The Minnehaha Creek Watershed:

Mapping the Master Water Stewards Program

MACALESTER COLLEGE

FRESHWATER SOCIETY

MINNEHAHA CREEK WATERSHED DISTRICT

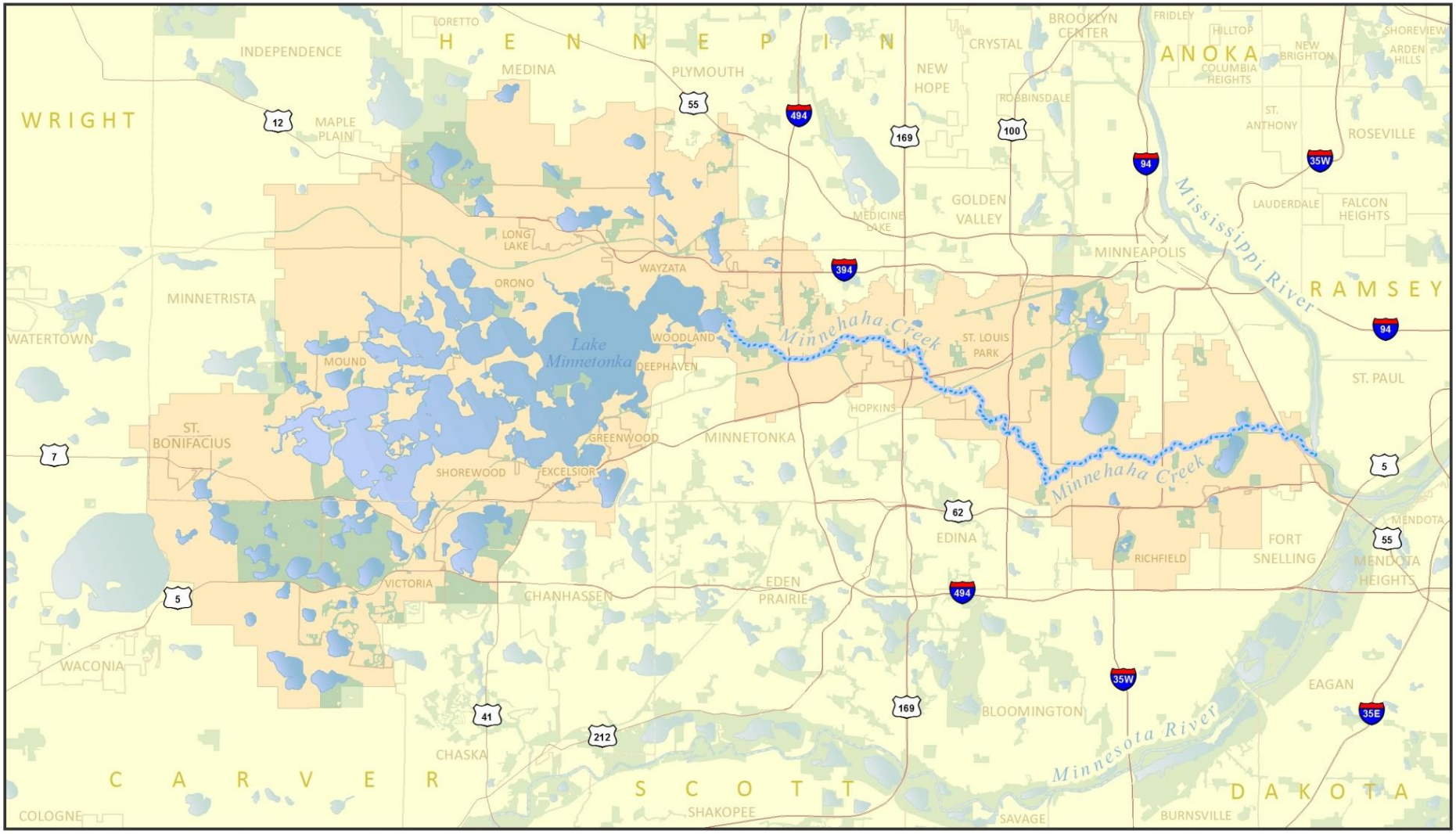
Project Context

- Map the physical features of the Minnehaha Creek Watershed at the neighborhood scale
- Analyze social characteristics of the watershed and its population
- Use existing neighborhood survey data to spatially represent behavioral trends
- Assess the progress and potential opportunities for the Master Water Stewards Program

Data Sources

- Physical Features: Department of Natural Resources, Minnesota Geospatial Information Office, University of Minnesota, Minnesota Pollution Control Agency
- Demographic Information: US Census Bureau, ESRI, Metropolitan Council
- Survey Data: Macalester College Qualitative Research Methods in Geography, Fall 2013

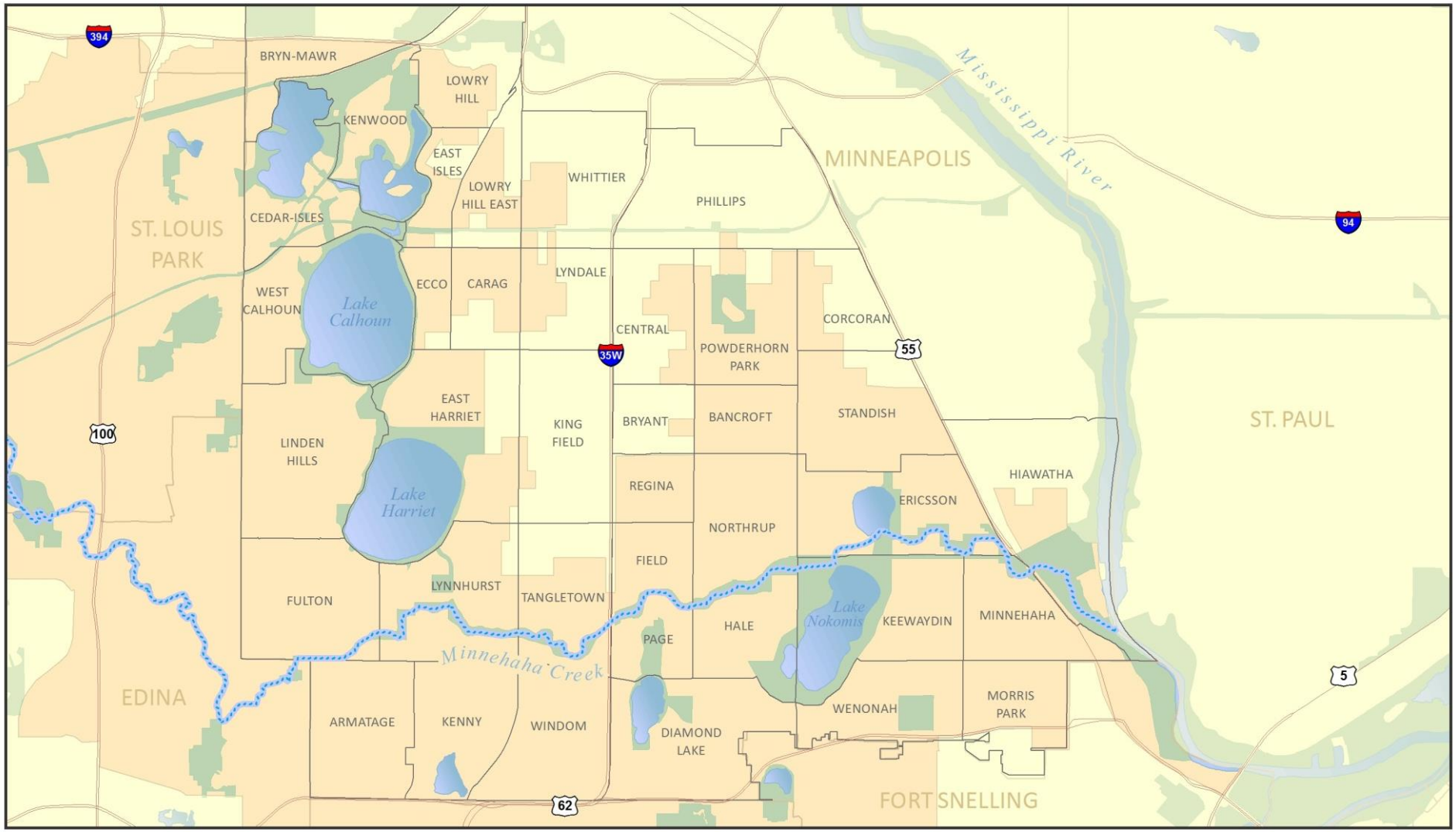
MINNEHAHA CREEK WATERSHED DISTRICT



Road
Water
Park
Minnehaha Creek Watershed District
COUNTY
CITY

0 2.5 5 10 Mi

MINNEAPOLIS NEIGHBORHOODS IN THE MCWD

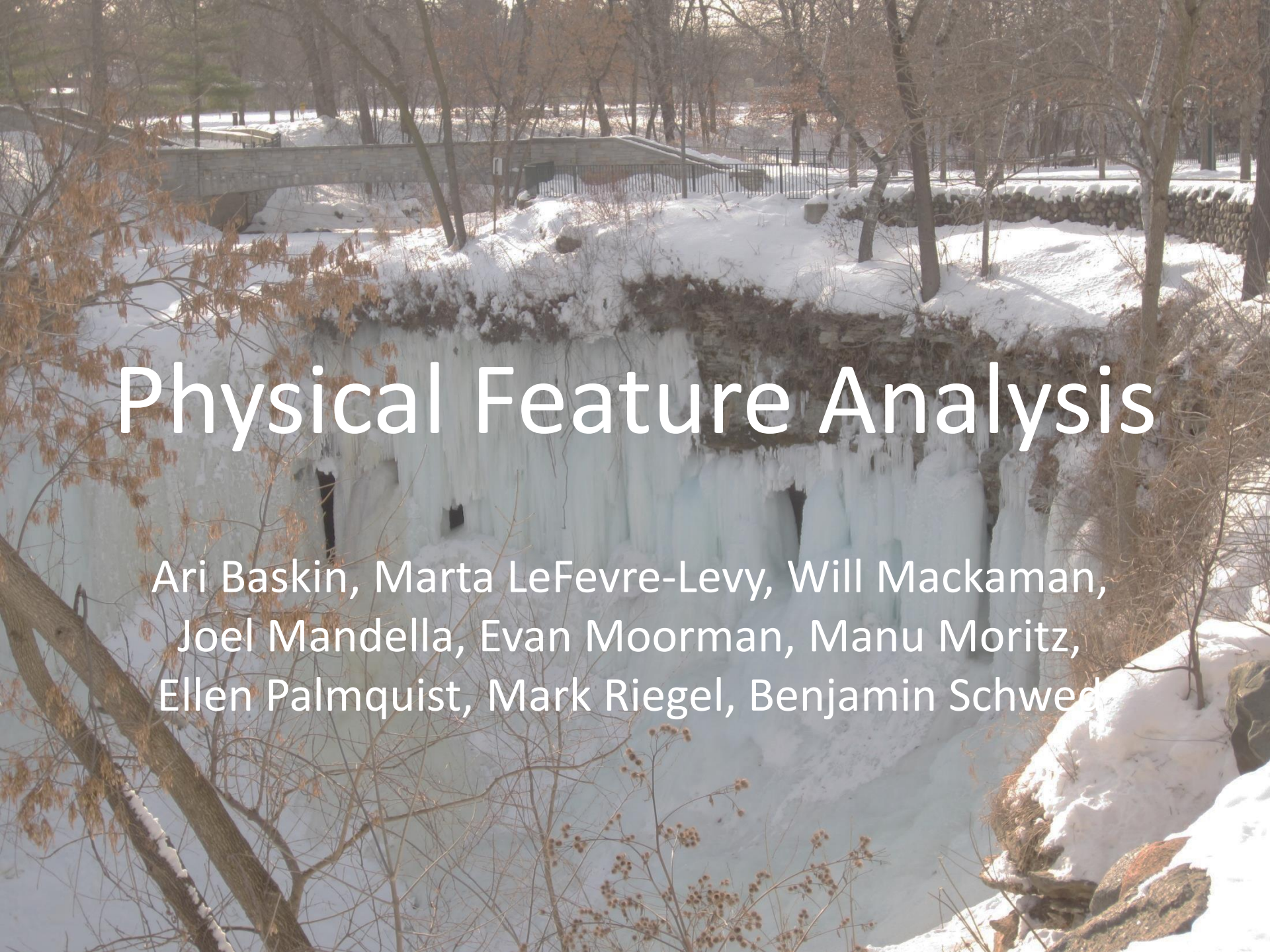


Road
Water
Park

MINNEAPOLIS NEIGHBORHOOD
CITY
Minnehaha Creek Watershed District

0 0.75 1.5 3 Mi

Sources: Met Council, MNDOT, MNDNR
Projection: Nad 1983 UTM Zone 15N



Physical Feature Analysis

Ari Baskin, Marta LeFevre-Levy, Will Mackaman, Joel Mandella, Evan Moorman, Manu Moritz, Ellen Palmquist, Mark Riegel, Benjamin Schwed

Goals

- Create base maps of physical variables that impact water quality for the Minnehaha Creek Watershed and Water Steward Neighborhood extents.

