

Geol 588

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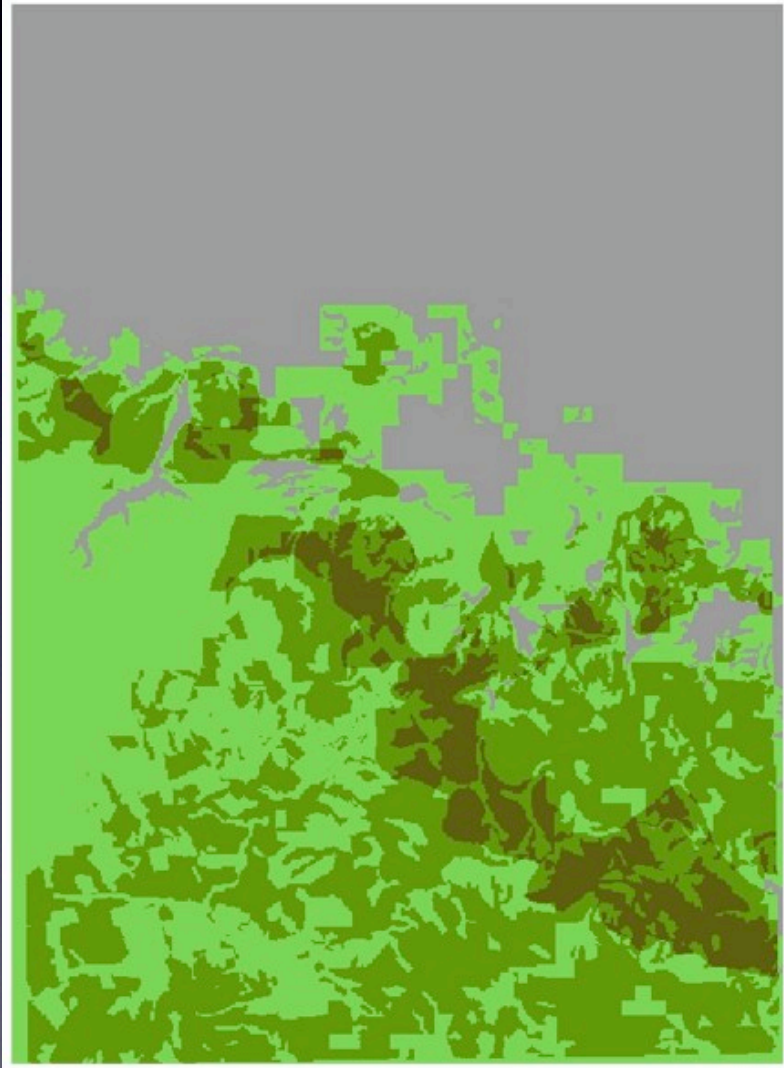
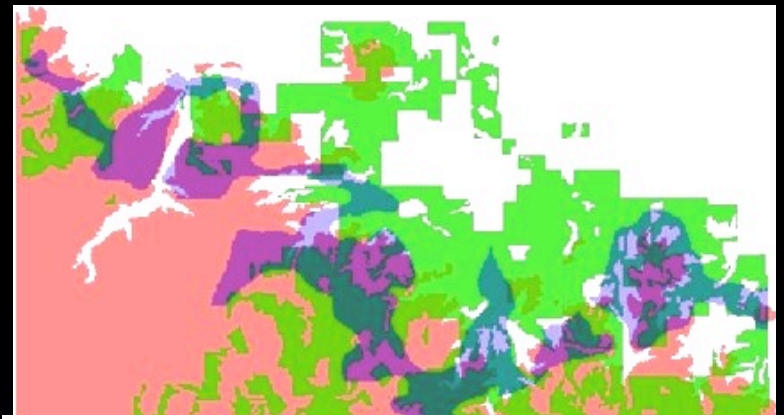
GIS for Geoscientists II

