Classification and Mapping of Urban Tree Cover: City of Minneapolis

Project Summary

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Urban Tree Cover

Minneapolis examples

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Urban Tree Cover

- Trees are an important component of urban environments with significant aesthetic, environmental and economic benefits and values:
  - Stormwater management and improving water quality
  - Energy conservation
  - Improving air quality
  - Enhancement of property values and community vitality

- Accurate maps of existing tree cover are essential for analysis and planning of possible and preferable tree planting sites
- Remote sensing image classification and geographic information system (GIS) analysis represent the most cost effective methods for mapping and modeling

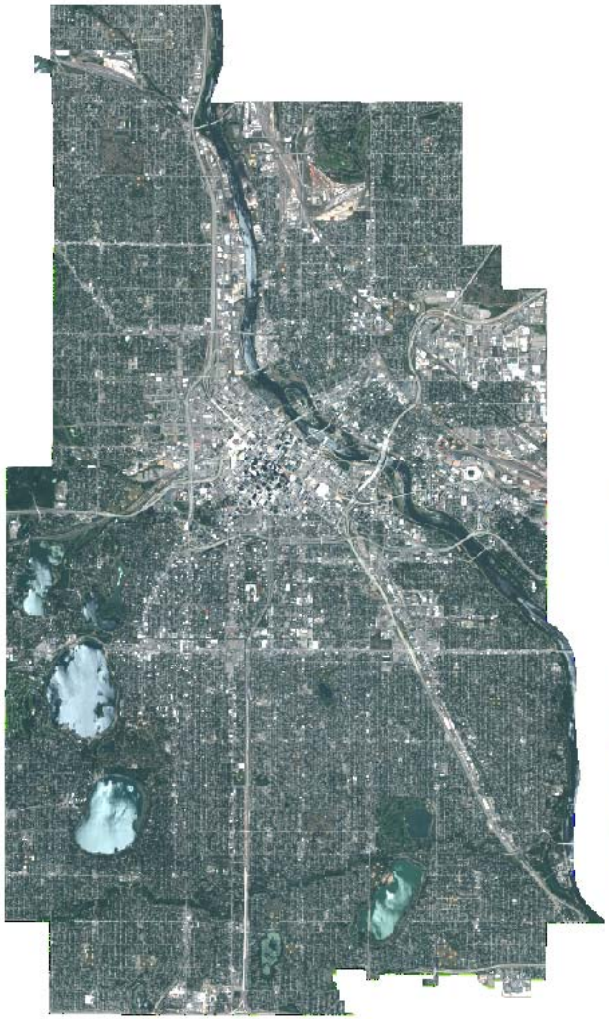
Multispectral QuickBird Satellite Imagery

