# What's the Difference?: An ArcMap Tool for Comparing Two DEMs with Different Resolutions

AR GIS Users Forum Symposium
Bentonville, AR
1 September 2011

Adam Barnes and John Wilson

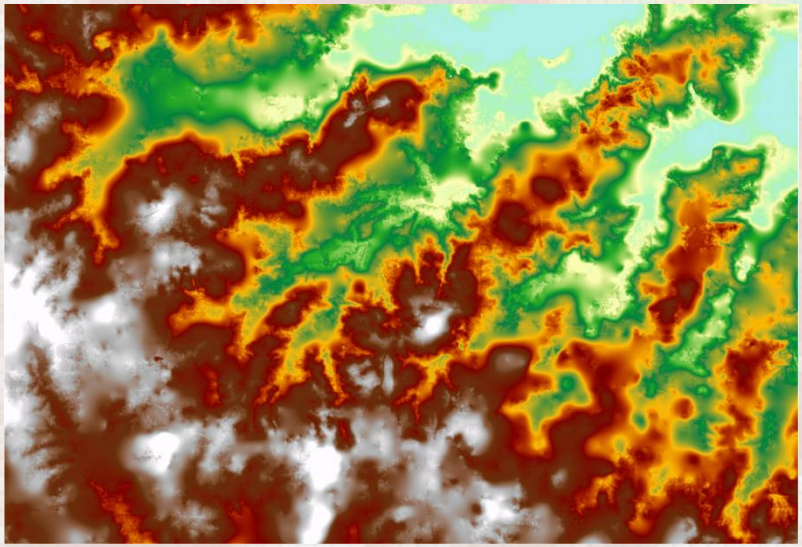
Center for Advanced Spatial Technologies,
University of Arkansas

Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

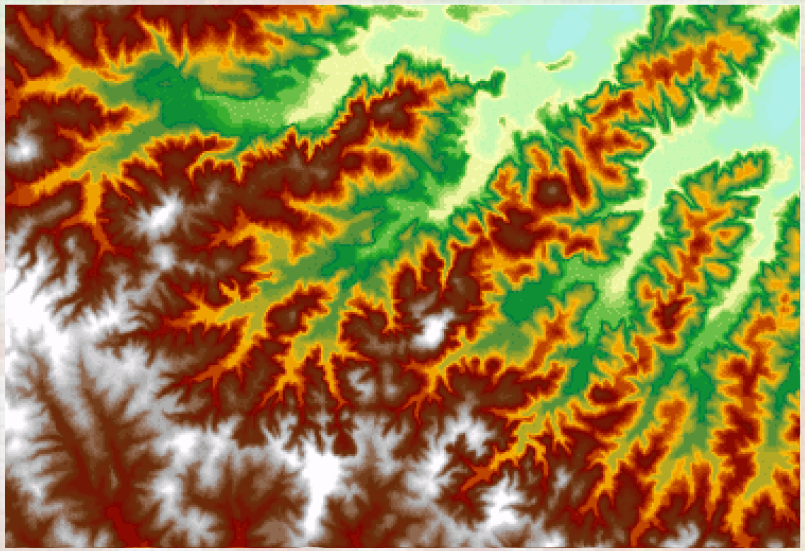
# Our need for a tool

- To locate possible problem areas in 5m DEM
- To characterize these areas using slope, aspect

