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.clfuture.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?

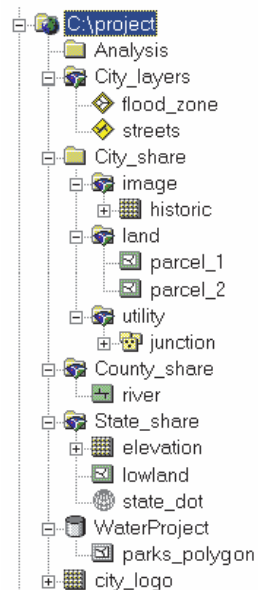 – Which cities have sufficient resources to provide public **services** to residents?

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!

```
C:\project
   Analysis
   City_layers
      flood_zone
      streets
   City_share
      image
         historic
      land
         parcel_1
         parcel_2
      utility
         junction
   County_share
      river
   State_share
      elevation
      lowland
      state_dot
   WaterProject
      parks_polygon
   city_logo
```

GIS Analysis

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

GIS Tools (ArcGIS)
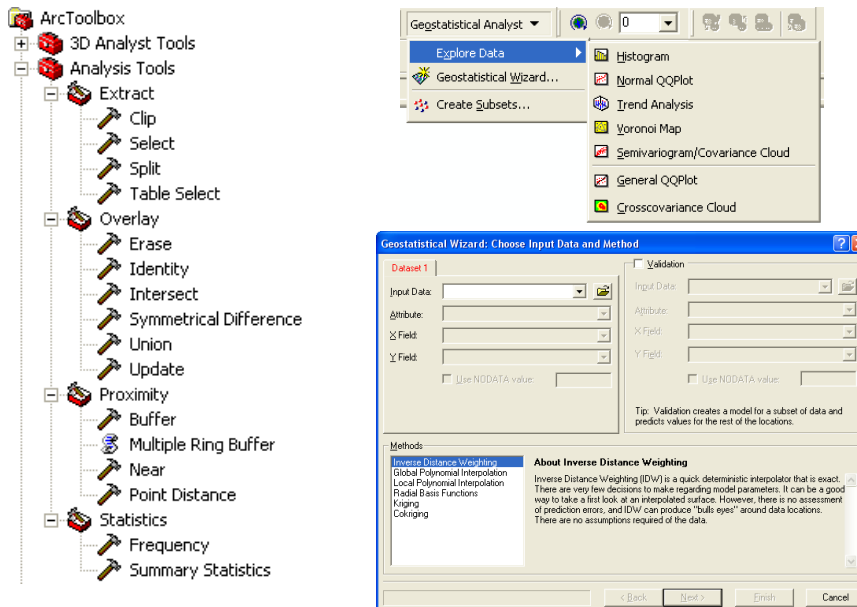
GIS Tools (ArcGIS)
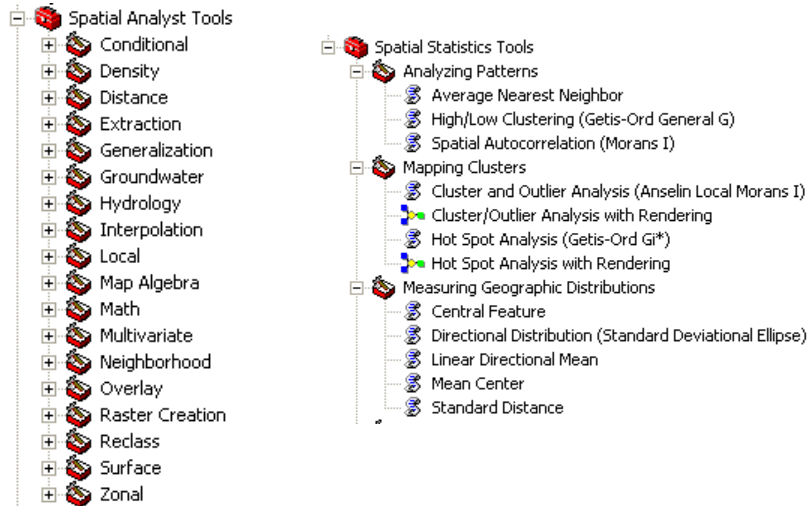
GIS Tools (Others)

