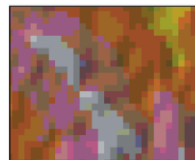


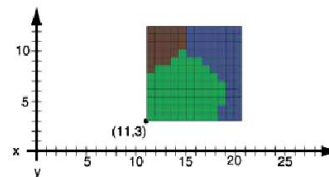
# Raster Data Analysis

## Raster Data Model

- Cells (Pixels)
- Cell value



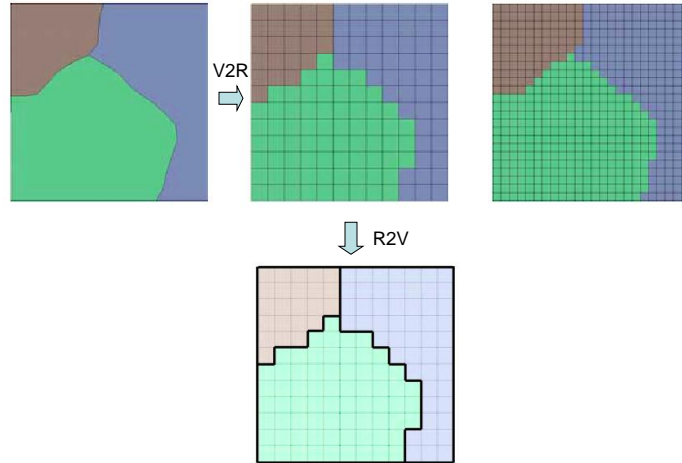
- x, y cell sizes
- Geographic coordinates



Attributes

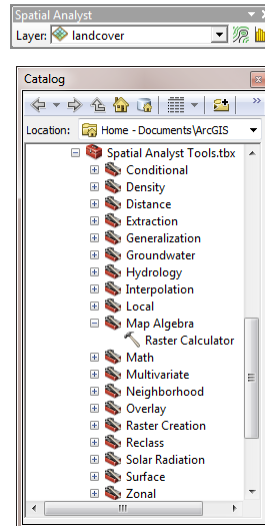
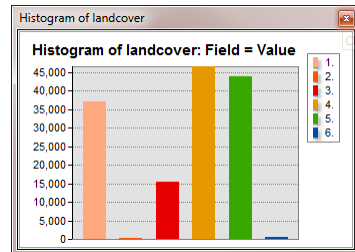
Value	Count	Name	Suitability	Type
2	30672	Cropland and pastureland		4 Agriculture
3	33398	Urban and industrial		5 Urban
10	212	Cleanings and brushfields		5 Cleared
21	1383	Cottonwood		4 Riparian
493	142	Ash-Cottonwood		3 Woodland
476	7205	Oak		3 Woodland
505	1112	Douglas fir		2 Forest
510	6557	Mixed evergreen-broadleaf		2 Forest
512	7943	Douglas fir-Hemlock-Cedar		1 Forest

## Raster to Vector / Vector to Raster



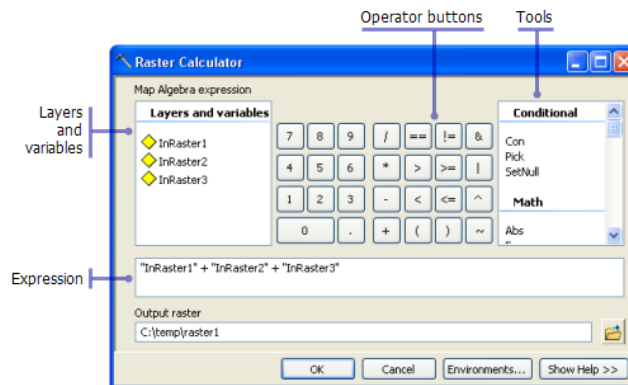
## ArcGIS Spatial Analyst

- Mainly for raster data analysis
  - Arctoolbox: Spatial Analyst Tools
  - Spatial Analyst Toolbar
  - Raster Calculator



