Visualizing Modeled Land Cover Change and Related Uncertainty

Jeannette Candau
United States Geological Survey &
Department of Geography
University of California, Santa Barbara
Santa Barbara, CA 93117
jcandau@usgs.gov

Our research on the impact of human induced change upon the natural landscape has produced a cellular automaton "Deltatron" model of land cover. Using modeled urban growth as a driver, land cover change, classified at Anderson Level 1, may be simulated for the future. The result is a land cover forecast for a study area that uses Monte Carlo simulation to estimate both the most likely future land cover class, and the associated uncertainty of the prediction. From the model, two prediction maps are produced that describe the likelihood and character of land cover change. The first, is a map of the most probable forecasted land cover. Each location is classified by its “winning” land cover type. That is, by the land class present most often over 100 Monte Carlo iterations. A second image produced by Deltatron is a map of uncertainty that is associated with the land cover forecasts. Uncertainty is calculated by counting the number of times each class is found at a given location over all Monte Carlo iterations. If a location is observed to always have the same land cover when the prediction year is reached, its uncertainty value is zero. However, if one land class is equally likely as another of being present, there is a high degree of uncertainty related to modeled class transition. The higher a pixel’s value in the uncertainty map, the less confidant we are in the model’s prediction at that location. Within the Geographic Information System (GIS) environment, these cumulative land cover and uncertainty maps clearly show the spatial and temporal relation of land transitions. A degree of confidence may be associated with each simulated class change, and a more informed analysis of model results can be performed.