- 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
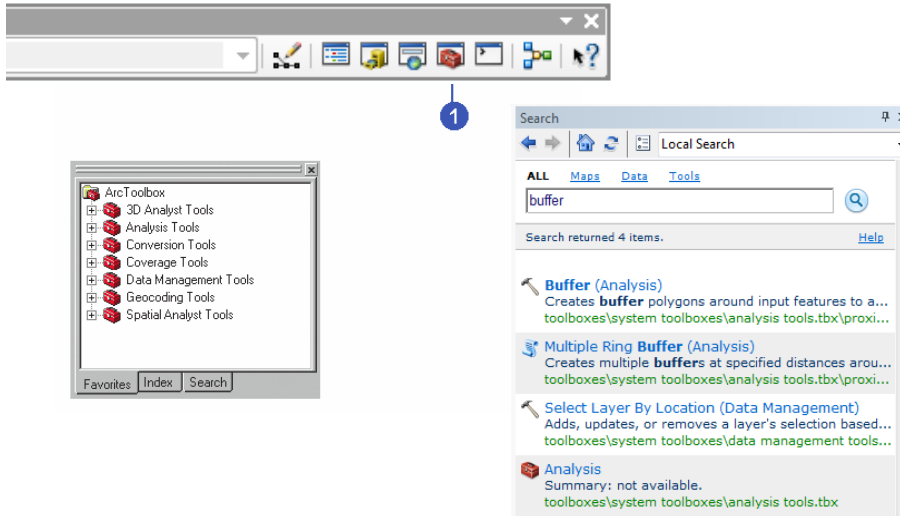
ArcToolBox

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

Toolsets

• Extract

• Overlay

• Proximity

• Statistics
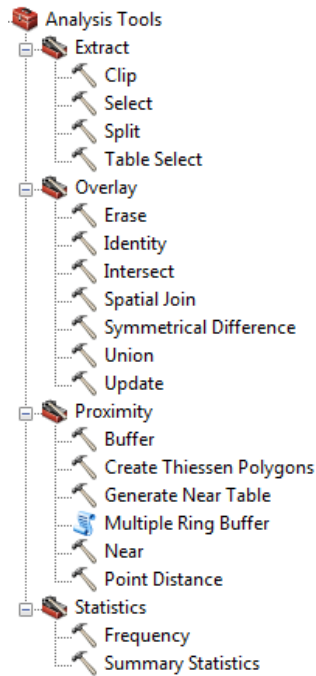
Extract - clip
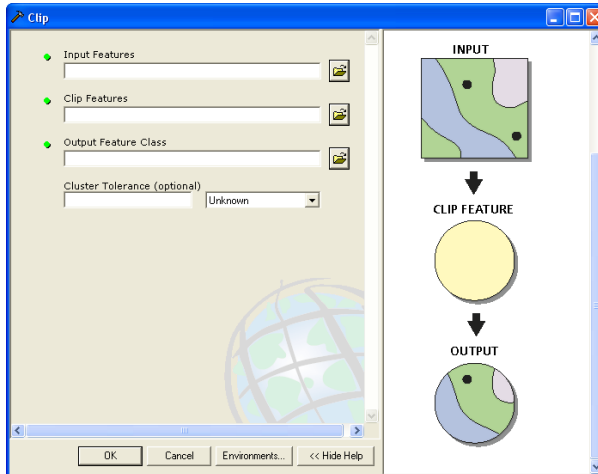
- Clip features must have polygon geometry.