- Help Water Stewards understand the water dynamics in their neighborhoods in order to target properties for projects that optimize runoff reduction.

Variables

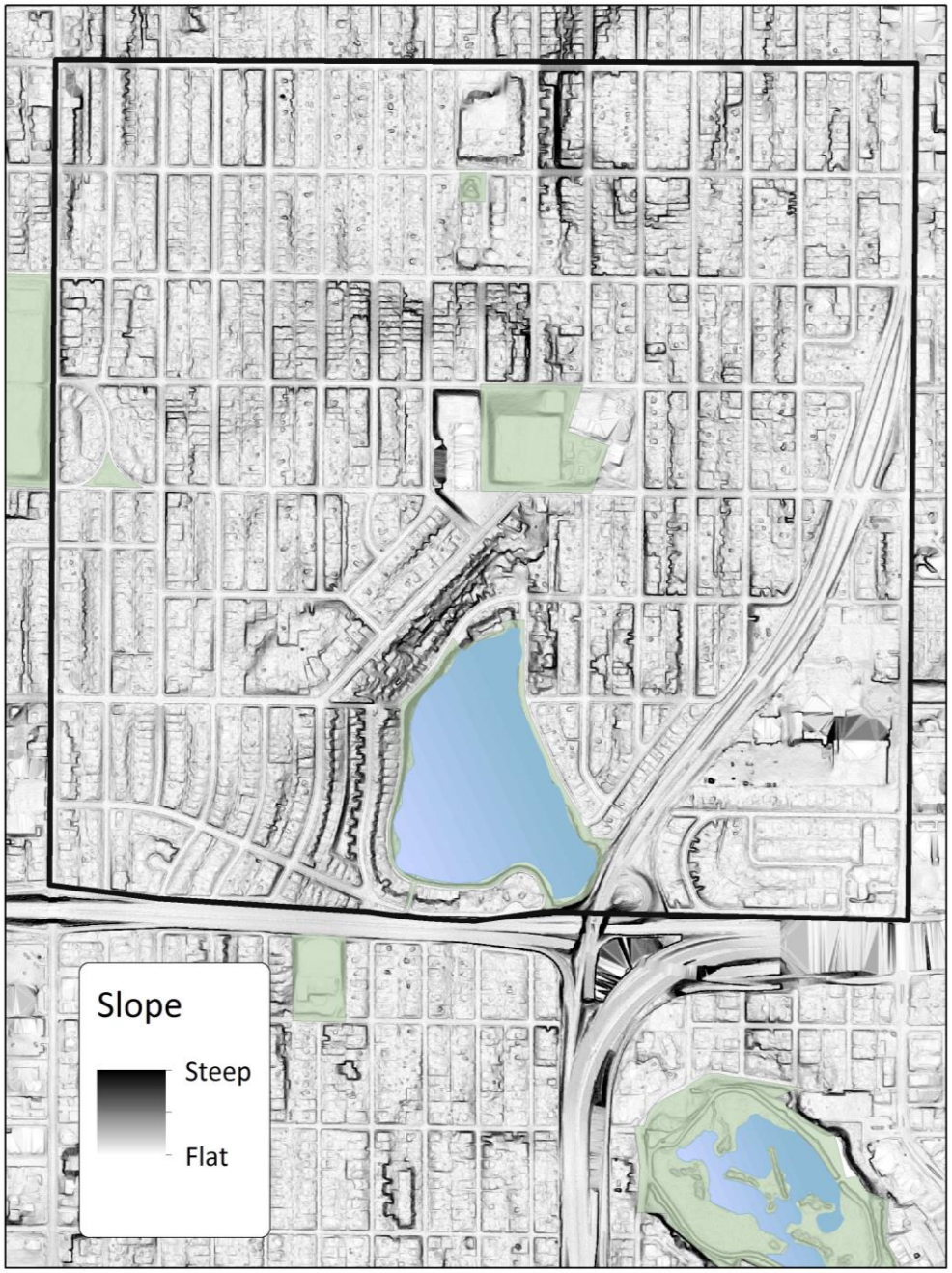
- Slope and Aspect
- Impervious Surfaces and Land Use
- Surface Water

Slope and Aspect

SATELLITE IMAGE FOR THE STROM NEIGHBORHOOD

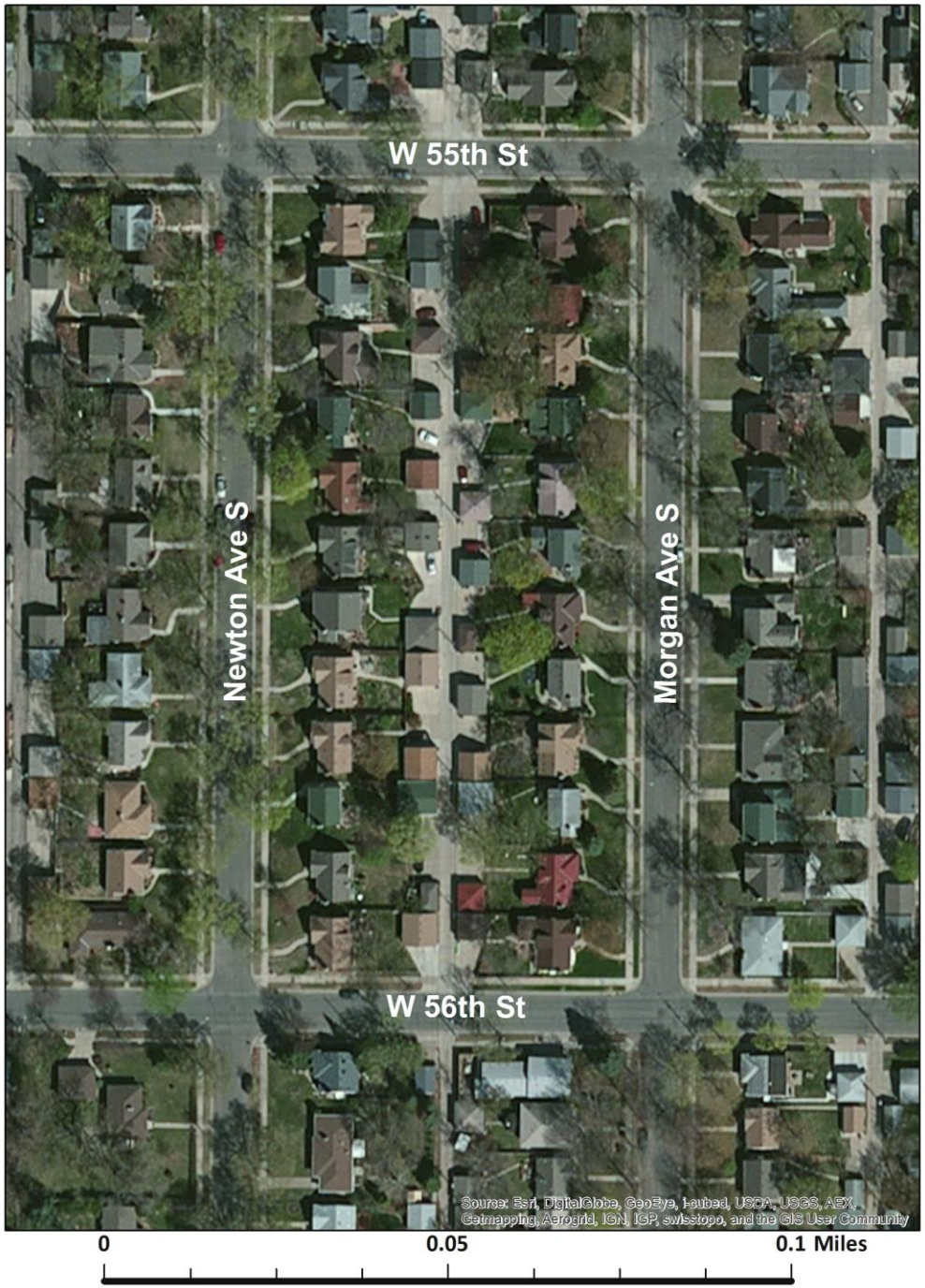
Satellite imagery showing the extent of the Strom Neighborhood.

