Geol 588

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GIS for Geoscientists II

Suitability analysis

Modelbuilder

March 3, 2011

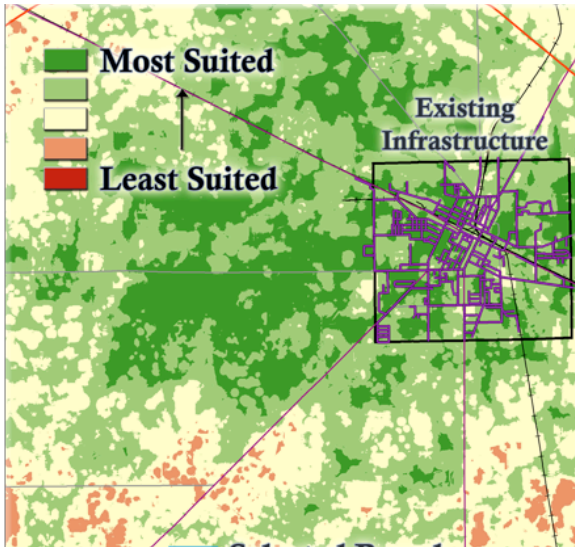
Today

- Suitability modeling in GIS
  - Reclassification
  - Weighted Overlay tool
- Intro to Modelbuilder
- Midterm next Tueday (2:10 - 4)
- HW 4 due next Tuesday

Suitability analysis

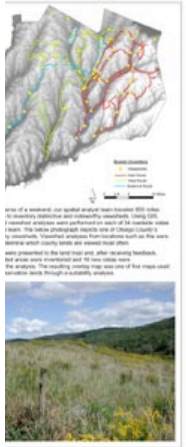
- Suitability value (rating): low -> high
- how suitable are different locations given a certain model and factors?
- Helps to make planning decisions, "condenses" spatial knowledge
- "granularity" of steps: integers (1) or floats (e.g. 0.1)
- the **theoretical** range (worst value to best value)
- 1 (worst) to 10 (best) or 1-100 or 0.0 to 1.00
- Fill all raster cells with suitability values (suitability raster)
- Suitability **map**: Show suitability in context

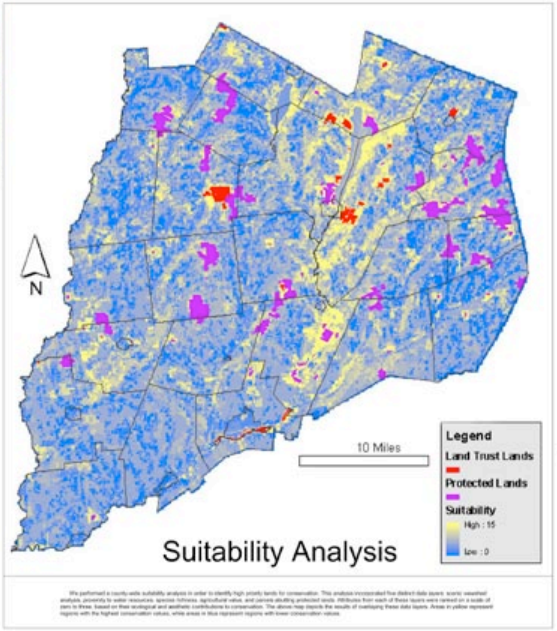
Suitability for placing a new facility



- Uses 5 colors to visualize suitability rating
- But: suitability could **internally** range from 1 to 10 or 1 to 100

Otsego Land Trust Conservation Plan





Developing Land Protection Criteria

Determining the Cost

Picturesque Otsego County is composed of agricultural lands, forests, towns, and the renowned Otsego Lake. However, the potential for subdivision growth increasingly threatens the county's land resources. The Otsego Land

OTSEGO LAND TRUS

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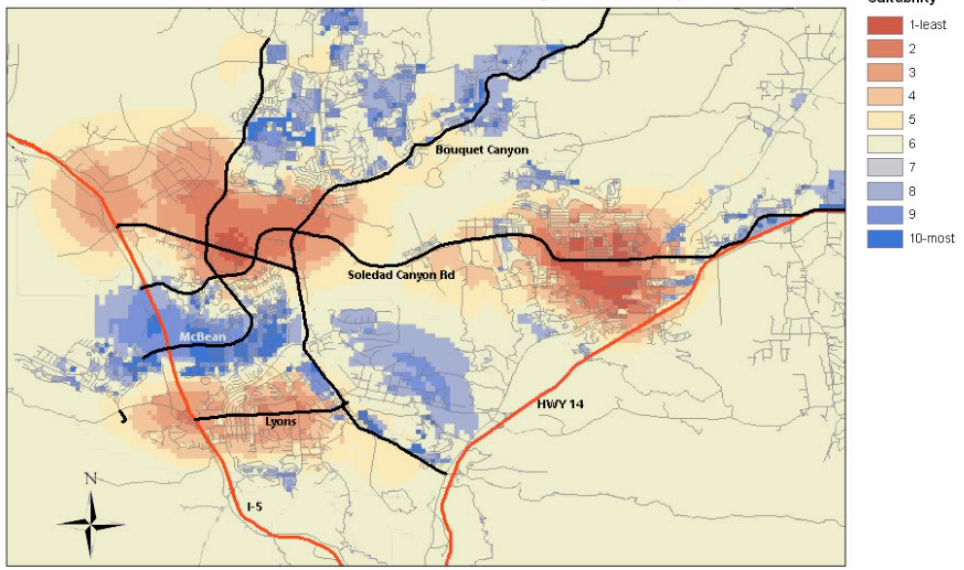
Taco Truck Suitability Analysis



suitability of each cell is informed by distance to existing taco restaurants and the population density