- When using ArcMap layers as input, only the currently selected features are used in the CLIP operation.
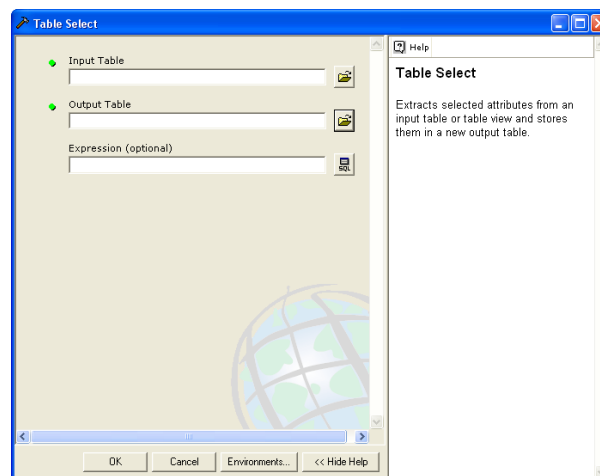
Extract - split
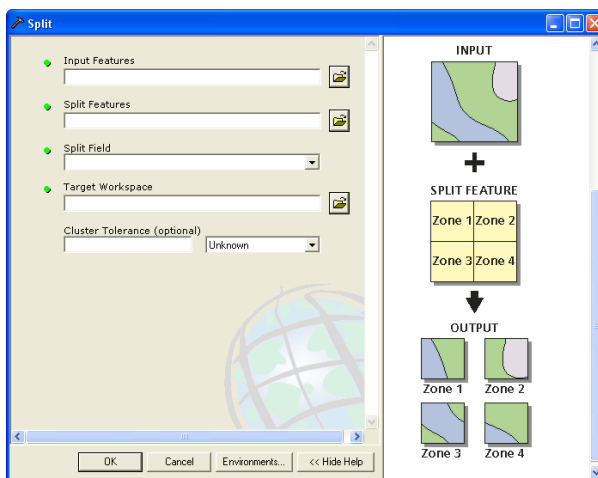
- Split features must be polygons.

- The Split Field datatype must be character.

# Extract - select
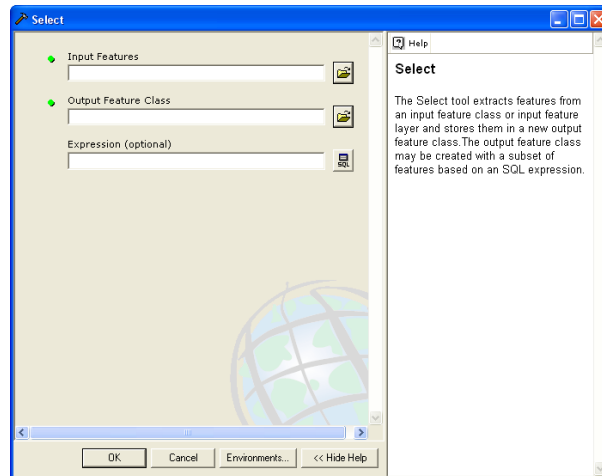
Extract - table select

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
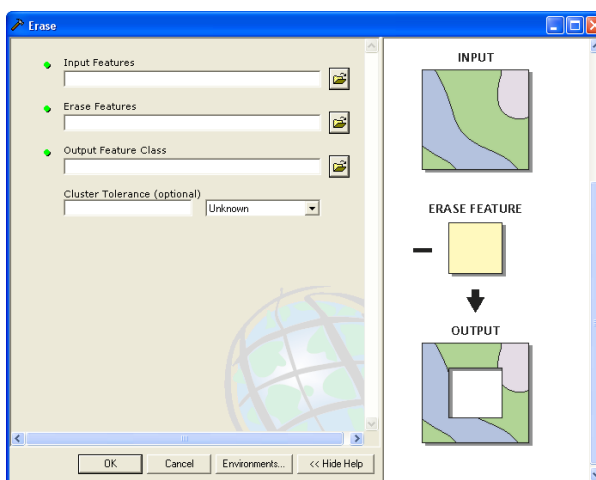
- Erase features must be polygons.

Overlay - identity
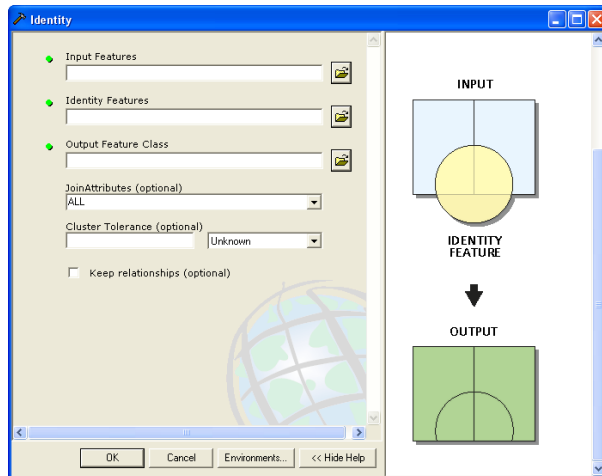
- Identity features must be polygons.