SLOPE BASEMAP FOR THE STROM NEIGHBORHOOD

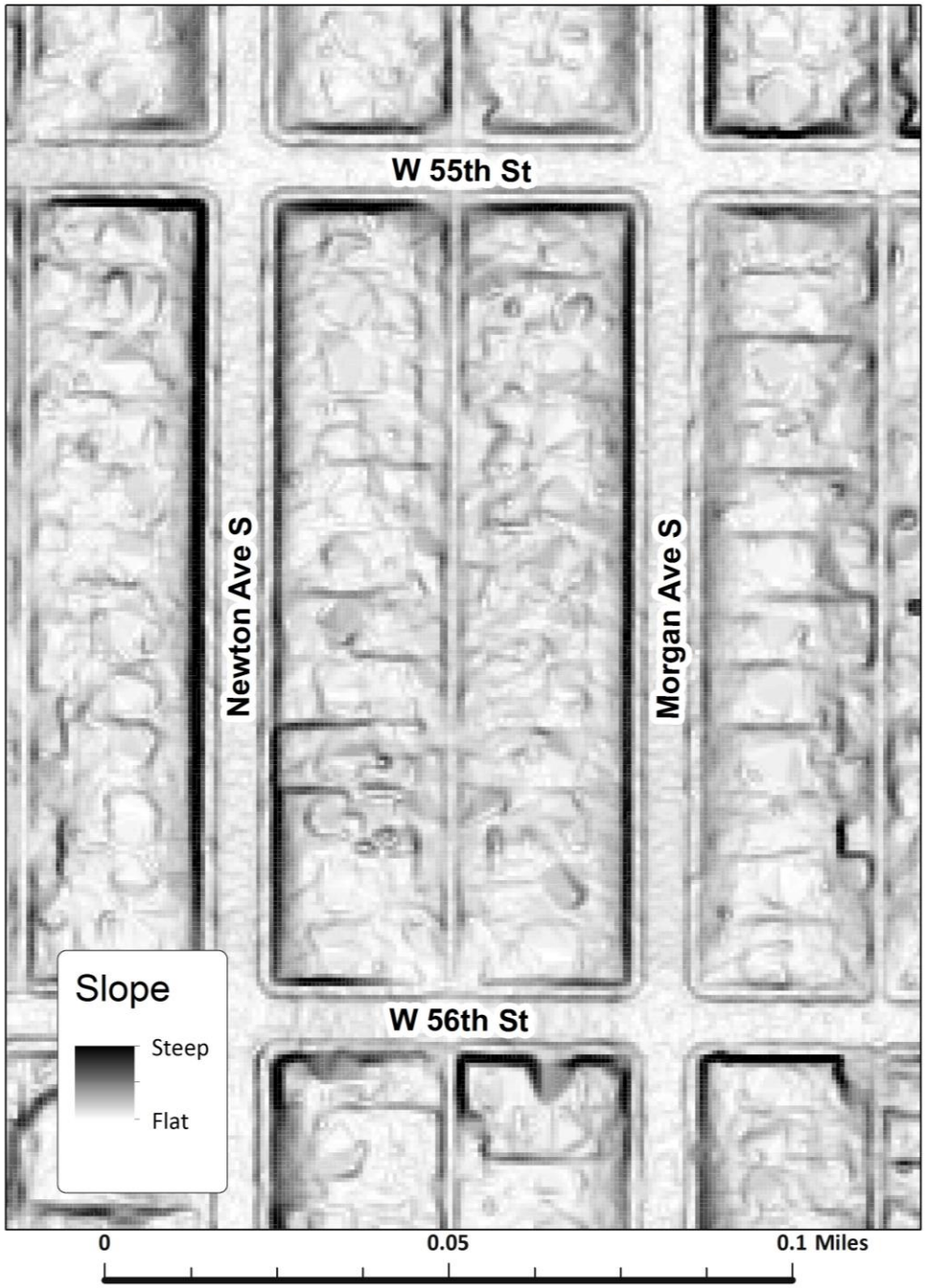


This map shows the degree of slope within the area designated as the “Strom Neighborhood”.

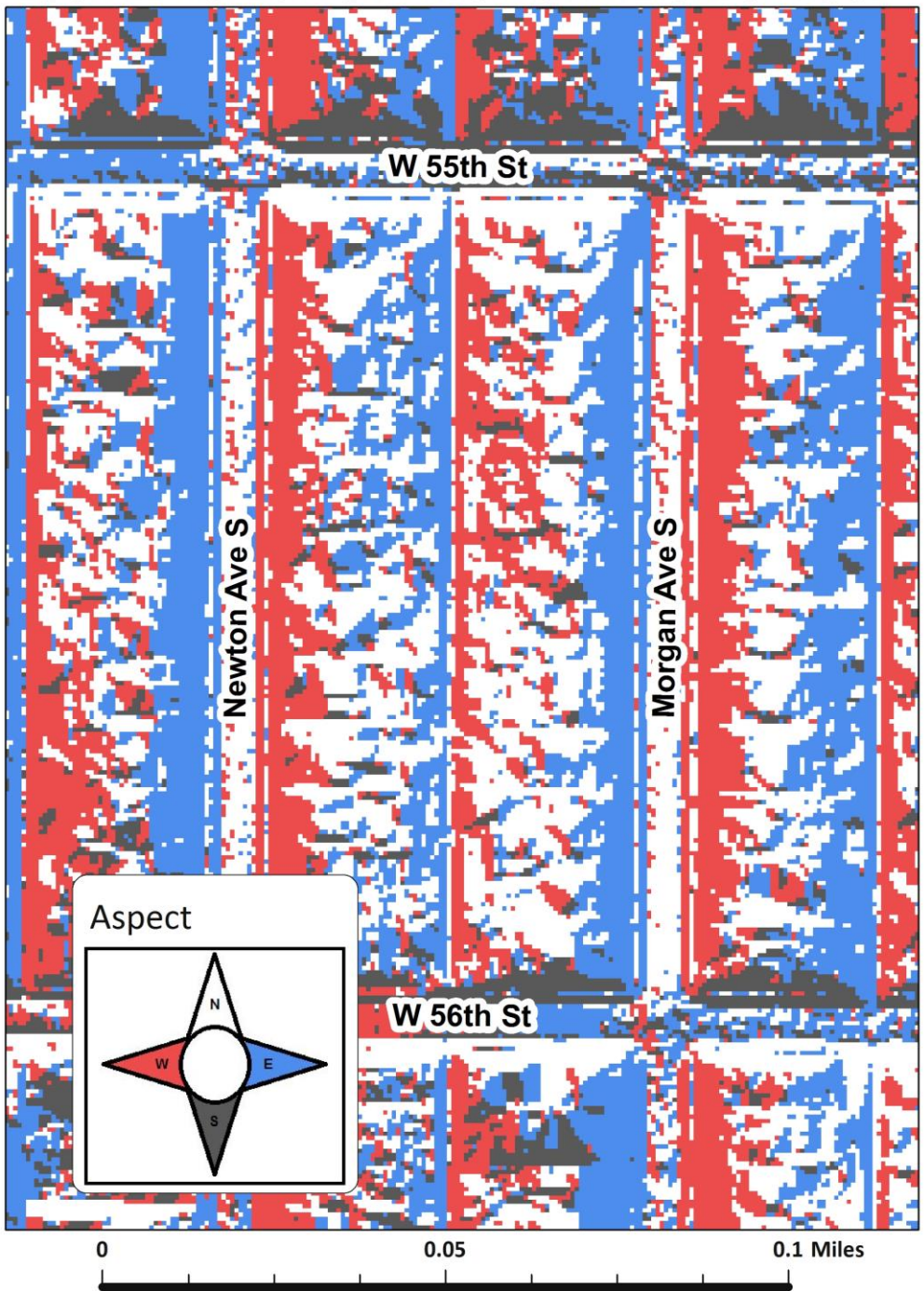
ZOOMED SATELLITE IMAGE: STROM NEIGHBORHOOD



Zoomed satellite image of a portion of the Strom Neighborhood.

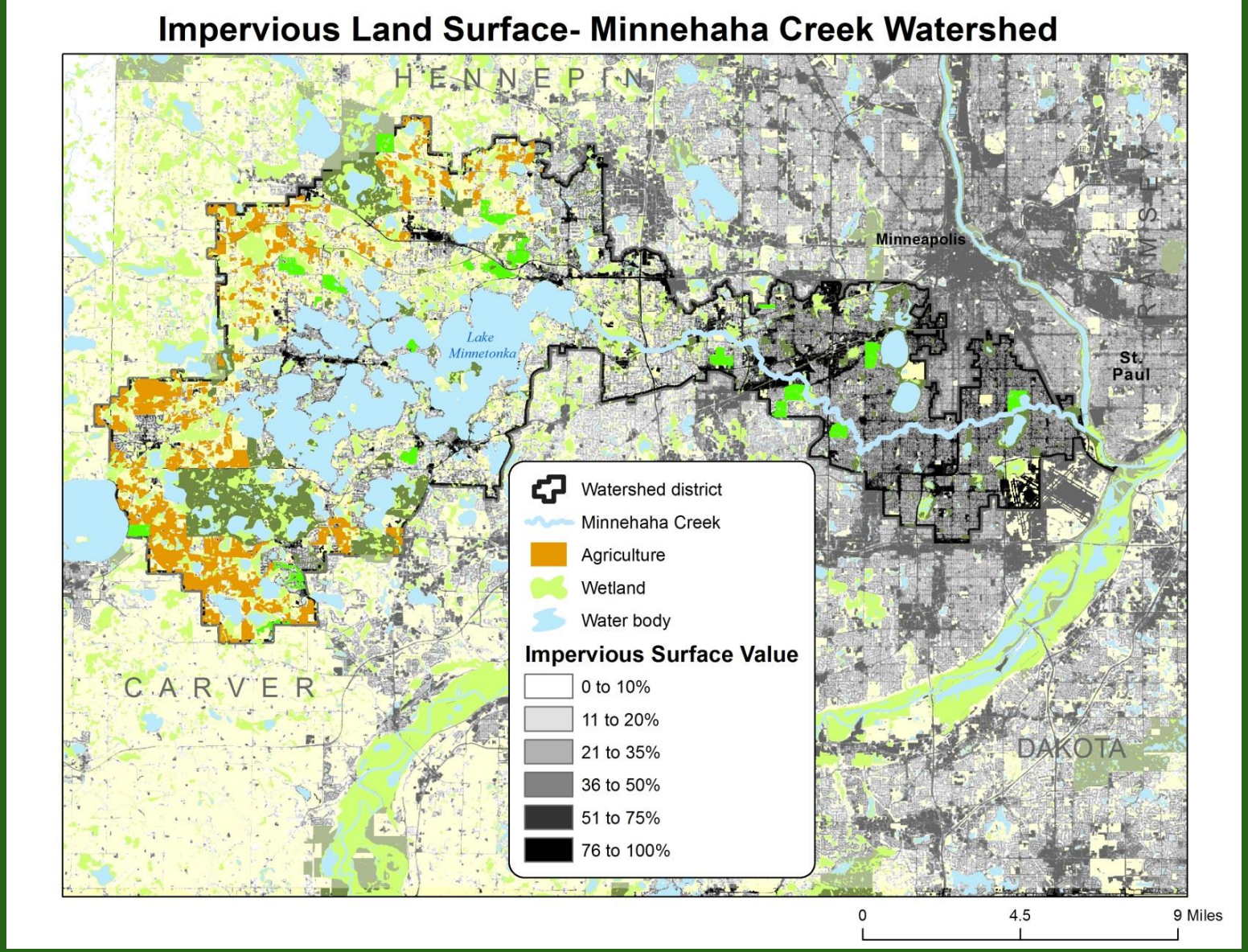


This is an example of the slope data at the level of one city block in the Strom Neighborhood.



