

Accuracy assessment of the NLCD 2006 impervious surface for Roanoke and Blacksburg

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Abstract

Impervious surface map products are important for the study of urbanization, urban heat island effects, watershed hydrology, water pollution, and ecosystem services in general. At the conterminous US scale, impervious surfaces are mapped for 2001 and 2006. The accuracy of the 2006 NLCD impervious surface, however, has not been thoroughly examined, especially for small and intermediate size cities (e.g., regional city). In this study, we selected two transects in two cities and visually interpreted aerial photo to develop impervious surface reference maps. We then compared percent impervious surface of the NLCD and aerial photo-interpreted reference maps. The comparison was conducted at 90m resolution to minimize the errors in image registration. Overall, we found that the 2006 NLCD impervious surface matched well with our reference data, although slight skewness at two extremes is present. The R^2 and RMSE statistics improved when the two datasets are compared at coarse aggregation levels (e.g. 180m).

Study Areas

In this study, we conducted accuracy assessment for the 2006 NLCD impervious surface for two selected Southwest Virginia cities: Roanoke city (Figure 1) and Blacksburg (Figure 2).

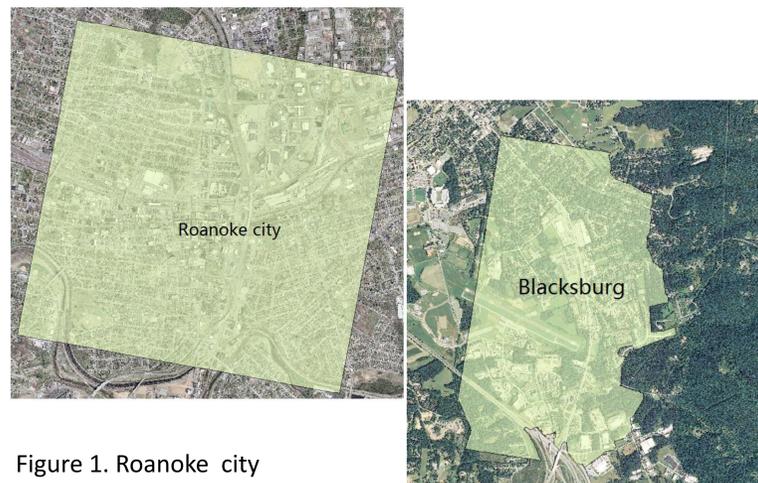


Figure 1. Roanoke city

Figure2. Blacksburg

Method

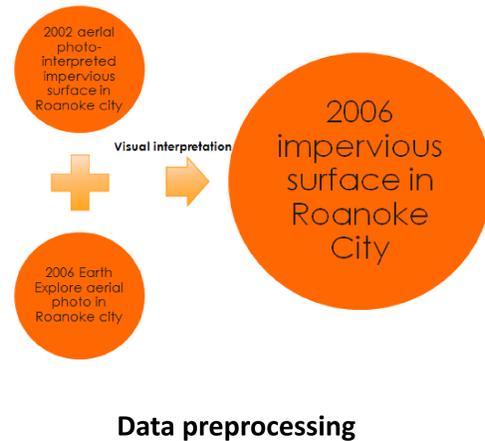


Figure 3. Visual-interpreting and digitizing of 1-m high-resolution aerial photo (2006) in Roanoke city to develop impervious surface reference maps.

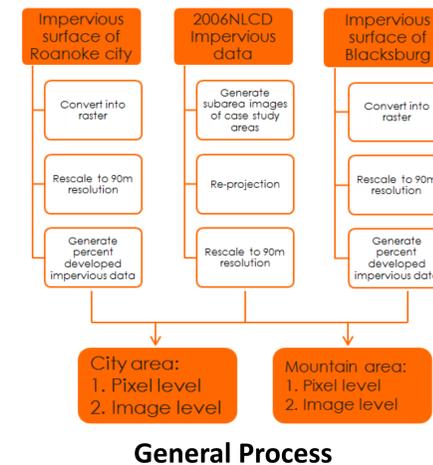


Figure 4. comparing percent impervious surface of the NLCD and aerial photo-interpreted reference maps. Both of the 2006 NLCD data and the reference data were rescaled to 90m resolution to minimize the errors in image registration.

Results

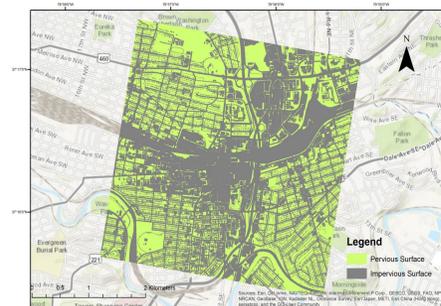


Figure5. Aerial photo-based visual interpretation for Roanoke impervious surface.