June 09, 2009

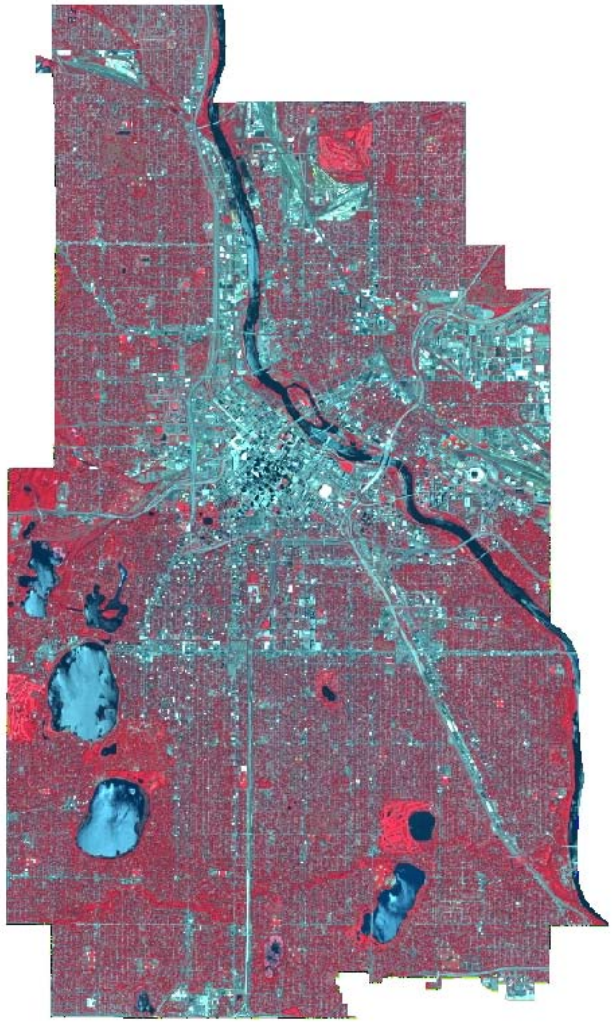
Lidar Imagery

June 2007

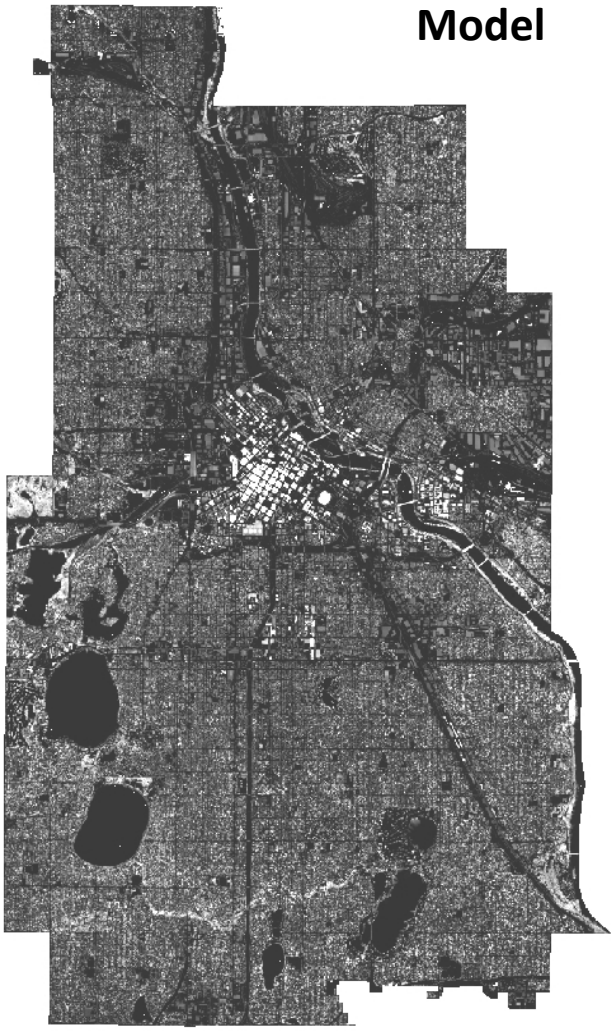
Natural Color



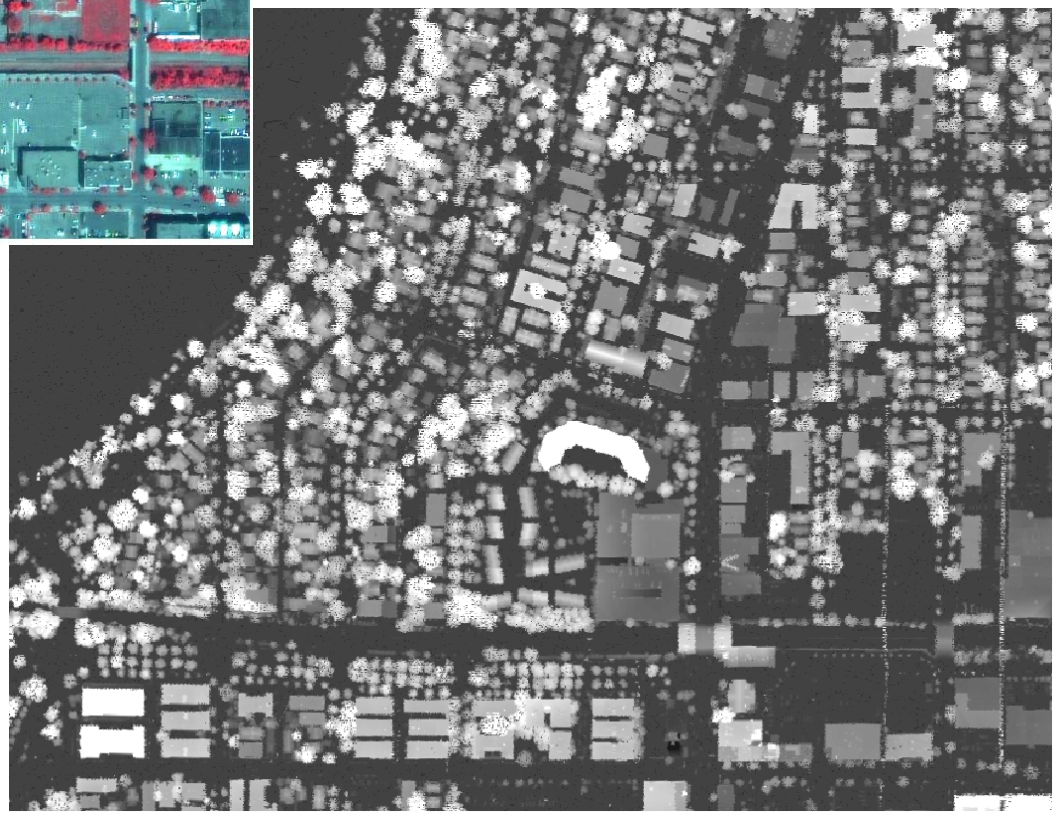
False Color w/ infrared band



Normalized Digital Surface Model



QuickBird and Lidar Image Enlargements

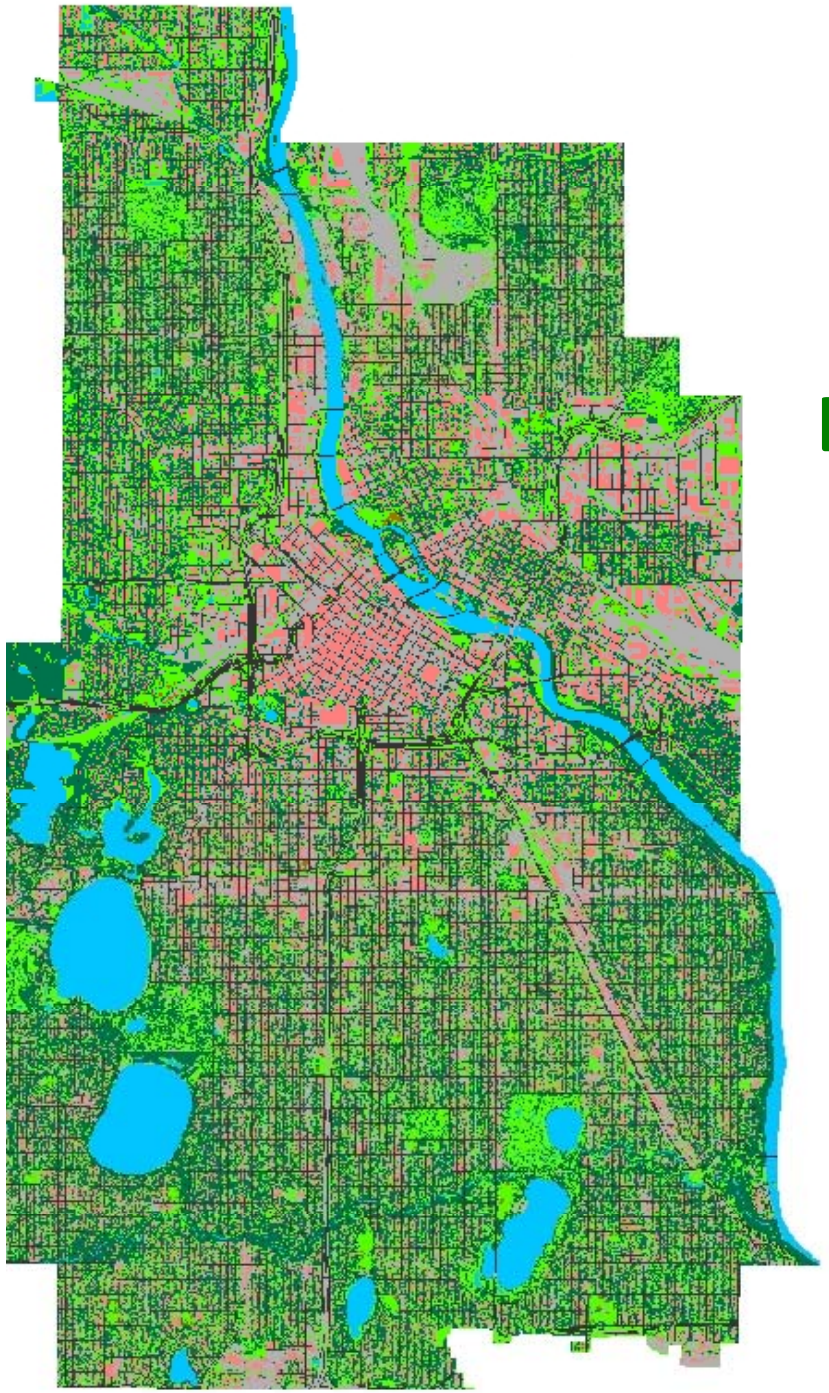


QuickBird: 0.6-m resolution

Separates vegetation and non-vegetation

Lidar:

