

Abstract

Detailed land cover mapping for arid area is essential for a range of research issues addressed by the CAP LTER, including all questions about the design or configuration of the land and landscape on ecosystem services and human wellbeing. Our project produces 1 meter land cover map with 12 classes for CAP LTER site. The primary data sources include the 4 bands aerial imagery acquired from the National Agricultural Imagery Program in 2010, and cadastral GIS vector layers. Adopting the object-oriented techniques, a rule-based expert system approach is designed to cluster pixels into meaningful objects based on their spectral, spatial, and contextual properties.

Comparing the fine scale mapping results with other LTER sites (e.g. PIE LTER, BES LTER), we encounter challenges in both urban universal classification systems and the unique desert landscape in CAP LTER site. Additionally, due to the high level of landscape heterogeneity and the diverse variation of object composition from the urban core to the desert fringe, several systematic issues exist in the result product: (1) difficulties in delineating residential building boundaries from their surrounding drive ways and bare soil in urban/rural areas; (2) separation of seasonal river beds from soil and rock in rural areas; and (3) separation of big shrub from tree canopies in urban areas.

Study Area

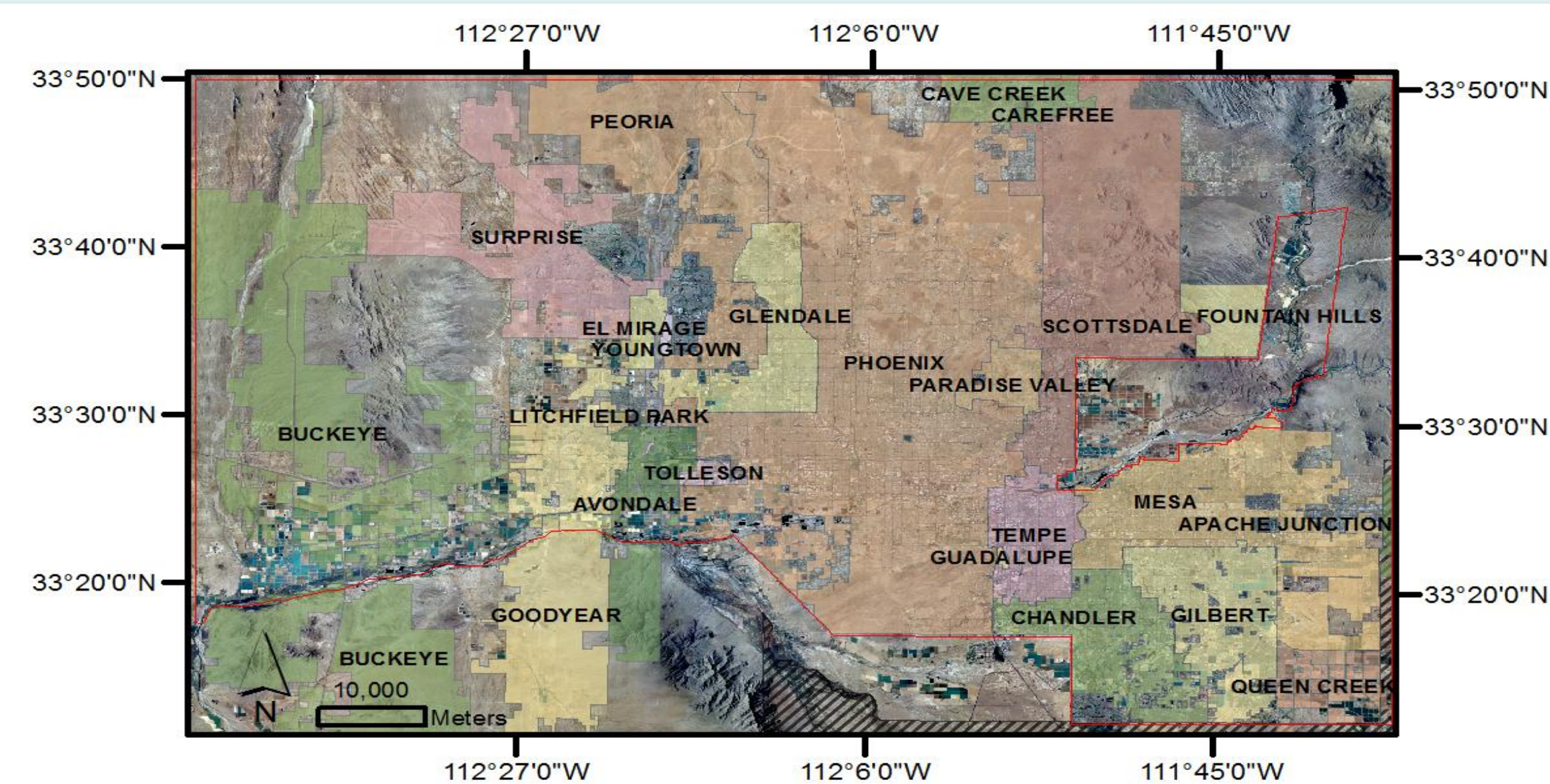


Figure 1. Study Area (The red outline is the CAP-LTER boundary)