Lecture 4

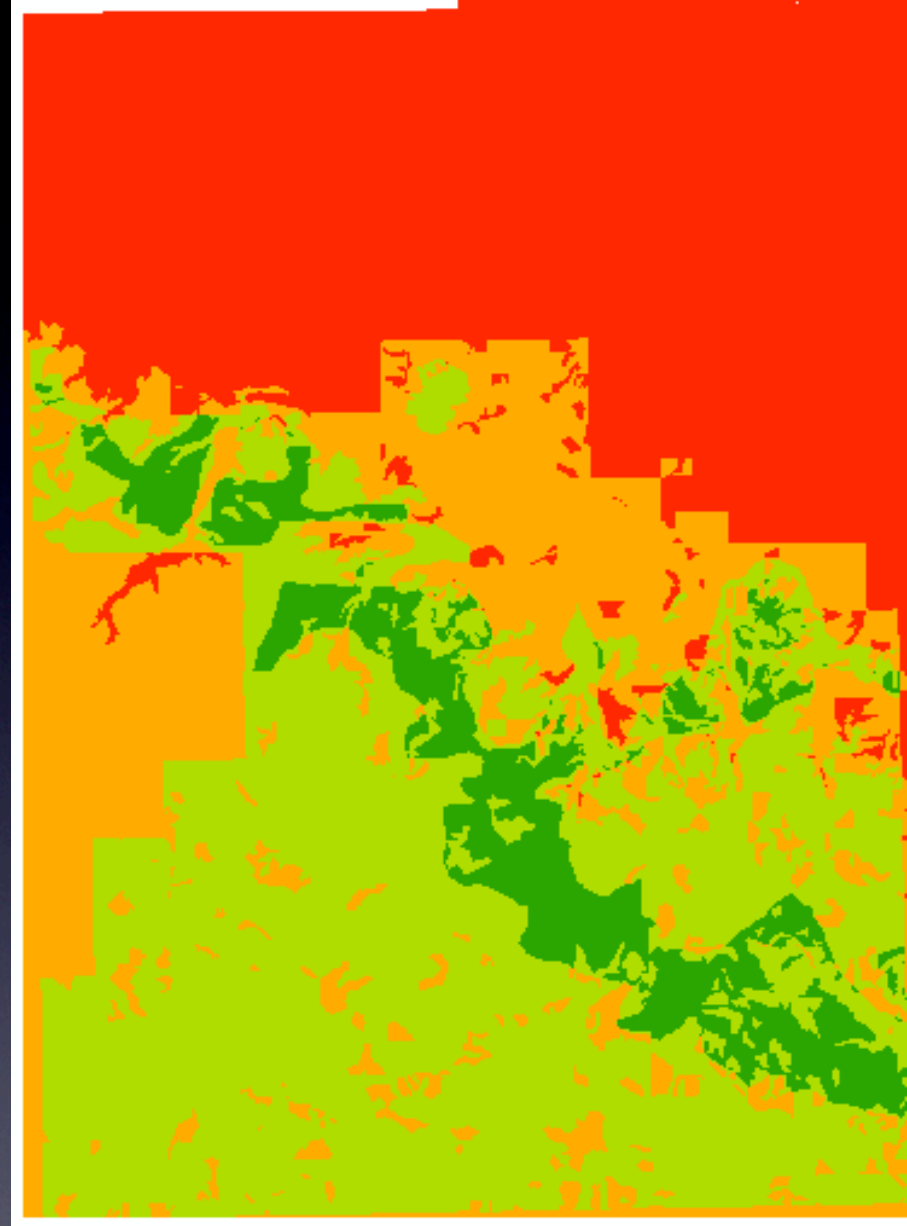
Today

- HWI solution
- Neighborhood & zonal functions
- Pause
- HW questions?

- 3 binary rasters (Red, Green, Blue):
- Elev: (raster, int or float), Elevation > 1400
- Veg: (vector, cat.):
`TREE_SZ96 = 'O' OR TREE_SZ96 = 'L'`
- Soil: (vector, cat.)
`NAME = "Madison Limestone"`
- `SnailHab_1 = Elev * Veg * Soil`
or: `Elev AND Veg AND Soil`
- Min: $0 * 0 * 0 = 0$, Max: $1 * 1 * 1 = 1$
- Area: 16886 cells, each cell is 50 m x 50 m,
 $16886 * 2500 = 42.2 \text{ Mio m}^2$

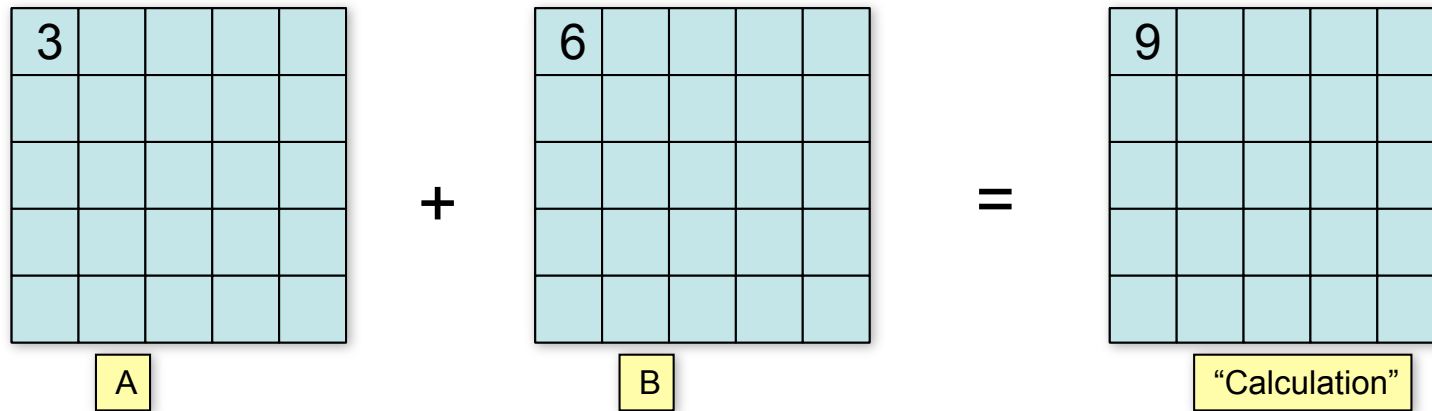


- more levels of “happiness”
- $\text{SnailHab_I} = \text{Elev} + \text{Veg} + \text{Soil}$
- Min: 0, Max: 3, Range: 4
- Very simple suitability analysis (equal weight given to all three factors)
- Good colors?
- % for each level?
- 100 % is raster width x raster height - provided there are no NoData areas
- 410 x 540 cells or ~540 Mio. m²
- 0: 40%, 1: 30%, 2: 26%, 3: 5%



Global raster functions - Expression evaluation

❑ Raster calculator: [A] + [B]



- ❑ 1. Define an empty output raster based on the analysis environment (Spatial Analyst - Options)
- ❑ 2. Position to the next output cell (start at row 0, column 0)
- ❑ 3. Find cell values corresponding to row/column
- ❑ 4. Evaluate the expression (raster calculator) and write the result to the output cell
- ❑ 5. Repeat steps 2—4 for all output cells (0/0, 0/1, ...4/4)
- ❑ Same functions as in Tools: $\text{SLOPE}([A]) / 10.0$

The CON function

□ IF-THEN-ELSE function for Map Algebra

```
CON(<condition>, <>true_expression>, {false_expression})  
IF      TEST          THEN(TEST= 1)          ELSE(TEST=0)
```

