

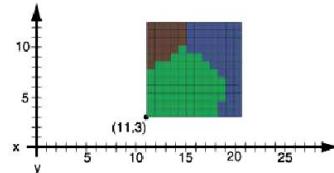
# Raster Data Analysis

## Raster Data Model

- Cells (Pixels)
- Cell value



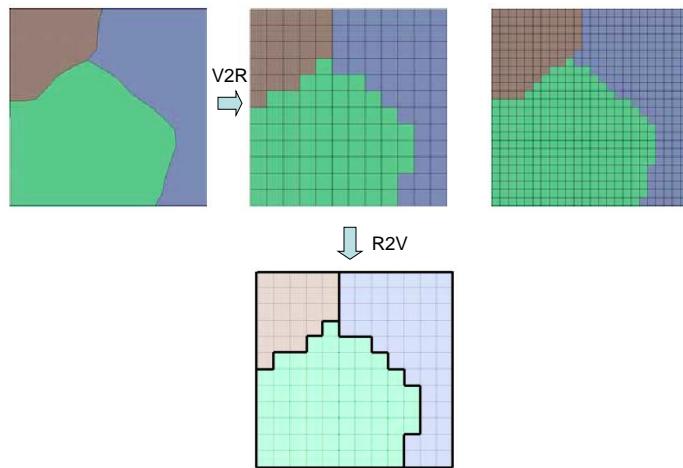
- x, y cell sizes
- Geographic coordinates



### Attributes

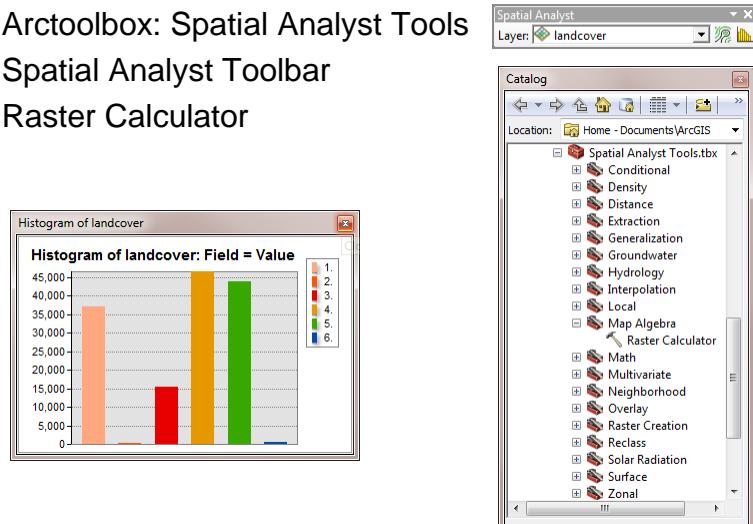
Value	Count	Name	Suitability	Type
2	30672	Cropland and pastureland	4	Agriculture
3	3119	Urban and industrial	5	Urban
10	312	Clearings and brushfields	5	Cleared
21	1383	Cottonwood	4	Paper
463	142	Ash-Cottonwood	3	Woodland
476	7205	Oak	3	Woodland