Statewide 5m DEM



NED 30m DEM

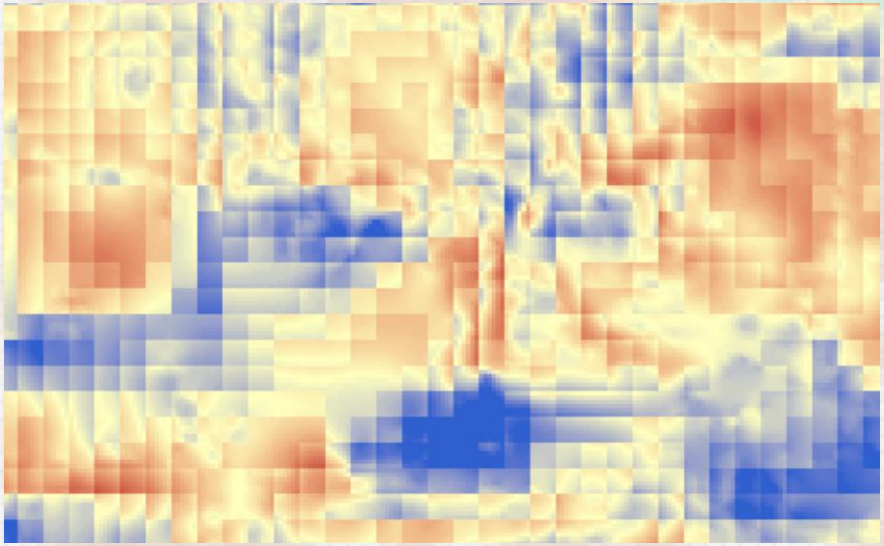


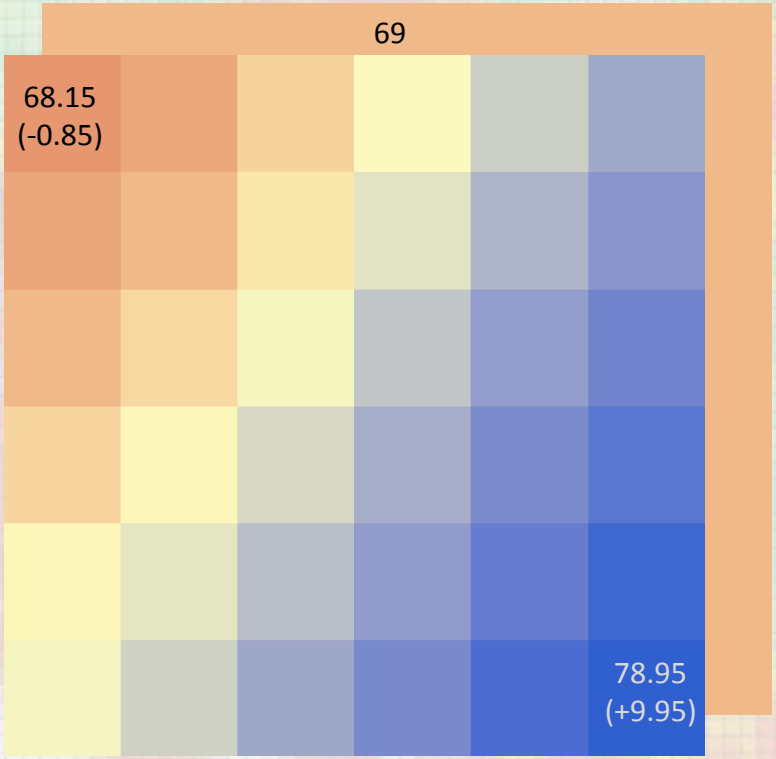
Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