□ May be a simple IF-THEN-ELSE

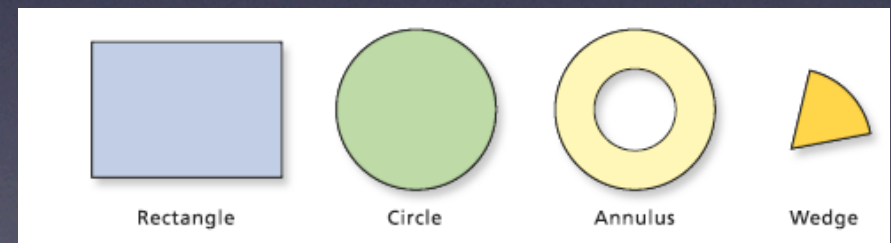
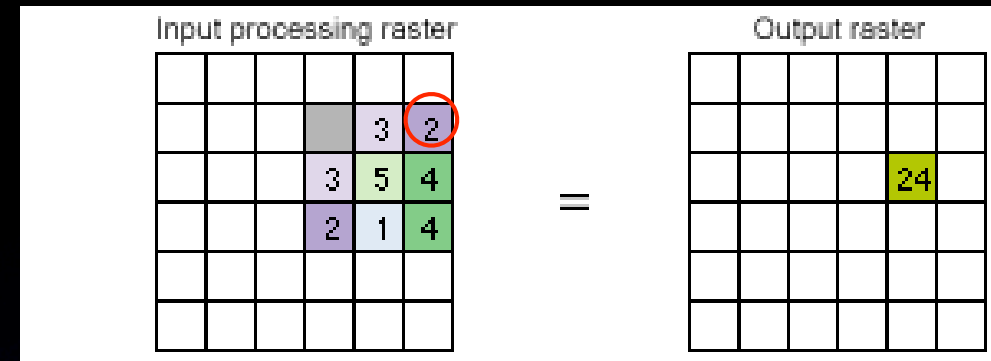
```
CON(Slope <20, 1, 0)
```

□ Or nest CONs for an ELSE-IF

```
CON(Slope < 20, 1,  
    CON(Slope < 40, 2,  
        CON(Slope < 90, 3, 5)  
    )  
)
```

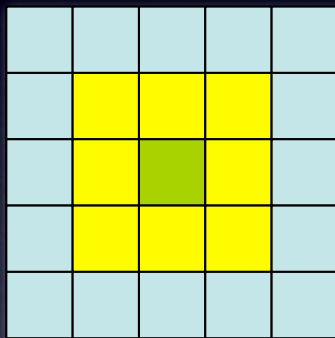
Neighborhood functions

- got through all cells (locations) of output raster
- for each cell calculate value (SUM) from *many* cells “around” it (in input grid)
- shape of “stamp”: kernel
- typical: 3 x 3 square
- other shapes
- ArgMap menu, Toolbox and raster calculator