# Raster Calculator

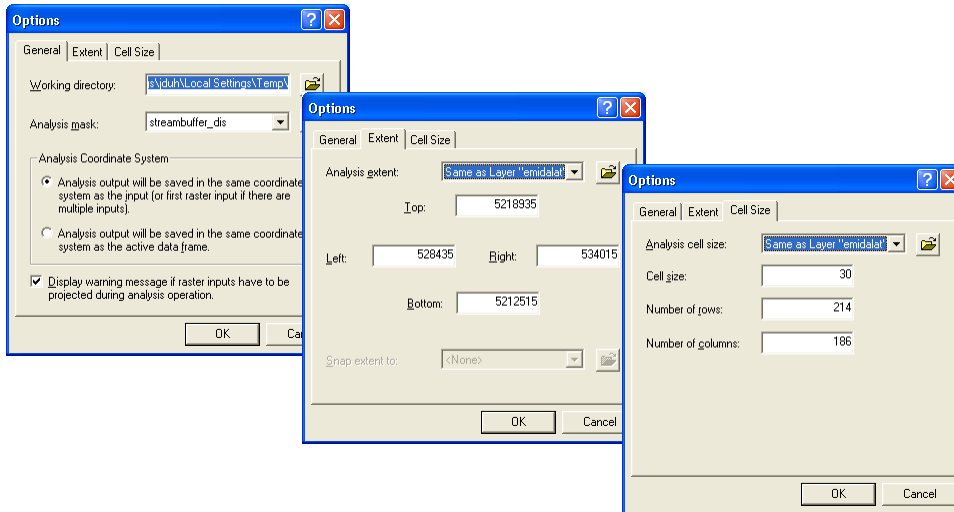
- Single-line map algebraic expression
- Multiple inputs in a single expression.
- Multiple Spatial Analyst tools in a single expression.



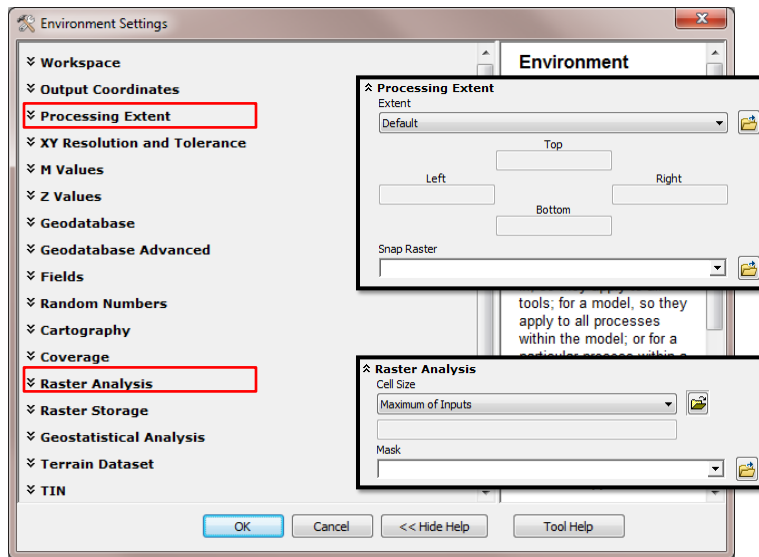
## Raster Calculator Syntax

- Operators  
`inraster1 + inraster2`
- Tools & Functions (tool names are case sensitive!)  
`Aspect("C:/Datat/inraster")`
- Tool parameters  
`Slope("dem", "PERCENT_RISE")`

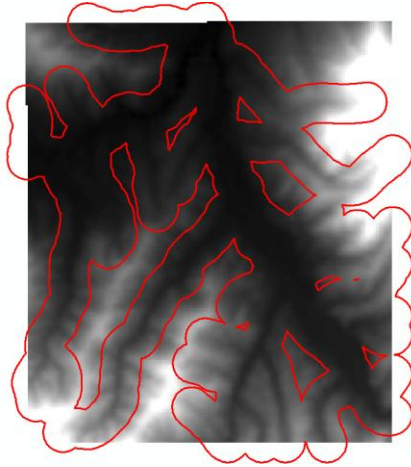
## Spatial Analyst Option Menu (ArcGIS 9.x)