# Basic Raster Calculator

- Problems encountered with pixel to pixel raster calculator

Statewide 5m DEM – NED 30m DEM

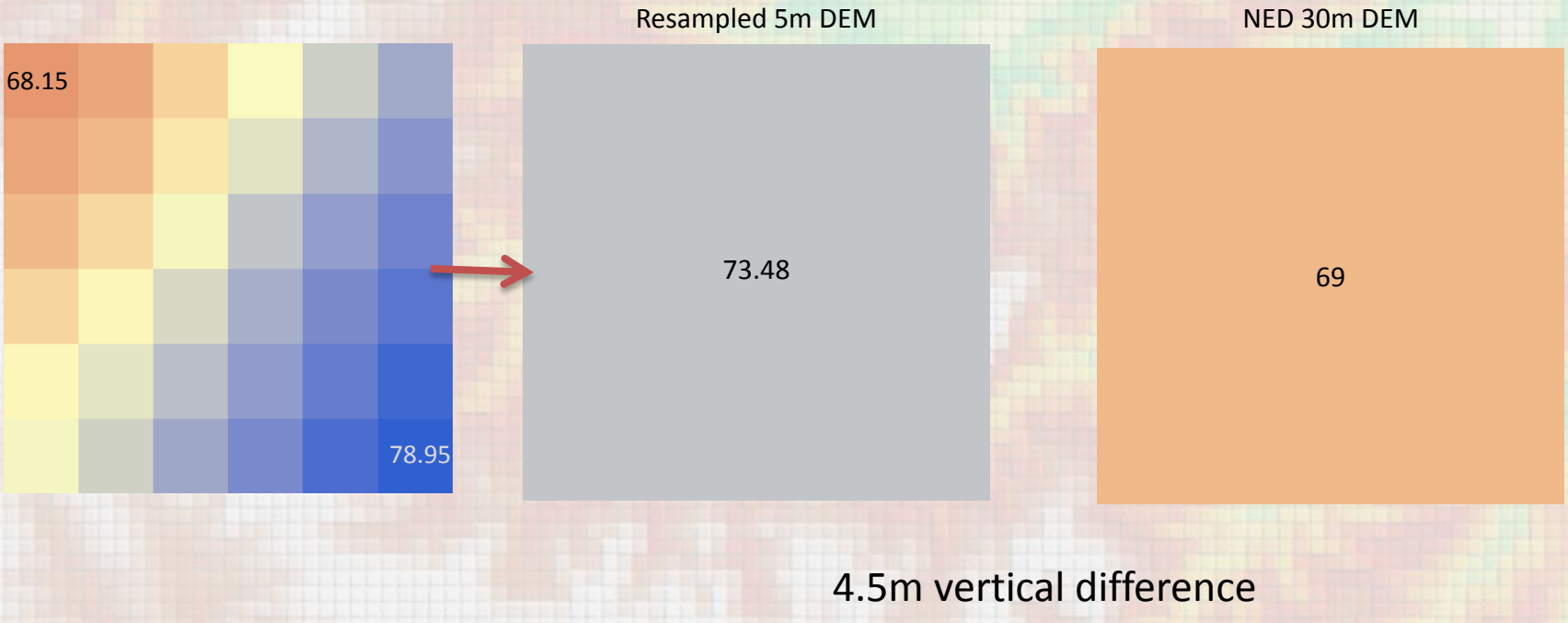




Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

# Basic Raster Calculator

- Resampling 5m DEM to 30m

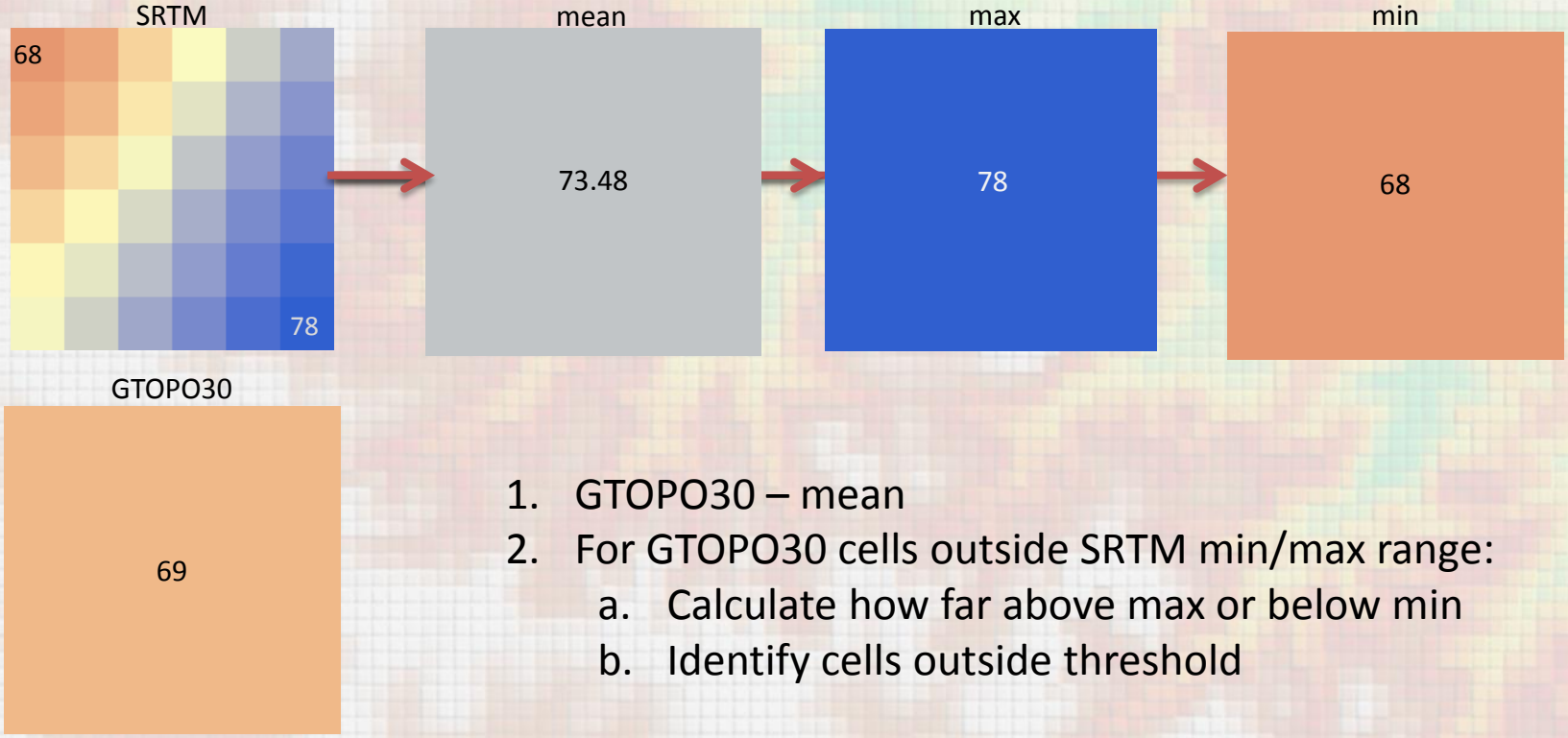



4.5m vertical difference

Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

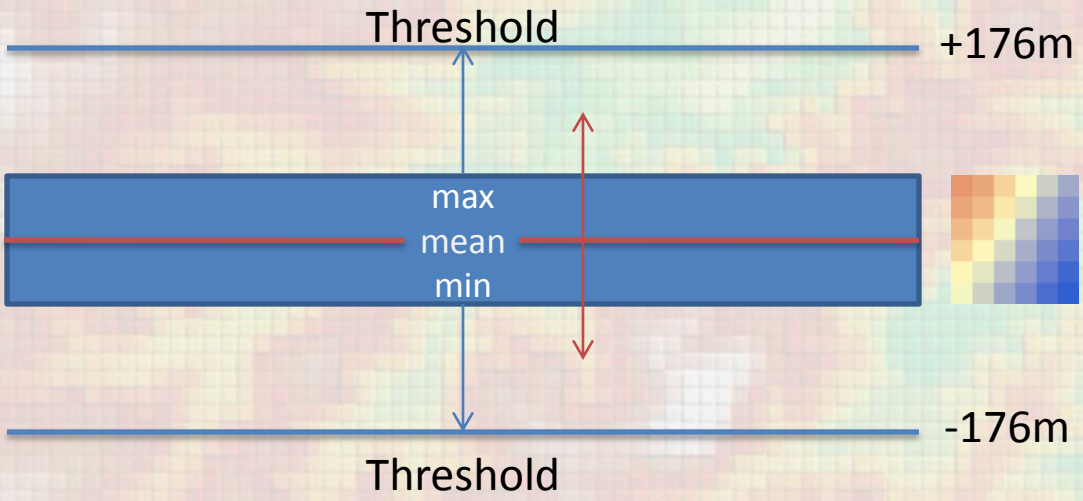
- Jarvis et al. compares SRTM and GTOPO30

"First, we calculated the gross differences between the mean value of the SRTM and GTOPO30 sources. Then GTOPO30 was compared to the range of SRTM values encountered in the larger cell."