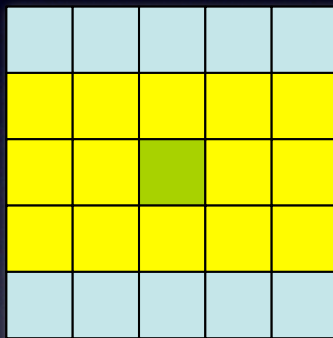


Focal Neighborhoods

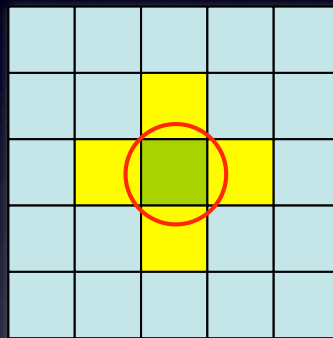
Default



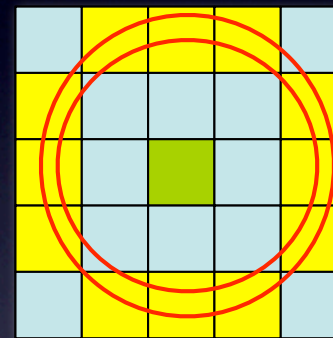
Rectangle



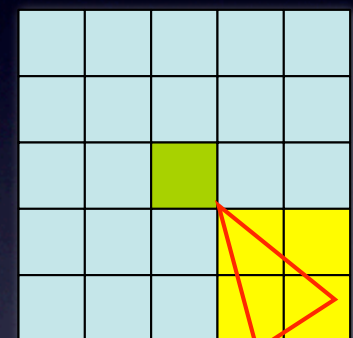
Circle



Annulus



Wedge

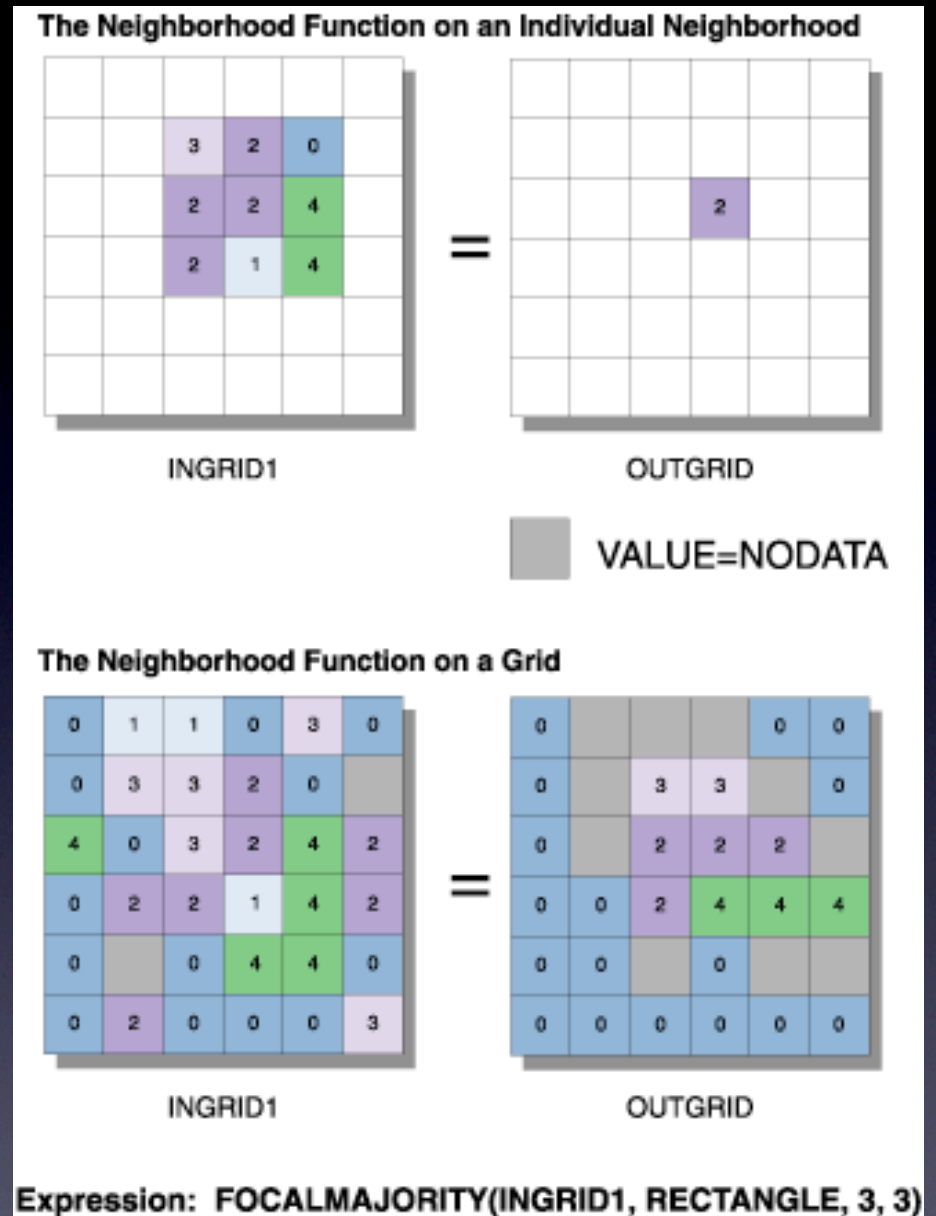


```
FOCALSUM (Elev)
FOCALSUM (Elev, Rectangle, 5, 3)
FOCALSUM (Elev, Circle, 2)
FOCALSUM (Elev, Annulus, 2, 3)
FOCALSUM (Elev, wedge, 4, 300, 330)
```

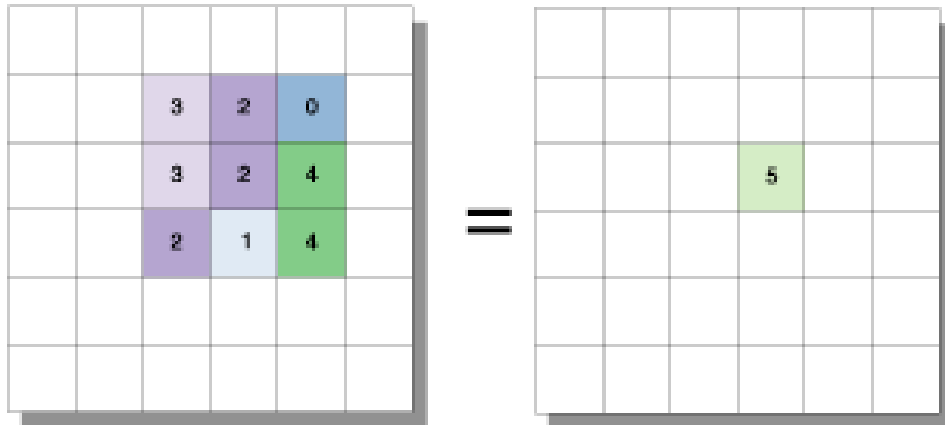
Kernel.txt

```
5 3
1 1 0 1 0
1 0 0 1 1
0 1 1 1 0
```


- Ex: 5 x 5 Majority of Slope > 10 deg
- Effect of 2. pass?
- Majority: needs int or categorical raster!
- Gotcha for Majority for 3 or more possible values: *tie* results in NoData!
-