506	1112	Douglas Fir	2	Forest
510	6957	Mixed evergreen-brushfield	3	Forest
512	7943	Douglas fir-Hemlock-Cedar	1	Forest

## Raster to Vector / Vector to Raster



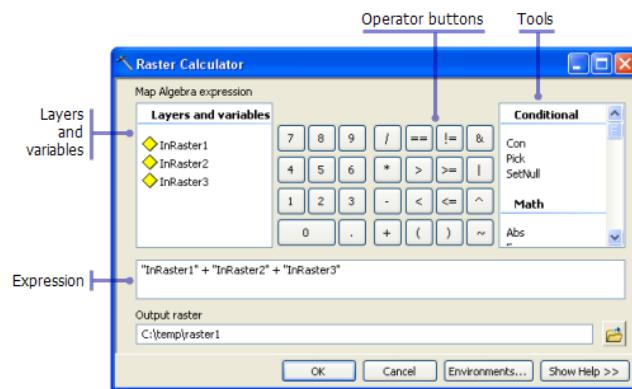
## ArcGIS Spatial Analyst

- 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
```

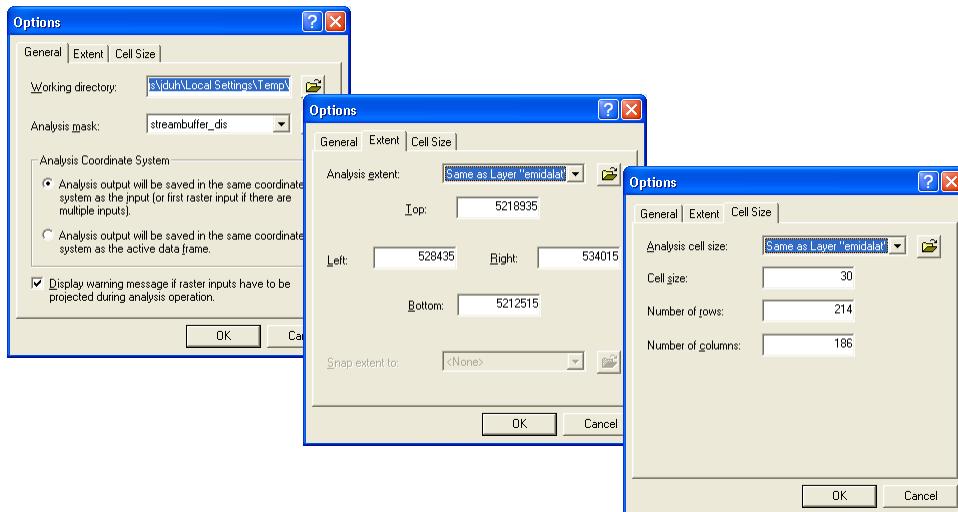
- Tools & Functions (tool names are case sensitive!)

```
Aspect("C:/Datat/inraster")
```

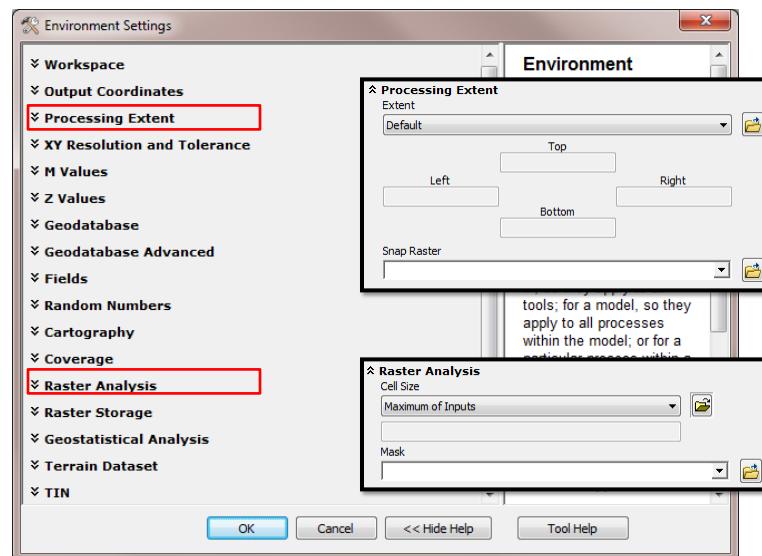
- Tool parameters

```
Slope("dem", "PERCENT_RISE")
