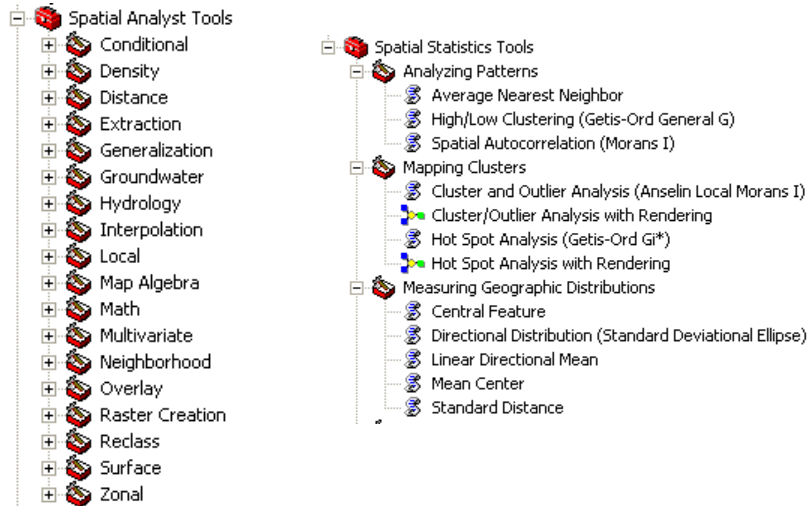
GIS Analysis

- Visualization
- Querying
 - Attribute querying
 - Location (spatial) querying
- Distance (Proximity)
- Overlay
- Modeling

GIS Tools (ArcGIS)



GIS Tools (ArcGIS)



GIS Tools (Others)

- Landscape pattern analysis - FRAGSTATS
- Network analysis
 - ArcGIS Network Analyst Extension (<http://www.esri.com/software/arcgis/extensions/networkanalyst/>)
- Spatial statistical modeling
 - Spatial Statistics Toolbox for Matlab (http://www.spatial-statistics.com/software_index.htm)
 - S-Plus (<http://lib.stat.cmu.edu/S/>)
 - R (<http://sal.agecon.uiuc.edu/csiss/Rgeo/>)
 - Geoda (<https://www.geoda.uiuc.edu/>)
- Agent-based modeling
 - ArcGIS Agent Analyst Extension
 - Netlogo (<http://ccl.northwestern.edu/netlogo/>)

GIS Tools (Others)

- Optimization (?)
 - Multi-objective decision-making (IDRISI – MOLA)
- Data mining (?)
- Geovisualization (?)
- Coupling with other models (?)

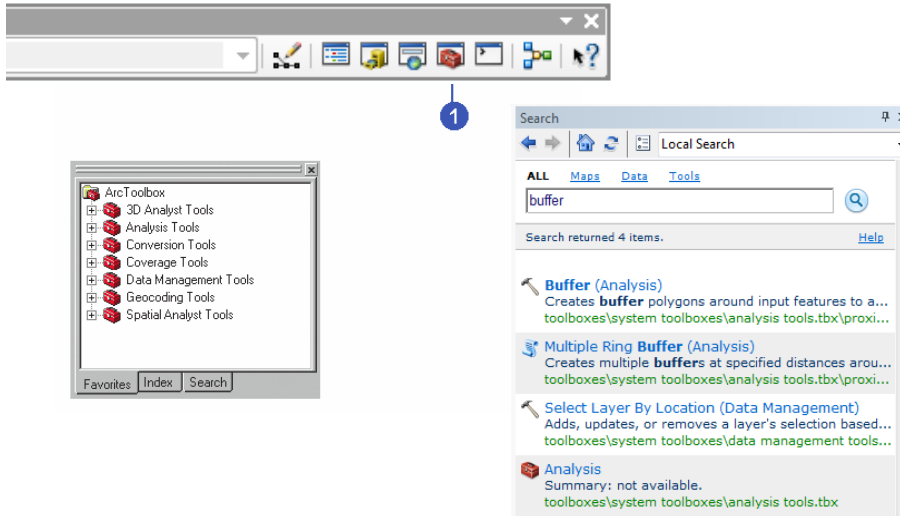
Where to get help?