The Neighborhood Function on an Individual Neighborhood

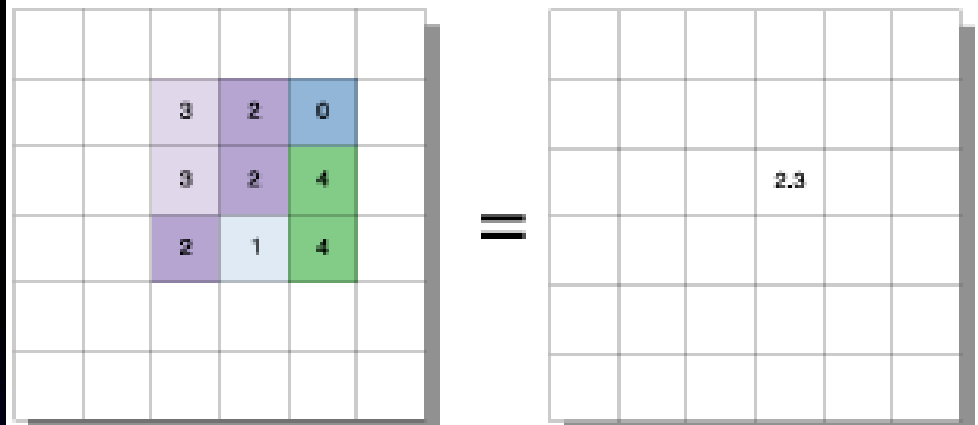


INGRID1

OUTGRID

VALUE=NODATA

The Neighborhood Function on an Individual Neighborhood

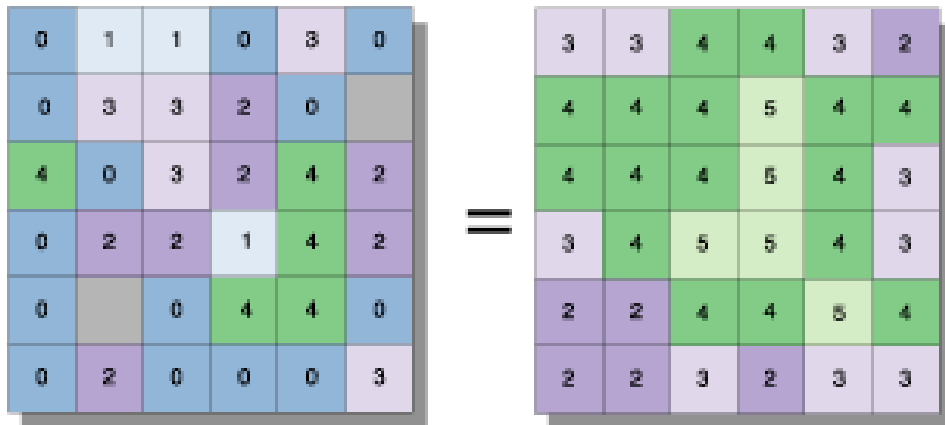


INGRID1

OUTGRID

VALUE=NODATA

The Neighborhood Function on a Grid

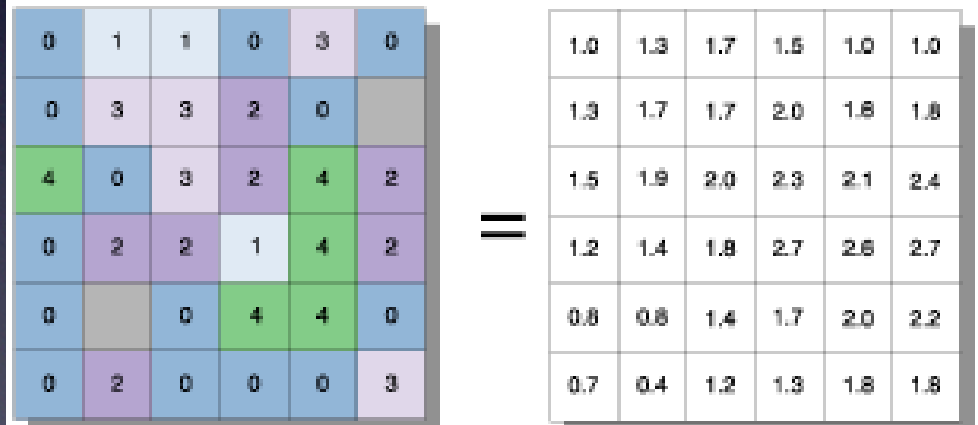


INGRID1

OUTGRID

Expression: FOCALVARIETY(INGRID1, RECTANGLE, 3, 3)

The Neighborhood Function on a Grid



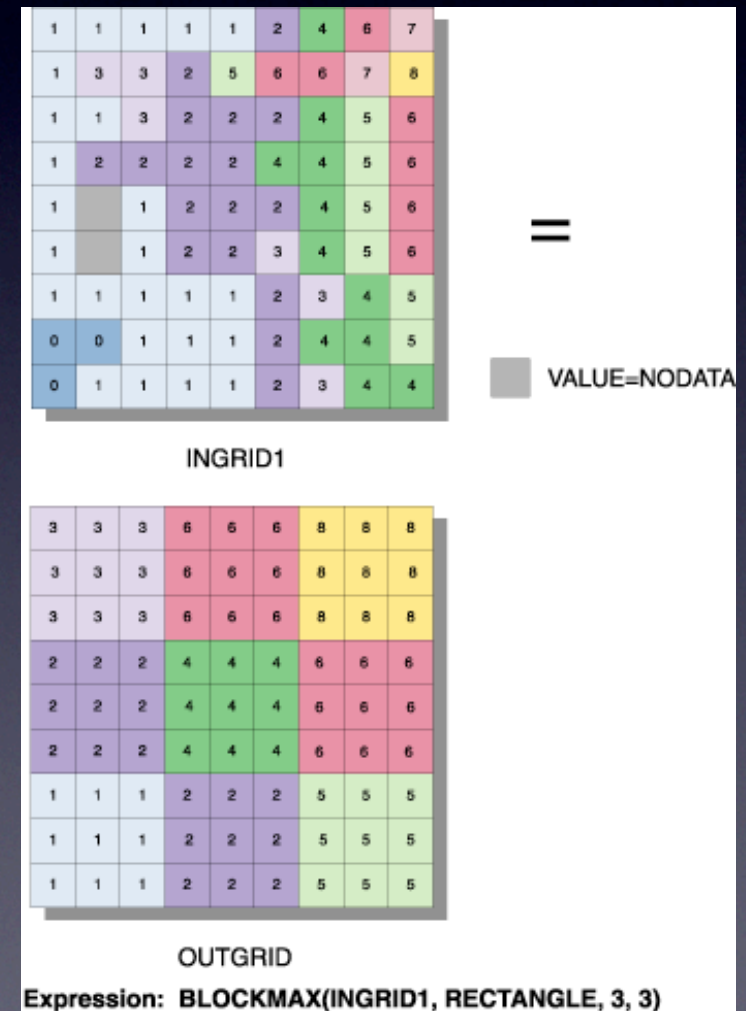
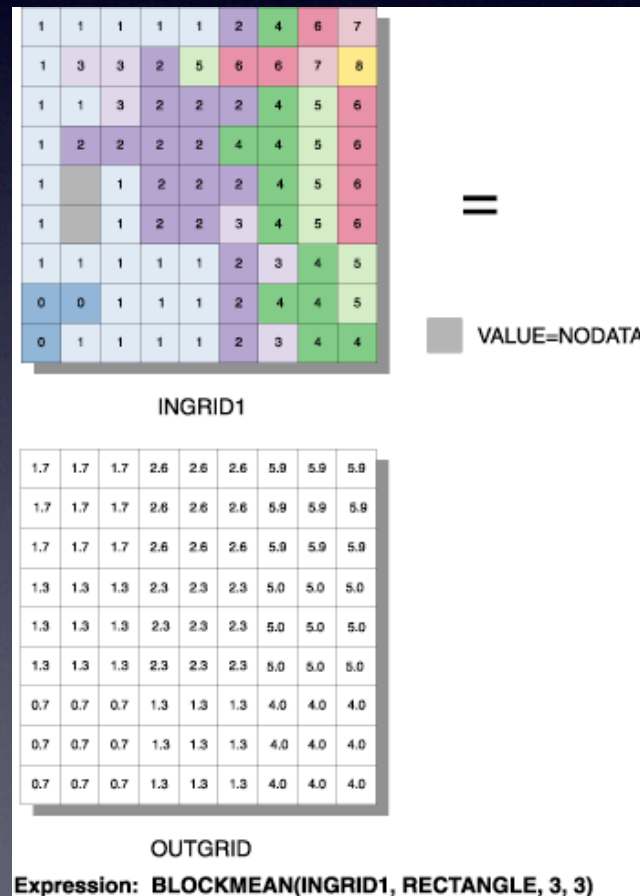
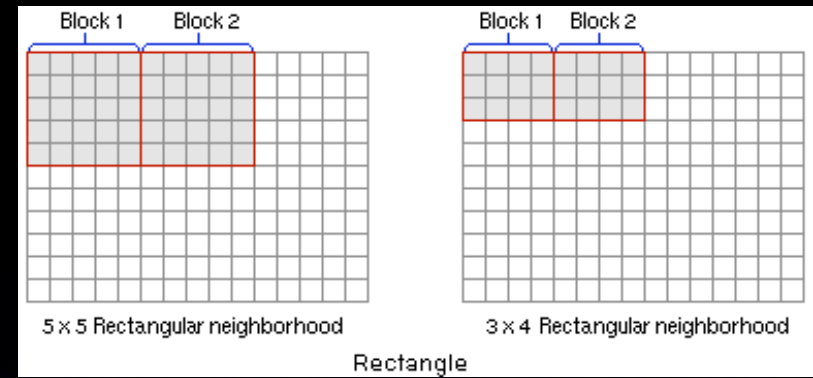
INGRID1