```

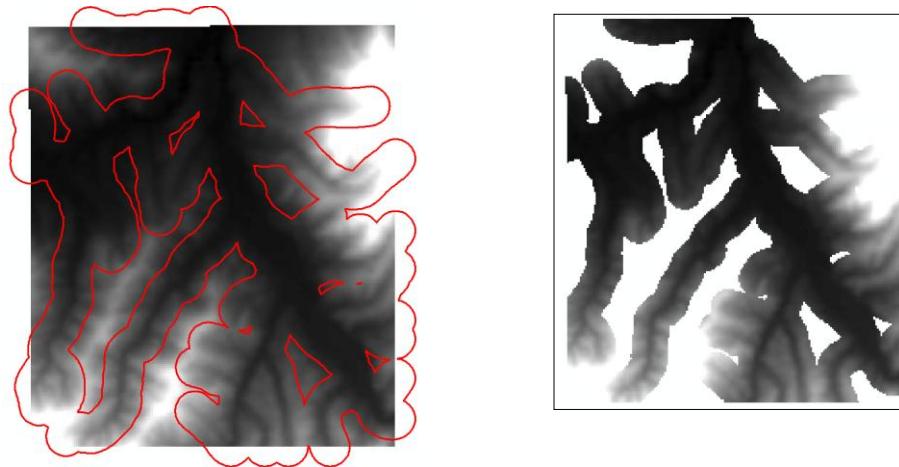
## Spatial Analyst Option Menu (ArcGIS 9.x)



## Geoprocessing Environment Setting (ArcGIS 10)



# Mask & Extent



## Raster Calculator Functions

- Arcinfo Workstation / Arcdoc
- > 200 functions

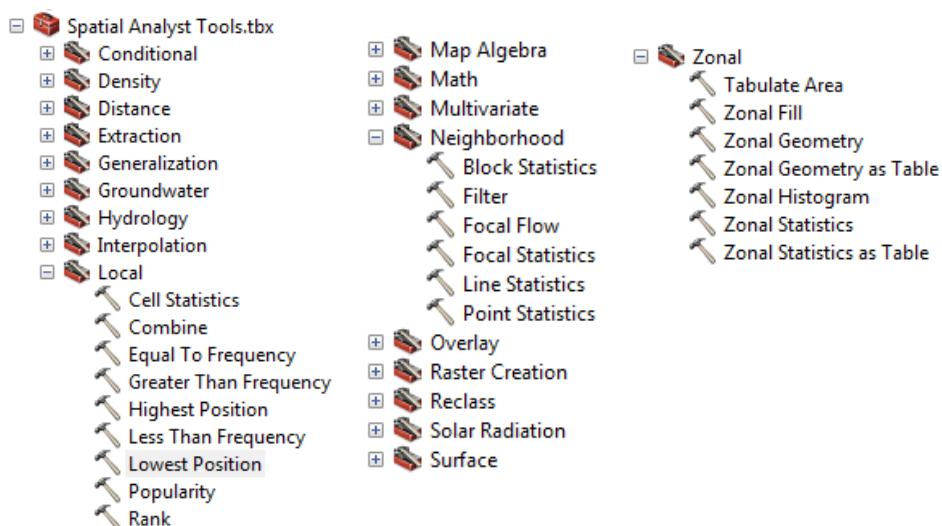
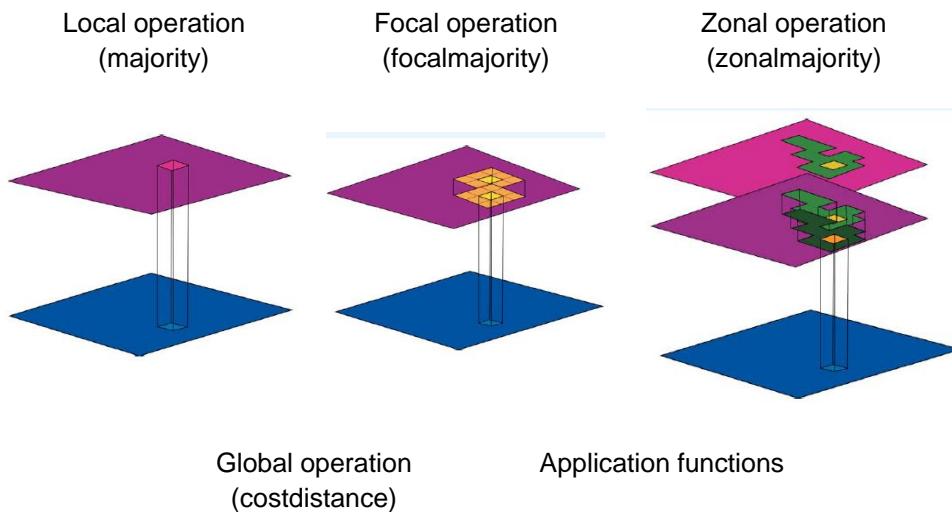
ARC/INFO Help

An alphabetical list of GRID functions

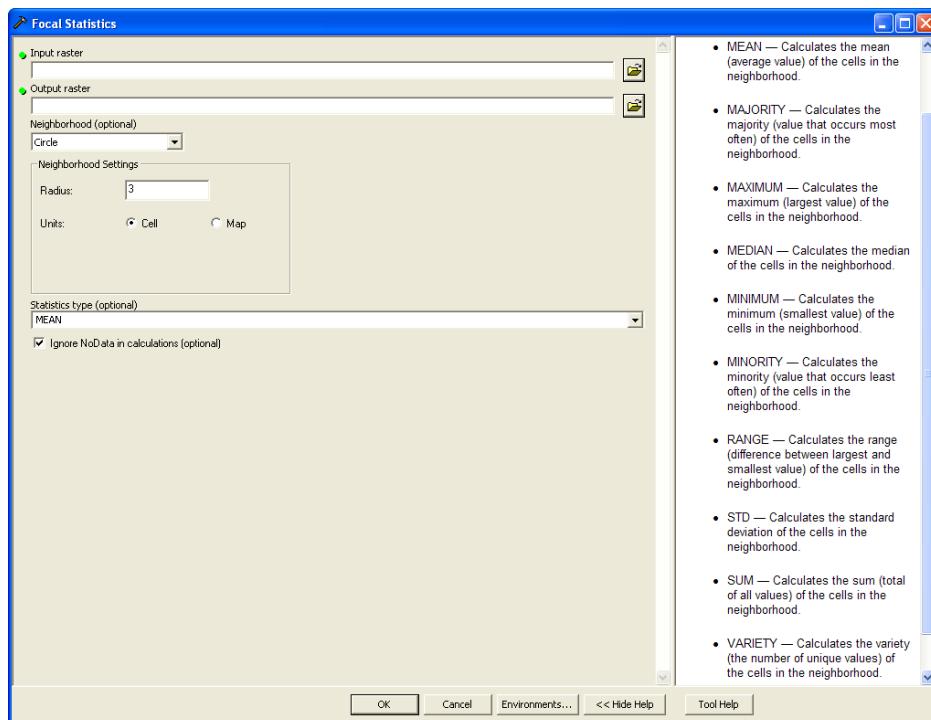
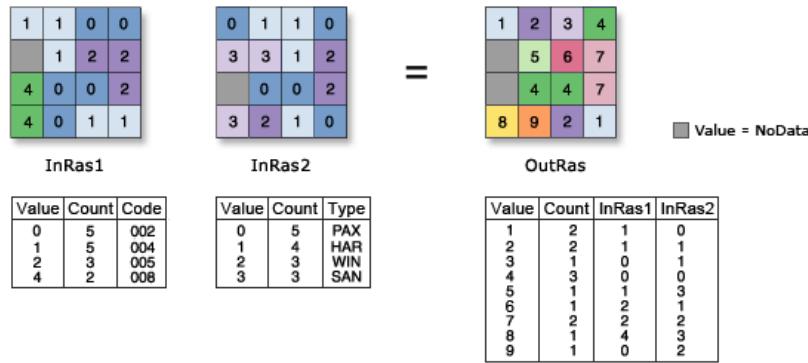
ABCDEFGHIJKLMNOPQRSTUVWXYZ Related Topics