## Geoprocessing Environment Setting (ArcGIS 10)

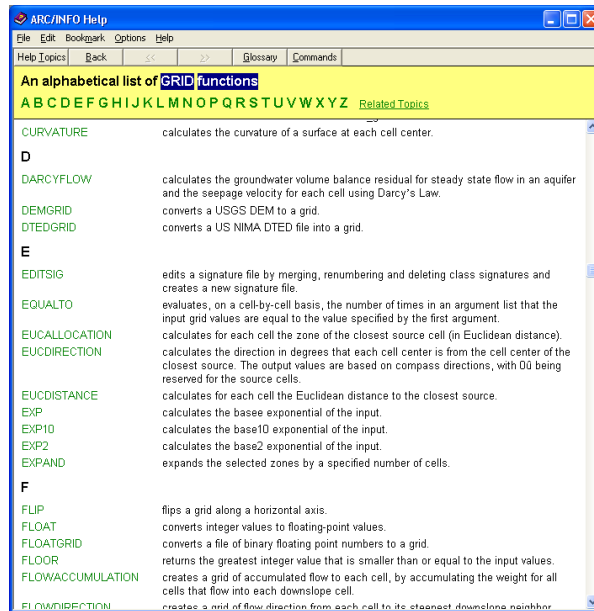


# Mask & Extent



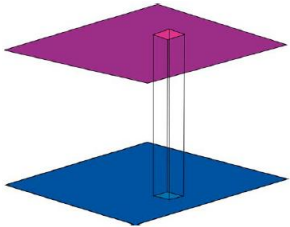
# Raster Calculator Functions

- Arcinfo Workstation / Arcdoc
- > 200 functions

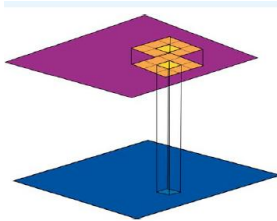


# Raster Operations

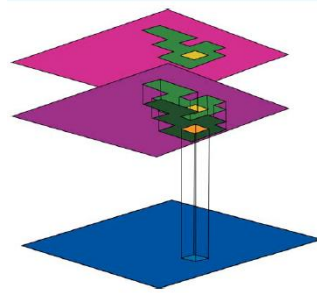
Local operation  
(majority)



Focal operation  
(focalmajority)



Zonal operation  
(zonalmajority)



Global operation  
(costdistance)

Application functions

Spatial Analyst Tools.tbx

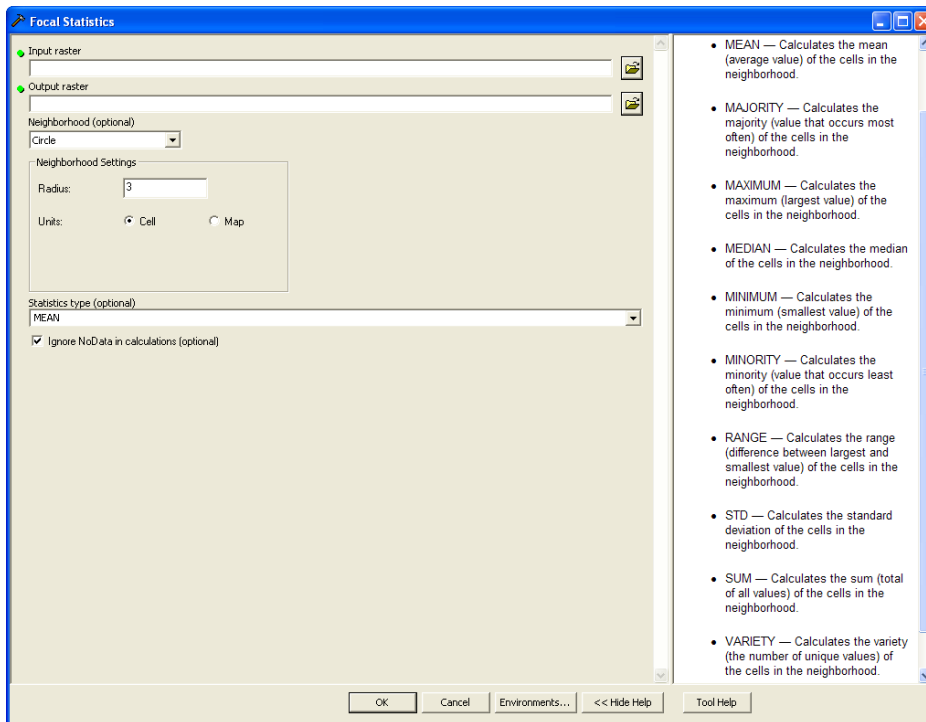
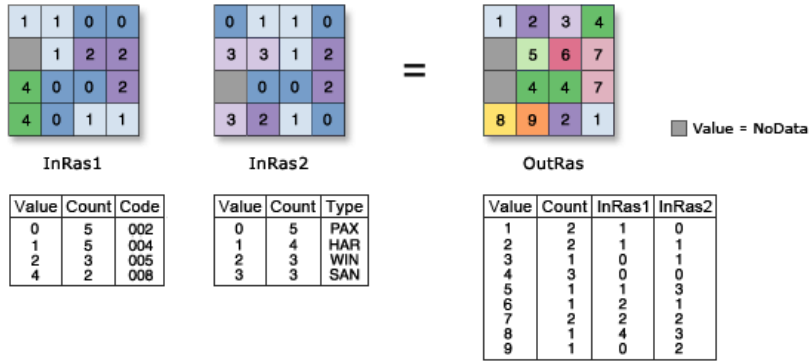
- ⊕ Conditional
- ⊕ Density
- ⊕ Distance
- ⊕ Extraction
- ⊕ Generalization
- ⊕ Groundwater
- ⊕ Hydrology
- ⊕ Interpolation
- ⊖ Local
  - 🔧 Cell Statistics
  - 🔧 Combine
  - 🔧 Equal To Frequency
  - 🔧 Greater Than Frequency
  - 🔧 Highest Position
  - 🔧 Less Than Frequency
  - 🔧 Lowest Position
  - 🔧 Popularity
  - 🔧 Rank