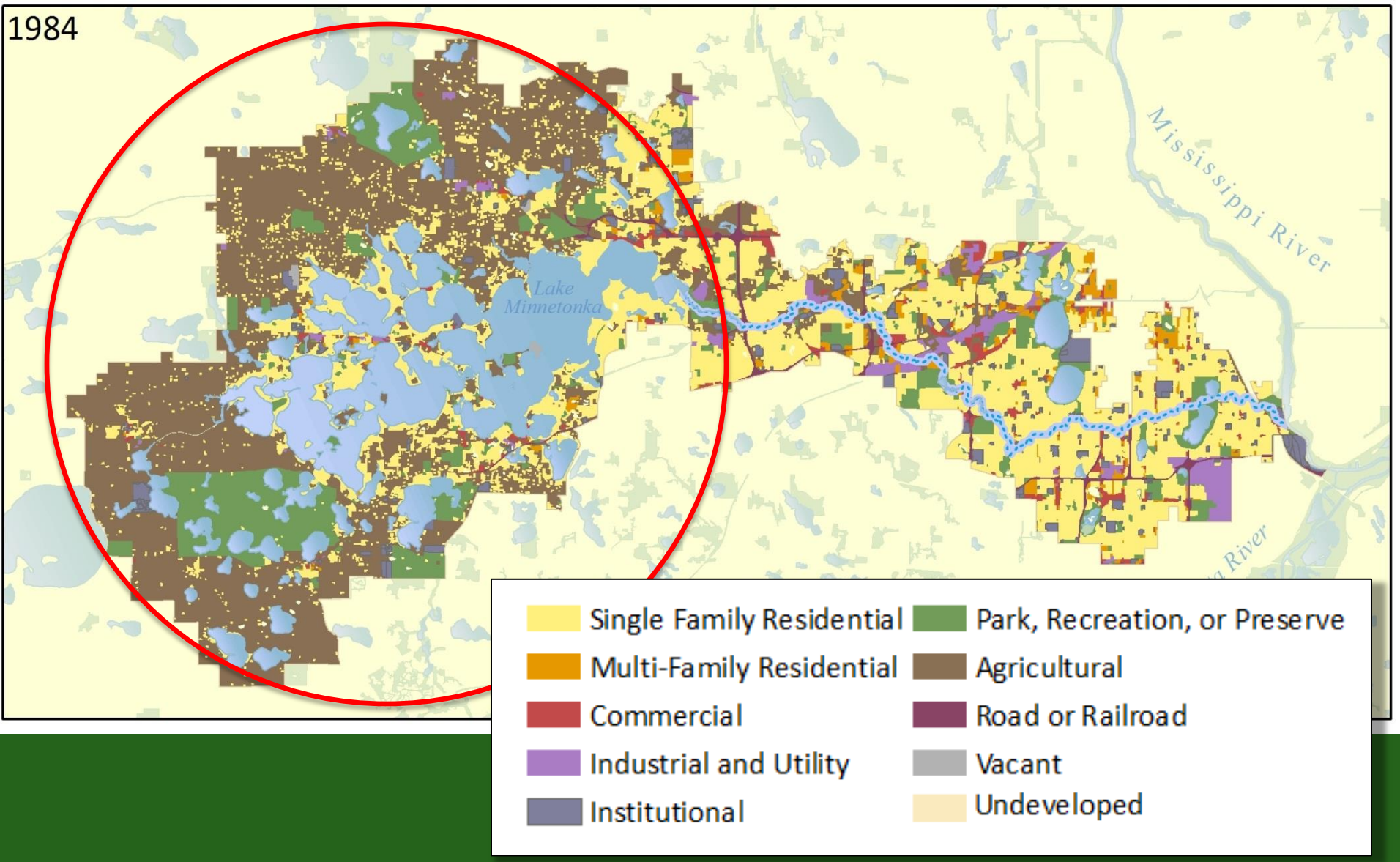
This is an example of aspect data at the level of one city block in the Strom Neighborhood.

Impervious Surfaces and Land Use



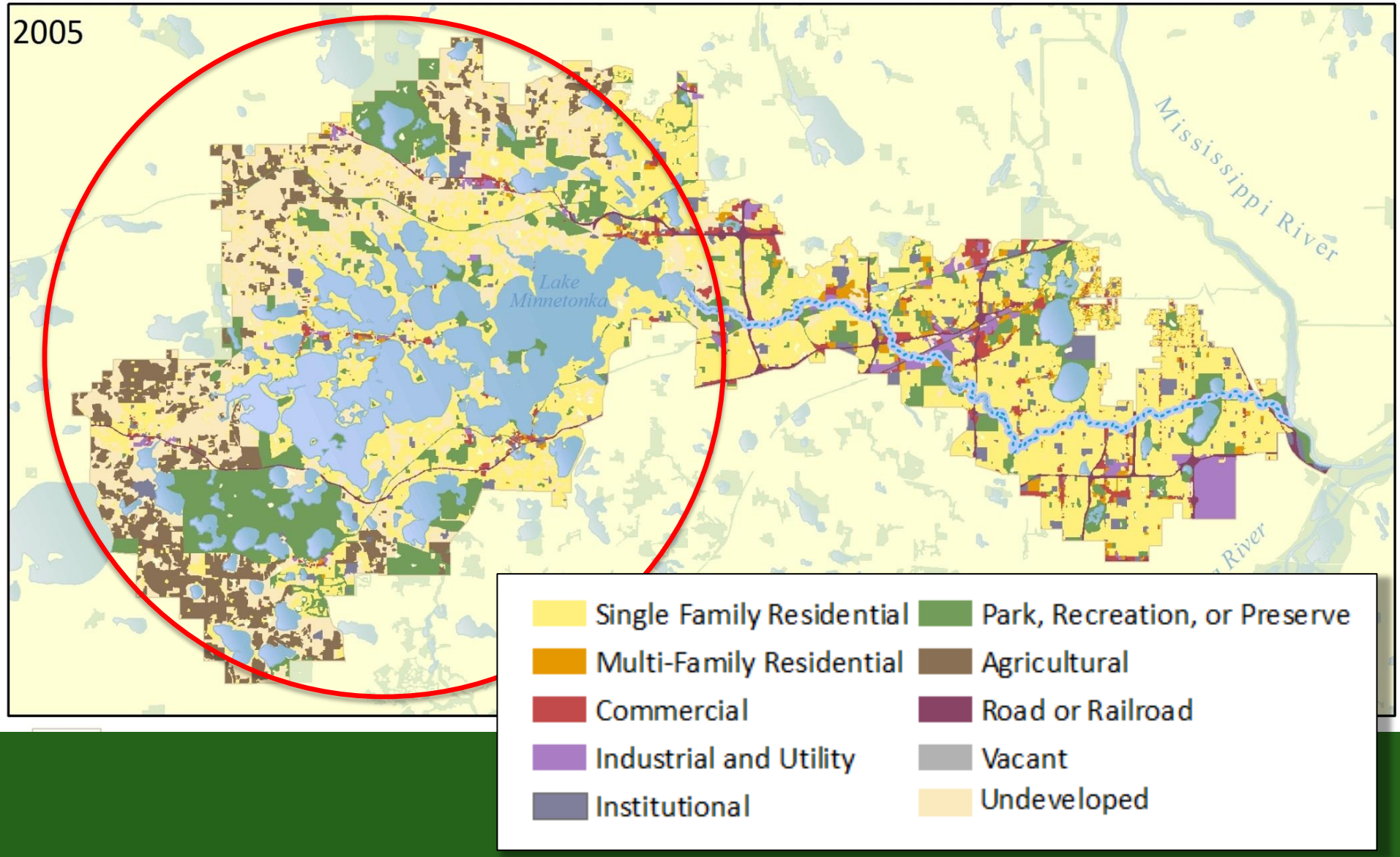
More land with an impervious surface exists on the eastern side of the watershed district, in neighborhoods closer to Minneapolis and St. Paul.

MINNEHAHA CREEK LAND USE



In 1984, there is a high concentration of agricultural land in the northwestern region of the watershed.

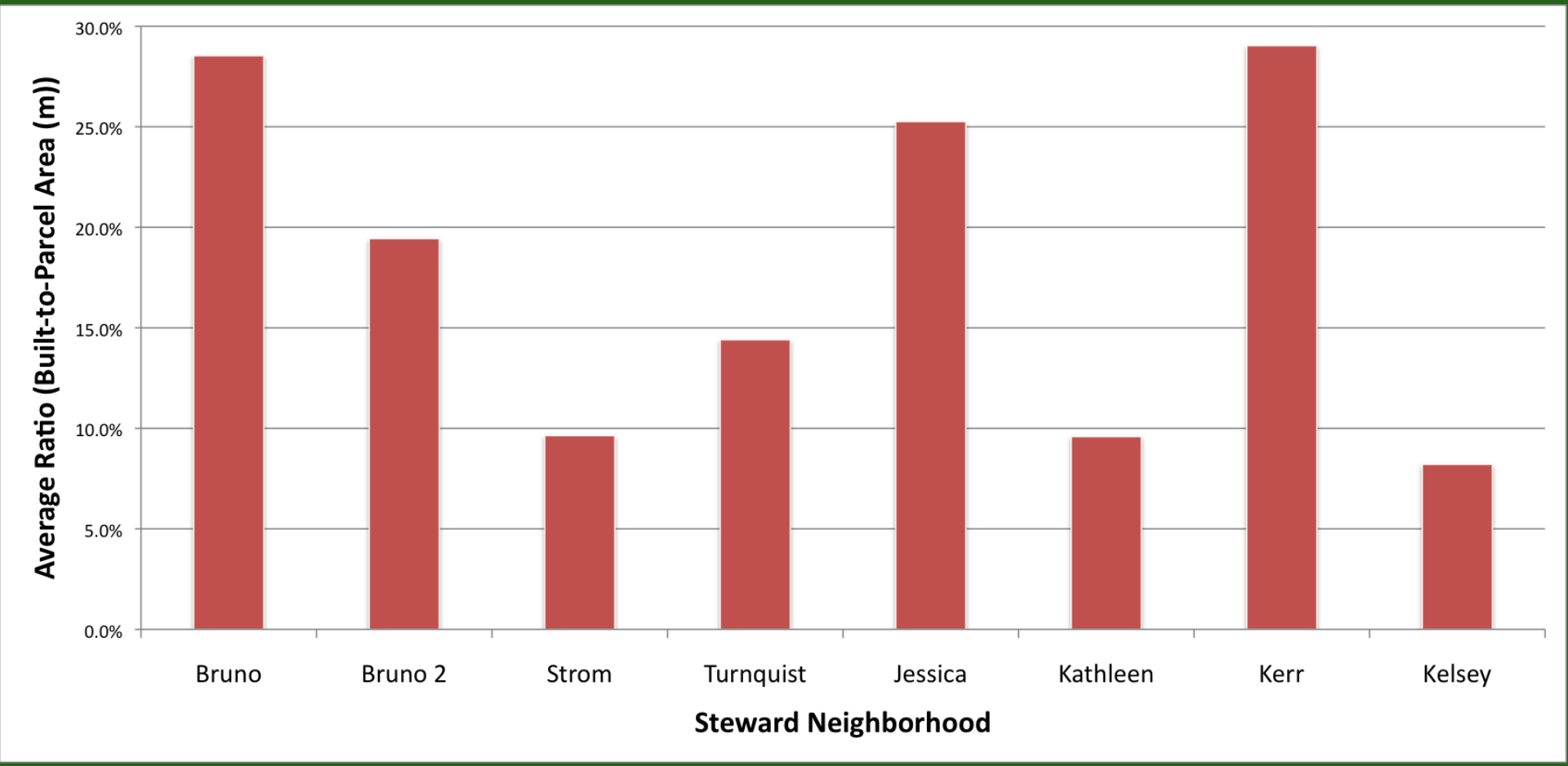
MINNEHAHA CREEK LAND USE



By 2005, agricultural land area has declined and is being replaced by residential and undeveloped land.