OUTGRID

Expression: FOCALMEAN(INGRID1, RECTANGLE, 3, 3)

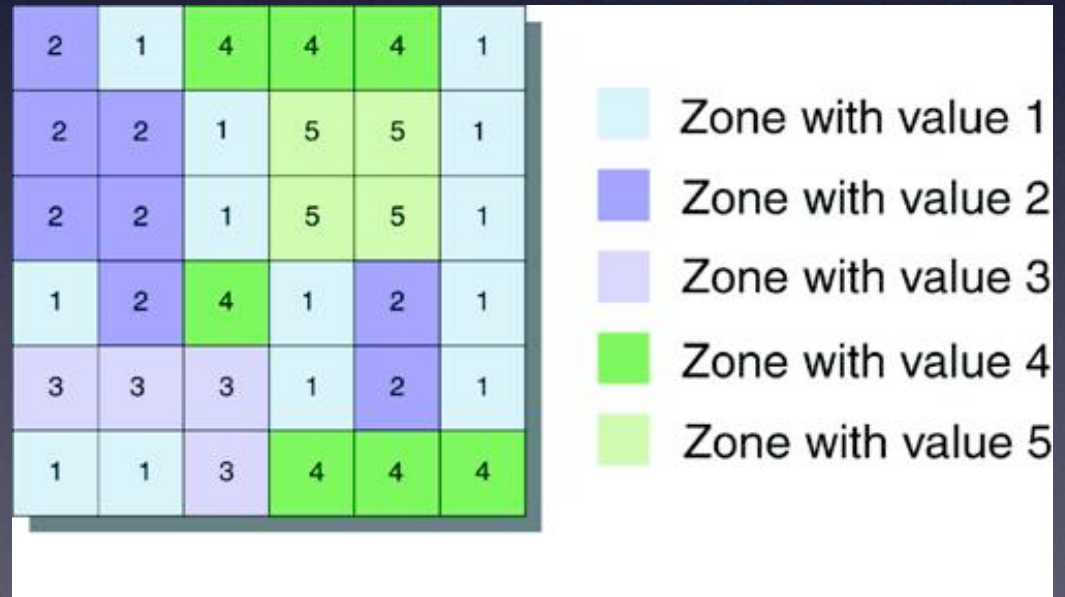
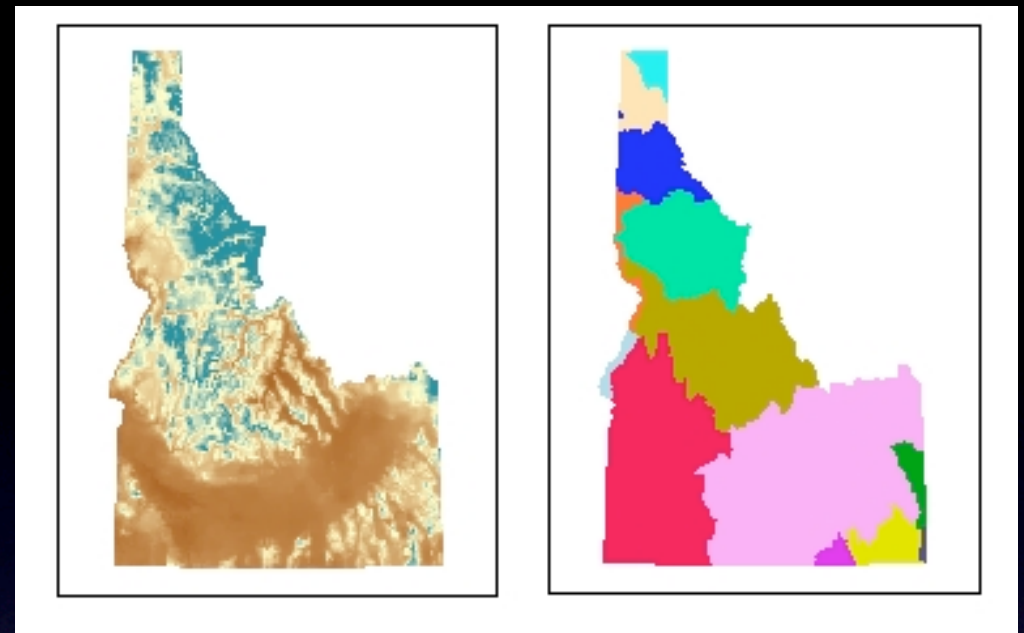
Block Functions:

- Similar to focal but fill area with **same** value

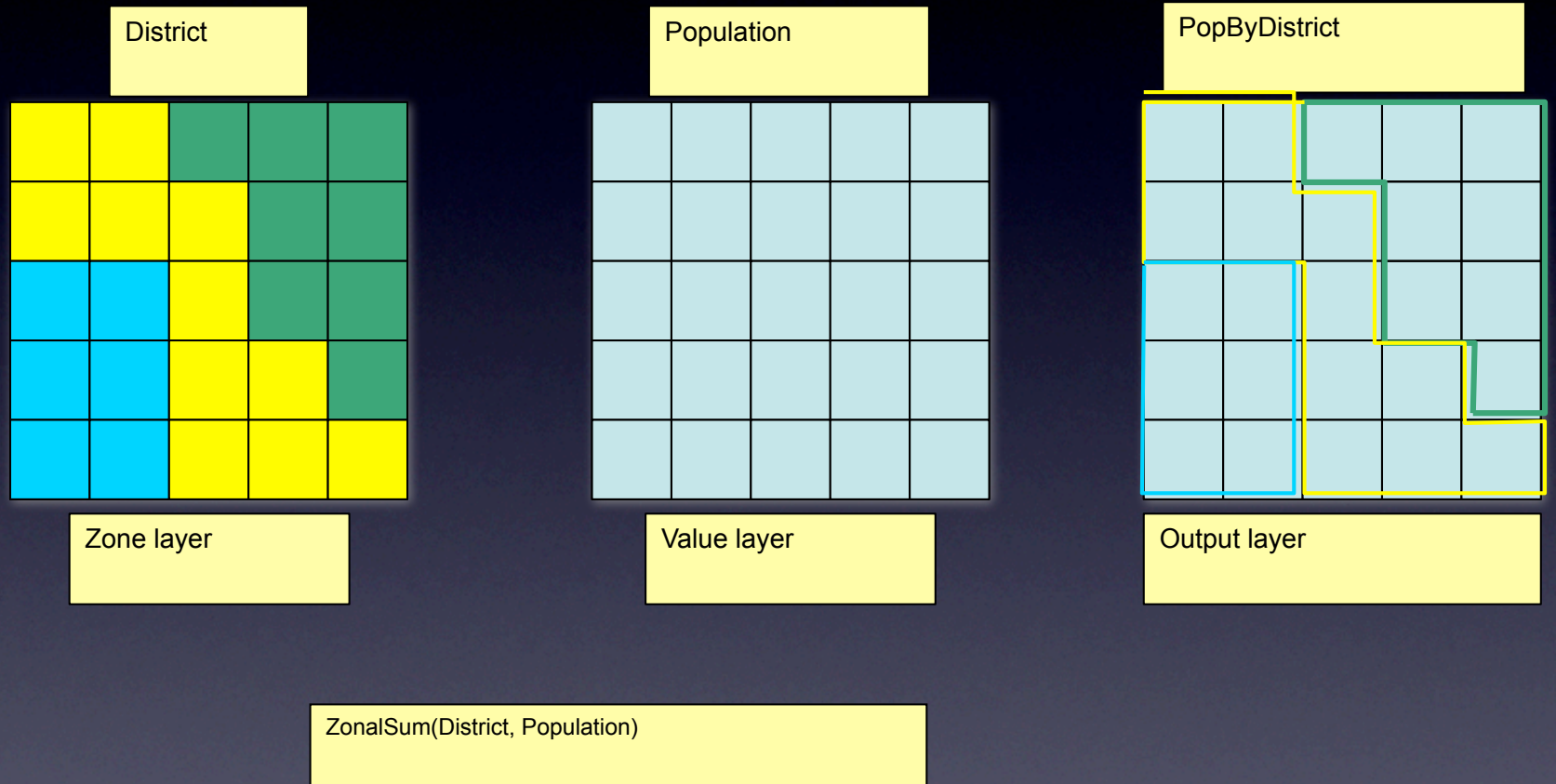


Zonal functions

- Needs 2 inputs:
 - a **zone layer**: non-float raster or polygon
 - a value raster
- Zones don't need to be continuous! (see: regions)