- ArcGIS Online Help
(I:\Students\Data\GIS\ArcGIS Documentation\ArcGIS9.1_documentation\ESRI_Library)
- ArcScripts (<http://arcscripts.esri.com/>)
- ESRI Developer Network (<http://edn.esri.com/>)

Software Installation






- Send requests to Geography Lab Manager, David Banis (dbanis@pdx.edu)
- Provide a copy of or a link to the software
- Indicate which computers to have the software

ArcToolBox: Analysis



ArcToolBox

ArcToolBox is available from both ArcCatalog and ArcMap.

-  A toolbox can contain tools, toolsets, and scripts and is organized according to the collection of geoprocessing commands it contains.
-  A toolset can contain tools, toolsets, and scripts and is organized according to the geoprocessing commands it contains.
-  A tool is a single geoprocessing command.
-  A script is a set of instructions usually stored in a file and interpreted, or compiled, at run time.
-  A model consists of one process or, more commonly, multiple processes strung together.

Scripts

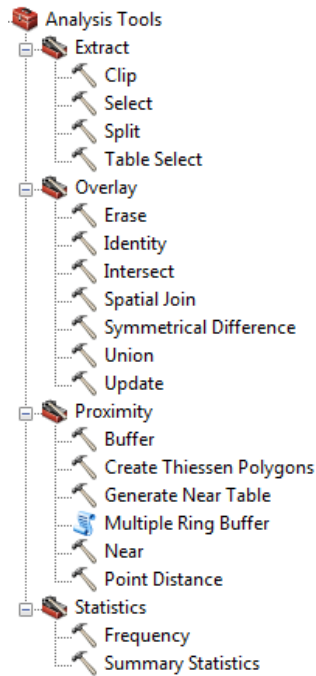
```
PythonWin
File Edit View Tools Window Help
Interactive Window
PythonWin 2.1 (#15, Apr 16 2001, 18:25:49) [MSC 32 bit (Intel)] on win32
Portions Copyright 1994-2001 Mark Hammond (mhammond@skippinet.com.au) - see 'Help/About PythonWin'
for further copyright information.
>>>
MultiRingBuffer.py (read-only)
#####
## Tool Name: Multiple Ring Buffer
## Source Name: Multiringbuffer.py
## Version: ArcGIS 9.0
## Author: Environmental Systems Research Institute Inc.
## Required Arguments: An input feature class or feature layer
##                      An output feature class
##                      A set of distances (multiple set of double values)
## Optional Arguments: The name of the field to contain the distance values,
##                      "distance" is the default name
##                      Option to have the output dissolved. "All" is the default,
##                      which will dissolve all overlapping polygons. "None" will
##                      will maintain all overlaps.
## Description: Creates a set of buffers for the set of input features. The buffers
## are defined using a set of variable distances. The resulting feature
## class has the merged buffer polygons with or without overlapping
## polygons maintained as separate features.
#####
#Import required modules
import win32com.client, win32api, sys, os

#Create the Geoprocessor Object
GP = win32com.client.Dispatch("esriGeoprocessing.GPDispatch.1")
GP.OverwriteOutput = 1

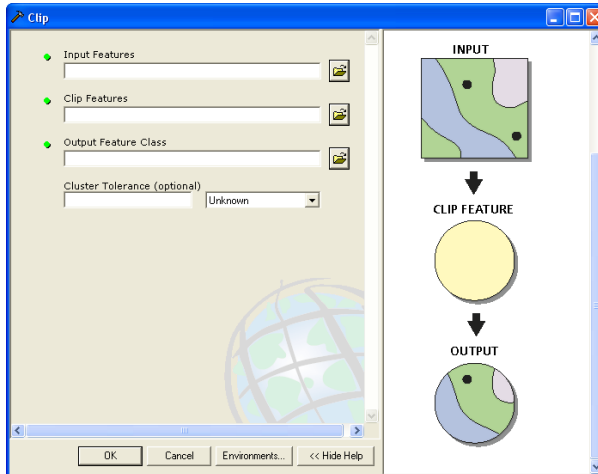
#Define message constants so they may be translated easily
msgDist = "Distances must be provided in ascending size."
msgBuffRings = "Buffering ring "
msgMergeRings = "Merging rings..."
msgDissolve = "Dissolving overlapping boundaries..."
msgError = "Error in Multi-ring Buffer function."
msgOutputError = "Output workspace is undefined. Please provide a full path."
```