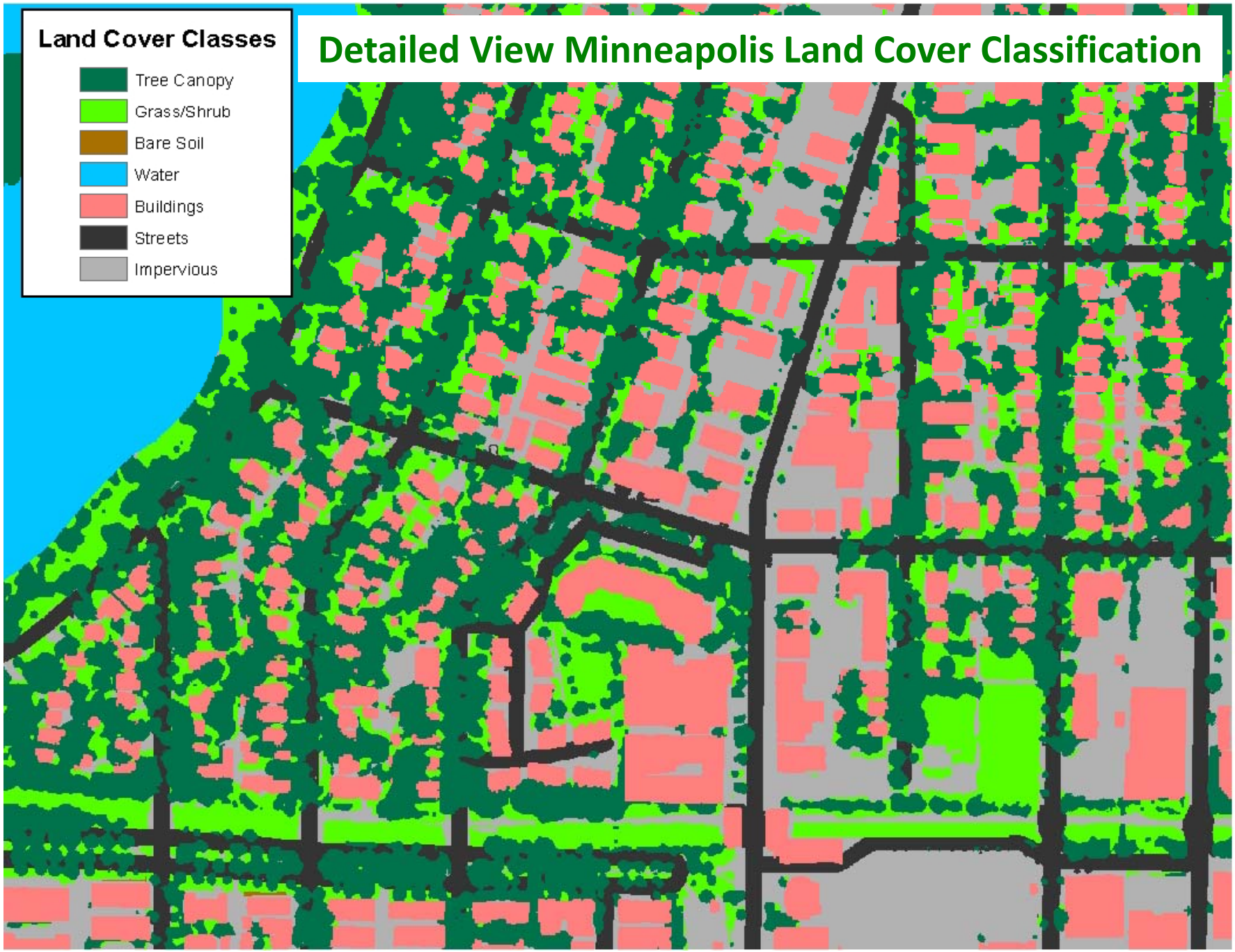
Height information helps separate grass and trees



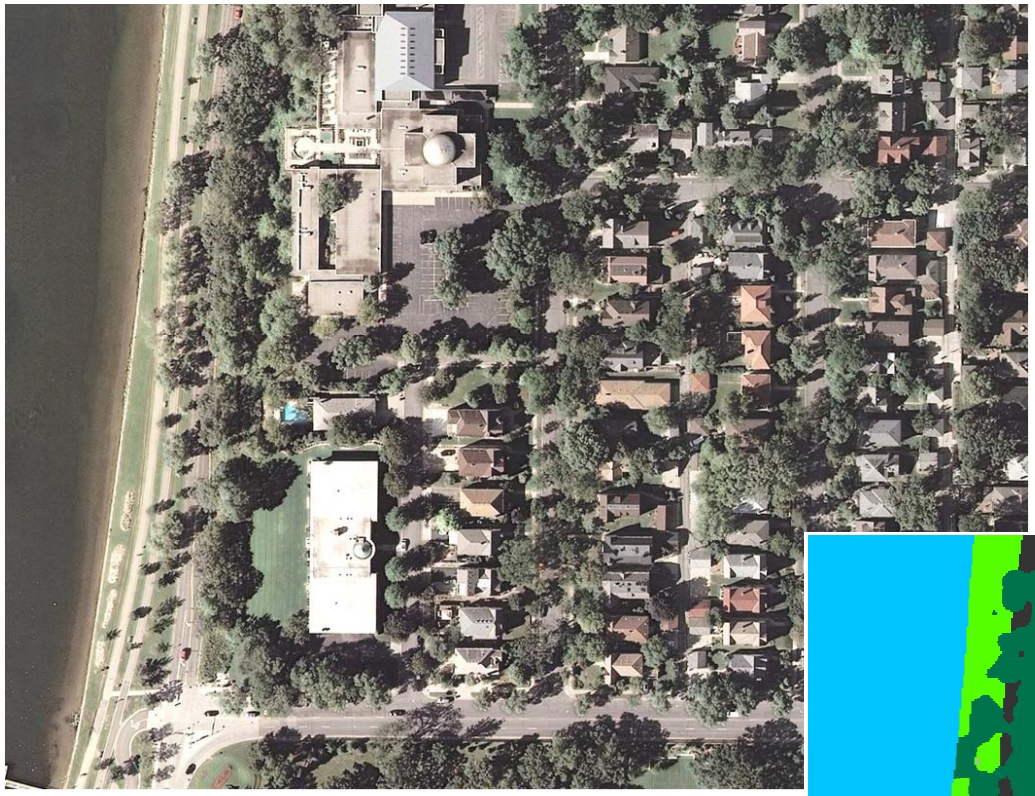
Minneapolis
Land Cover Classification

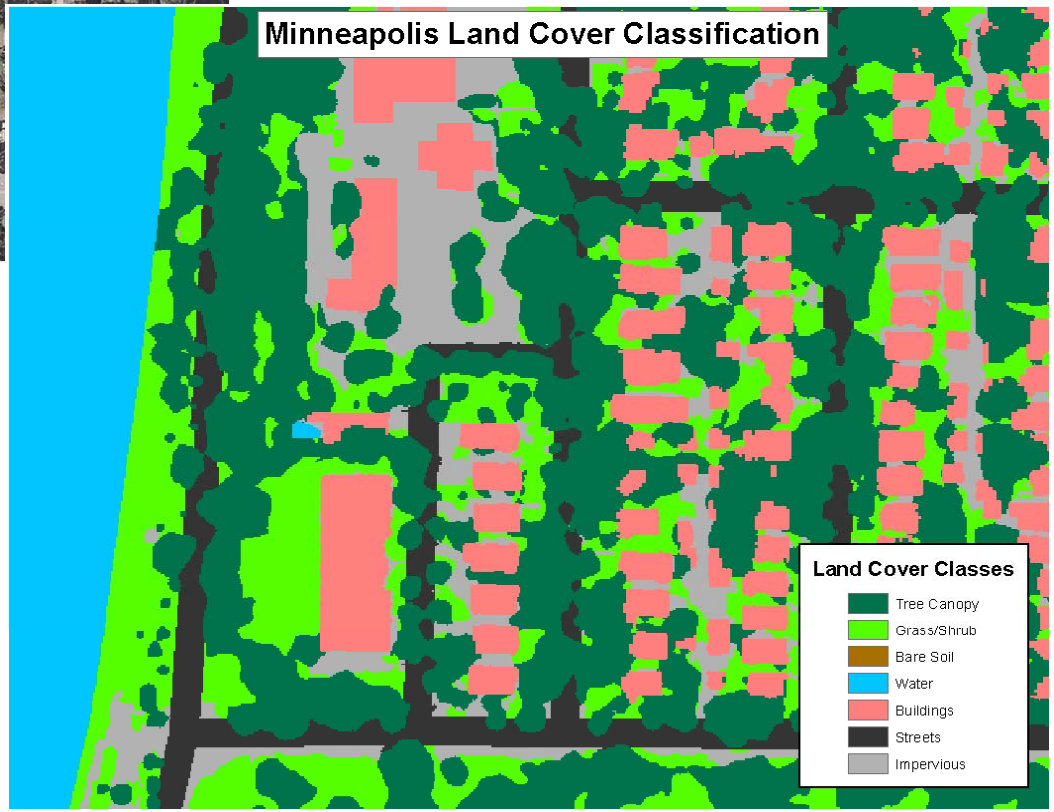
Class	Percent
Tree Canopy	31.5
Grass/Shrub	19.7
Bare Soil	0.2
Water	6.2
Buildings	15.5
Streets	9.5
Impervious	17.5