BUILDING-PARCEL RATIO DIAGRAM

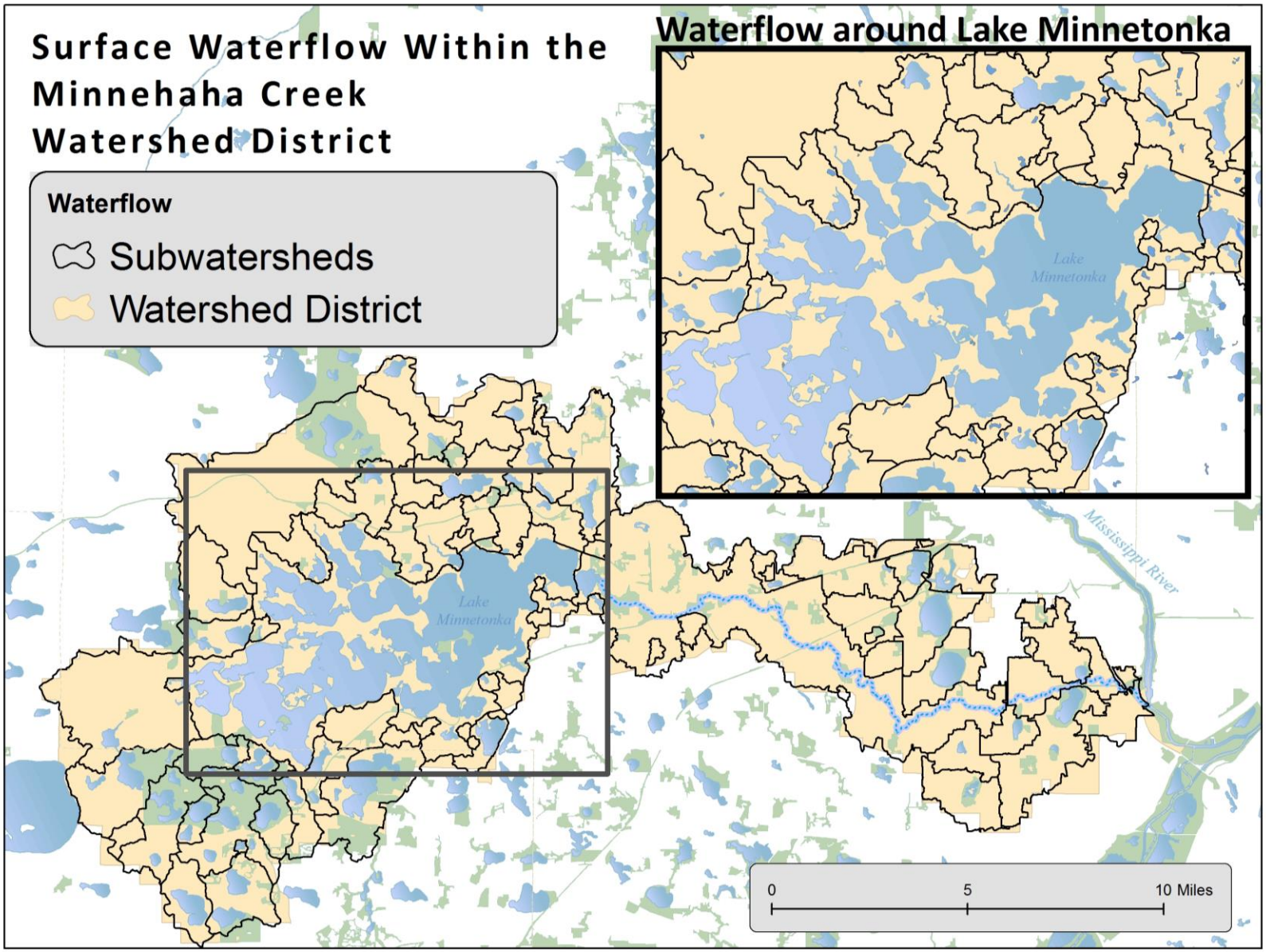
Building-to-parcel ratio provides a general idea of built area in the Water Steward Neighborhoods.



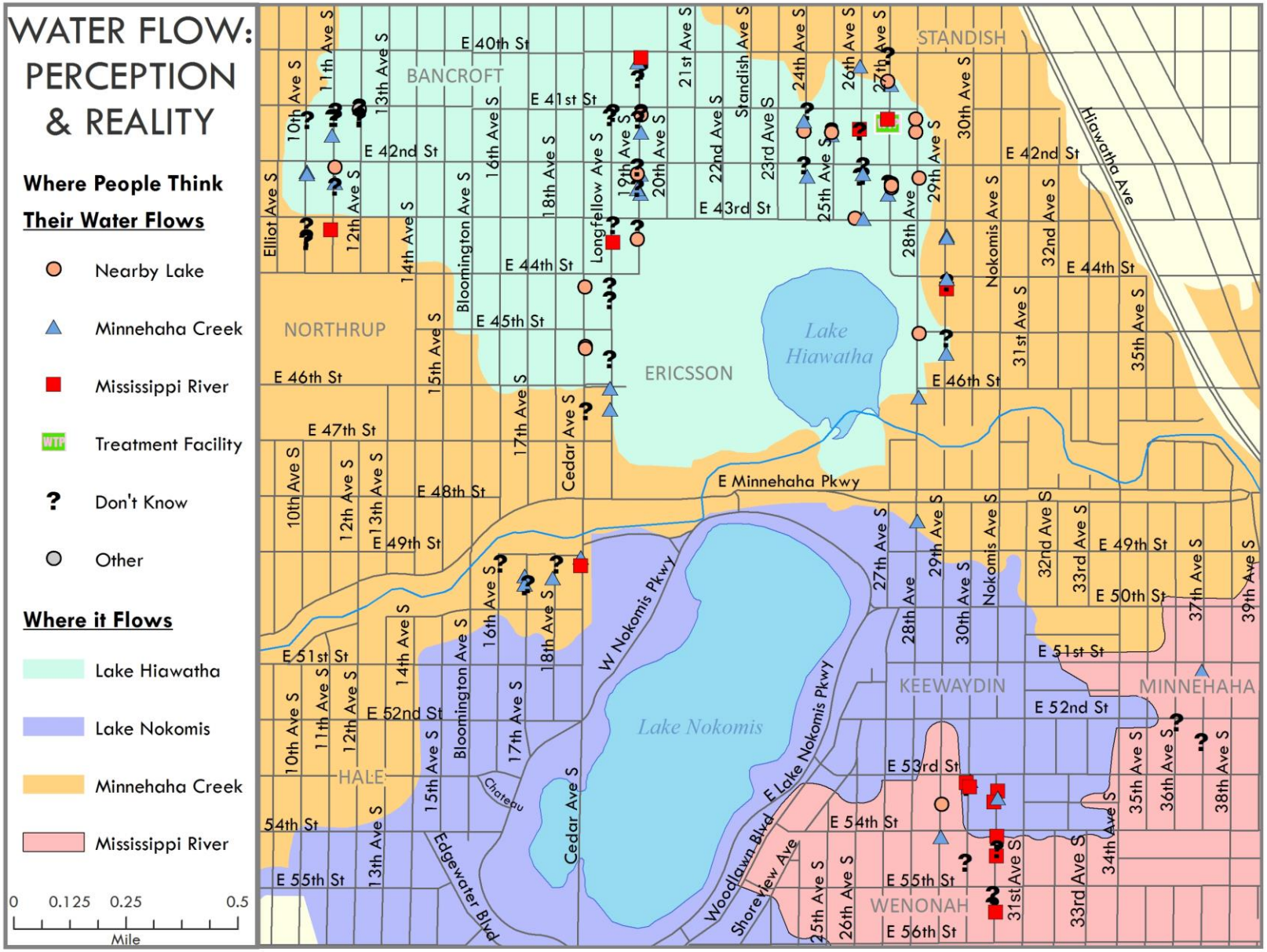
For land parcels in the Kerr Neighborhood, on average almost 30% of parcel area is covered by buildings.

High canopy cover in this neighborhood helps reduce runoff, though there are areas of the neighborhood in which there could be more trees to cover up impervious surfaces.

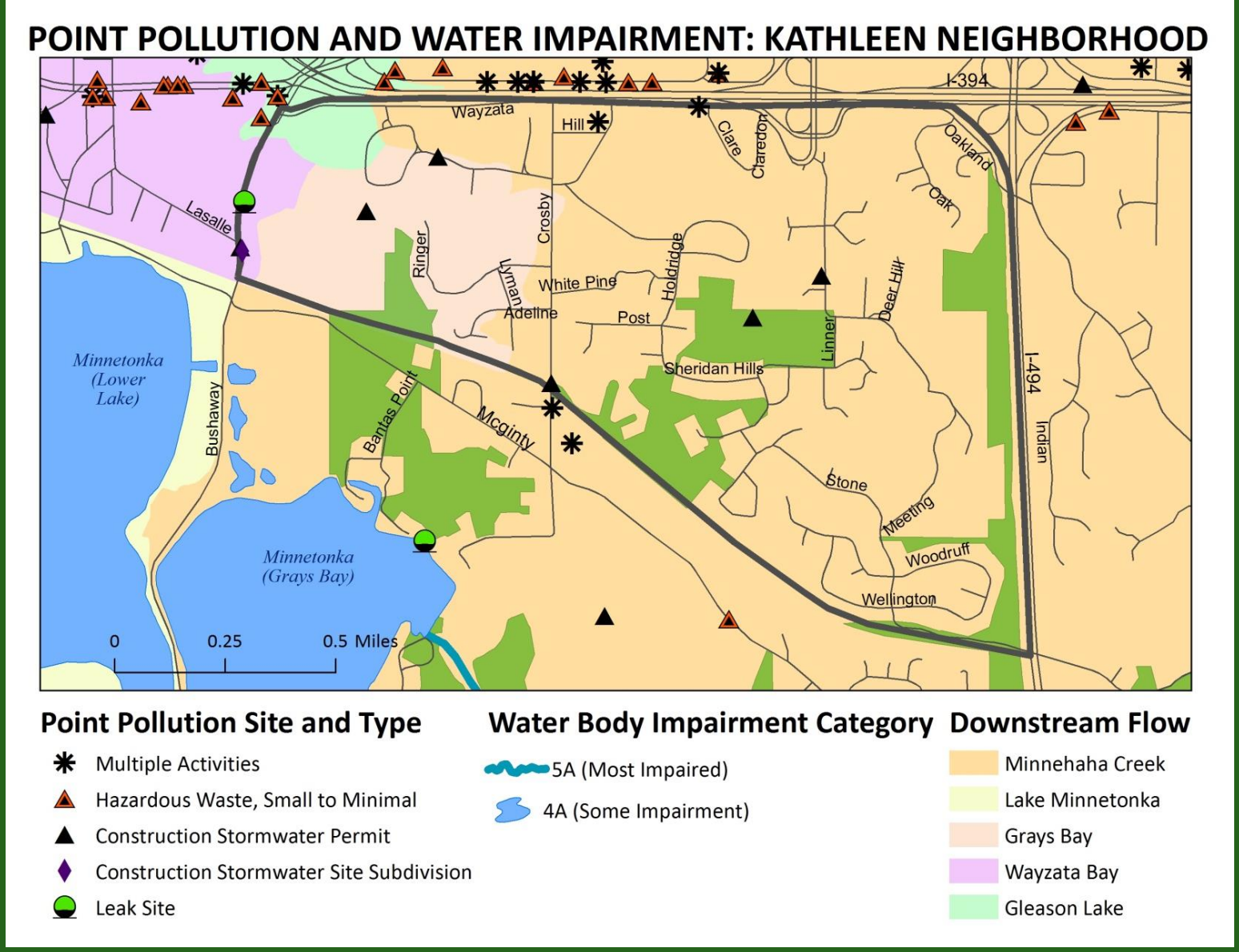
Surface Water



This map shows where water that falls in certain parts of the watershed originally goes before joining Minnehaha Creek and the Mississippi River.