Methods

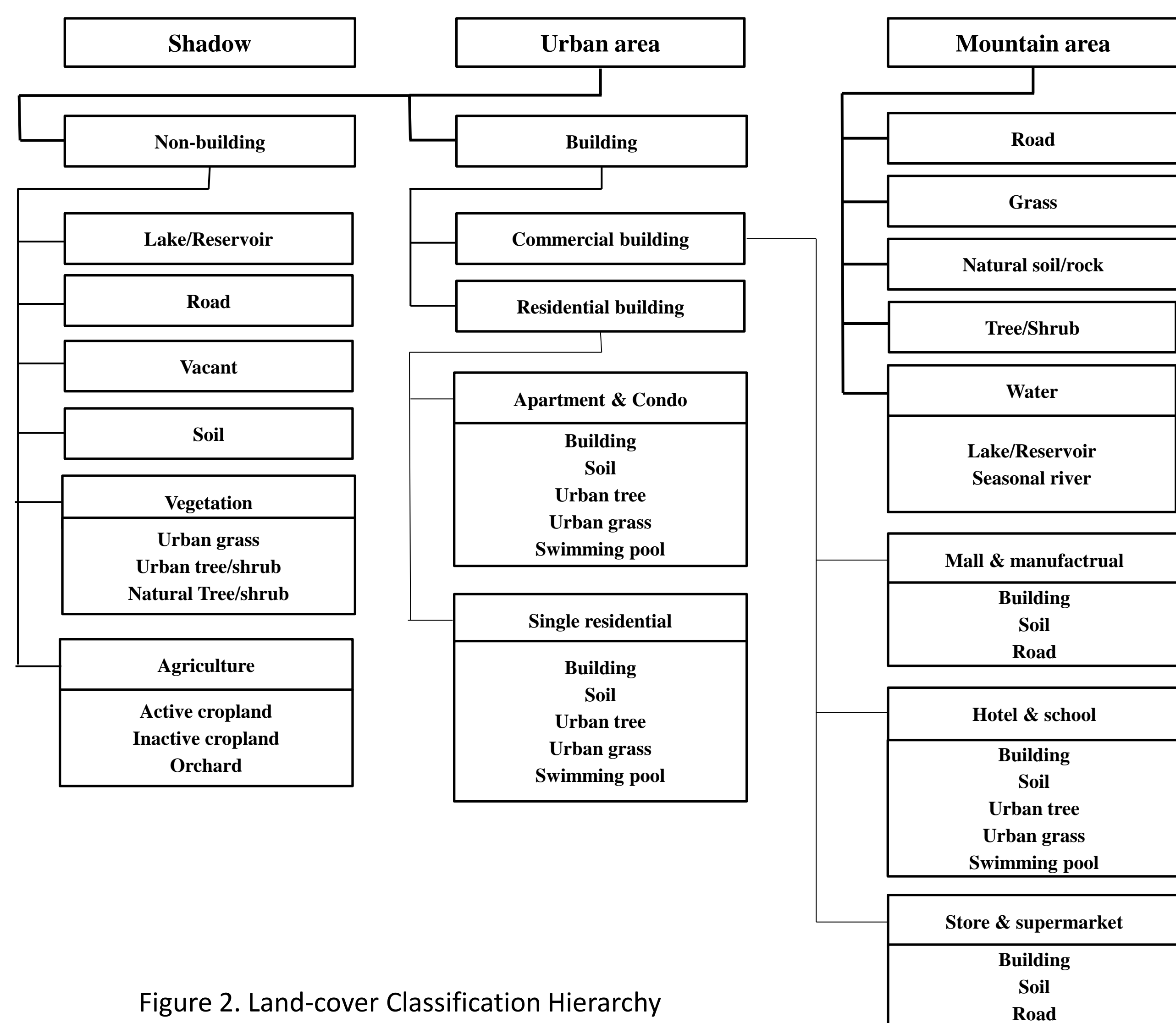


Figure 2. Land-cover Classification Hierarchy

Results