1. GTOPO30 – mean
2. For GTOPO30 cells outside SRTM min/max range:
   a. Calculate how far above max or below min
   b. Identify cells outside threshold

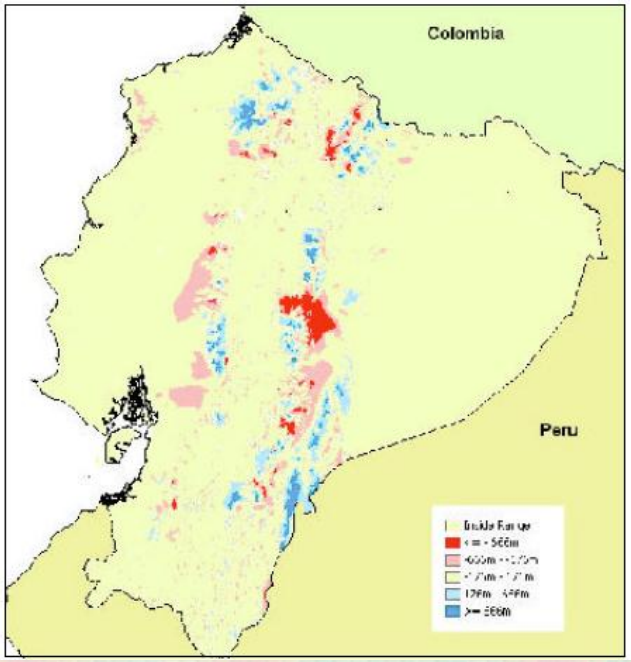
Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

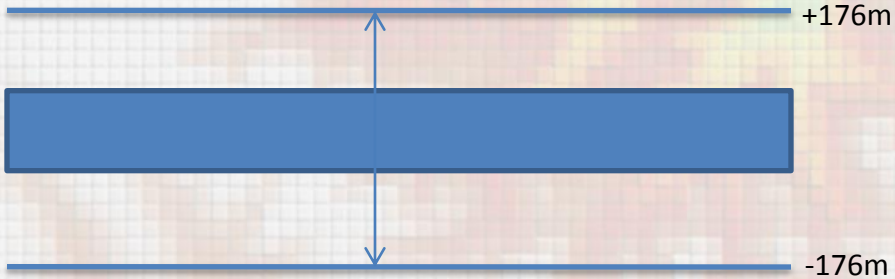


Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

Table 2. Relative differences between GTOPO30 and aggregated mean, maximum, or minimum values of Shuttle Radar Topography Mission (SRTM) elevation models.