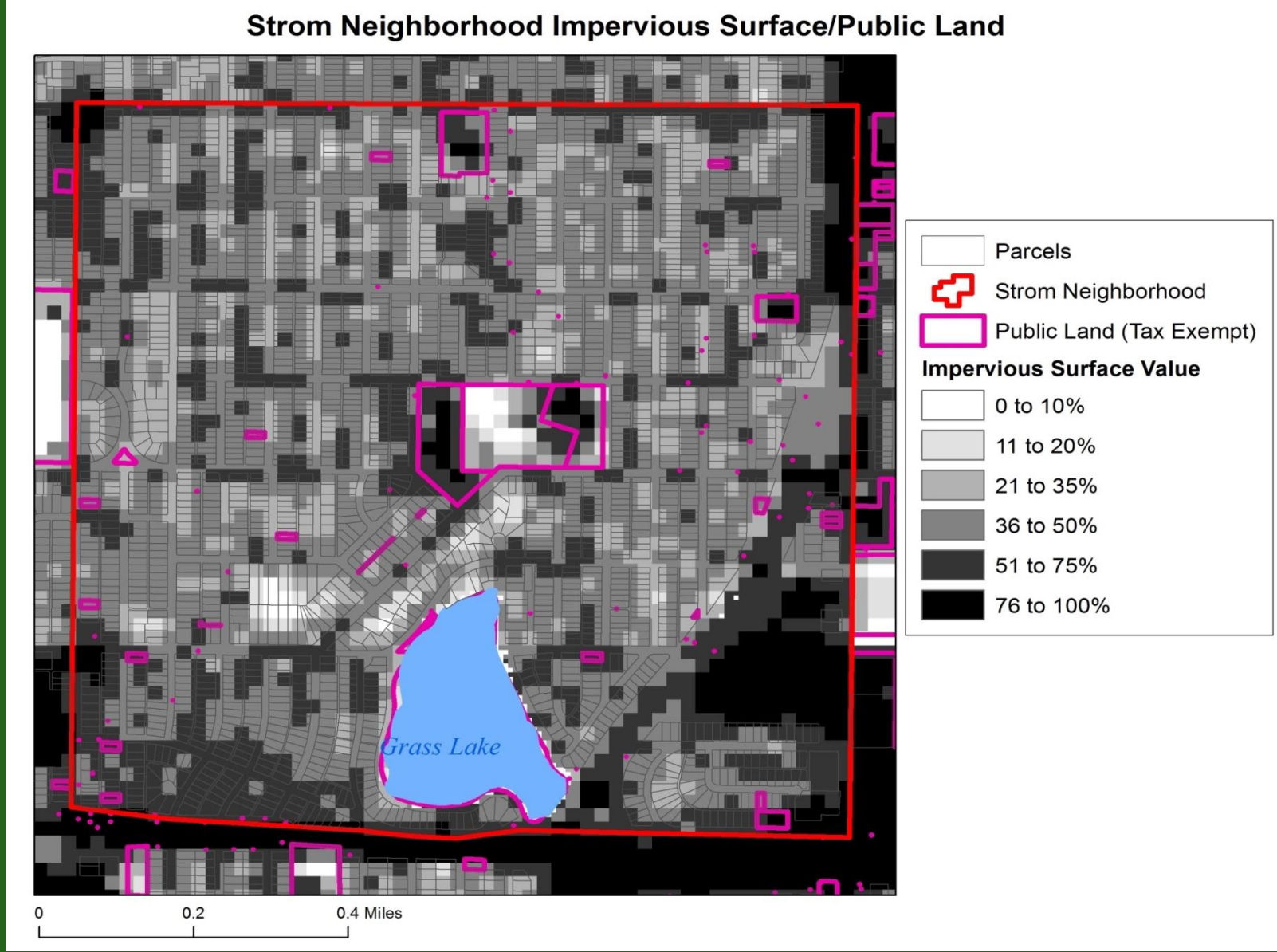


This map shows that people are relatively unaware of the downstream flow of water from their stormdrains.

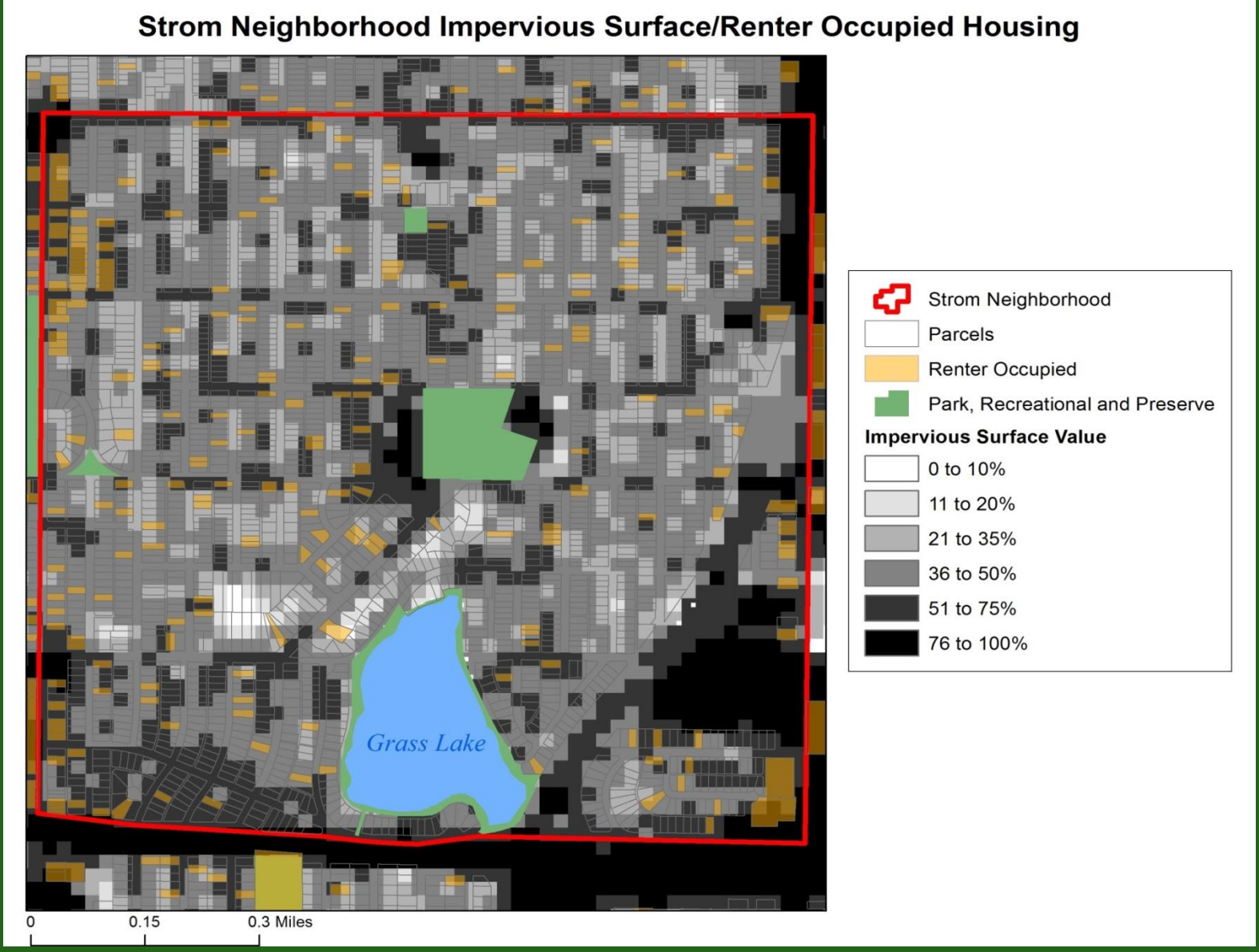


Minnehaha Creek is highly impaired, ranked in the most severe impairment category (5A). The leak site on the north bank of Grays Bay could be a contributor to the pollution that flows into the river.

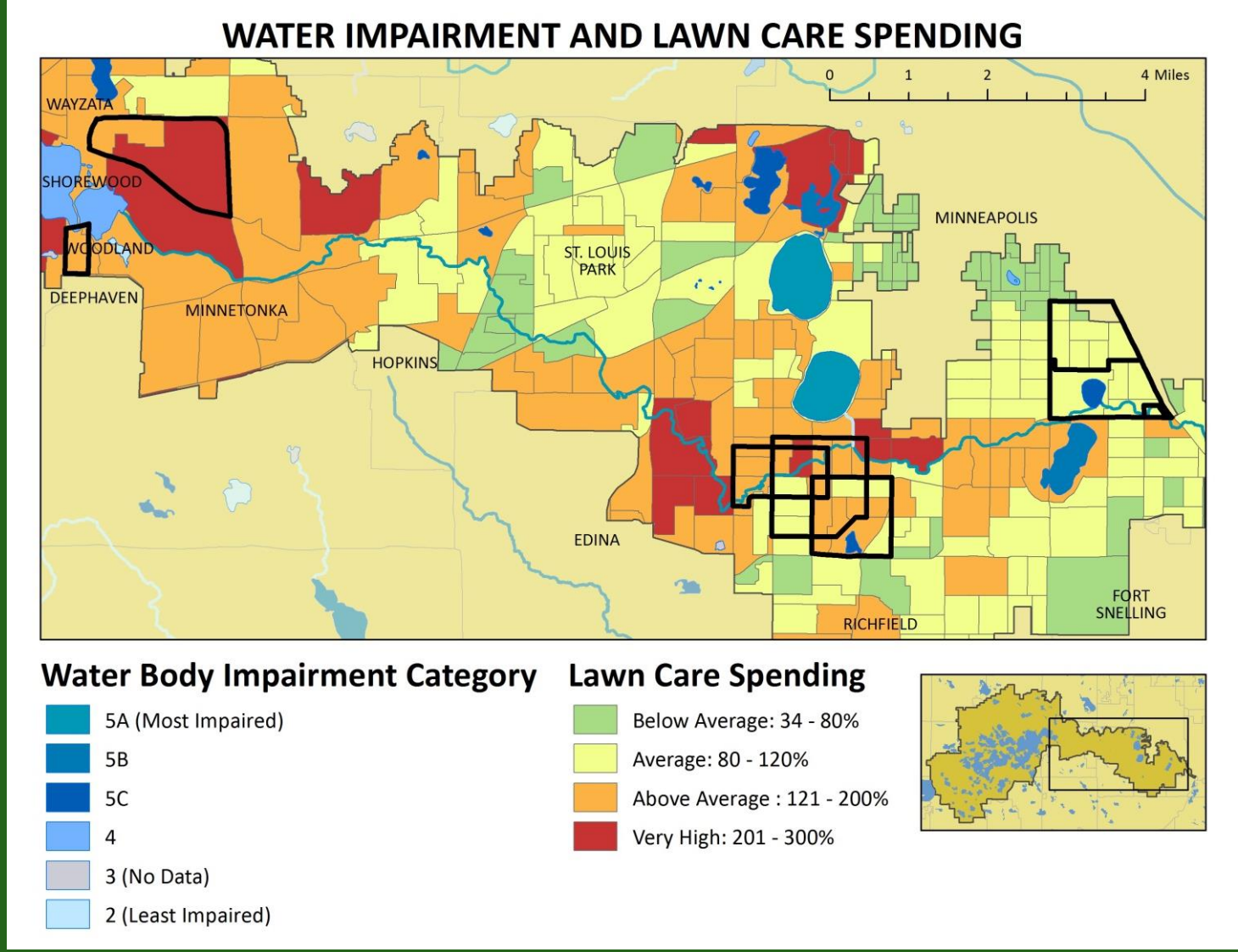
Multivariable Maps



Zoning for tax-exempt land differs from that of privately-owned land, and knowledge of these parcels can influence a Water Steward's approach within a neighborhood.



Renter- vs. owner-occupied maps may be useful to Water Stewards in targeting properties in which the occupants are more likely to be willing to invest in changes.



Kathleen's neighborhood stands out as a generally high spender regarding lawn care. Perhaps more attention should be focused on her neighborhood and the surrounding area considering its proximity to the headwaters of the Minnehaha Creek.

Conclusions

- The area where current Water Stewards live is fairly flat and is characterized by a high percentage of impervious surfaces and residential land use.