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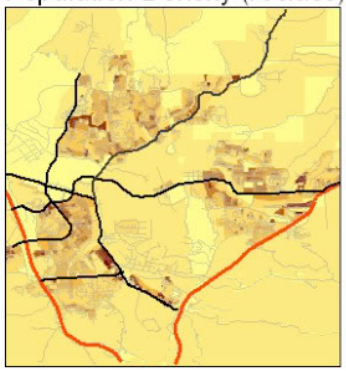
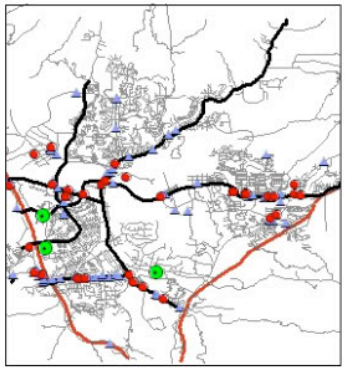
Suitability is informed by two factors: population density and distances to Restaurants

Population Density (reclass)



Restaurant Locations



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modeling suitability

- model: formula that (for each cell) combines multiple factors into a (final)suitability value (rating)
- Suitability of each cell is informed by:
  - distance to already available tacos (restaurants)
    - => locations (cells) with high distance values are good
    - => locations (cells) with low distance values are bad
  - and the population density
    - locations with high density values are good
    - locations with low density values are bad
- "Raw" data rasters for this area:
  - Dist: distance raster containing distances: 0 - 5000 m
  - Dens: density raster: 20 to 2000 people per square km

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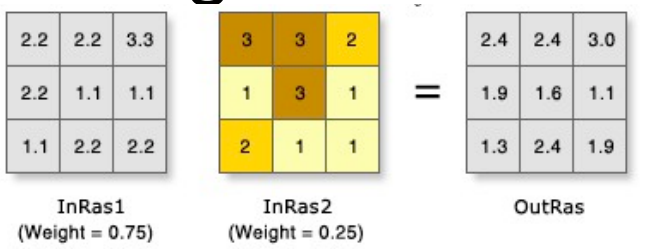
Reclassifying the raw data

- raw data (Dist: from 0 to 5000 Dens: 0 - 2000
- cannot compare Dist directly to Dens
- Reclassify both to contain values from 1 to 10
- ReclDens = Dens / 500.0 ReclDist = Dist / 200.0
- the two reclassified raster are now comparable!
- Show Reclassified rasters with same color scheme
- Tool: Spatial Analyst Tools - Reclass - Reclassify

Weighted Sum of reclassed rasters

- Each reclassed raster (ReclDist and ReclDens) has values 1 -10
- Each cell of the Suitability raster values
  - "Average" of ReclDist and ReclDens (at this cells location!)
- Simple average: Suitability = (ReclDist + ReclDens) / 2.0
  - same weights for each "factor" here (equally important)
    - 50% Distance (weight is 0.5), 50% Density (0.5)
    - Suitability1 = ReclDist * 0.5 + ReclDens * 0.5
    - weight must always add to 1.0 (i.e. 100%)!
- different mix (now: Distance is more important!):
  - 75% Distance (weight is 0.71), 25% Density (0.25)
  - Suitability2 = ReclDist * 0.75 + ReclDens * 0.25
  - weights for: Density (much) more important than Distance?

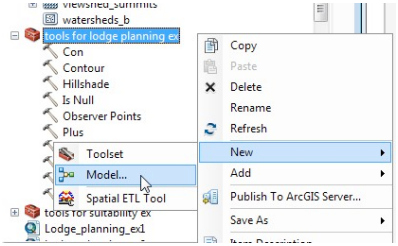
Weighted Sum tool

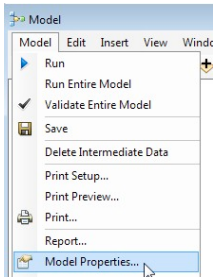


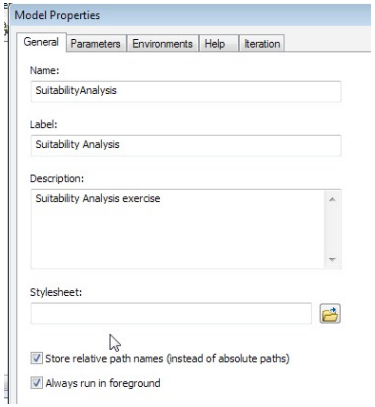
- Calculates your Suitability rating (value)
- Spatial Analyst Tools - Overlay - Weighted Sum
- or: Raster calculator: Rcl_Dist * 0.75 + Rcl_Dens * 0.25
- if reclassed rasters' values range from 1 to 10
- Weighted sum (with weights adding to 1.0) should (theoretically) also ranges from 1 - 10
- Convert to integer version with Int tool
  Raster calculator: int(suitability_with_float_values)
- Advantage: area per suitability value via attribute table (VAT)