Detailed View Minneapolis Land Cover Classification



Comparison of High Resolution Aerial Photo and Land Cover Classification

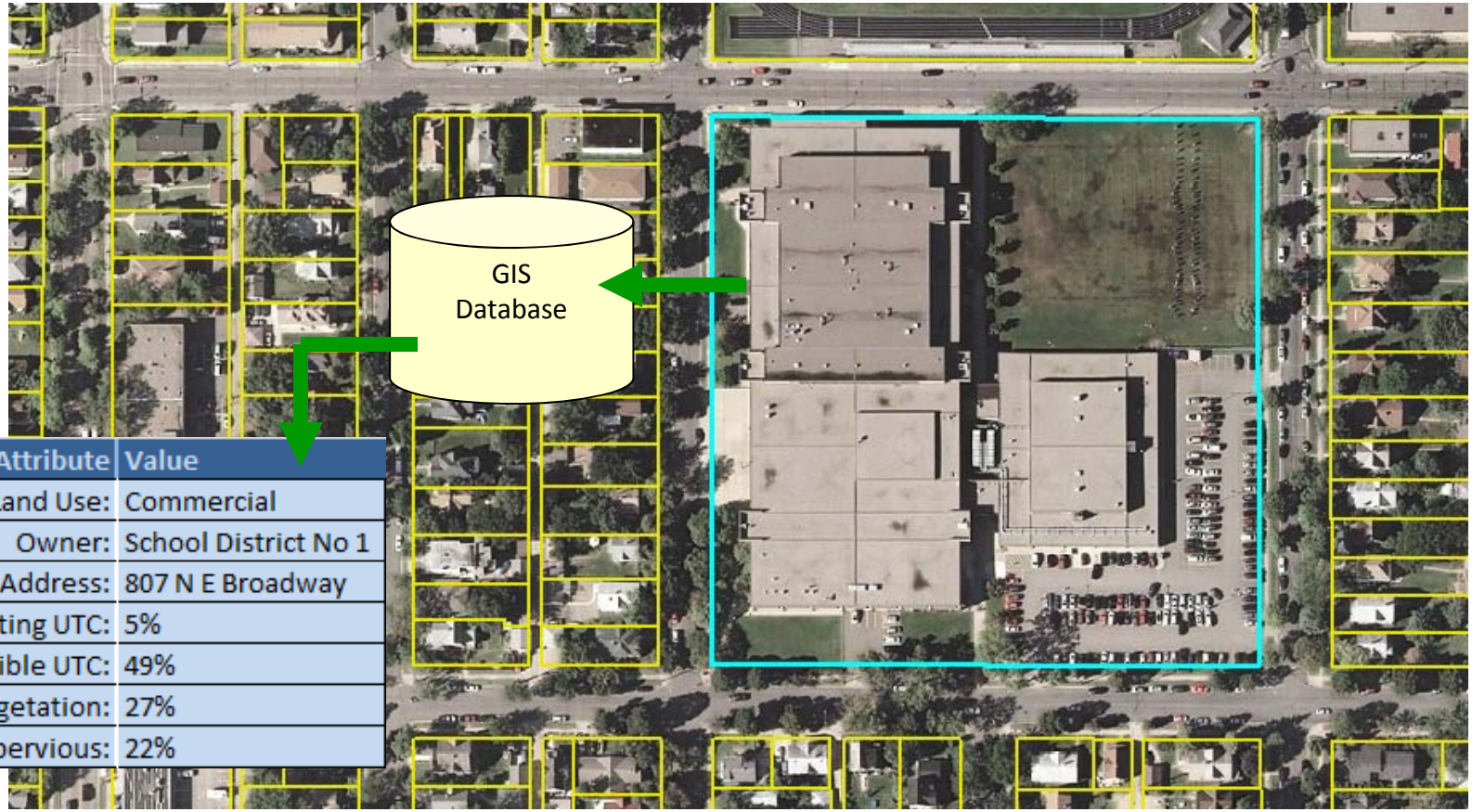




Accuracy Assessment

92% accuracy for 1,413 sample points compared to high resolution photos

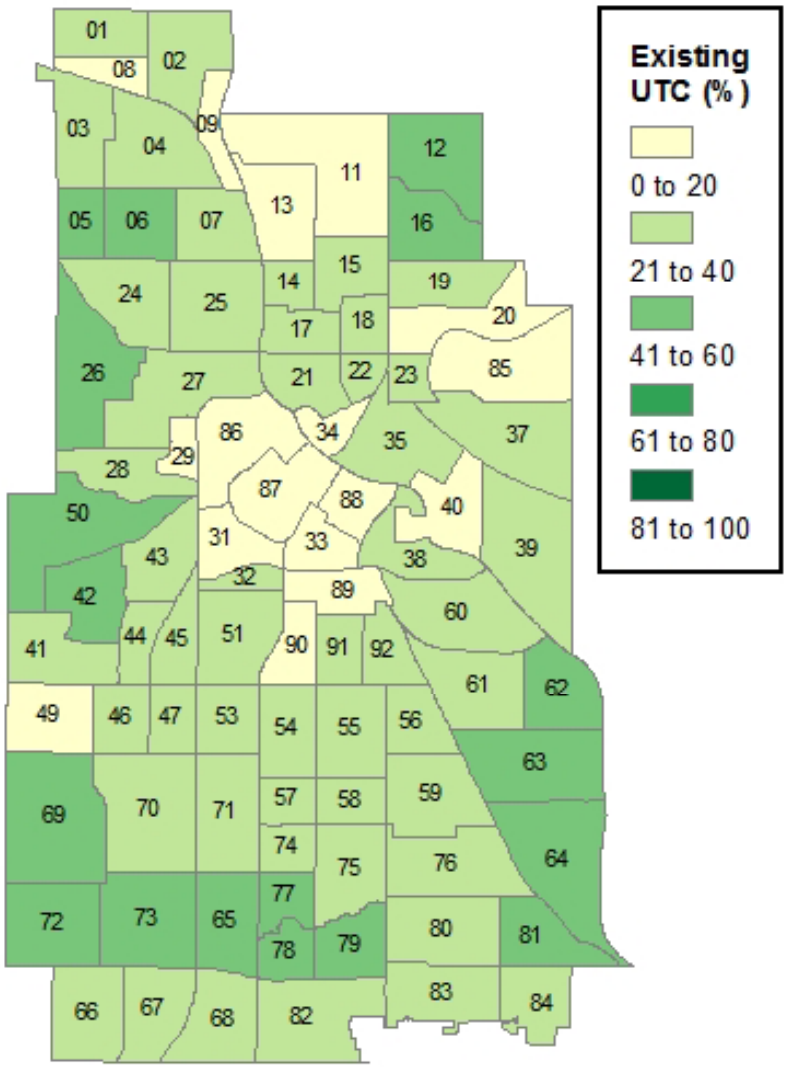
GIS Database

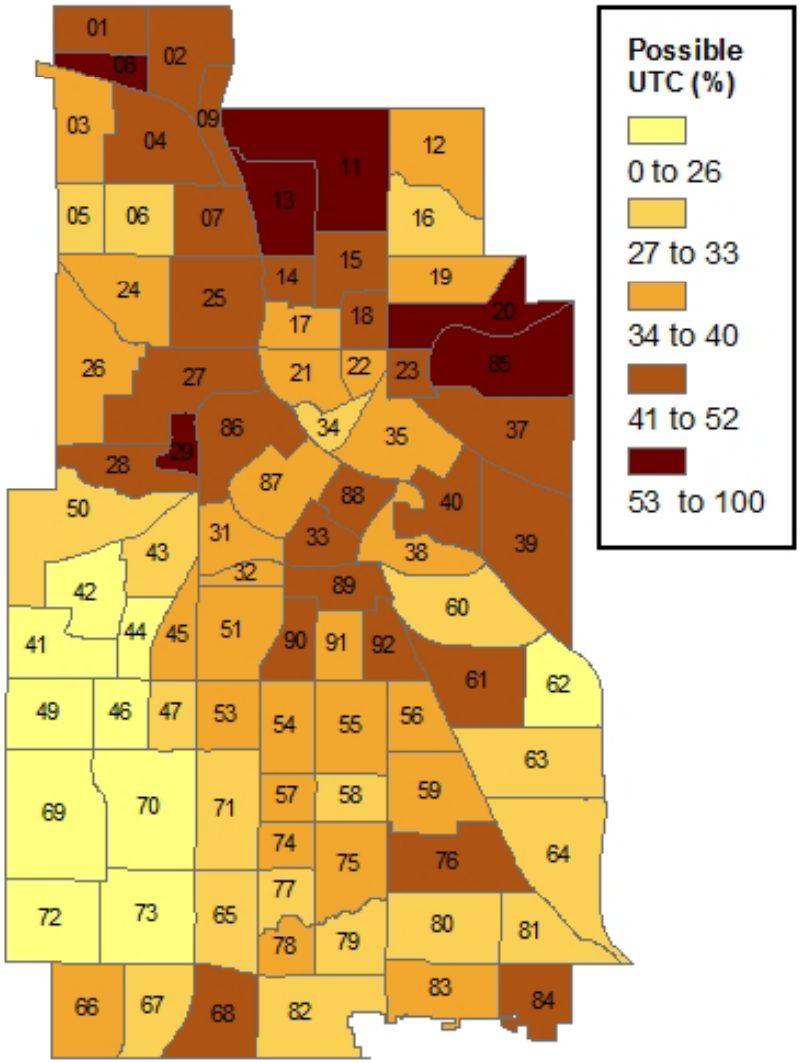


Attribute	Value
Land Use:	Commercial
Owner:	School District No 1
Address:	807 N E Broadway
Existing UTC:	5%
Possible UTC:	49%