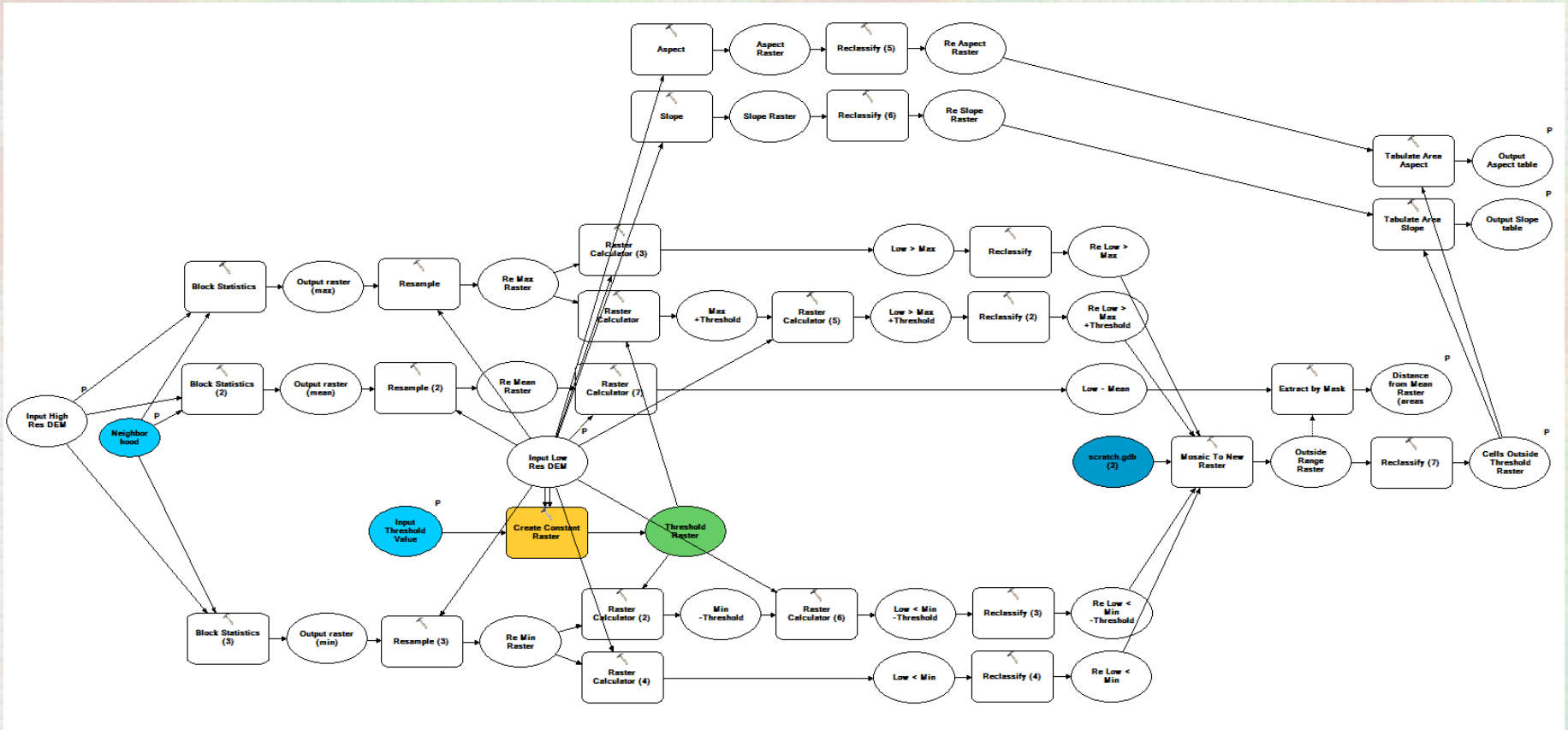
| How far out of min.-max. range | Count (1 km² cells) | Percentage of study area |
|---|---|---|
| Inside range | 124839 | 40.48 |
| <= -666 m | 2808 | 0.91 |
| -666 - -176 m | 16341 | 5.30 |
| -176 – 176 m | 148843 | 48.26 |
| 176 – 666 m | 12752 | 4.13 |
| >= 666 m | 2828 | 0.92 |
| **Total** | **308411** | **100** |