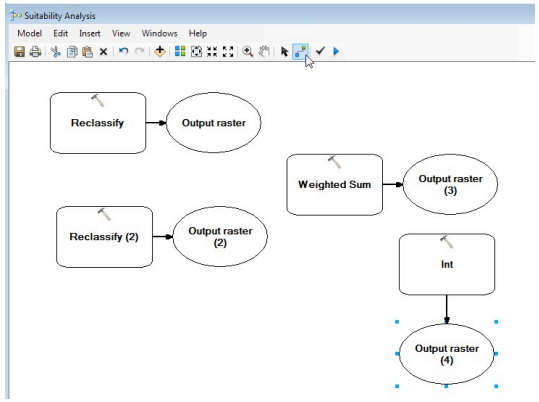
Lodge location suitability

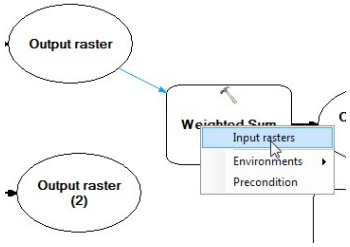
- Suitability based on number of views and slope angle
- raw data (same as lodge planning data):
  - viewshed raster: 0 to 10 views
  - slope raster: 0 - 54.3 degrees
  - (distance to road raster: 0 - 9500 meters, use later?)
- Use Modelbuilder to reclassify raw data to 1 - 10
- mix using weighted sum with:
  - case 1: viewshed 50%, slope 50% both weights are 0.5
  - case 2: viewshed 75%, (0.75) slope 25% (0.25)
- color suitability raster Green - Yellow - Red
- visually compare both
- convert to int rasters, what's the area of suitability values of 8 (5) or more?

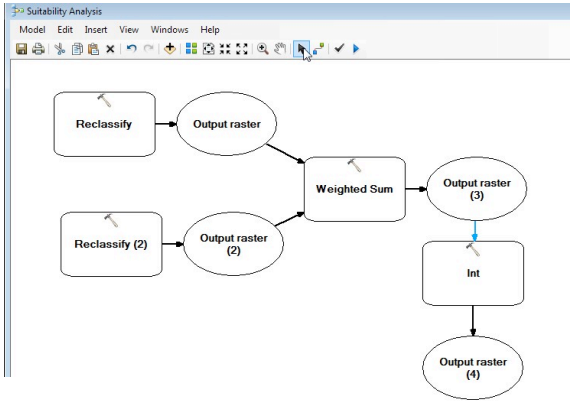

watersheds_b
tools for lodge planning ex
Con
Contour
Hillshade
Is Null
Observer Points
Plus
Toolset
Model...
Spatial ETL Tool
tools for suitability ex
Lodge_planning_ex1
Copy
Paste
Delete
Rename
Refresh
New
Add
Publish To ArcGIS Server...
Save As

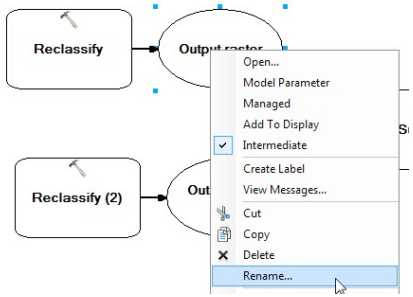

Model
Model
Edit
Insert
View
Run
Run Entire Model
Validate Entire Model
Save
Delete Intermediate Data
Print Setup...
Print Preview...
Print...
Report...
Model Properties...

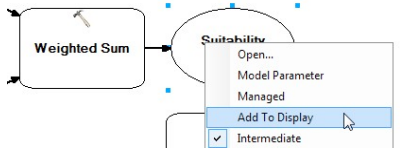

Model Properties
General
Parameters
Environments
Help
Iteration
Name:
SuitabilityAnalysis
Label:
Suitability Analysis
Description:
Suitability Analysis exercise
Stylesheet:
Store relative path names (instead of absolute paths)
Always run in foreground


Suitability Analysis
Model
Edit
Insert
View
Windows
Help
Reclassify
Output raster
Reclassify (2)
Output raster (2)
Weighted Sum
Output raster (3)
Int
Output raster (4)


Output raster
Output raster (2)
Input rasters
Environments
Precondition


Suitability Analysis
Model
Edit
Insert
View
Windows
Help
Reclassify
Output raster
Reclassify (2)
Output raster (2)
Weighted Sum
Output raster (3)
Int
Output raster (4)


Reclassify
Reclassify (2)
Open...
Model Parameter
Managed
Add To Display
Intermediate
Create Label
View Messages...
Cut
Copy
Delete
Rename...


Weighted Sum
Open...
Model Parameter
Managed
Add To Display
Intermediate