Possible UTC-Vegetation:	27%
Possible UTC-Impervious:	22%

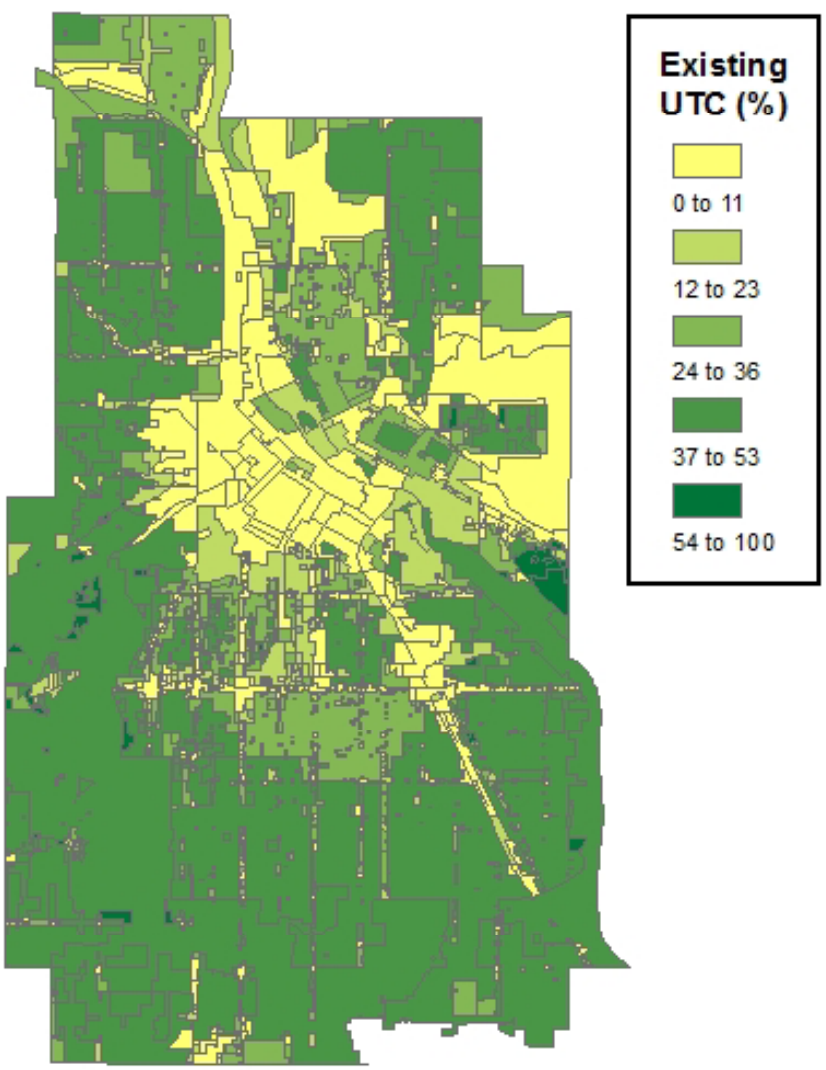
The GIS database can be used to identify specific UTC metrics for a parcel, a neighborhood, or other area of interest. This information can be used to estimate the amount of Possible tree loss in a planned development or to set UTC improvement goals for individual properties.

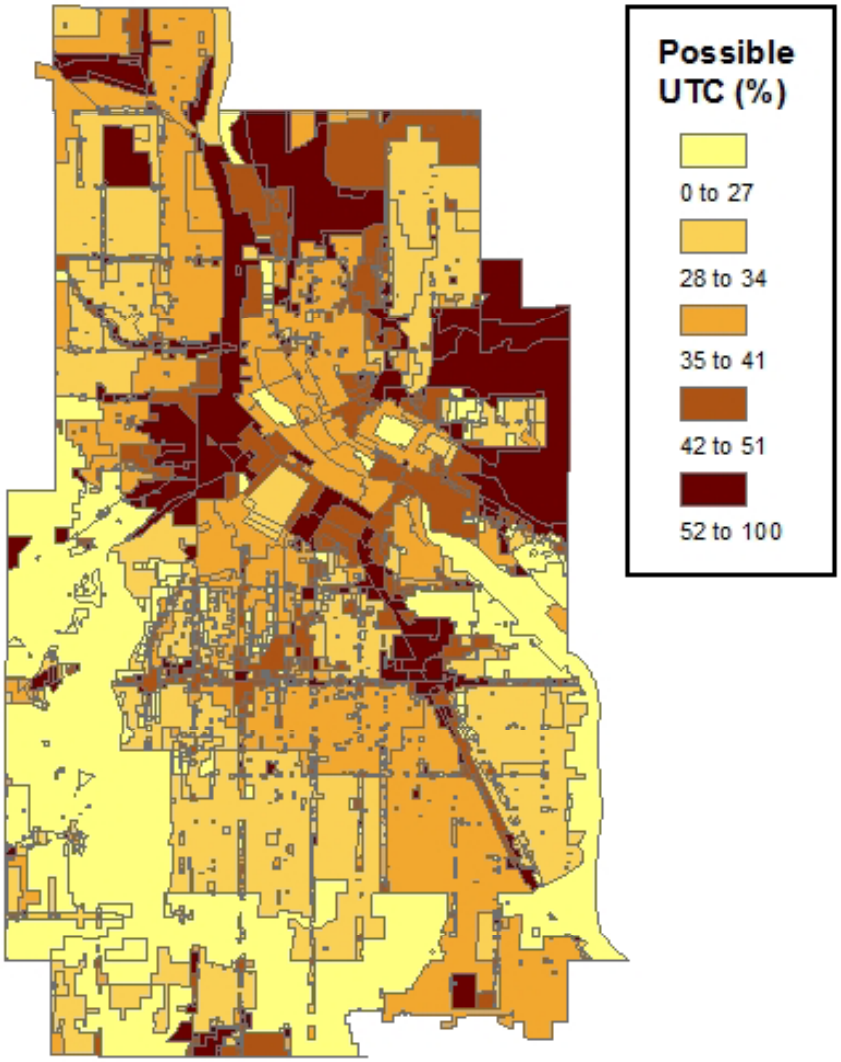
Existing and Possible Tree Canopy as Percent of Land Area for Neighborhoods