Jarvis, Andy
Practical use of SRTM data in the tropics: Comparisons with digital elevation models generated from cartographic data / Andy Jarvis, Jorge Rubiano, Andy Nelson, Andrew Farrow and Mark Mulligan
-- Cali, CO : Centro Internacional de Agricultura Tropical (CIAT), 2004. 32 p. -- (Working document no. 198)

Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas



Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

DEMcompare

Input High Res DEM

Input Low Res DEM

Input Threshold Value

0

Cells Outside Threshold Raster

Distance from Mean Raster (areas outside min/max range)

Neighborhood (optional)

Rectangle

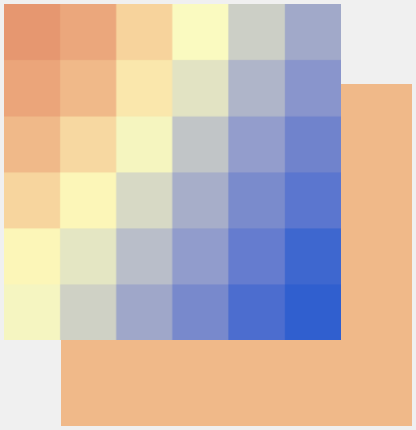
Neighborhood Settings

Height:

Width:

Units: Cell Map

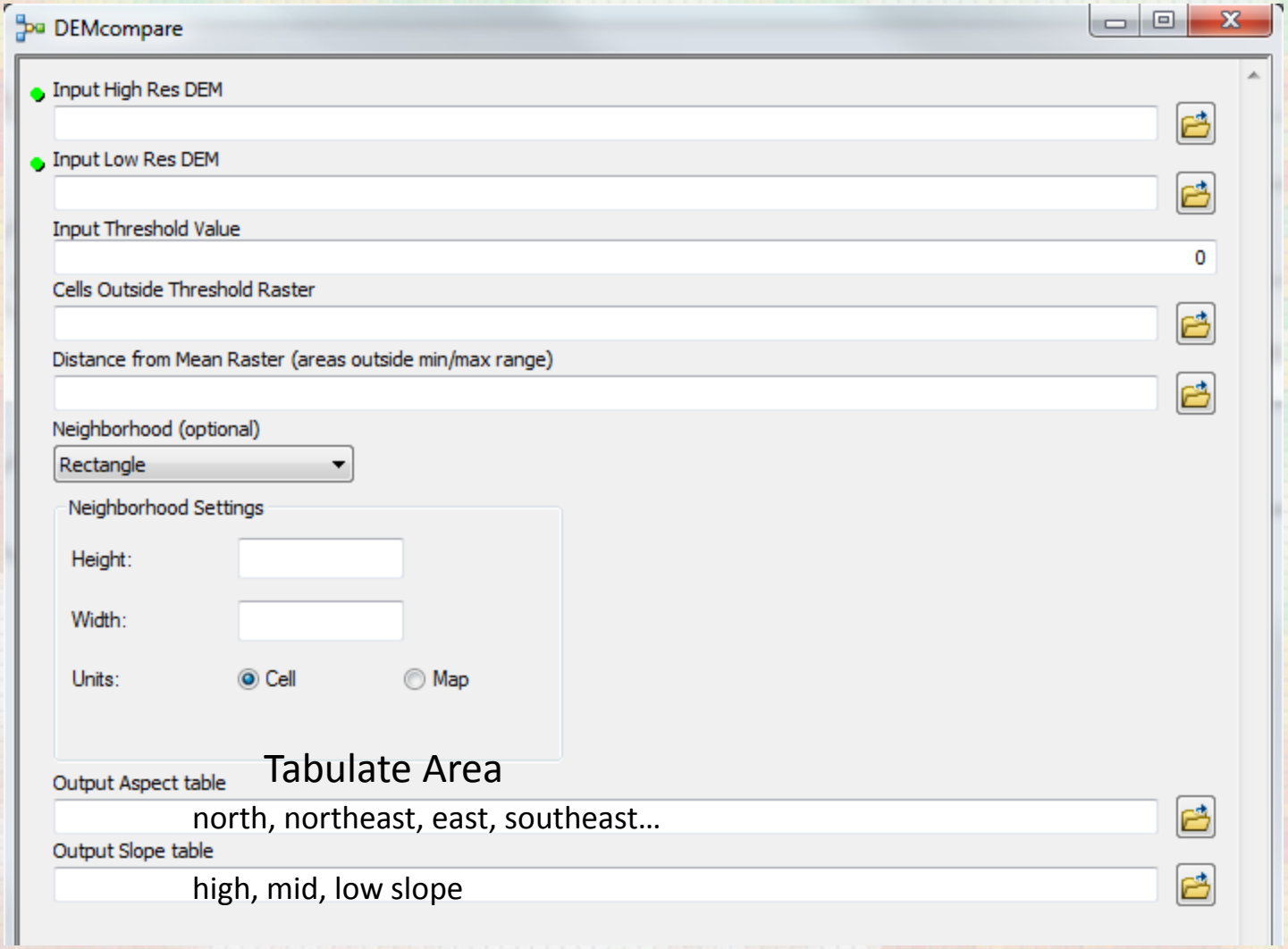
Block Statistic



Output Aspect table

Output Slope table

Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas




Tabulate Area