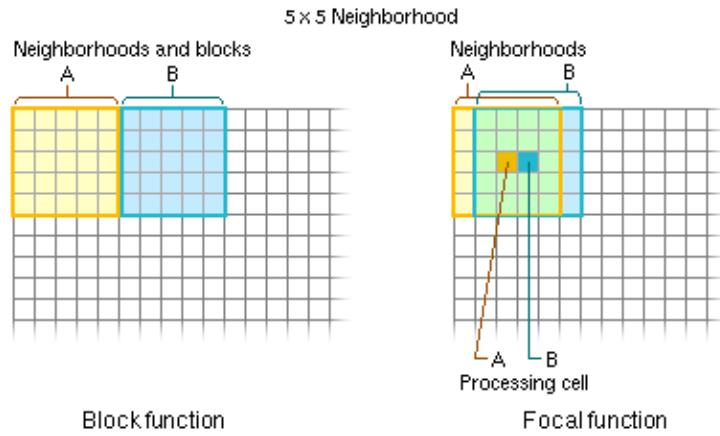
Function	Description
CURVATURE	calculates the curvature of a surface at each cell center.
D	
DARCYFLOW	calculates the groundwater volume balance residual for steady state flow in an aquifer and the seepage velocity for each cell using Darcy's Law.
DEMGRID	converts a USGS DEM to a grid.
DTEDGRID	converts a US NIMA DTED file into a grid.
E	
EDITSIG	edits a signature file by merging, renumbering and deleting class signatures and creates a new signature file.