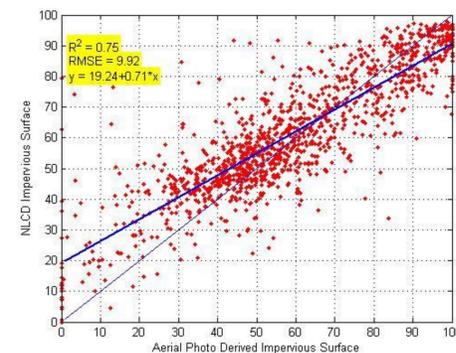


Figure7. Percent impervious surface comparison between NLCD and reference image for Roanoke after aggregated to 90m.

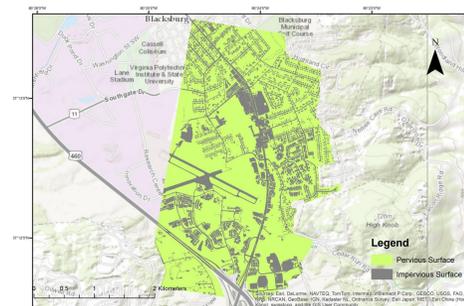


Figure6. Aerial photo-based visual interpretation for Blacksburg impervious surface.

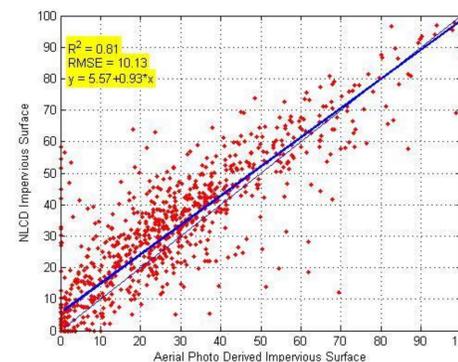


Figure8. Percent impervious surface comparison between NLCD and reference image for Blacksburg after aggregated to 90m.

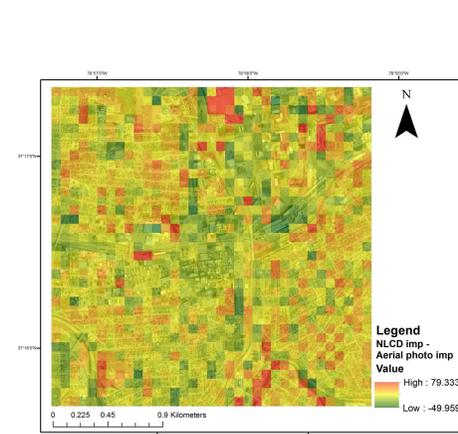


Figure9. Error distribution for Roanoke

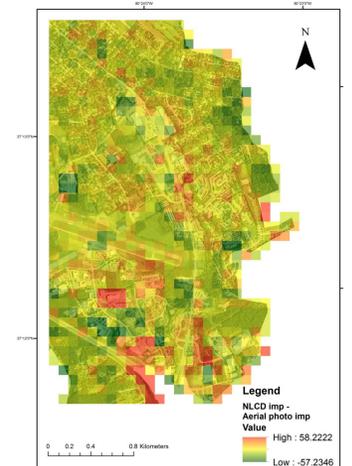


Figure10. Error distribution for Blacksburg

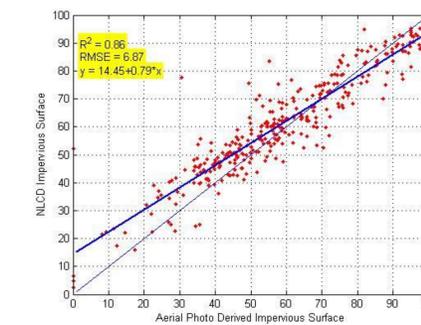


Figure11. Percent impervious surface comparison between NLCD and reference image for Roanoke after aggregated to 180m.

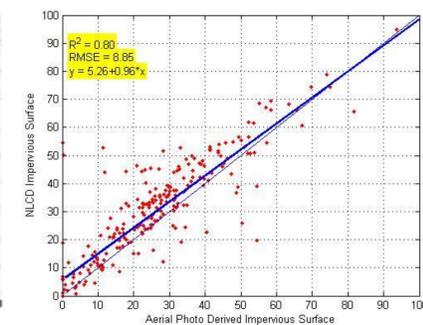


Figure12. Percent impervious surface comparison between NLCD and reference image for Blacksburg after aggregated to 180m.

Conclusion & Discussion

NLCD 2006 overestimates impervious surface in low density impervious surface area. As for high density impervious surface area, NLCD shows underestimation.

Large error can be seen in several parcels in Blacksburg, for example, in low residential density area. Errors appear to be spatially correlated. For Roanoke, random error distribution may be attributed to quality of reference data derived from air photo interpretation.

Upscale can decrease random errors, which can be seen in a smaller RMSE.

Acknowledgement

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