- At the neighborhood level, building-to-parcel ratio ranges from 8.2 to 28.5%. We expect this to be higher than ratios for future stewards living in the western portion of the watershed.

- Residents of surveyed neighborhoods do not have a good idea of where their runoff flows, thus, neighborhood-level maps of slope, aspect, and flow are important.

Social Variables

Josie Ahrens, Aileen Clarke, Jessica Klion,
Paige Moody, Joe Speer

Goals

- Collect and map baseline demographic data to help stewards better understand the characteristics of their neighborhood and help to identify good locations with high potential for future projects.

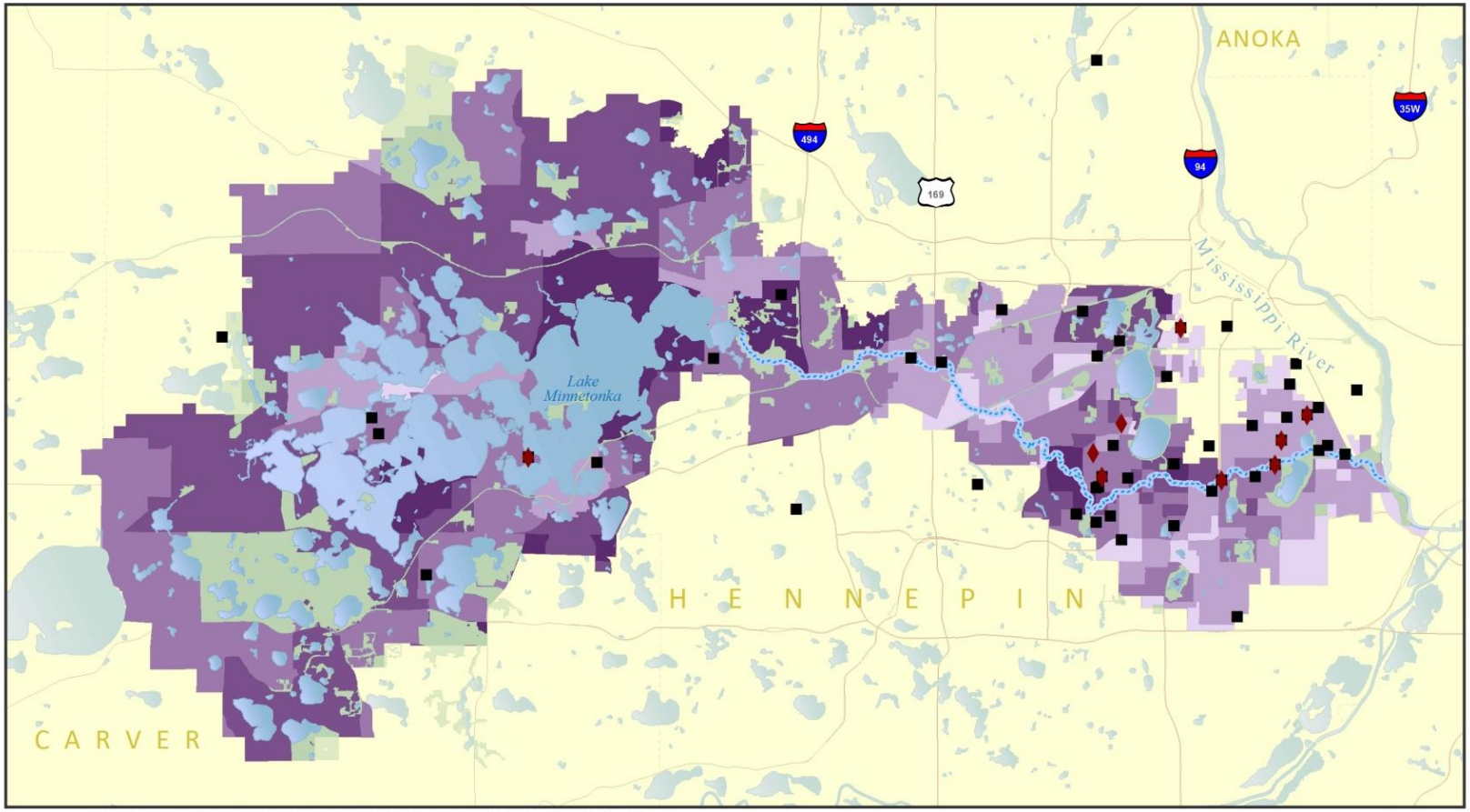
- Where are neighborhoods that would be good candidates to host steward projects?

Variables

- Population
  - Income
  - Age
  - Tapestry Life Mode
- Land Use
  - Parcel Use
  - Private v. Public
  - Owner v. Renter

Population

2011 MEDIAN HOUSEHOLD INCOME AND MASTER WATER STEWARDS



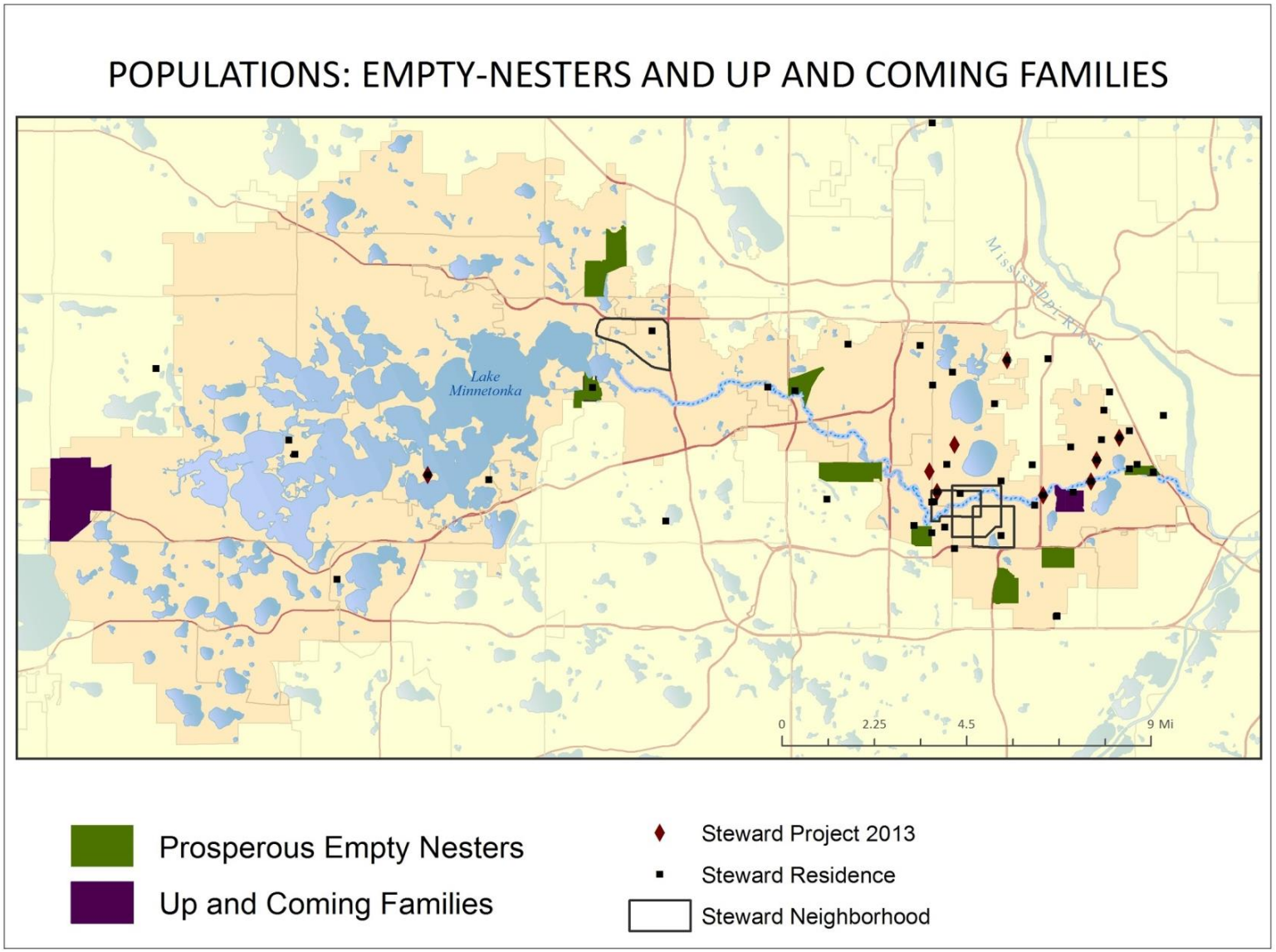
2011 Median Household Income By Block Group

- $13,515 - $44,000
- $44,001 - $67,000
- $67,001 - $94,000
- $94,001 - $131,000
- $131,001 - $210,000

- 2013 Steward Projects
- Steward Residences

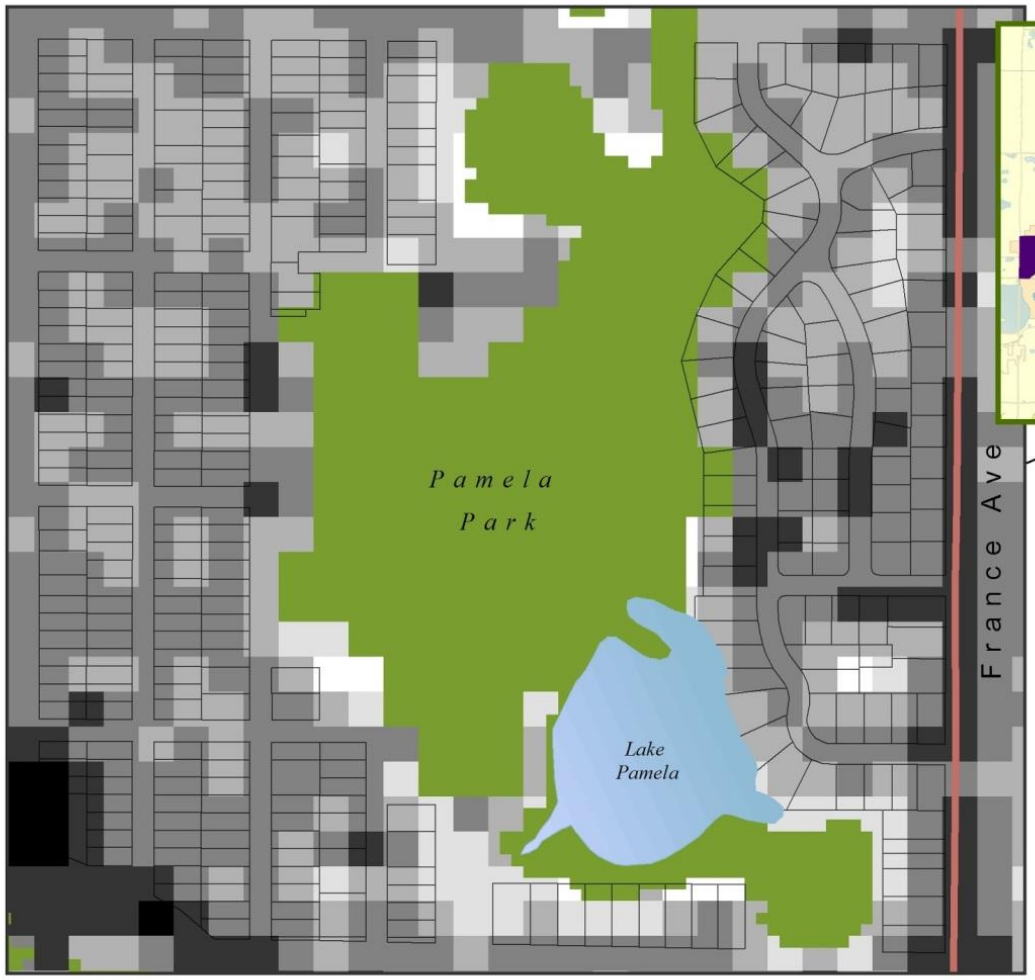
0 2 4 8 Mi

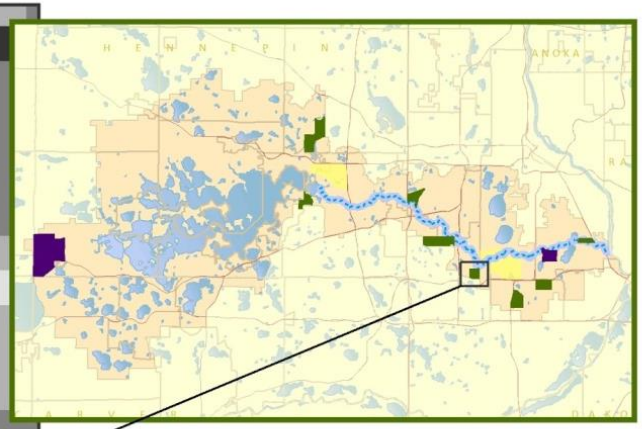
Income is not a determining factor regarding participation in the Water Steward Program, either as a steward or as a recipient of a project.