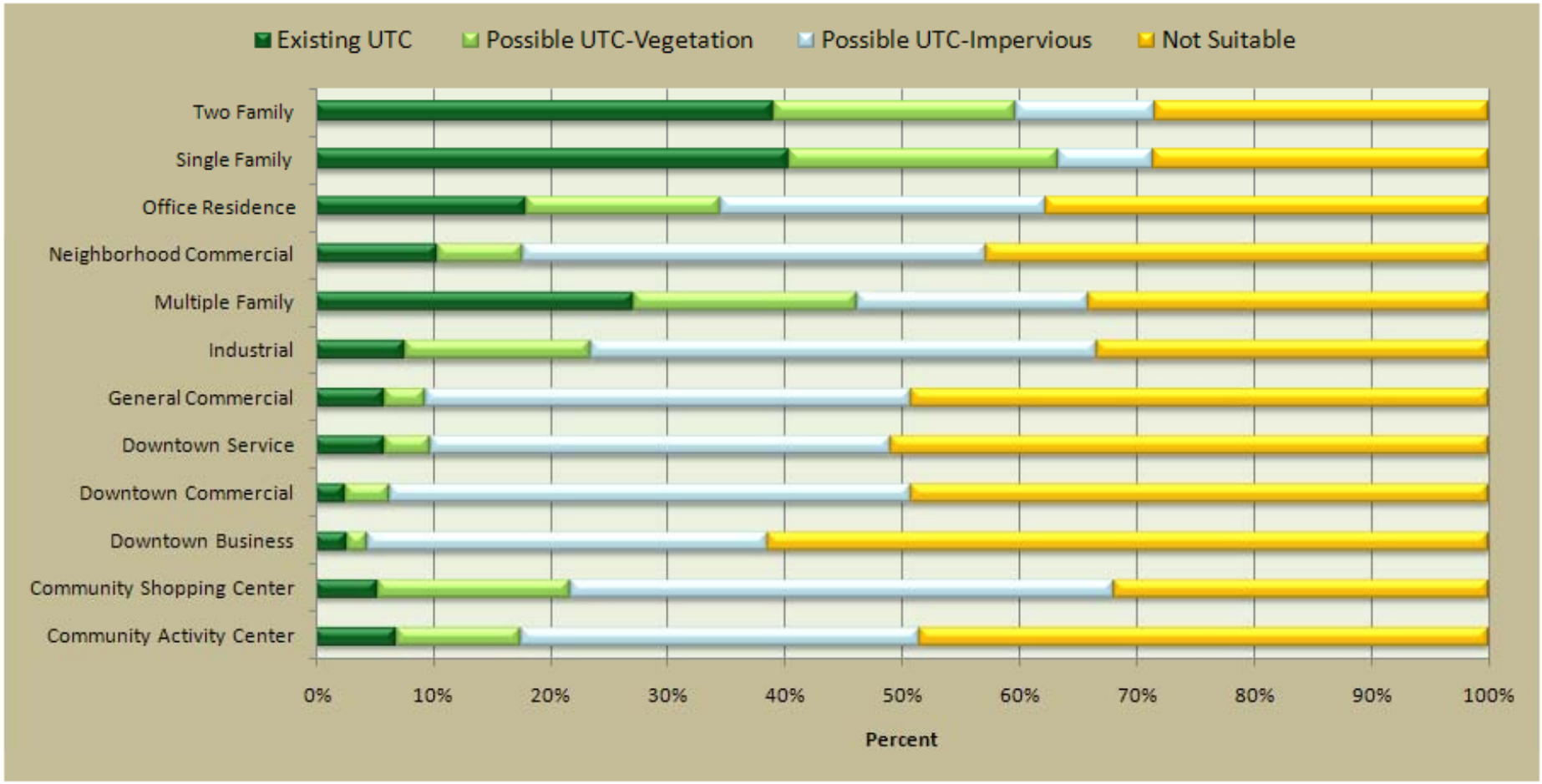


Distribution of Existing and Possible Tree Canopy by Land Use Zoning Districts

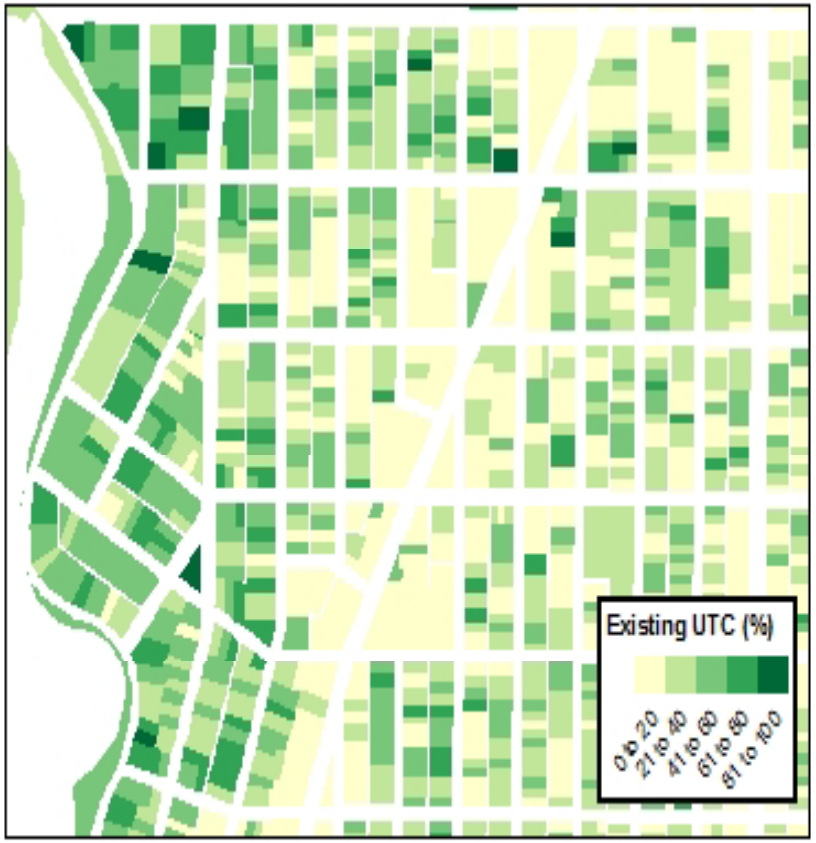


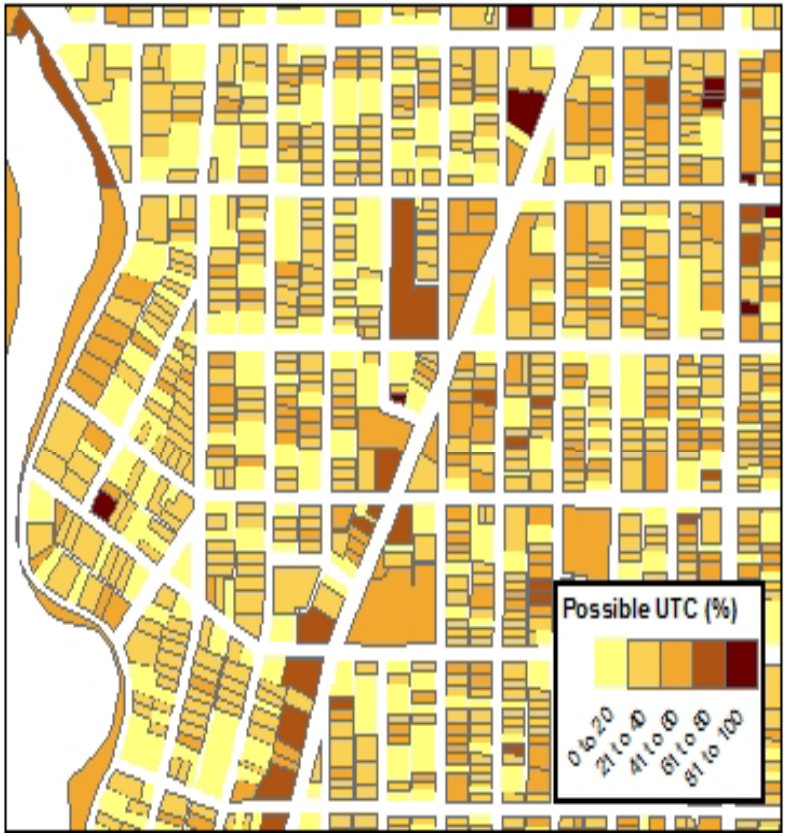