Toolsets

- Extract
- Overlay
- Proximity
- Statistics

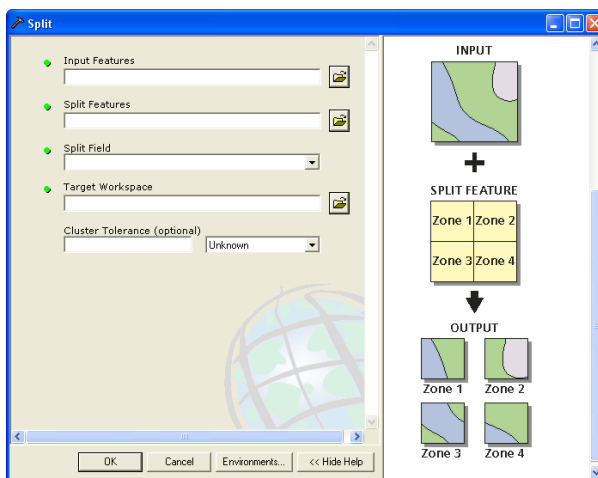


Extract - clip



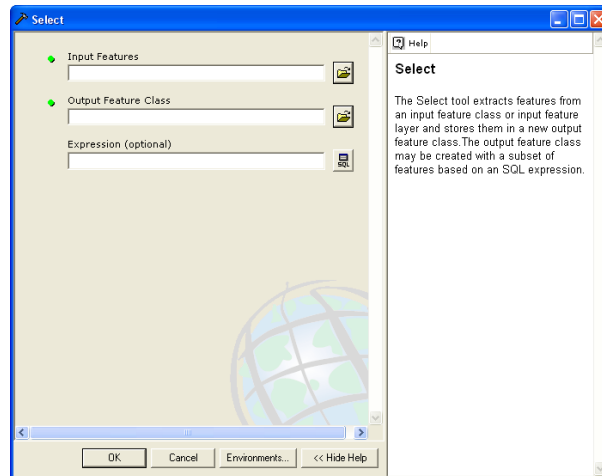
- Clip features must have polygon geometry.
- When using ArcMap layers as input, only the currently selected features are used in the CLIP operation.

Extract - split

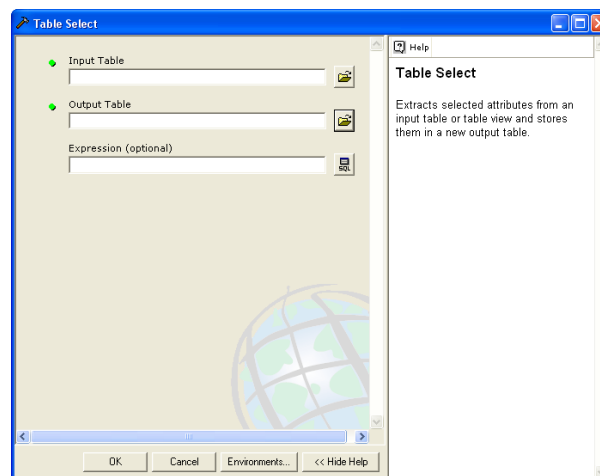


- Split features must be polygons.
- The Split Field datatype must be character.

