Deriving JHS NLCD Data

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1. Open ArcCatalog 10.1 and create file geodatabase called JHS\_NLCD on the (secure) U drive. This file will house the GIS data and ensure that each layer is using a consistent geographic coordinate sytem.
2. Unzip the NLCD Percent Developed Imperviousness 2006 raster layer to the Desktop (not the geodatabase—the raster is too big). This file is a raster, at a resolution of 30 x 30m, of percent imperviousness, across the continental United States. This file was downloaded from <http://www.mrlc.gov/nlcd2006.php>.
3. Create a list of unique addresses, as well as unique counties, for JHS participants from the file of geocoded addresses provided by Steven Wang. See the SAS program JHS\_20140102 for details.
4. Import the list of JHS counties into the JHS\_NLCD geodatabase.
5. Import TIGER/Line 2000 Census county shapefile into the JHS\_NLCD geodatabase. This file contains the boundaries, as of 2008, for counties in the U.S. and conforms to the boundaries used in the 2000 Census. This file was obtained from <http://www.census.gov/geo/maps-data/data/tiger-line.html>.
6. Join the list of JHS counties to the TIGER/Line county shapefile, and Select (in Analysis Tools) only those counties in Mississippi and inhabited by JHS participants to create a new feature class.
7. From this new layer, create a buffer of 1 km around the counties and dissolve the boundaries.
8. Clip the NLCD raster (Data Management -> Raster -> Raster Processing -> Clip) using the buffered county layer (do not use the input features as clipping geometry), and save the new smaller raster in the JHS\_NLCD geodatabase. Otherwise, the raster is unwieldly to work with, and computation time is excessive.
9. Create a feature class of the geocoded addresses in the JHS\_NLCD geodatabase, and define the geographic coordinate system for this table as being WGS\_1984.
10. Re-project the address feature class to the datum of the TIGER/Line file (D\_North\_American\_1983), and clip the address feature class by the buffered JHS county layer.
11. Extract the raster value for each address (Spatial Analyst -> Extraction -> Extract Values to Points), open the attribute table and export the table as a dbf file.
12. Create a fishnet of 0.025N x 0.025W decimal degrees (approximately 2.7 x 2.3 km), making sure the fishnet extent goes beyond the address layer extent to include every address. Intersect this fishnet layer with the addresses layer to assign a quadrant to each address.
13. Create layers of 100m and 500m buffers around each of the addresses. Create a new address field, addID2, which contains the values of addID.
14. Open ArcMap and add the ZonalStatsWOverlaps tool (with the makeZones.py script) to the toolbox. This tool iteratively calculates zonal statistics by sets of non-overlapping polygons and is a work-around for the limitation of the ZonalStatisticsAsTable tool which calculates zonal statistics incorrectly in feature classes with overlapping polygons. This is a big problem for this data set, which includes many addresses which are in close proximity to each other. The ArcGIS documentation recommends calculating zonal statistics for each polygon (e.g., buffer) separately when the polygons overlap, but this would take a long time for the 5000+ buffers. Additionally, I have modified the ZonalStatisticsAsTable tool to iterate by the fishnet quadrants to roughly address the additional limitation that the ZonalStatisticsAsTable tool in ArcGIS internally converts the zonal feature layer to a raster with cell sizes equivalent to 1/250th of the layer extent, and the layers of non-overlapping polygons differ in their extents. Even working within each quadrant, this results in big differences for buffers as small as 50m which end up ranging from 7200 m2 to 10,800 m2 in size, so 50m buffers are not calculated here.
15. Calculate zonal stats for 100 and 500m buffers around the addresses, selecting the addID2 field as the Zone Field. Export these files as dbf files.
16. Repeat for the 2001 NLCD Percent Developed Imperviousness file.
17. Repeat for participant addresses outside of Mississippi.