north, northeast, east, southeast…

high, mid, low slope

Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

DEMcompare

Input High Res DEM
D:\Projects\9_GIF_project\DEMCompare\ToolData\state_5m_test

Input Low Res DEM
D:\Projects\9_GIF_project\DEMCompare\ToolData\ned_30m_test

Input Threshold Value
6

Cells Outside Threshold Raster
D:\Projects\9_GIF_project\DEMCompare\Scratch\scratch.gdb\outside_thresh

Distance from Mean Raster (areas outside min/max range)
D:\Projects\9_GIF_project\DEMCompare\Scratch\scratch.gdb\dist_mean

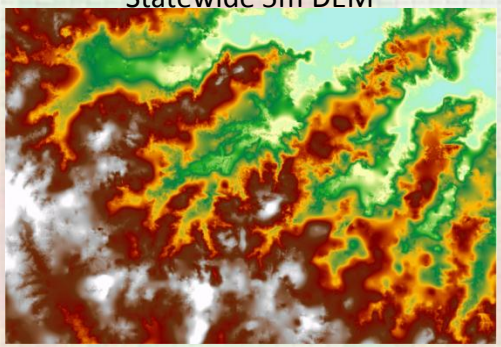
Neighborhood (optional)
Rectangle

Neighborhood Settings
Height: 6
Width: 6
Units: Cell Map

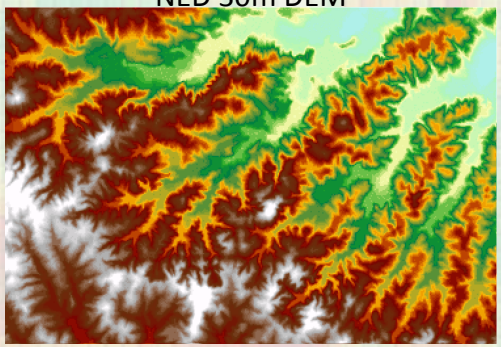
Output Aspect table
D:\Projects\9_GIF_project\DEMCompare\Scratch\scratch.gdb\Tabulate_aspect

Output Slope table
D:\Projects\9_GIF_project\DEMCompare\Scratch\scratch.gdb\Tabulate_slope