Extract - select



Extract - table select

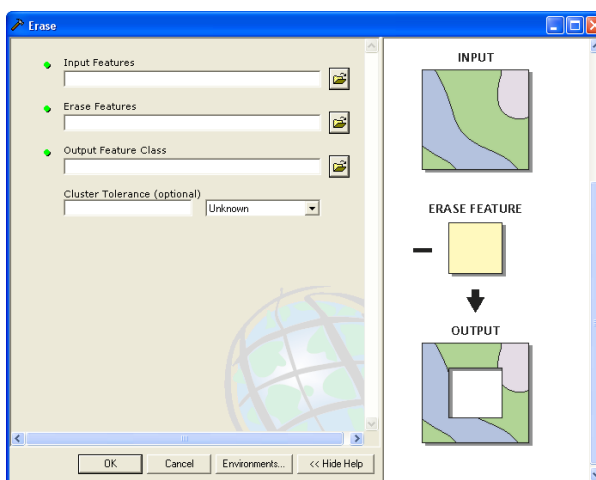


Overlay Procedures

(for all but spatial join tool)

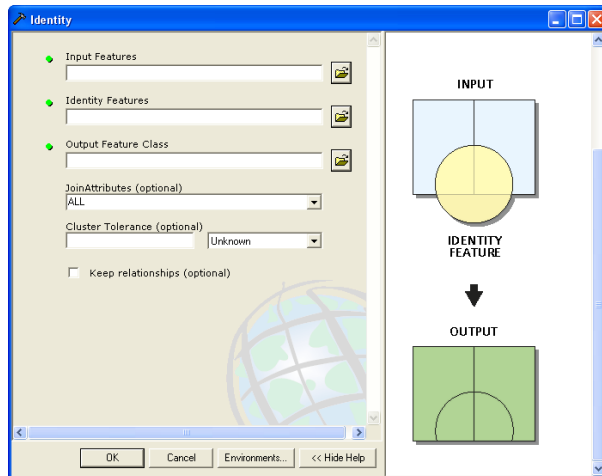
- Determine the spatial reference for processing. All the input feature classes are projected (on the fly) into this spatial reference.
- Crack and cluster the features.
- Discover geometric relationships (overlap) between the input features and the overlap features.
- Assign attributes based on the type of overlay.
- Remove features based on the combinations of attributes and overlay types.

Overlay - erase



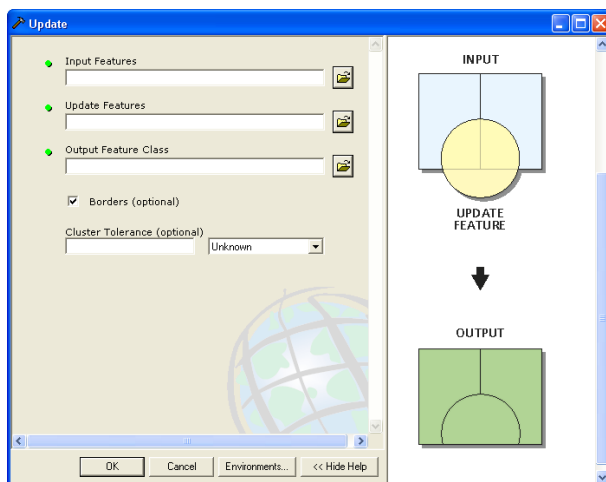
- Erase features must be polygons.

Overlay - identity



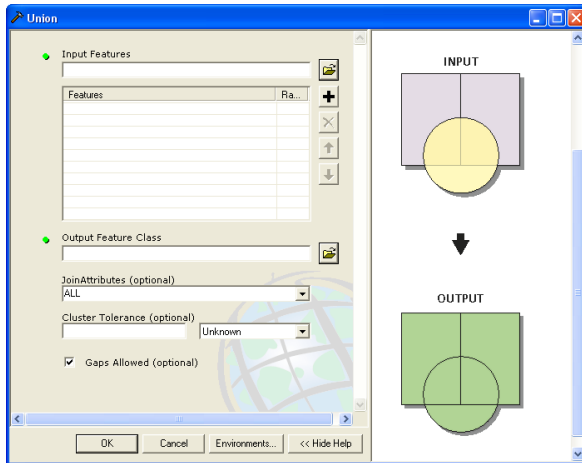
- Identity features must be polygons.

