Method for evaluating proposed Urban Area criteria

Ted LaBoube, East-West Gateway Council of Governments

April 12, 2021

1. Finding blocks that meet the initial Criteria.
2. Select all Census 2010 blocks that fall within 5-miles of the East-West Gateway 8-county border.
3. Export to database. I am storing all data in a coordinate system that will work well with an area that covers a large area of two states: USA\_Contiguous\_Albers\_Equal\_Area\_Conic
4. Join census 2010 housing data to block file to add housing unit density (housing units per square mile of land area)
5. Create a column in the attribute table to select and mark (Y or N) if the block has 385 housing units per square mile.
6. Download NLCD 2016 Percent Developed Imperviousness (CONUS), clip to area that includes all selected blocks.
7. Use Reclassify tool to create a raster that includes only cells that have 20% or greater imperviousness. Lower values receive a NoData value.
8. Use Zonal Statistics as Table tool to determine the number of cells that have an imperviousness of 20% or greater per census block. Multiply the sum by 900 (30mx30m cell) to determine the area in meters that is at least 20% impervious. This tool counts the number of pixels by a zone, in this case a block. Since pixels can’t be split at boundaries, it is possible to have more impervious area than block area. Another way to do this would be to convert the raster to a shapefile, then intersect the converted raster with the block layer. This is a more data intensive process, but would eliminate the problem of having more impervious area than there is block area. Further clarification from the Census Bureau on how they assign imperviousness to the blocks, and what coordinate system is used when processing data, would be useful.
9. Sum the land area and water area provided in the block table to determine total area of block.
10. Divide 20% impervious area by total area, select every block where at least one-third of the total area is 20% impervious.
11. Create a column in the attribute table to select and mark (Y or N) blocks if they meet the imperviousness criteria.
12. Calculate Perimeter in meters using calculate geometry.
13. Use the provided formula, I = 4πA/P2 , where A is the total area of the block and P is the perimeter, to determine if the block is compact.
14. Create a column in the attribute table to select and mark (Y or N) if the block has a shape index of at least 0.185 using the data that was created in step A.12.
15. It is useful at this point to create a column that marks (Y or N) if a block meets both the impervious criteria and the compactness criteria.
16. Create a column in the attribute table and mark (Y or N) if a block meets the housing criteria or the impervious/compactness criteria.
17. It is useful at this point to create a new dissolved layer using the column made in step A.15.
18. Intersect blocks that meet impervious criteria, but not compactness criteria to determine if it shares at least 40% of its boundary with territory meeting the first two initial criteria. Make sure output type is line. Use layer created in A.16.
19. Calculate length in meters, join back to block and add to table
20. Divide this length by the perimeter length to determine the percent of shared boundary.
21. Create a column in the attribute table and mark (Y or N) if the block share at least forty percent of its boundary with already qualifying territory. This step primarily brings back blocks that cover urban roads/highways.
22. Create a column in the attribute table and mark (Y or N) if the block meets the housing criteria, or the impervious and compactness criteria, or meets impervious and shares at least forty percent of its boundary with territory meeting the first two criteria.
23. Finding enclaves.
24. Create two new layers, one with all the blocks meeting just the housing criteria dissolved together, and one with all blocks that are 100 percent water dissolved together.
25. Create a union between the dissolved housing layer and a solid feature that covers the entire block group area. I am using a buffer that is the EWG boundary, plus 10 miles. This union will be used to determine enclaves that are completely surrounded by housing unit territory and are five square miles or less.
26. Start editing the union from B.2. Delete the initial housing area from layer, then explode all remaining features, remove the portion that fell outside the housing area leaving behind only the pieces that were holes within this area. Determine the area in square miles of these enclave areas, delete anything over five square miles.
27. Create a column in the attribute table and mark (Y or N), then use this new enclave layer to select and mark any blocks that are part of an area completely surrounded by housing territory and are under five square miles.
28. Create a new layer that includes the blocks meeting the initial criteria, A.21, with blocks meeting the first enclave criteria, B.4. Dissolve all features.
29. Repeat steps B.2 and B.3 with this dissolved layer.
30. Create a layer that includes all blocks that don’t meet previously selected territory. Also, remove all territory that is identical to areas found in step B.6.
31. Use the Near to determine if any of the enclaves selected in B.6 are more than 1.5 mile from the layer created in B.7, Delete any feature that are less than 1.5 miles.
32. Create a column in the attribute table and mark (Y or N) any blocks that are within the layer.
33. Create a new layer that includes all blocks meeting initial urban core criteria with all blocks meeting the above enclave criteria. Dissolve all features.
34. Merge the layer from step B.10 with the dissolved water layer. Edit layer and merge (under editor) all features together. This layer will be used to find enclaves that are partly surrounded by territory that meets the initial criteria, with the rest of the boundary closed off by water.
35. Repeat steps B.2 and B.3 with the layer from step B.11.
36. Intersect the layer from step B.12 with the water only layer and with the initial urban core layer, A.21, with line as the output. Use this to determine the length of adjacency with both. If the length is greater for land than water, the enclave area is included. Remove areas that do not meet this criteria.
37. Create a column in the attribute table and mark (Y or N), using the layer from A.13 to select and mark any blocks that are part of an area completely surrounded by water and territory that meets the initial criteria, where the length of adjacency is more for land than water.
38. Create a column in the attribute table and mark (Y or N) if a block meets any of the initial criteria or any of the enclave criteria. This can be used to simulate what potential changes may occur to the urban area, before hops and jumps are applied.