Multiscale Land Cover Processing for The National Map

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Overview

- Design vision, multiscale land cover
- Automation
- Generalization and enhancement
- Categorical treatments
  - “spray” and “feather” processing
- Quantitative treatments
  - Upsamples & thresholding
- Final steps in land cover rendering
Problem: NLCD: 30 m is coarse, imprecise and noisy

Solution:

• Aggregate classes
• Other layers map certain classes (e.g. NHD)
• Generalize and enhance edges
• Subtle lightness contrast differences
Un-touched NLCD data.
Prototypical final product. Use of common non-white canvass background color.
Vision, Data and Basic Aggregation

Painterly, accurate land cover without pixelation or noisy pixels to all scales

Representation in GeoPDF – not new data for analysis

Combine categorical and quantitative representations: data from all 3 NLCD products

5 land cover classes mapped

5/19/12
Automation

Existing ArcGIS Spatial Analyst tools

Python scripting:

- gen/enhancement
- symbolization
- Allows for parameter modification (e.g., canopy thresholds)
- Greater programmatic control than ModelBuilder
Categorical Land Cover
Edge attenuation by "Spray Can" and "Feathering" techniques
1. “Spray Can” Processing

- Raw 30m Pixels
- Shrink/upsample
- Buffer and Randomize
- Extract random pixels within buffer
- Allocate for final Spray Can Effect

2. “Feathered Edge”

- Reclass desired LC as nodata
- Euclidean distance
- Set threshold distance
Un-touched NLCD data.
Aggregated Ag class.
Shrunk by one 30 m pixel, upsampled to 2 m.
30 m buffer regions around shrunk Ag sample a random noise raster with a constant Value vs. No-Data probability.
Previous step yields Ag ‘noise’ with a constant frequency but random placement. Combined with shrunk Ag regions.
Euclidean allocation to a maximum “fills out” empty pixels in the noise zone.
Further softening region edges by filling out holes at region edges. “Spray Can” processing complete.
“Feathered Edge” starts.
“AntiAg” zone (violet color).
Distances to “antiAg”.
Create “plateaus” of distance by threshold. Feathering complete.
Prototypical final product. Use of common non-white canvass background color.
Un-touched NLCD data.
Quantitative Land Cover
Quantitative data: Thresholding

Canopy and Impervious Surface data

Meaningful threshold parameter needed, according to USGS map requirements

Removes noisy single cells below threshold

20%, adjustable
Quantitative data: Resampling

Cells upsampled 3 times to smooth out pixels, each time bilinear resampling.

Then extracted by threshold.
15 m cells
5 m cells
2 m cells
5 m
Prototypical final product. Use of common non-white canvass background color.
Un-touched NLCD data.
Lightness contrast for magnitude information

% Canopy - % Impervious
Canvas color: “patches”

Canvass color important for symbology lightness differences

Occur in slivers between classes

Generated by raster process: 5 land cover layers mosaicked, and gaps queried for “patches”
Flattening to single raster

Single 8-bit raster

Each land cover type assigned a range of values

Mosaicked

Hierarchy: impervious
canopy
agriculture
grazzland
barren
canvas patches
Flattening to single raster

Colors applied to each value (0-255) according to colormap (i.e., template .lyr file), containing all necessary feather & magnitude ramps

Creates single GeoPDF layer, represented by RGB values alone
GeoPDF Context

Basemap representation, alone & with ortho
Not meant for analysis, and not served as data
File sizes: 8-bit raster, within 1 MB at 300 dpi, compressed jpg.
Thanks!