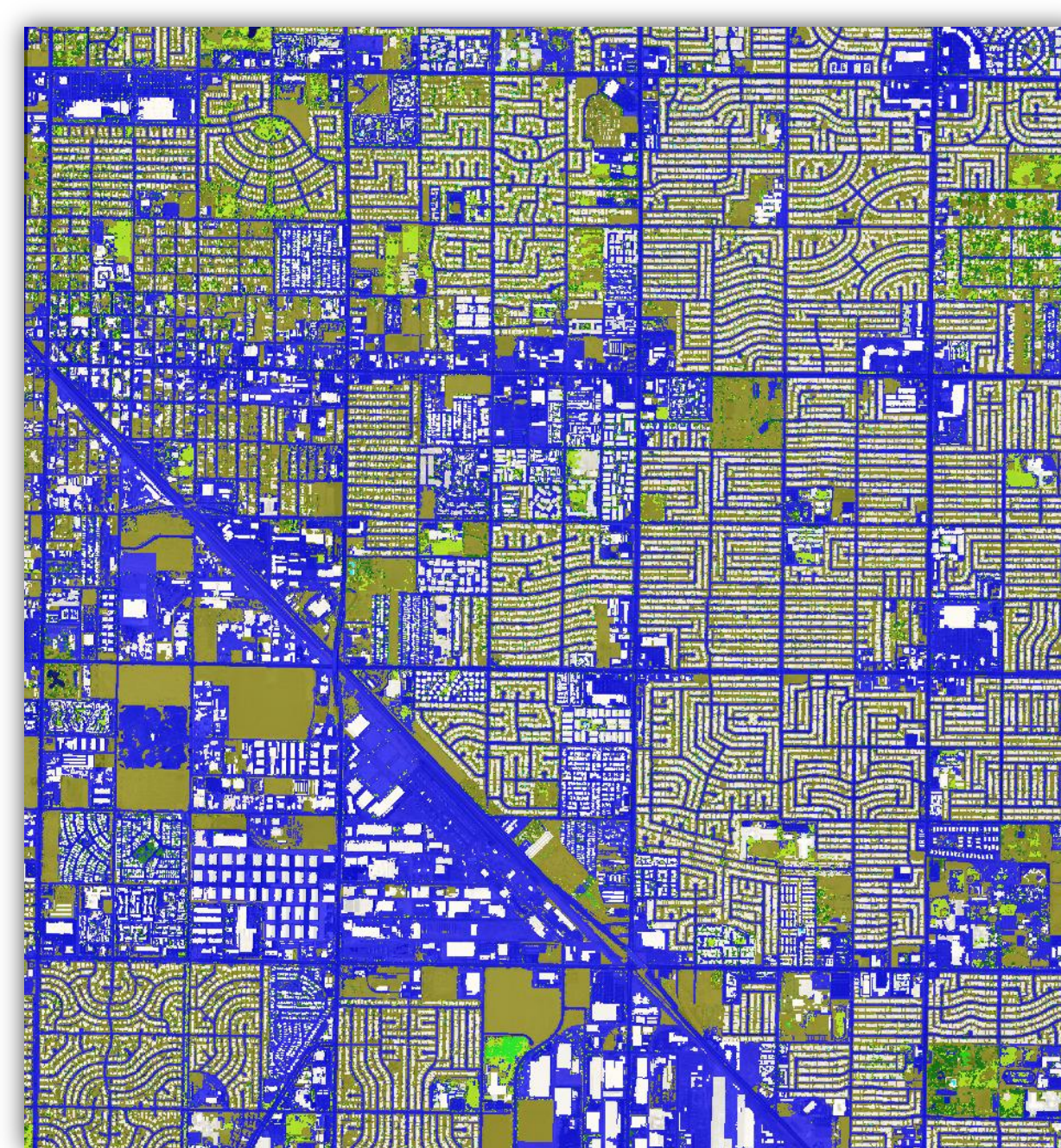


Figure 3.1 A result sample of commercial, and high density xeric residential area

