Appendix M – Population Growth Model

Spatial Growth Model

Spatial Growth Modeling is accomplished using a contractor developed ArcView extension and can be done at the parcel level, or by the use of any size-assigned grid cells. The Spatial Growth Model (SGM) may be constructed as a set of "nested" models moving from the County to the community and potentially the neighborhood level. The following steps are involved in the creation of an SGM, which will generate GIS maps for the growth study area by decade (or other preferred time step):

1. Determine the growth study area; insure the data available spatially matches this region.

2. Determine the land available for growth with the study area. This process will create an initial "land bank" which can exclude areas such as those designated for open space, agriculture, riparian preserves, etc. (This land bank can be adjusted to meet the needs of different groups or values, and several land banks may be created to test different policies.) This creates a grid file in Arc View using Spatial Analyst. Land may be assigned as a "zoning" category specifying that the model, "assign this land sub-area to a particular type of growth."

3. Input the anticipated population growth rate, by housing type; including commercial and industrial allocations. A "Growth Calculator" has been developed to accomplish this in a Graphical User Interface (GUI) venue. This Growth Calculator allows the user to adjust the percentage of population assigned to different housing types (i.e., Single Family 35%, Multi-family 30%, Rural 25%, etc. – this may also be more specific zoning), as well as adding/deleting or changing these values/types for each scenario run. This also allows the user to calculate the amount of land required to accommodate different choices for each land use type, reflecting demand in term of total land, lot size, people per household, units/lot, etc.

4. Develop a set of "Growth Rules" (this can be specific zoning) by which this growing number of people and businesses will be housed and distributed. Conversely, growth rules can specify land *not to be developed.* For instance:
   - Place new multi-family within one mile of existing multifamily
   - Place new multi-family within 2 miles of existing commercial
   - Keep all low density (perhaps 1/2 acre or more…) 2 miles away from existing intersections
   - Cluster all development around nodes on a new/existing transportation corridor.
   - Notably, there may be <u>any number of rules</u>, and
   - <u>Each rule may be assigned a priority weight</u> in relation to the other rules used in that scenario "run" to reflect the values of the user.
   - The addition of rules will add to the "run times" of the model, however the output will reflect the complex aggregation of these rules.

These rules can be developed as a separate set for each type of land use being assessed in the model. These various rules sets can then be run consecutively in a comprehensive model run, letting each rule set allocate land based on available area and priority in the run. Essentially, this allows the user to assess various differences based on which types of development have priority. When a scenario is generating, once land is used up by one type of development, it becomes unavailable to any other land use type. The model also notifies the user if there is insufficient land to meet the demand of a particular rule set. There is no limit on the number of rules in rule set or the number of rule sets run for a given scenario.

5. Run the model; this will take anywhere from a few minutes to several hours, based on the number of rules used, the size of the land bank and the scale of the grid, lot or parcel resolution to be utilized.
    - The model will generate a grid for each rule, which can be displayed to show where the rule applied.
    - The resultant rule grids are then combined to create a Composite Suitability Grid. This grid is used to allocate growth for that particular rule set.
    - Finally, a grid is created for each time step and rule set. For example if there was a set of 4 rules for Single Family Growth growing in ten year intervals to 2050, the model would generate:
        i. 4 grids representing each rule
        ii. 1 Composite Suitability Grid
        iii. Grids that represent Single Family Growth 2010, Single Family Growth 2020, Single Family Growth 2030, Single Family Growth 2040 and Single Family Growth 2050
    - These sets of grids are created for each rule set run for a given Scenario. These grids can then be merged by land use type, year of growth, etc., to display different scenario data for assessment.

6. Rerun the model with different population, land bank and growth rule scenarios. This accommodates a variety of values and opinions regarding community growth options.

7. These scenarios may be overlaid or otherwise compared for similarities and differences.