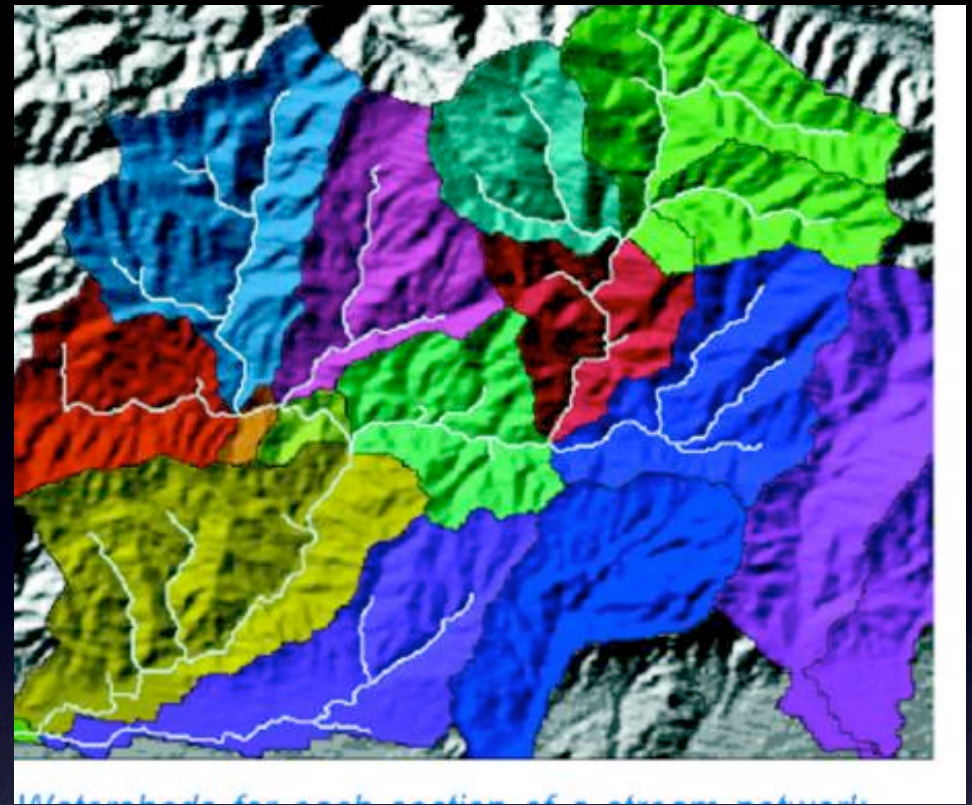


Zonal functions

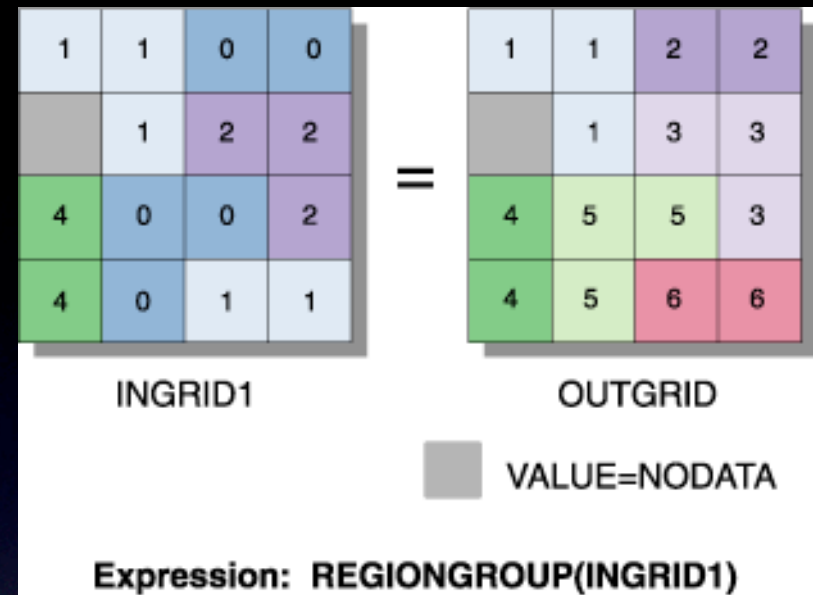


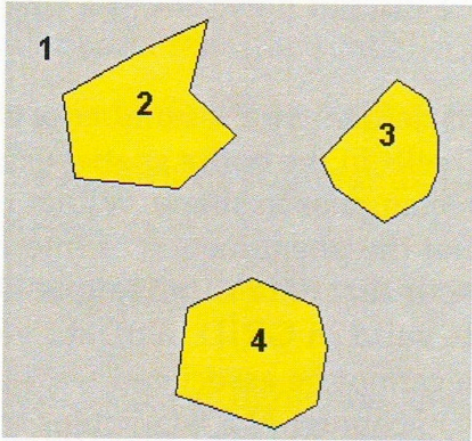
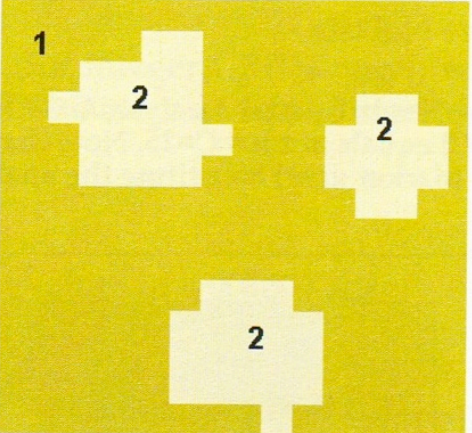
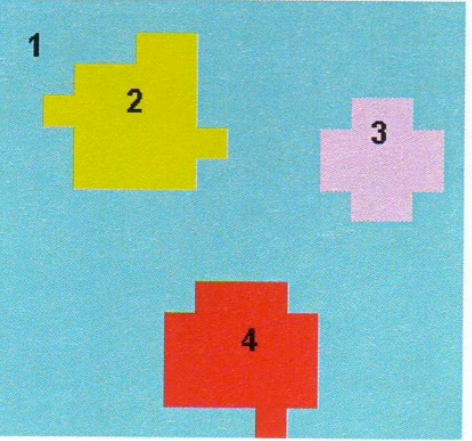
Zonal functions

- for each zone do:
 - get **stat** for value raster cells that are **inside** the zone
- Creates many types of stats per zone “id”
- creates a standalone table and a chart
- Table can be joined to zone layer
- example: get
 - mean (min, max, etc.)
 - elevation
- for each watershed



- more zone related functions in Toolbox and Raster Calculator
- for later: make regions (REGIONGROUP function)
- ex_15b.mxd:
- zonal layer - watershed
- (convert to raster)
- value raster: slope
- join result to watershed polygons
- (can also use points, lines as zones!)



Type	Map	Attribute Table
Polygon		ID Type 1 Sage 2 Aspen 3 Aspen 4 Aspen
GRID (zone)		Value Type 1 Sage 2 Aspen
GRID (after region grouping)		Value Type 1 Sage 2 Aspen 3 Aspen 4 Aspen