Urban Tree Canopy Metrics Summarized by Land Use

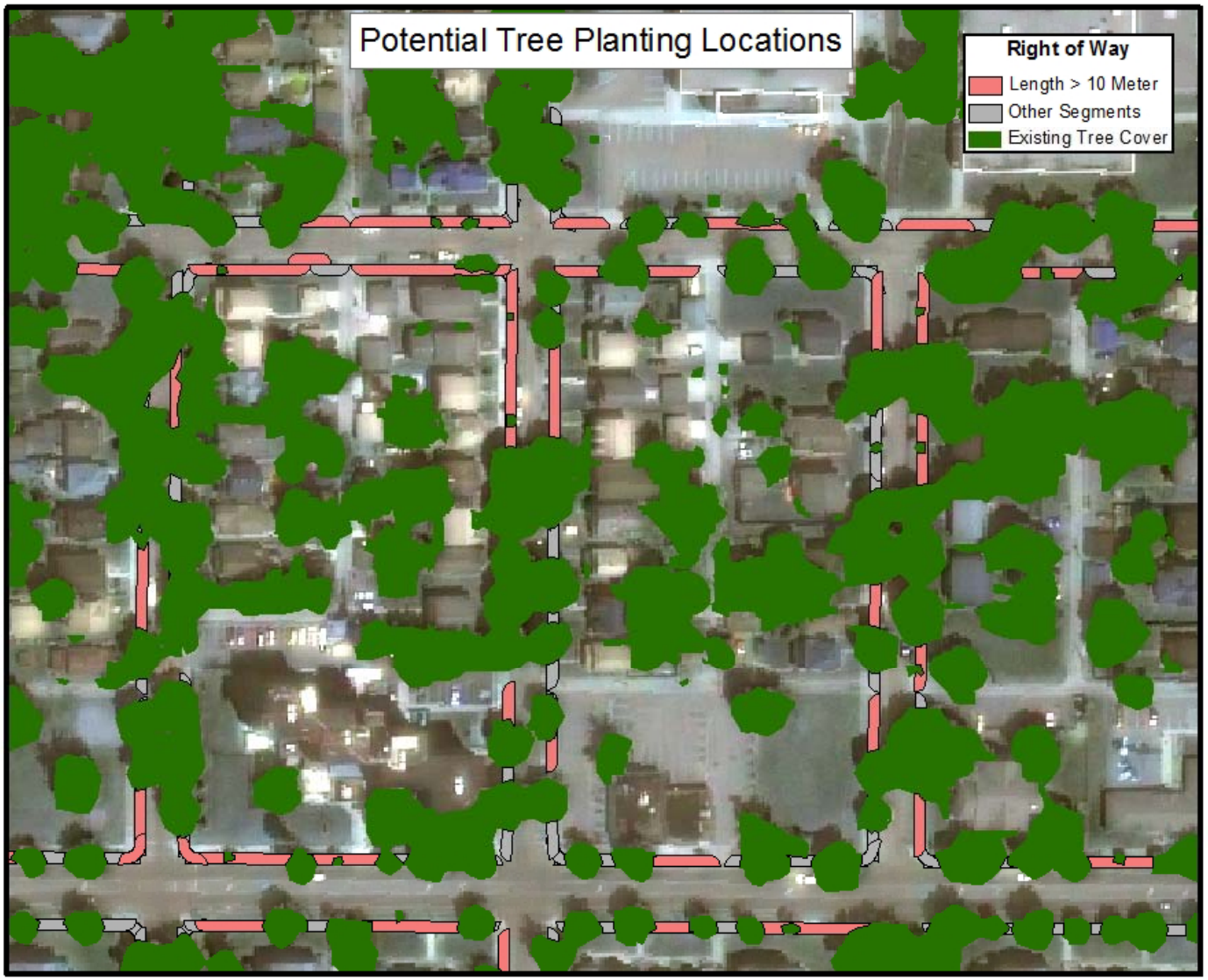


Distribution of Existing and Possible Tree Canopy in Parcels near Lake of the Isles