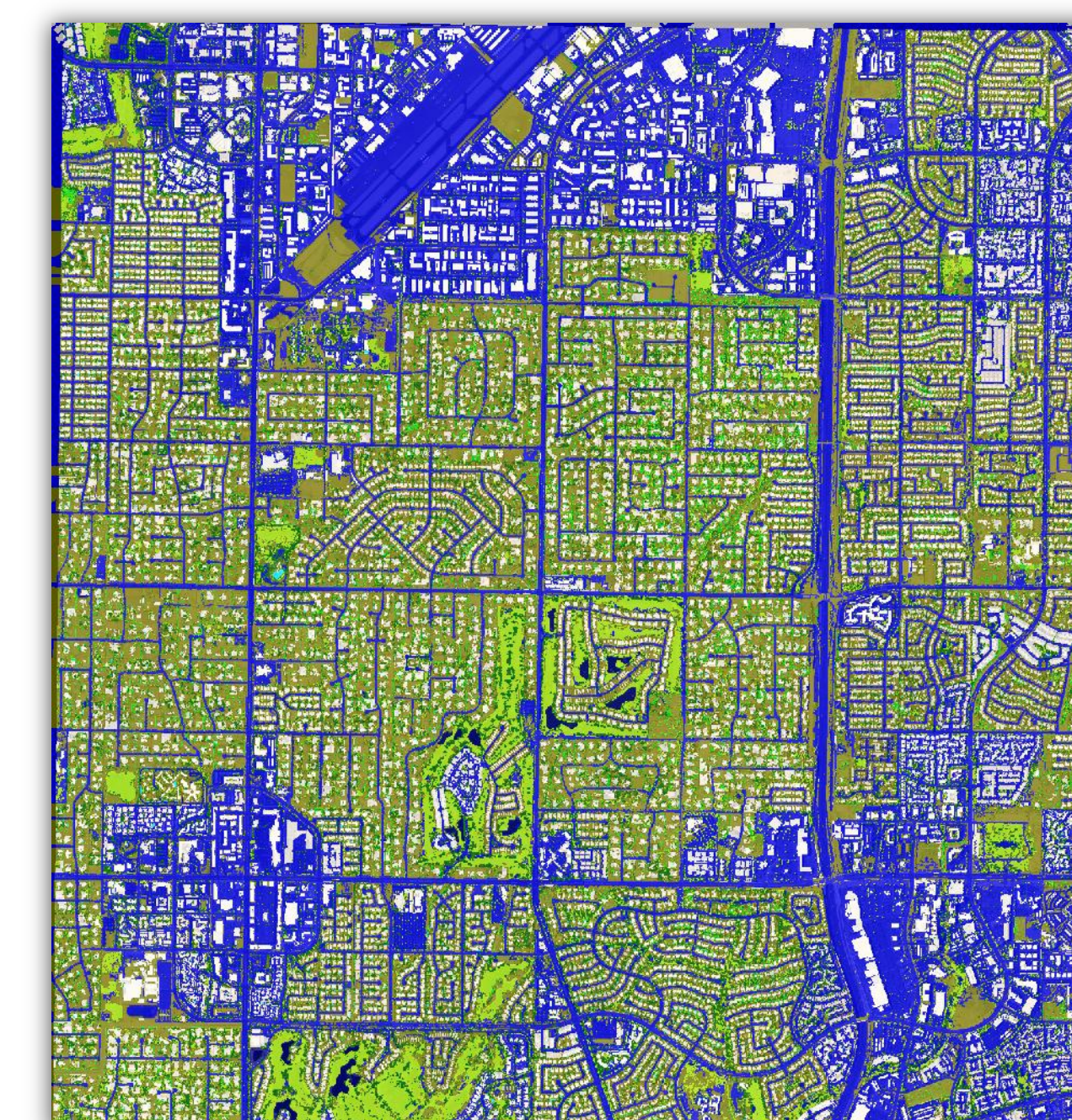


Figure 3.2 A result sample of commercial, and mesic residential area

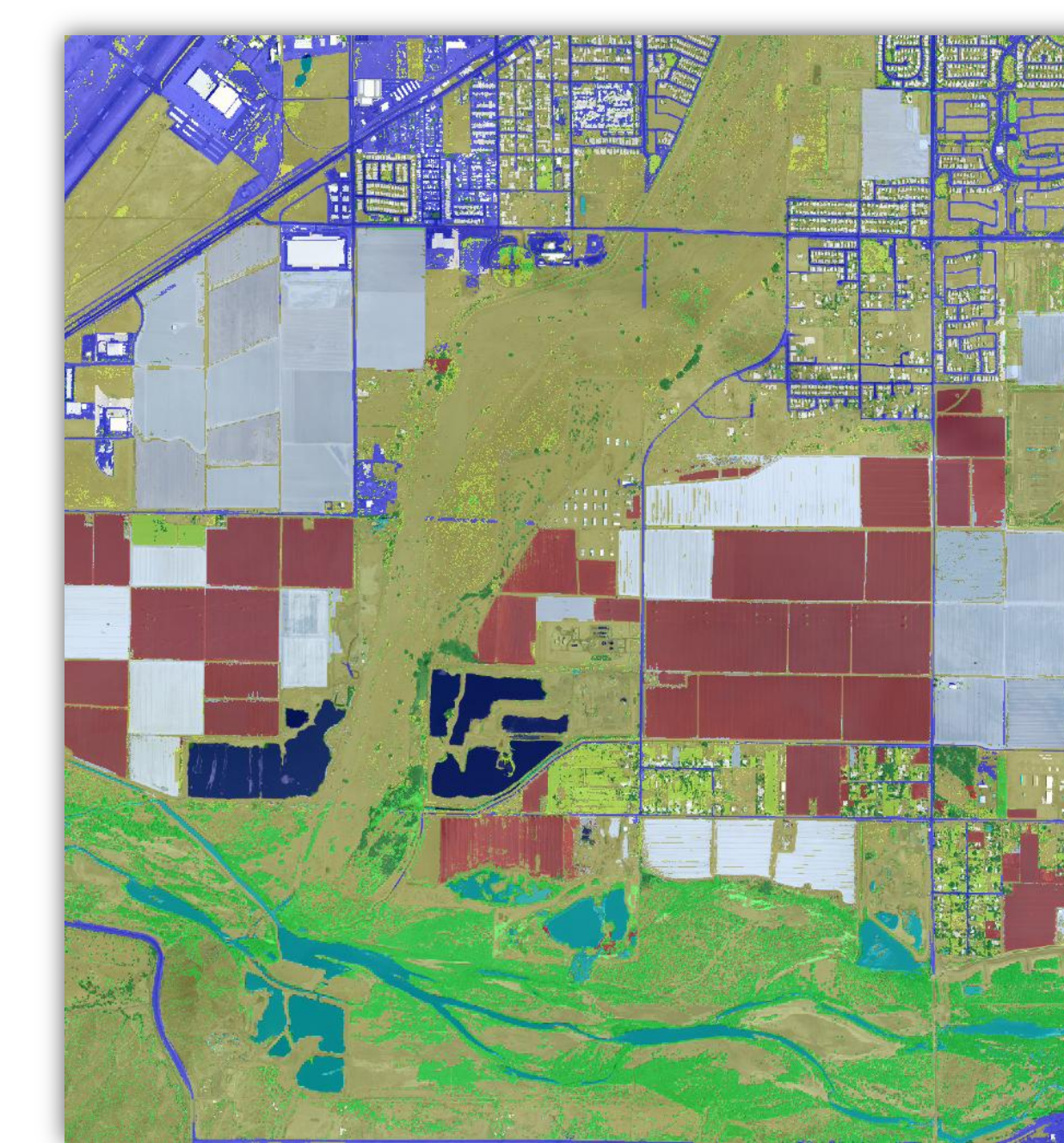


Figure 3.3 A result sample of seasonal river and cropland area



Figure 4.1 Mesic residential



Figure 4.2 Xeric residential