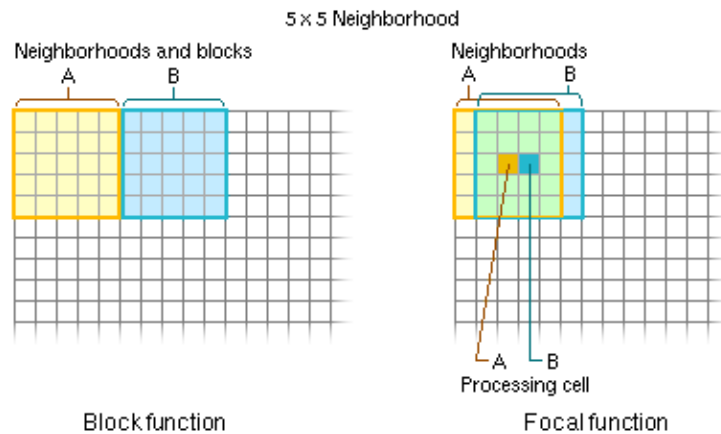
- ⊕ Map Algebra
- ⊕ Math
- ⊕ Multivariate
- ⊖ Neighborhood
  - 🔧 Block Statistics
  - 🔧 Filter
  - 🔧 Focal Flow
  - 🔧 Focal Statistics
  - 🔧 Line Statistics
  - 🔧 Point Statistics
- ⊕ Overlay
- ⊕ Raster Creation
- ⊕ Reclass
- ⊕ Solar Radiation
- ⊕ Surface

Zonal

- 🔧 Tabulate Area
- 🔧 Zonal Fill
- 🔧 Zonal Geometry
- 🔧 Zonal Geometry as Table
- 🔧 Zonal Histogram
- 🔧 Zonal Statistics
- 🔧 Zonal Statistics as Table

# Local Operator: Combine





## Working with Nodata in RC

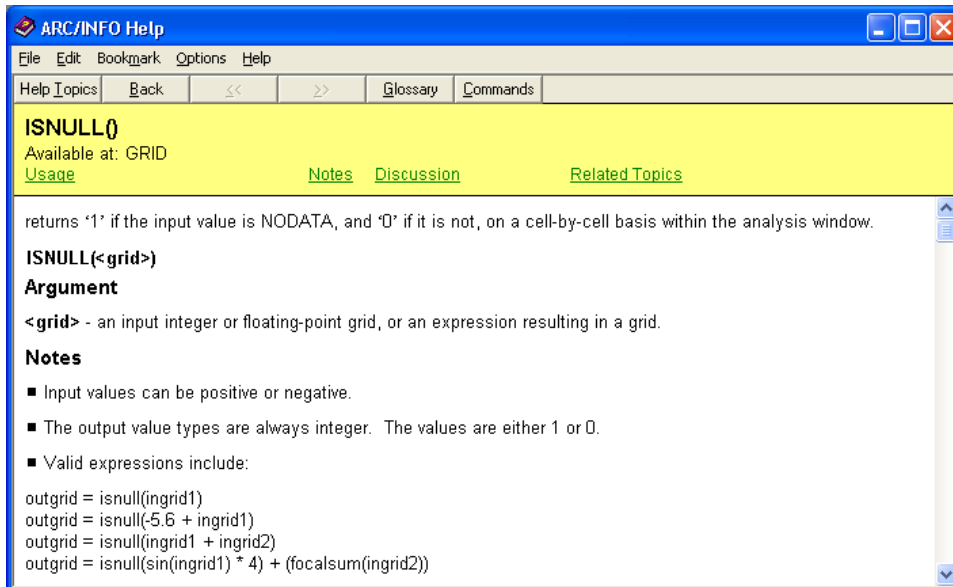
- ISNULL: convert Nodata to a value
- SETNULL: set cell value to Nodata
- CON: conditional function
  
- Examples
  - Replace Nodata with 0 in a DEM
 

```
con(isnull([dem]), 0, [dem])
```
  
  - Set slope > 15 to Nodata on the DEM
 

```
setnull([slope]> 15, [dem])
```



# ISNULL() Function



**ISNULL()**  
Available at: GRID  
[Usage](#) [Notes](#) [Discussion](#) [Related Topics](#)

returns '1' if the input value is NODATA, and '0' if it is not, on a cell-by-cell basis within the analysis window.