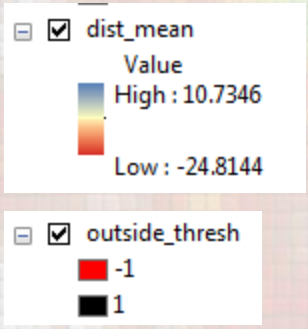
Statewide 5m DEM

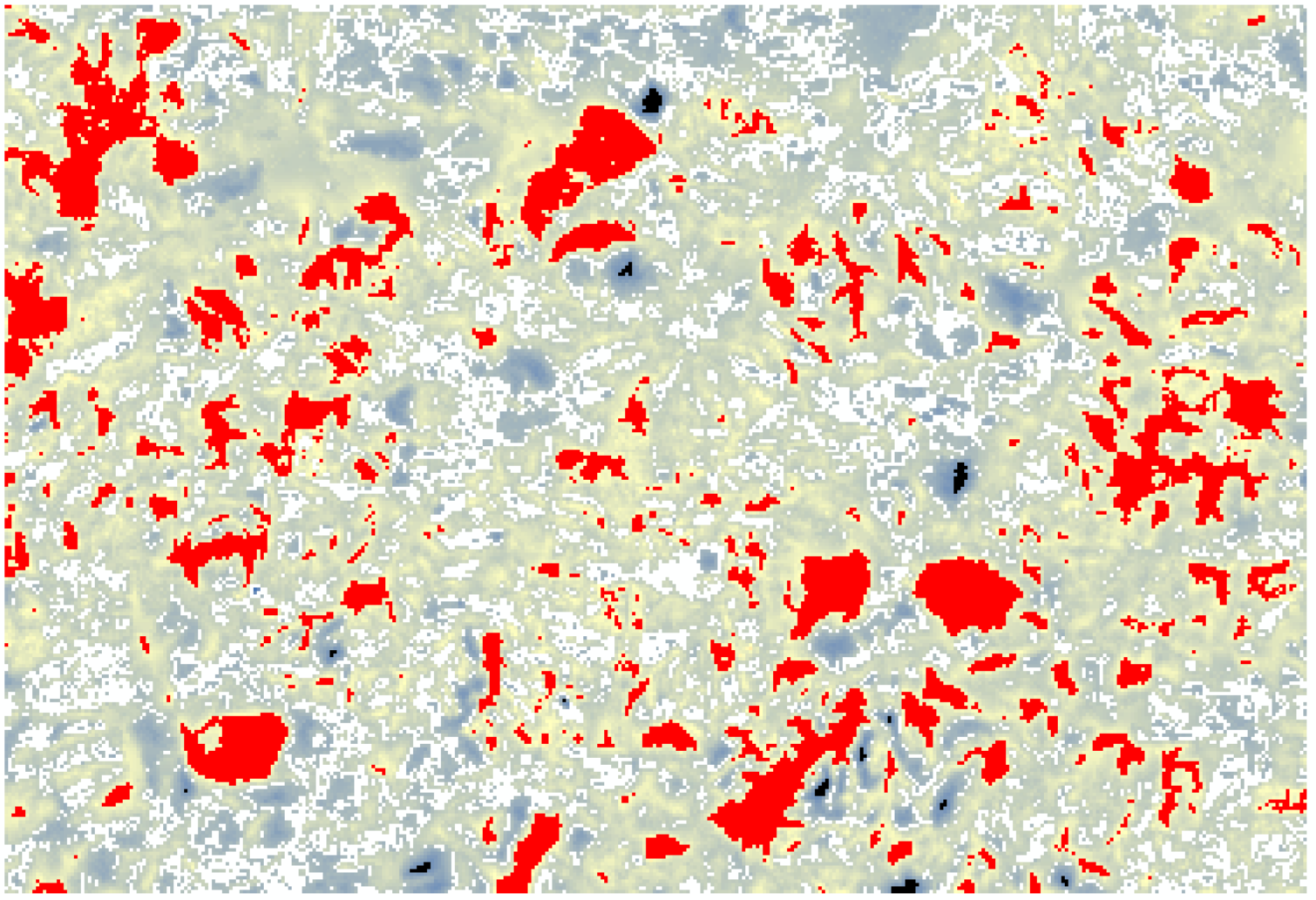


NED 30m DEM



Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas



Adam Barnes and John Wilson
Center for Advanced Spatial Technologies
University of Arkansas

Tabulate_aspect

| | | Flat | N | NE | E | SE | S | SW | W | NW |
|---|---|---|---|---|---|---|---|---|---|---|
| OBJECTID * | VALUE | VALUE_0 | VALUE_1 | VALUE_2 | VALUE_3 | VALUE_4 | VALUE_5 | VALUE_6 | VALUE_7 | VALUE_8 |
| 1 | -1 | 577800 | 1253700 | 1373400 | 1189800 | 1026900 | 720900 | 675900 | 969300 | 1561500 |
| 2 | 1 | 6300 | 15300 | 12600 | 17100 | 11700 | 6300 | 4500 | 4500 | 36900 |

Tabulate_slope

| | Low | Mid | High |
|---|---|---|---|
| OBJECTID * | VALUE | VALUE_1 | VALUE_2 | VALUE_3 |
| 1 | -1 | 1167300 | 7123500 | 1058400 |
| 2 | 1 | 16200 | 91800 | 7200 |

0-1 1-5 5-up

# Assumptions and Limitations

- Vertical datum and units same
- No horizontal shift
- Must have Spatial Analyst
- Probably more…

# Future Work

- Cross tabulate with landform classification
- Optional LULC input and cross tab
- Automate neighborhood size
- Send tables to formatted excel table (python)

# Thank You

- Questions?
- Suggestions?

abarnes@cast.uark.edu