Overlay - update



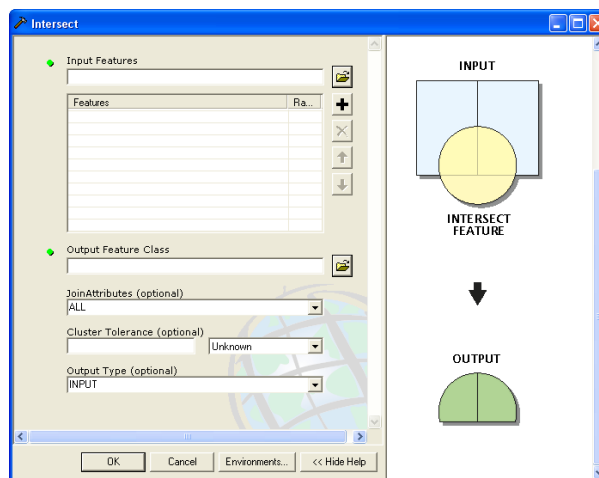
- Update features must be polygons
- The Input Features and Update Features field names must match

Overlay - union

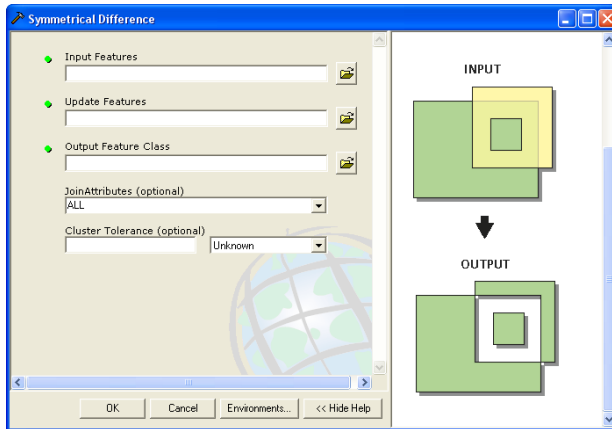


- Input features must be polygons

Overlay - intersect

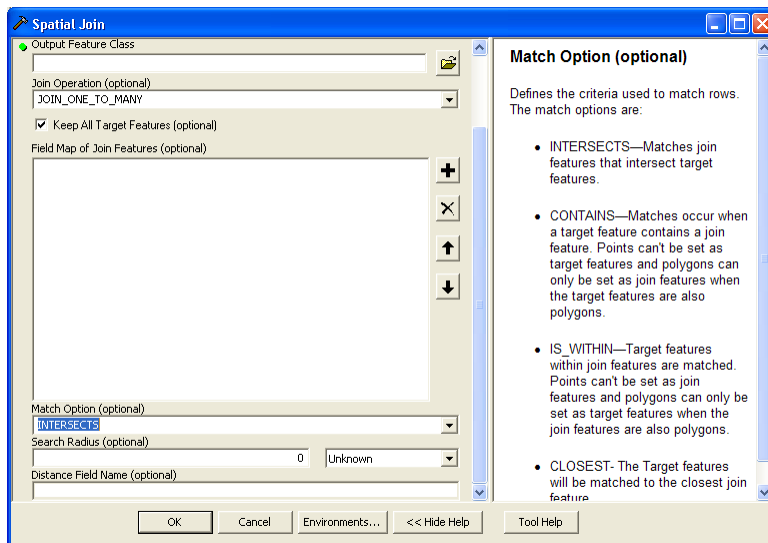


Overlay – symmetrical difference

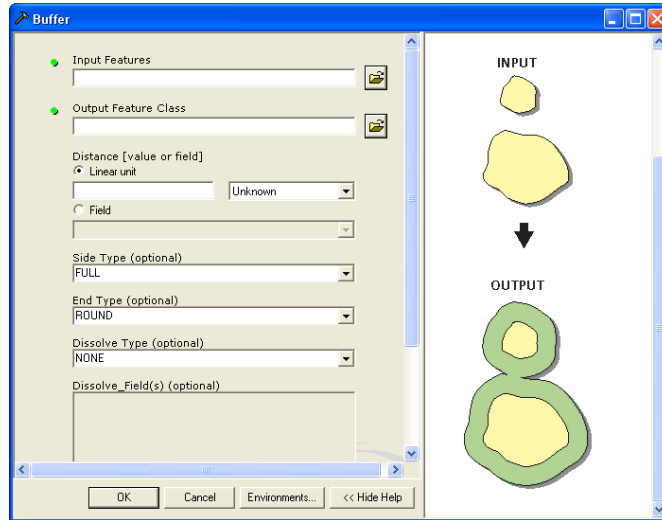


- Input and update features must be polygons

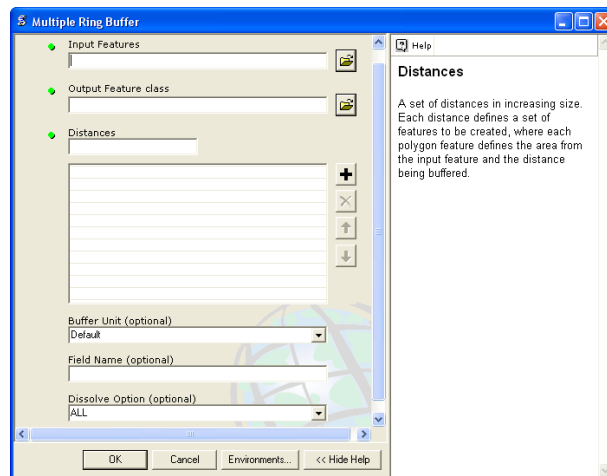
Overlay – Spatial Join



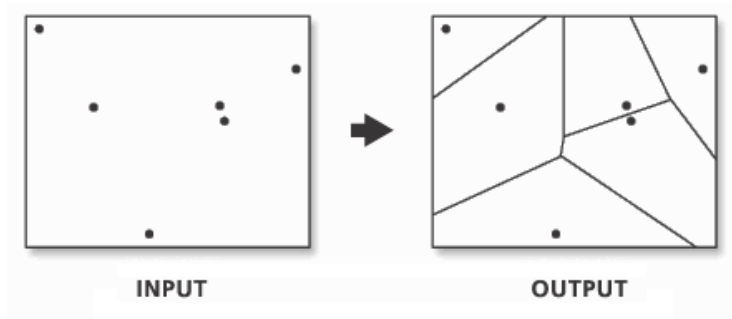
Proximity - buffer



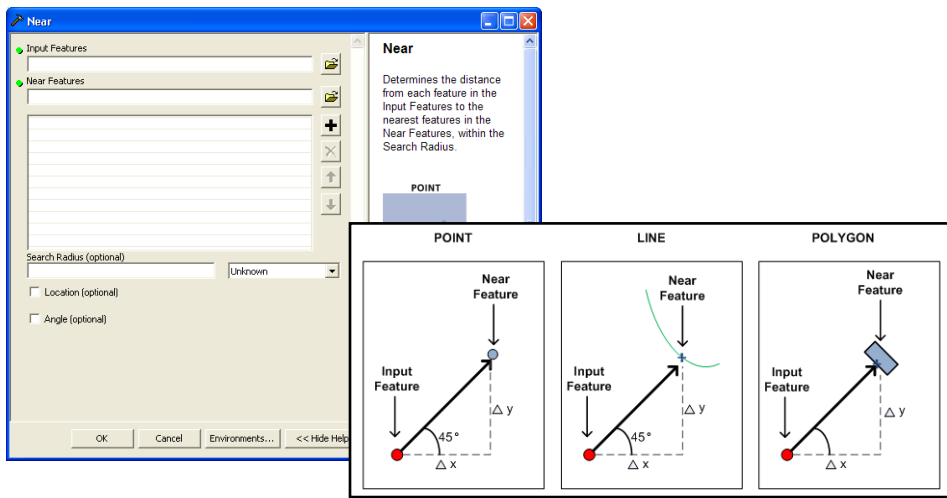
Proximity – multiple ring buffer



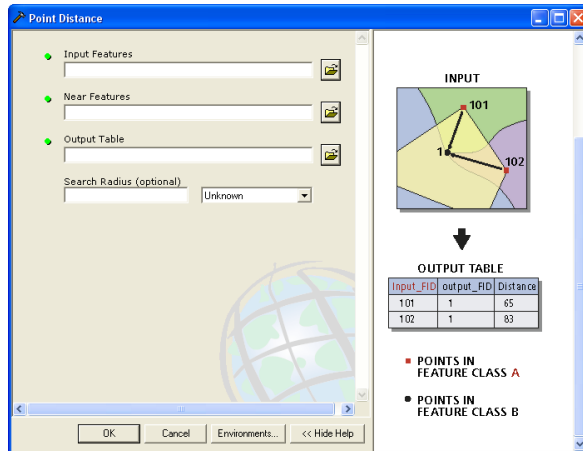
Proximity – create Thiessen polygons