Overlay - update
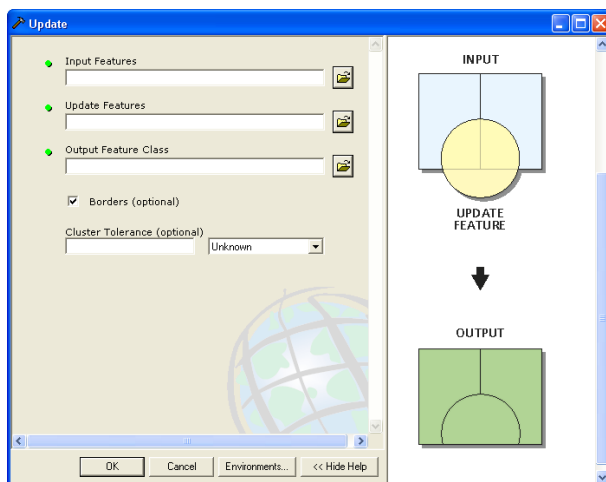
- Update features must be polygons

- The Input Features and Update Features field names must match

Overlay - union
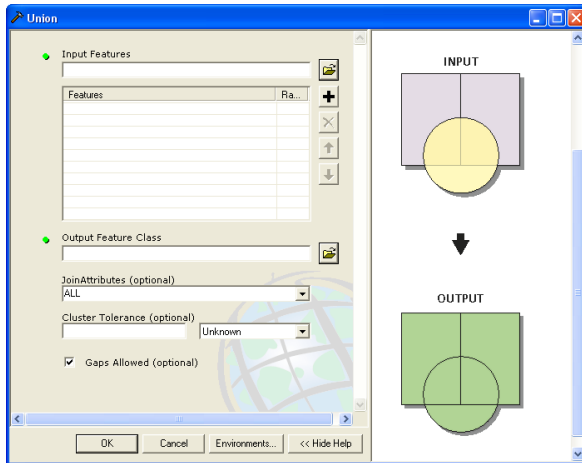
- Input features must be polygons

Overlay - intersect
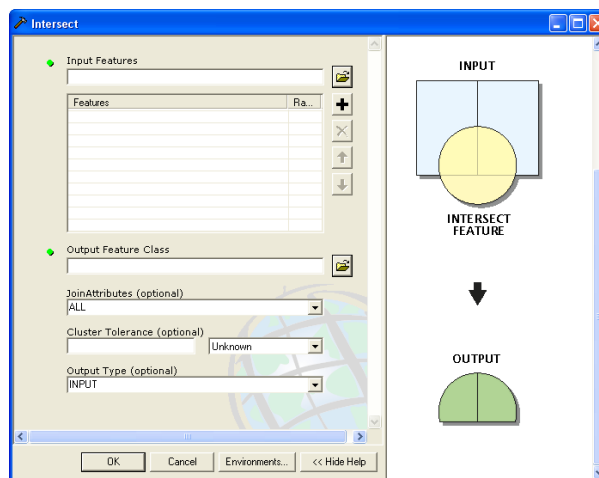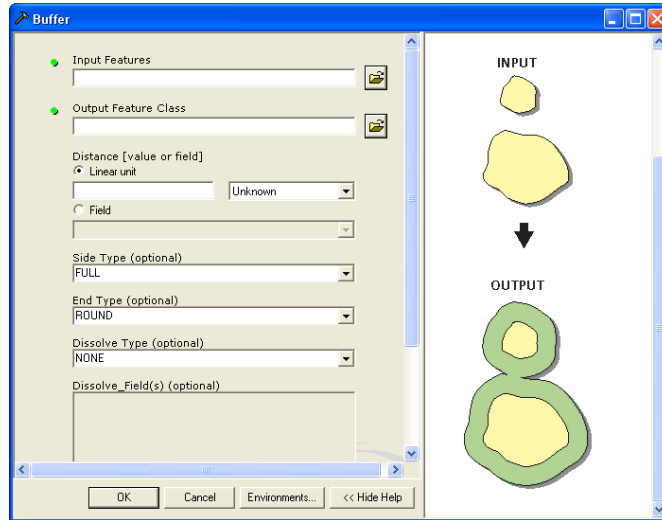
Overlay – symmetrical difference
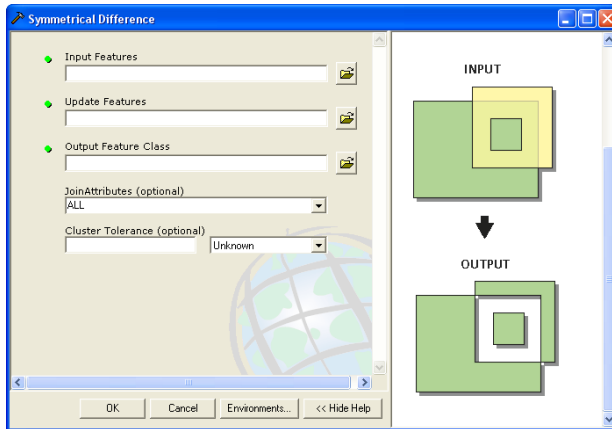
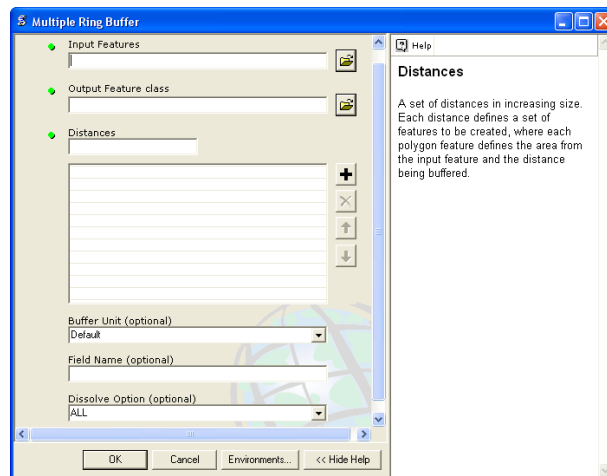- Input and update features must be polygons