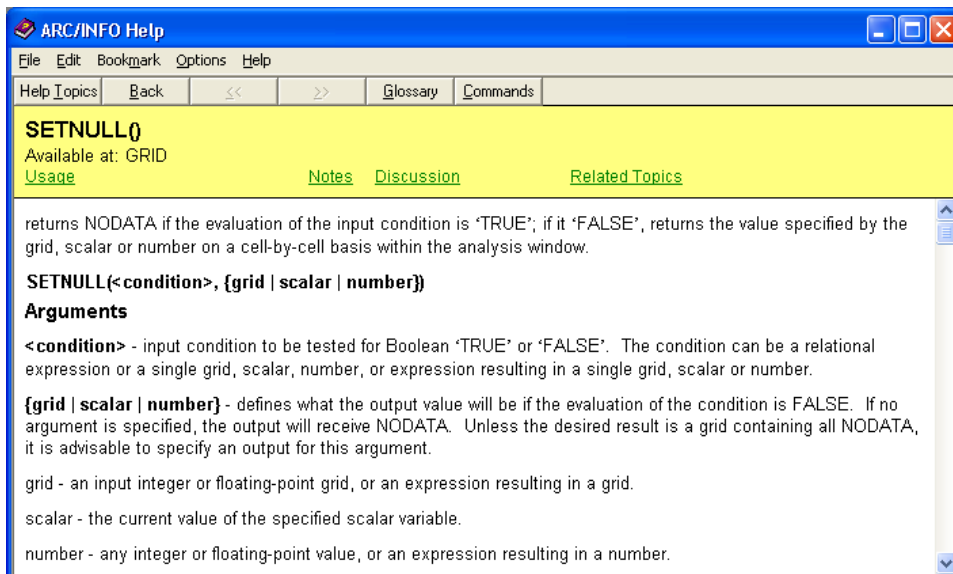
**ISNULL(<grid>)**  
**Argument**  
<grid> - an input integer or floating-point grid, or an expression resulting in a grid.

**Notes**

- Input values can be positive or negative.
- The output value types are always integer. The values are either 1 or 0.
- Valid expressions include:

```
outgrid = isnull(ingrid1)
outgrid = isnull(-5.6 + ingrid1)
outgrid = isnull(ingrid1 + ingrid2)
outgrid = isnull(sin(ingrid1) * 4) + (focalsum(ingrid2))
```

# SETNULL() Function



**SETNULL()**  
Available at: GRID  
[Usage](#) [Notes](#) [Discussion](#) [Related Topics](#)

returns NODATA if the evaluation of the input condition is 'TRUE'; if it 'FALSE', returns the value specified by the grid, scalar or number on a cell-by-cell basis within the analysis window.

**SETNULL(<condition>, {grid | scalar | number})**  
**Arguments**

<condition> - input condition to be tested for Boolean 'TRUE' or 'FALSE'. The condition can be a relational expression or a single grid, scalar, number, or expression resulting in a single grid, scalar or number.

{grid | scalar | number} - defines what the output value will be if the evaluation of the condition is FALSE. If no argument is specified, the output will receive NODATA. Unless the desired result is a grid containing all NODATA, it is advisable to specify an output for this argument.

grid - an input integer or floating-point grid, or an expression resulting in a grid.

scalar - the current value of the specified scalar variable.

number - any integer or floating-point value, or an expression resulting in a number.

# CON() Function

**ARC/INFO Help**

File Edit Bookmark Options Help

Help Topics Back << >> Glossary Commands

## CON()

Available at: GRID

[Usage](#) [Notes](#) [Discussion](#) [Related Topics](#)

performs one or more conditional if/else evaluations on a cell-by-cell basis within the analysis window.

**CON(<condition>, <true\_expression>, <condition>, <true\_expression>, ... <condition>, <true\_expression>, {false\_expression})**

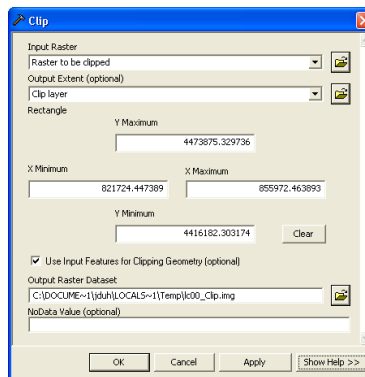
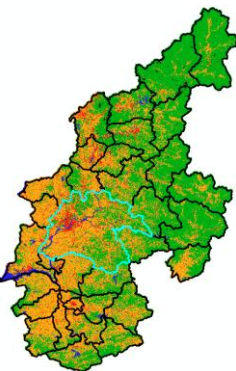
**Arguments**

**<condition>** - any valid Boolean or relational expression involving multiple grids, scalars, numbers, or expressions.

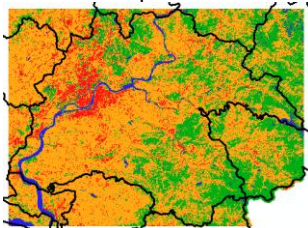
**<true\_expression>** - the value or expression that will be used to compute the output value if the evaluation of the <condition> is TRUE. The input argument can be a grid, scalar or number, or any valid map algebra expression involving operators and functions that results in a valid input. Another CON function is valid input.