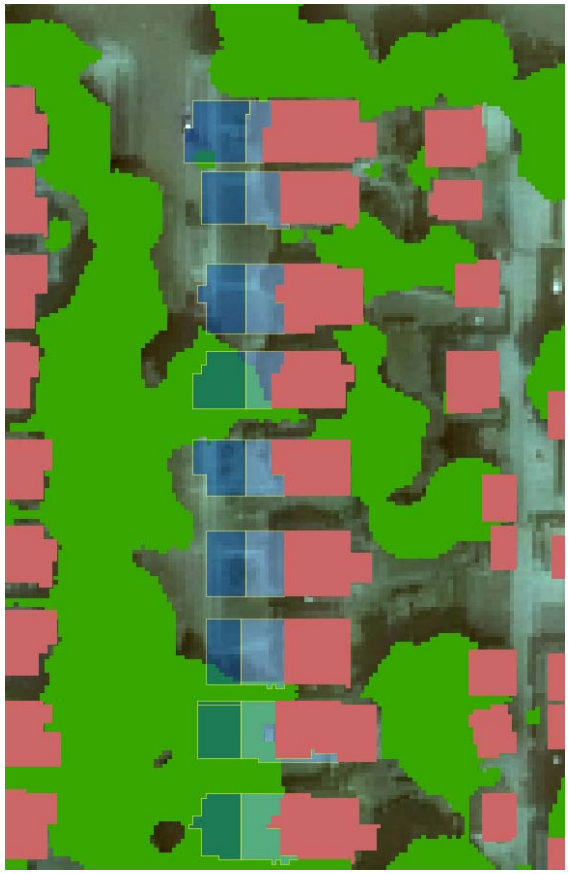


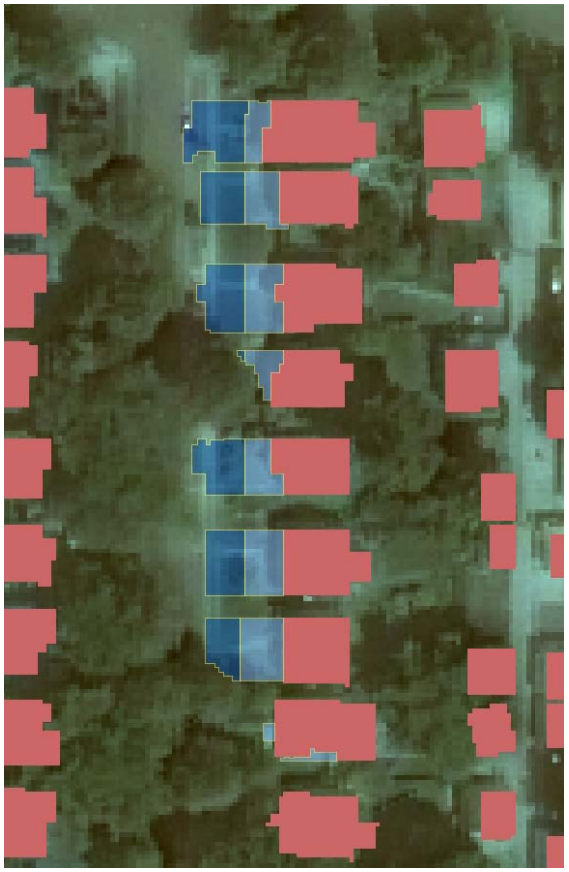
Right of Way Analysis for Potential Tree Planting



GIS Analysis of Potential Tree Planting Sites for Energy Conservation

A GIS analysis is currently being conducted to derive information on potential tree planting sites for energy conservation in the summer.

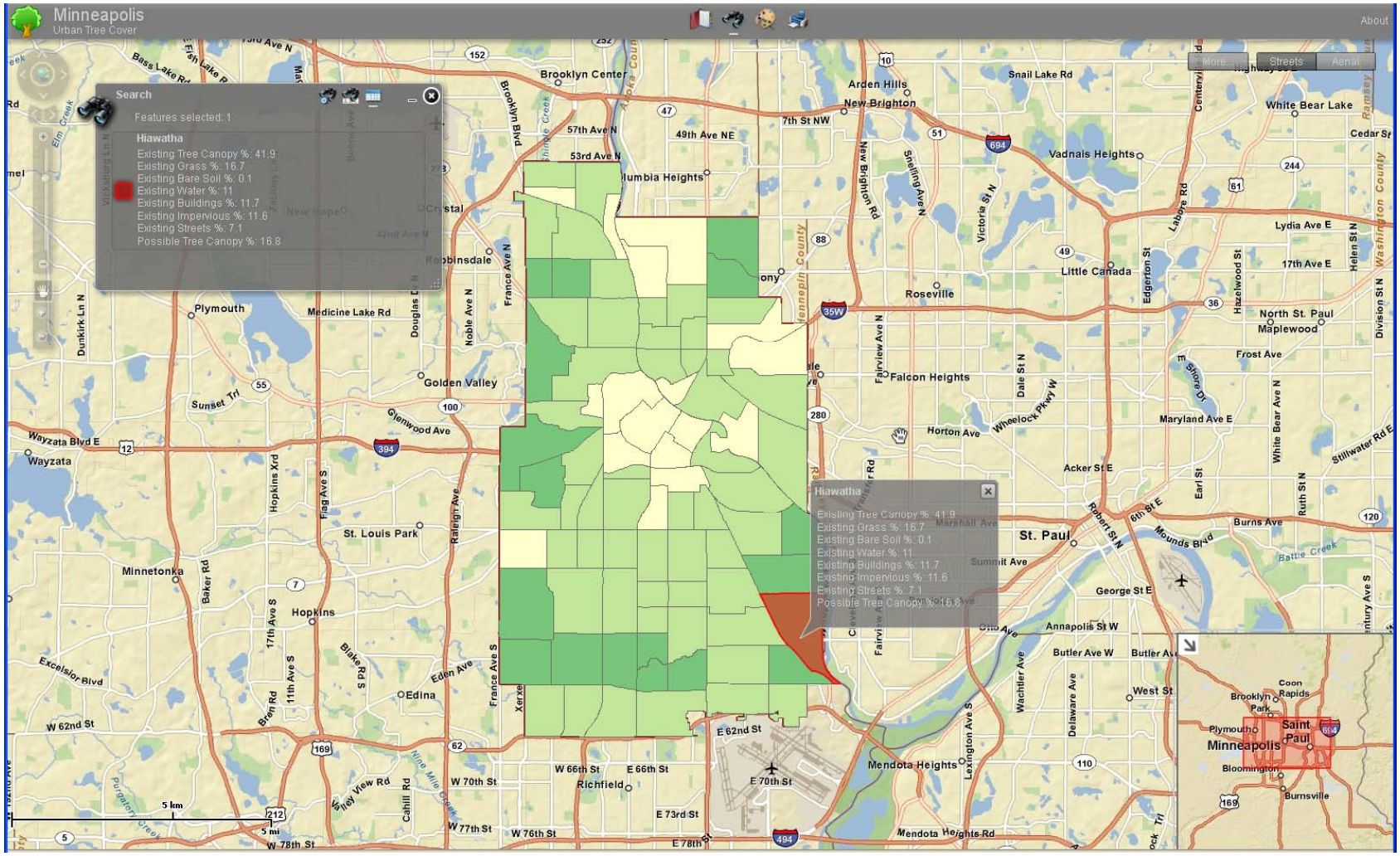




An <u>example</u> of the result for areas on the west sides of buildings with under 10% tree cover within 11 meters to their west sides is shown.

The building “shadow” is divided into the area within the parcel (light blue), where tree planting is the responsibility of home owners, and the area outside the parcel (darker blue), where tree planting (on boulevards) is within the city’s responsibility.

Web-based Mapping Application



Using the Search dialog box allows the user to select neighborhoods and display the percent of each land cover class

Similarly, parcels can be selected graphically or by entering the parcel ID number

Summary

- Minneapolis trees are a vital asset of the City, providing many environmental, socio-economic and aesthetic benefits.
- A digital GIS-compatible classification of tree cover, along with grass/shrubs, bare soil, water, streets, buildings and other impervious, has been produced.
  - Maps and statistics can be generated by: neighborhood, parcel, land use zoning, watershed, ownership, or other user-specified areas and used for setting tree canopy goals and planning for tree planting and maintenance.

- **Tree canopy**
  - Entire city = 11,569 acres or 31.5%
  - Among neighborhoods, range = <5 – 50%
- Residential areas represent 93% of the existing tree cover.
  - Single and two family residences contain about 40% of their land cover as tree canopy and represent 76% of the Possible vegetation UTC sites.
- Industrial land use categories also represent high potential for Possible UTC, both in vegetated (11%) and impervious (34%) areas.
- Neighborhood and parcel analyses utilizing the Existing and Possible UTC summaries can be used to help target tree canopy improvement and preservation activities.

Conclusion

- The maps and GIS database provide essential data needed for planning for the future of a vital Minneapolis asset – its tree canopy.