Overlay – Spatial Join
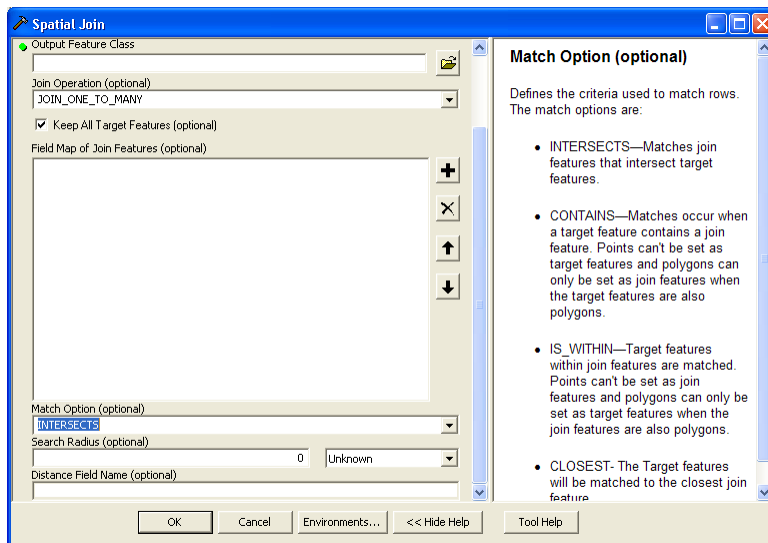
Proximity - buffer
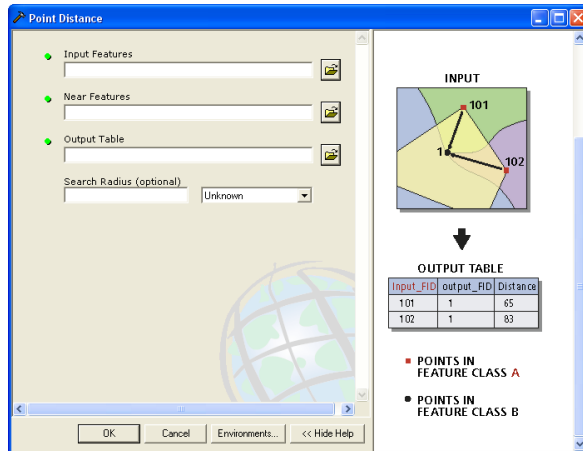