**<false\_expression>** - the value or expression that will be used to compute the output value if none of the evaluations of the conditions is TRUE. The input argument can be a grid, scalar or number, or any valid map algebra expression involving operators and functions that results in a valid input. Another CON function is valid input.

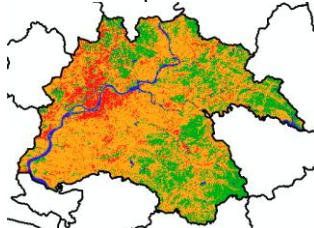
## Raster Clip Example



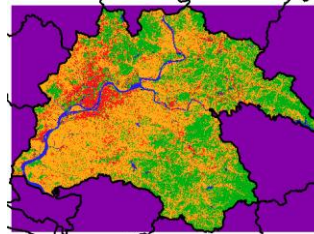
Output A



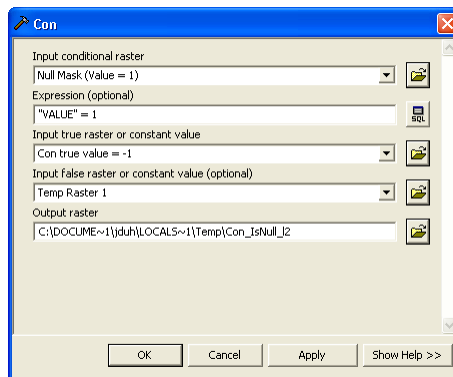
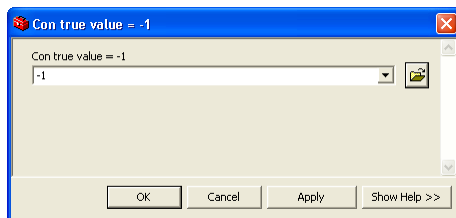
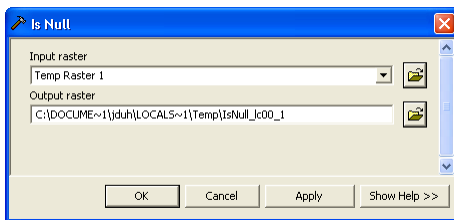
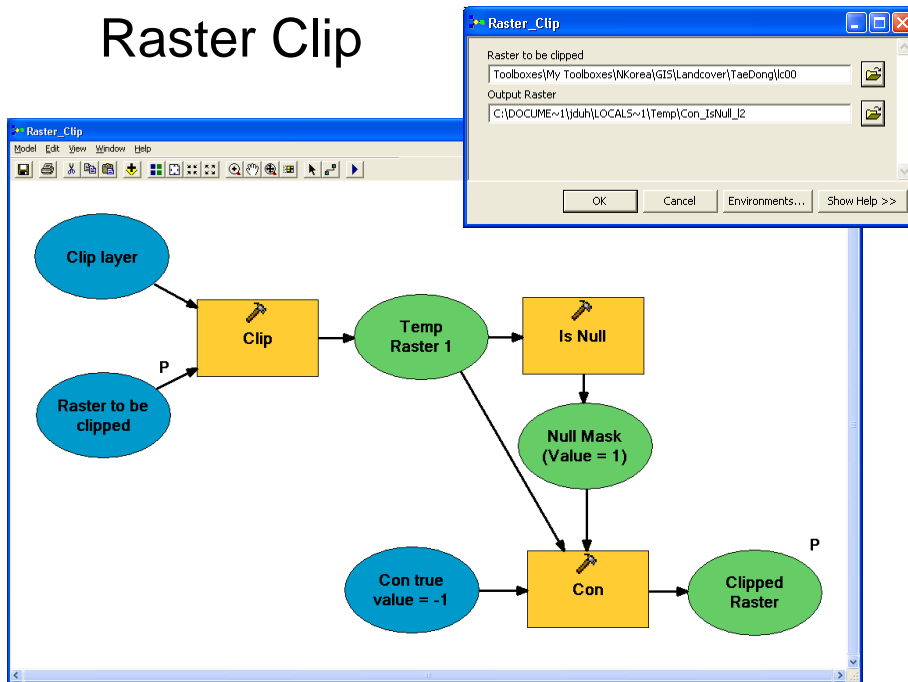
Output B