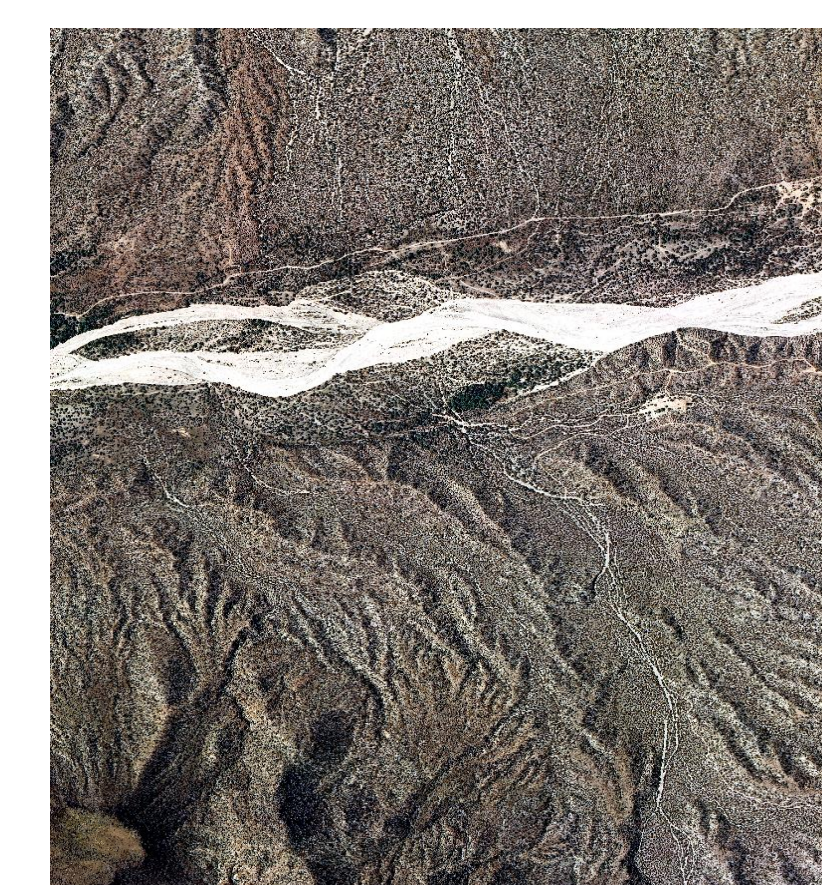


Figure 4.3 Desert and Seasonal river

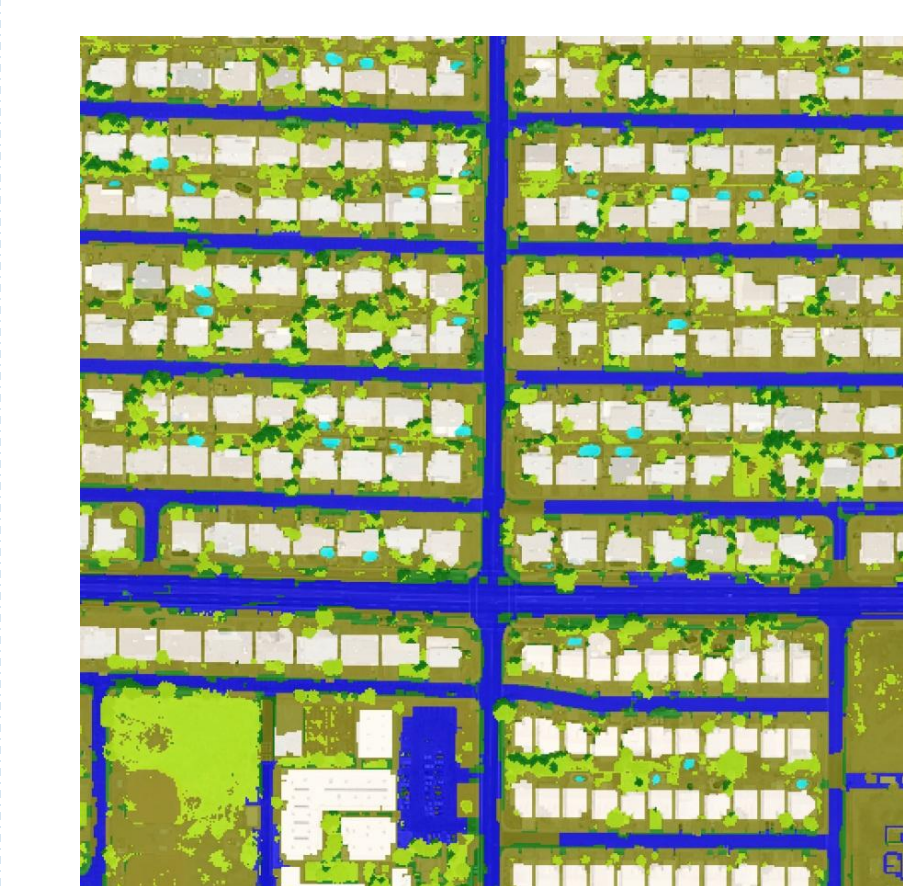
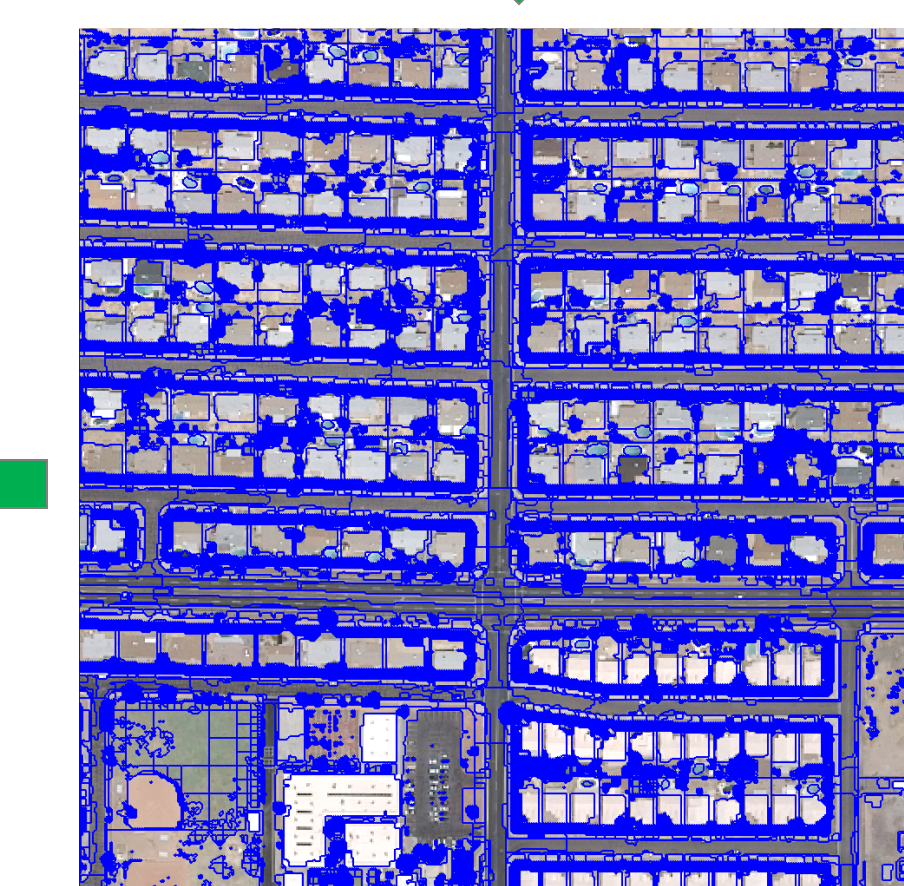
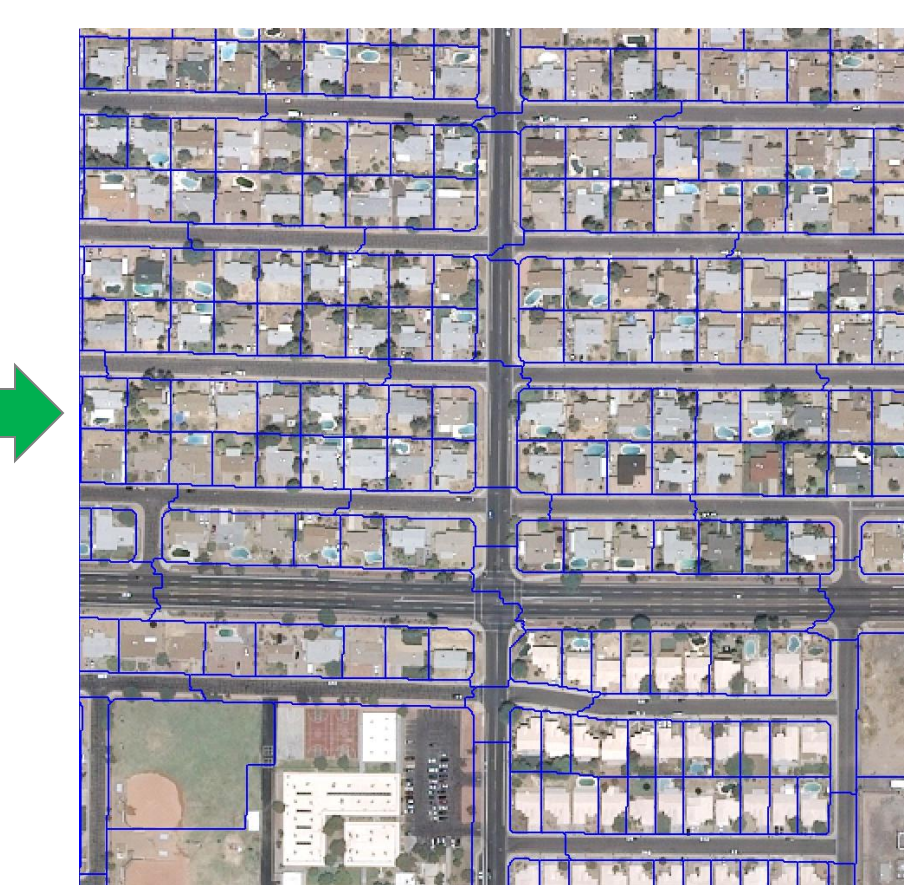


Figure 5. Two levels of object segmentation



Discussion and Concluding Remark

- Our study suggests the establishment of the systematic image process. Such process should not be only useful for small-sized areas but should be suitable for larger study areas with similar landscape pattern.
- The balance between the automatic level of image process and computational time should be considered an important issue.
- Difficulties in object delineation are mainly attributed to the current lack of the elevation information within the urban area and the increase of spectral interference within in the high resolution data. Therefore, post classification process and additional manual editing were conducted to reduce errors within the classification results.
- The object oriented classification was shown to be more accurate than the pixel-based classification method with ancillary cadastral GIS data.

Acknowledgement

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