Proximity – multiple ring buffer

Proximity – create Thiessen polygons

INPUT → OUTPUT
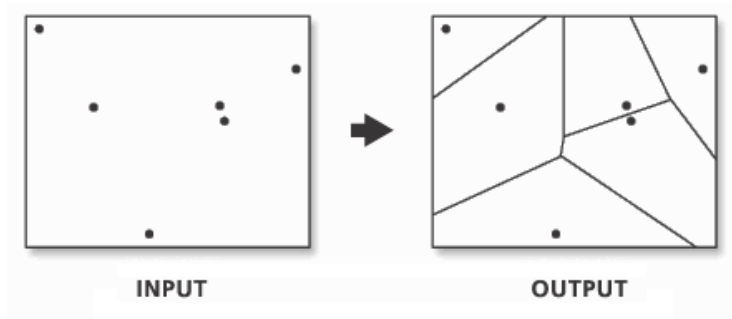
Proximity – near
- generate near table
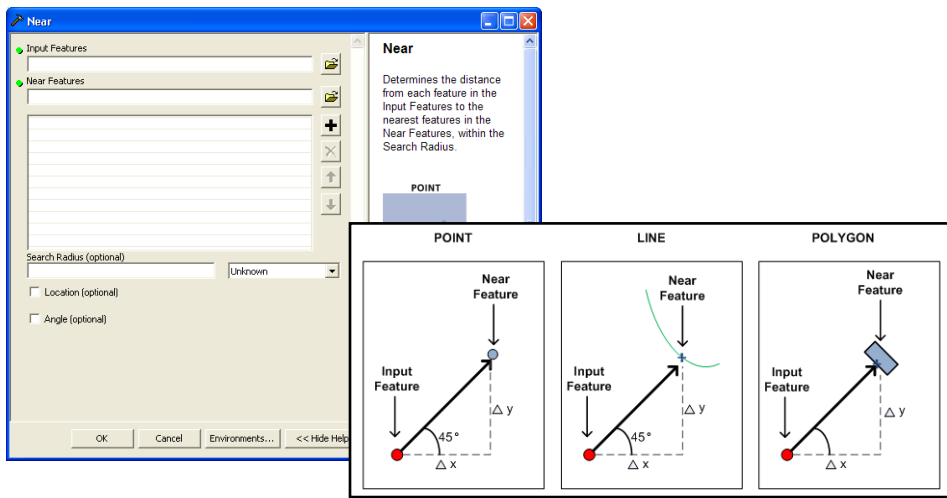
Proximity – point distance

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

Statistics – frequency
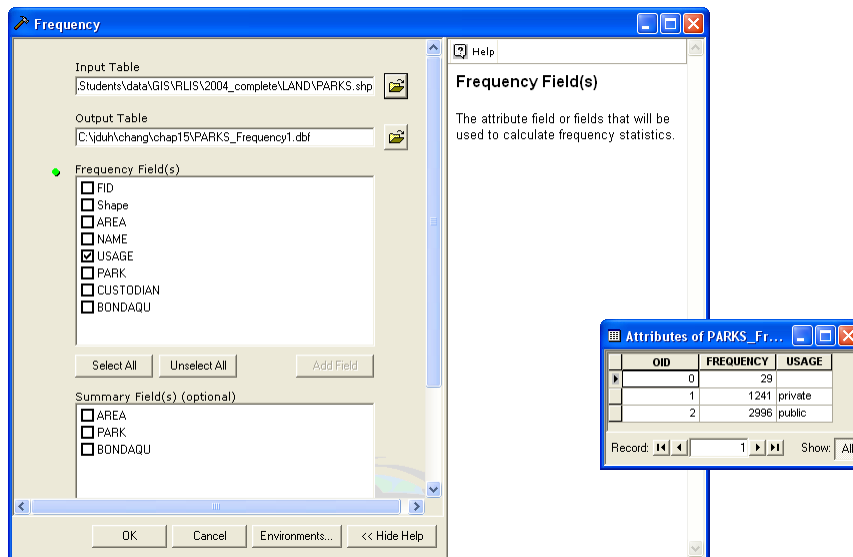
Statistics – summary statistics