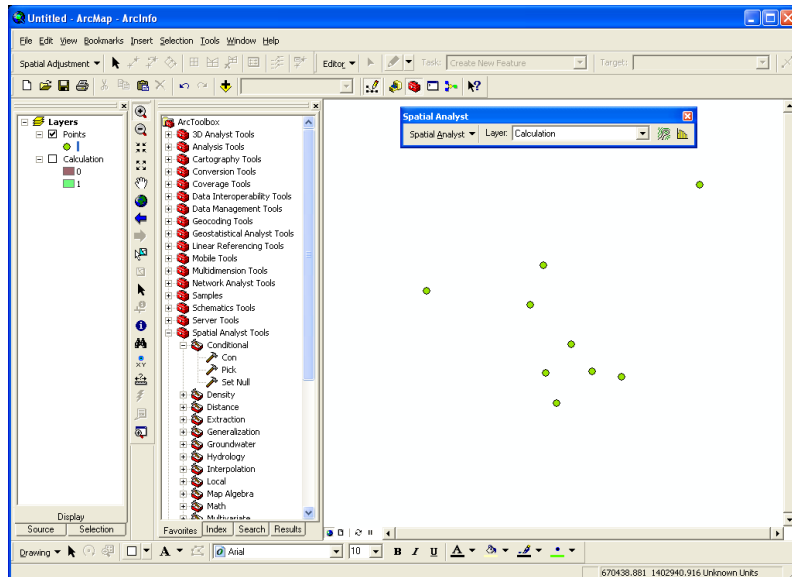
Output C



# Raster Clip

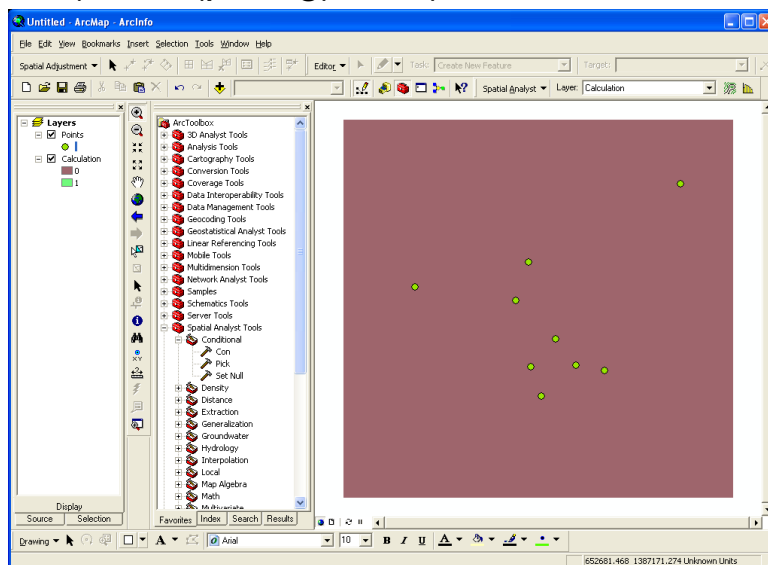


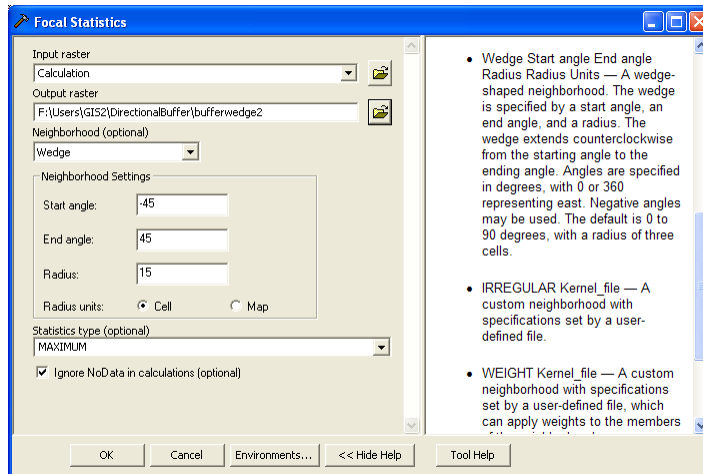
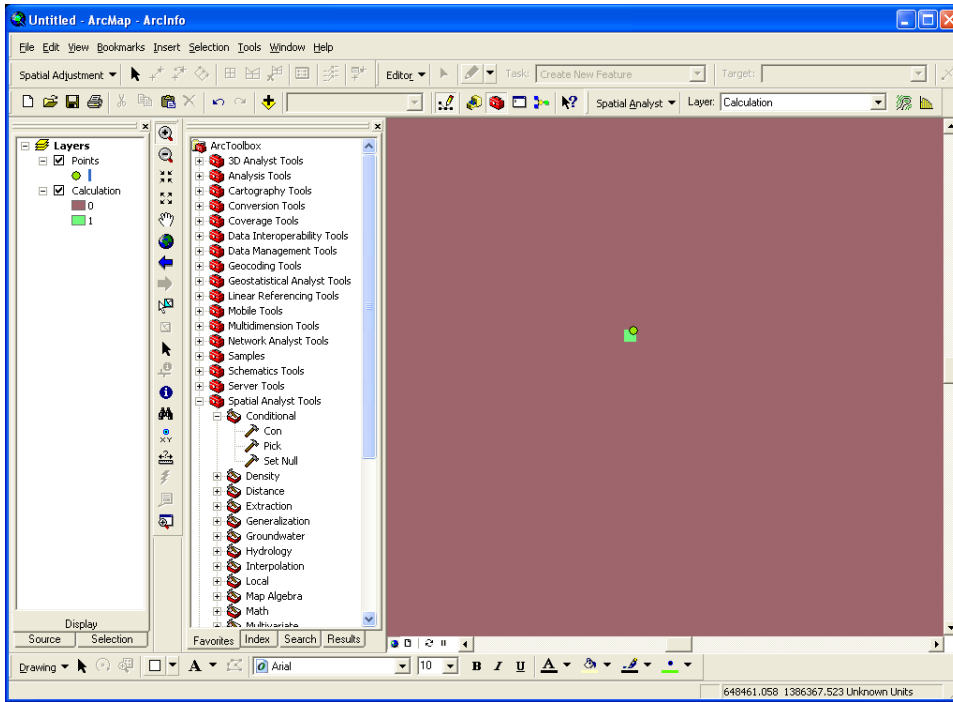
# Raster Buffering

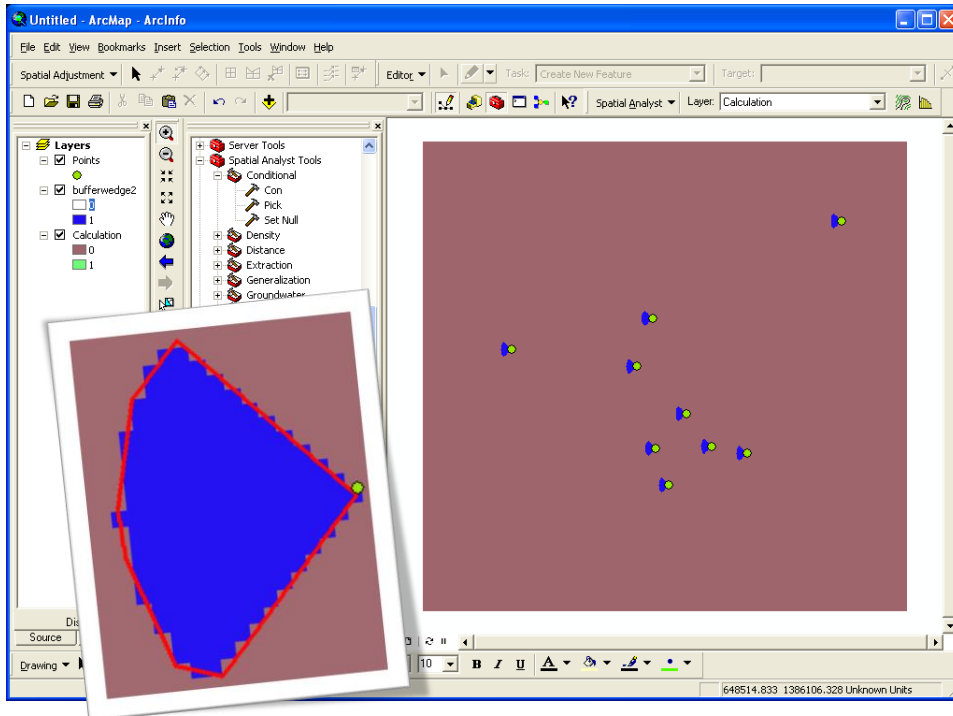


## Point Features to Raster

- $\text{Con}(\text{isnull}(\text{pointg}), 0, 1)$







## Implementing Ordered Weighted Average in ArcGIS

- Raster Calculator
  - $r1 = \text{rank}(1, [\text{factor1}], [\text{factor2}], [\text{factor3}])$
  - $r2 = \text{rank}(2, [\text{factor1}], [\text{factor2}], [\text{factor3}])$
  - $r3 = \text{rank}(3, [\text{factor1}], [\text{factor2}], [\text{factor3}])$
  - $\text{owavg} = [r1] * 0.5 + [r2] * 0.3 + [r3] * 0.2$