Proximity – near - generate near table

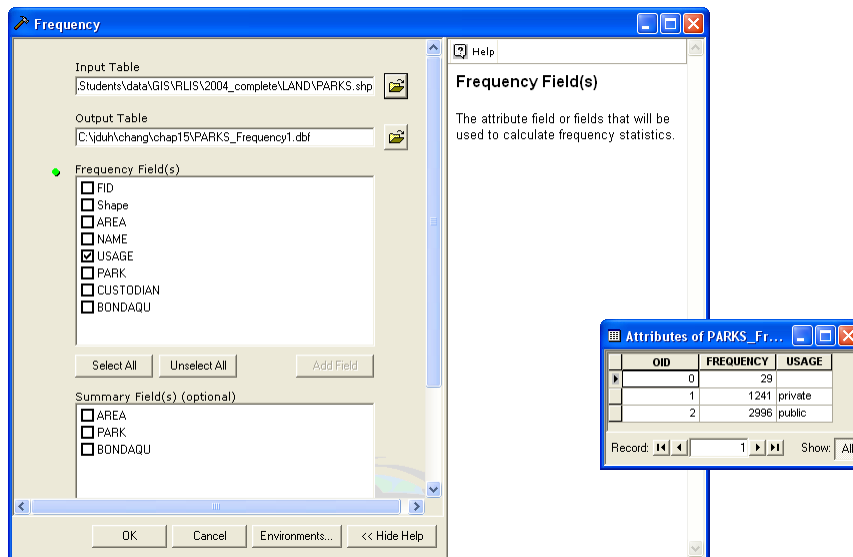


Proximity – point distance



- Both input and near features (layers) must have point geometry.

Statistics – frequency



Statistics – summary statistics

The image shows two screenshots from a GIS software interface. The top screenshot is the 'Summary Statistics' dialog box. It has an 'Input Table' field with the path 's:\data\GIS\VLIS\2004_complete\CENSUS\BLOCKGRP.shp' and an 'Output Table' field with 'C:\jduh\chang\chap15\BLOCKGRP_Statistics.dbf'. The 'Statistics Field(s)' dropdown is empty. Below it is a table with columns 'Field' and 'Statistic Type'. The table contains four rows: 'POP00' with 'SUM', 'POP00' with 'MEAN', 'POP00' with 'MIN', and 'POP00' with 'RANGE'. There are also 'Case field (optional)' and 'FIPS' dropdowns. The bottom screenshot is the 'Attributes of BLOCKGRP_Statistics' table, which displays the results of the summary statistics.

Summary Statistics

Input Table: s:\data\GIS\VLIS\2004_complete\CENSUS\BLOCKGRP.shp

Output Table: C:\jduh\chang\chap15\BLOCKGRP_Statistics.dbf

Statistics Field(s):

Field	Statistic Type
POP00	SUM
POP00	MEAN
POP00	MIN
POP00	RANGE

Case field (optional): FIPS

Attributes of BLOCKGRP_Statistics

OID	FREQUENCY	SUM_POP00	MEAN_POP00	MIN_POP00	RANGE_POP00
0	1160	1799457	1542.635345	122	10669

Record: 1 Show: All Selected Records (0 out of 1 Selected.) Options