EQUALTO	evaluates, on a cell-by-cell basis, the number of times in an argument list that the input grid values are equal to the value specified by the first argument.
EUCALLOCATION	calculates for each cell the zone of the closest source cell (in Euclidean distance).
EUDIRECTION	calculates the direction in degrees that each cell center is from the cell center of the closest source. The output values are based on compass directions, with 00 being reserved for the source cells.
EUDISTANCE	calculates for each cell the Euclidean distance to the closest source.
EXP	calculates the basee exponential of the input.
EXP10	calculates the base10 exponential of the input.
EXP2	calculates the base2 exponential of the input.
EXPAND	expands the selected zones by a specified number of cells.
F	
FLIP	flips a grid along a horizontal axis.
FLOAT	converts integer values to floating-point values.
FLOATGRID	converts a file of binary floating point numbers to a grid.
FLOOR	returns the greatest integer value that is smaller than or equal to the input values.
FLOWACCUMULATION	creates a grid of accumulated flow to each cell, by accumulating the weight for all cells that flow into each downslope cell.
FLOWDIRECTION	creates a grid of flow direction from each cell to its steepest downslope neighbor.

# Raster Operations



# 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

The screenshot shows the ARC/INFO Help window with the title bar "ARC/INFO Help". The main content area displays the documentation for the "ISNULL()" function. The title "ISNULL()" is bolded at the top. Below it, the text "Available at: GRID" and "Usage" are visible. A note states: "returns '1' if the input value is NODATA, and '0' if it is not, on a cell-by-cell basis within the analysis window." The "Argument" section contains "`<grid>`" - an input integer or floating-point grid, or an expression resulting in a grid. The "Notes" section includes three bullet points: "Input values can be positive or negative.", "The output value types are always integer. The values are either 1 or 0.", and "Valid expressions include:" followed by four examples:

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

# SETNULL() Function

The screenshot shows the ARC/INFO Help window with the title bar "ARC/INFO Help". The main content area displays the documentation for the "SETNULL()" function. The title "SETNULL()" is bolded at the top. Below it, the text "Available at: GRID" and "Usage" are visible. A note states: "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." The "Arguments" section contains two parts: "`<condition>, {grid | scalar | number}`" where "`<condition>`" is described as an input condition to be tested for Boolean 'TRUE' or 'FALSE', and "`{grid | scalar | number}`" is described as defining the output value if the condition is FALSE. It notes that if no argument is specified, the output will receive NODATA. The "grid" argument is described as an input integer or floating-point grid, or an expression resulting in a grid. The "scalar" argument is described as the current value of the specified scalar variable. The "number" argument is described as 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})**

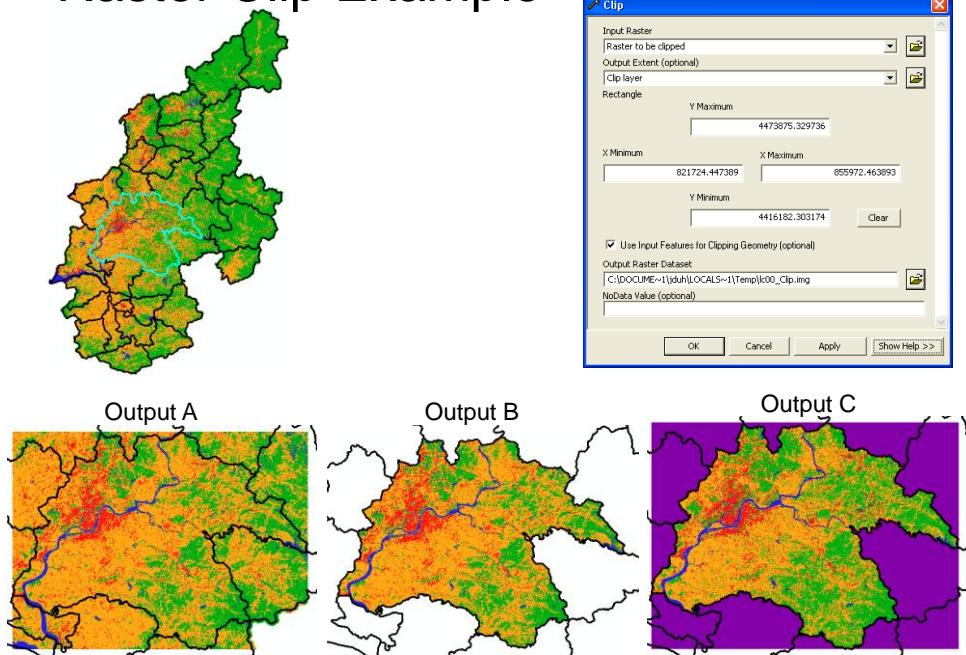
**Arguments**

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

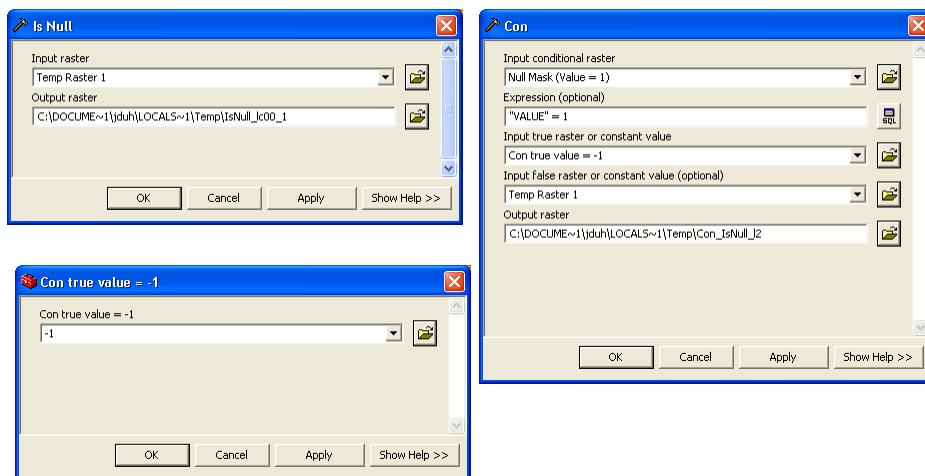
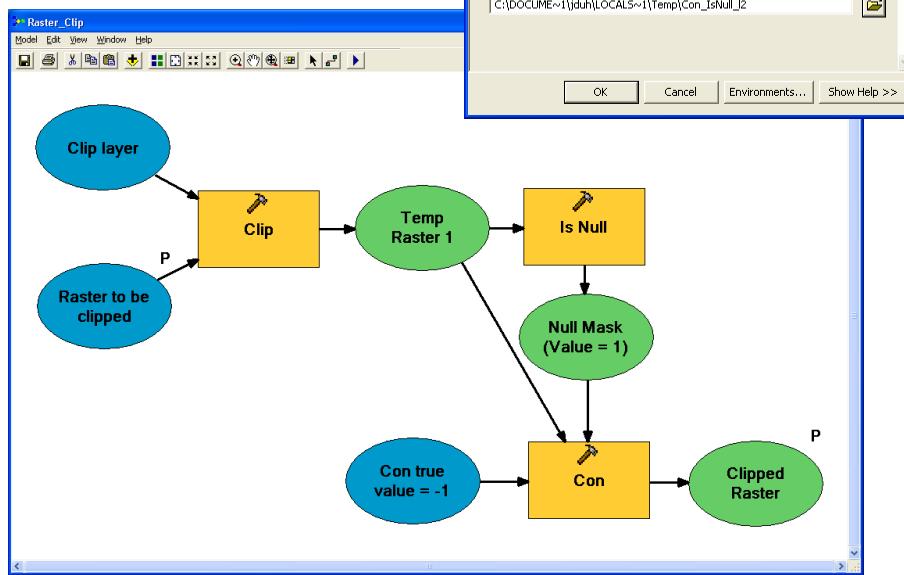
**<true\_expression>** - the value or expression that will be used to compute the output value if the evaluation of the <condition> is TRUE. The input argument can be a grid, scalar or number, or any valid map algebra expression involving operators and functions that results in a valid input. Another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

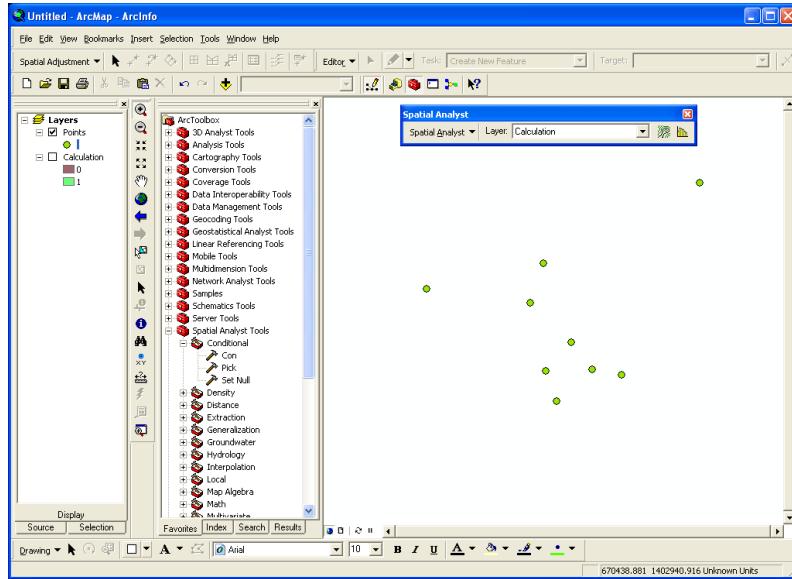
## Raster Clip Example



# Raster Clip

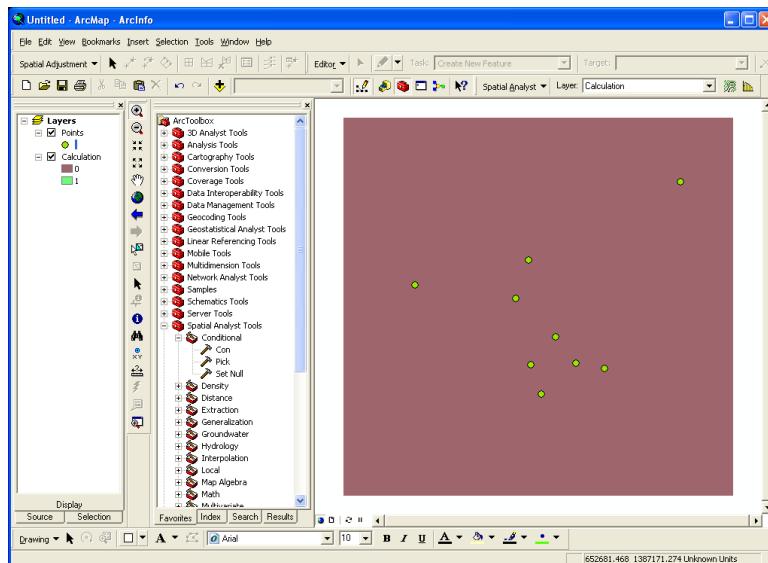


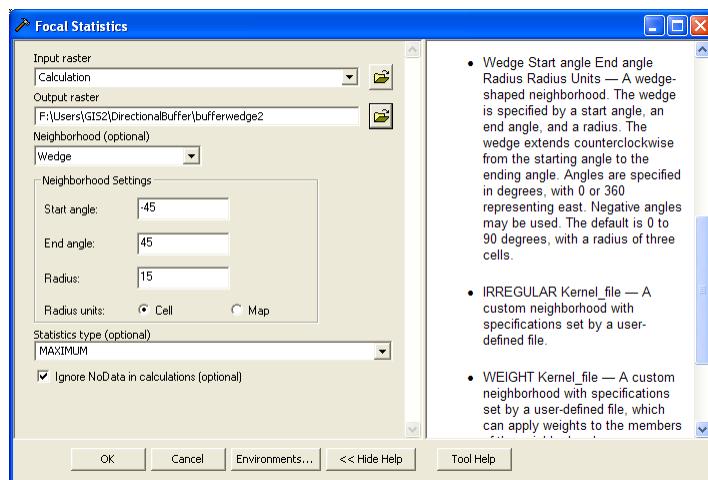
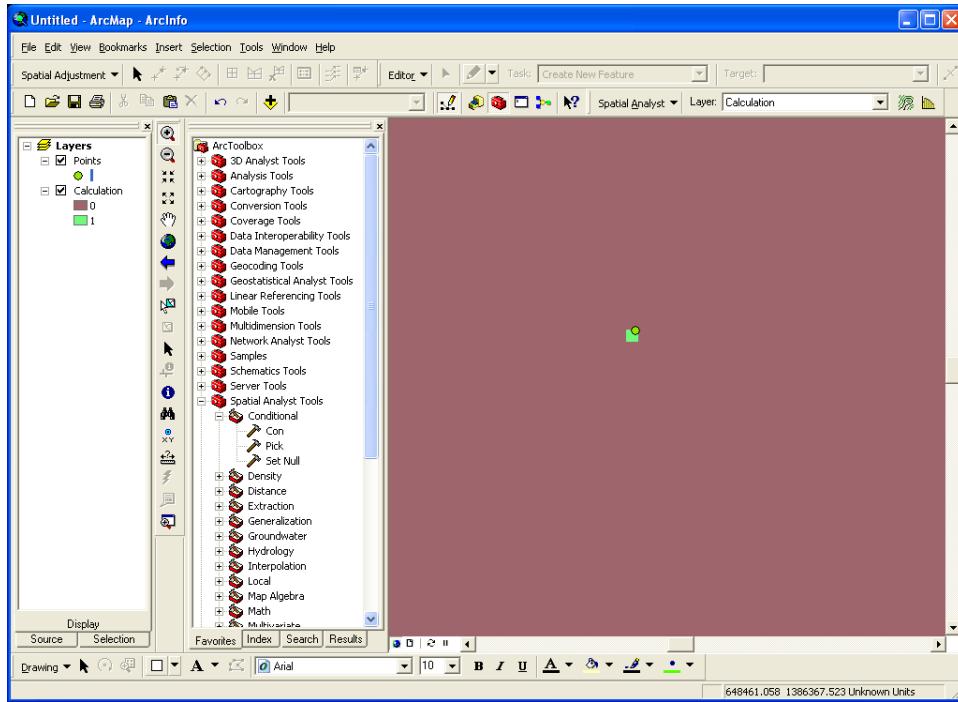
# Raster Buffering

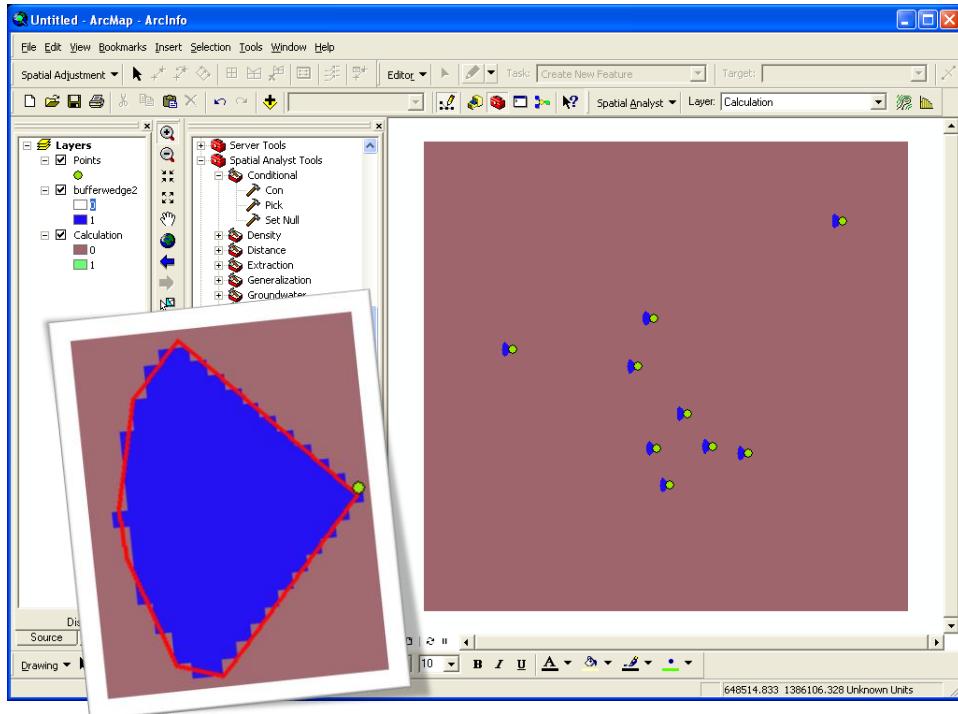


# Point Features to Raster

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







## Implementing Ordered Weighted Average in ArcGIS

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