There is a concentration of ‘Empty Nesters’ in the southeastern section of the watershed. The ‘Up and Coming Family’ groups are primarily on the periphery.

IMPERVIOUS SURFACES IN ESRI'S 'EMPTY NESTERS' BLOCK GROUP





Impervious Surfaces

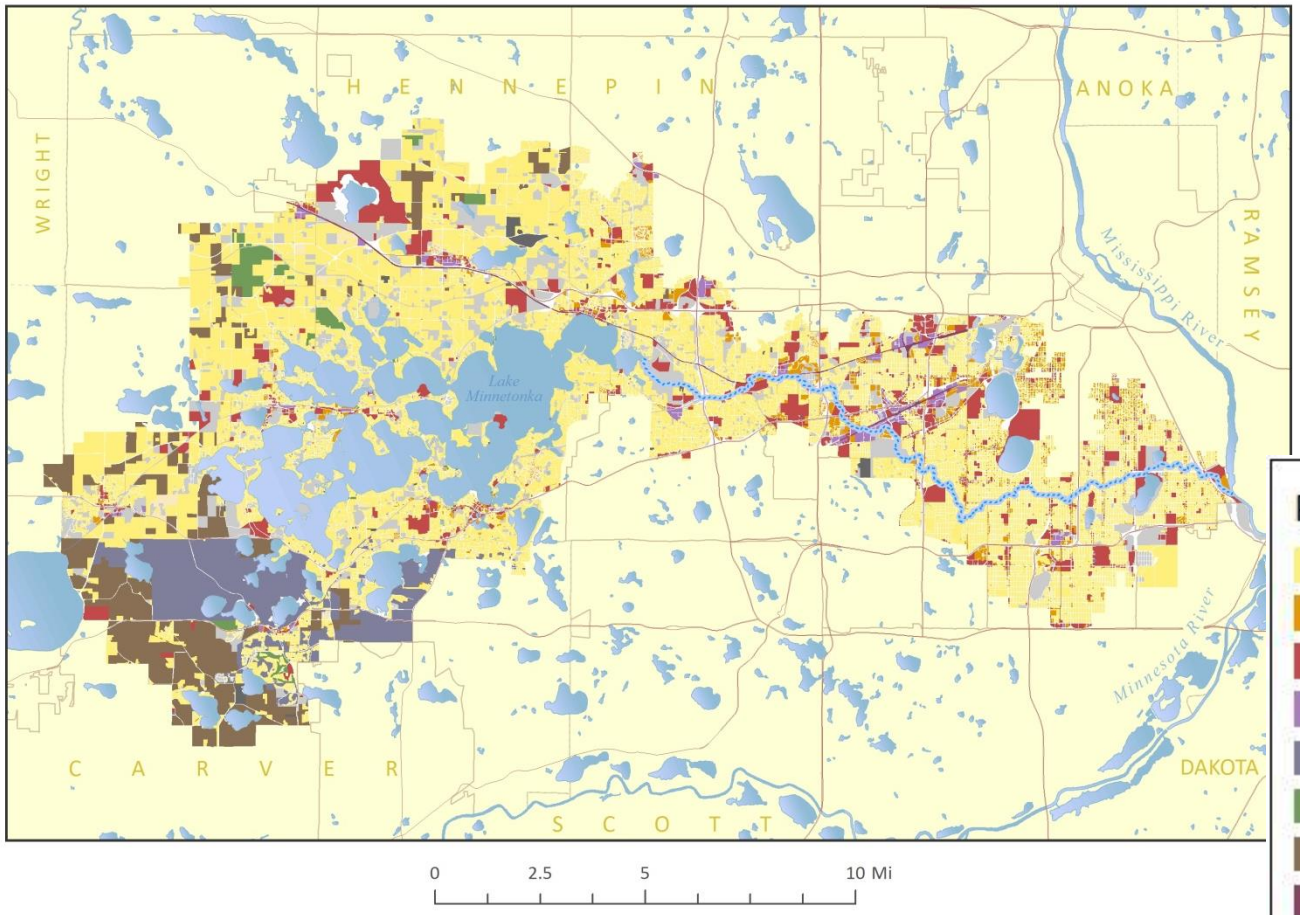
% Impermeable

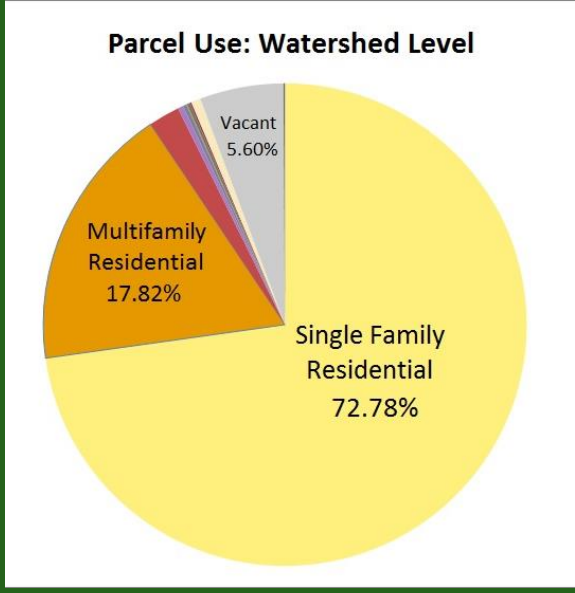
- 1 - 10
- 11 - 20
- 21 - 35
- 36 - 50
- 51 - 75
- 76 - 100
- Park

The majority of parcels are 11% - 50% impermeable. The southwestern area is especially impermeable.

Land Use

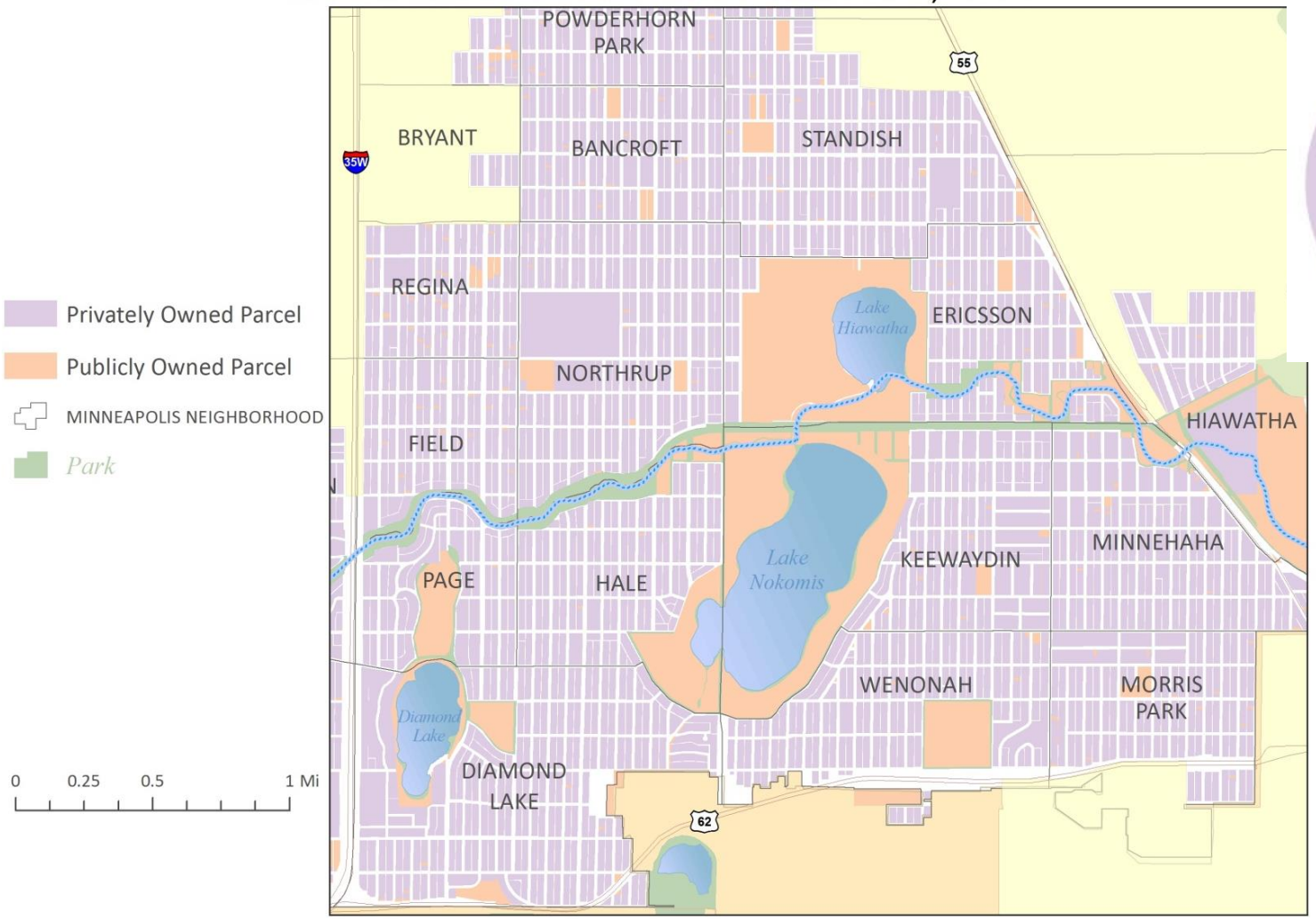
LAND USE BY PARCEL, 2011

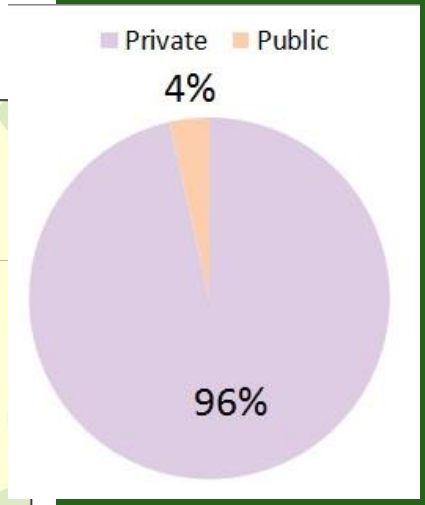




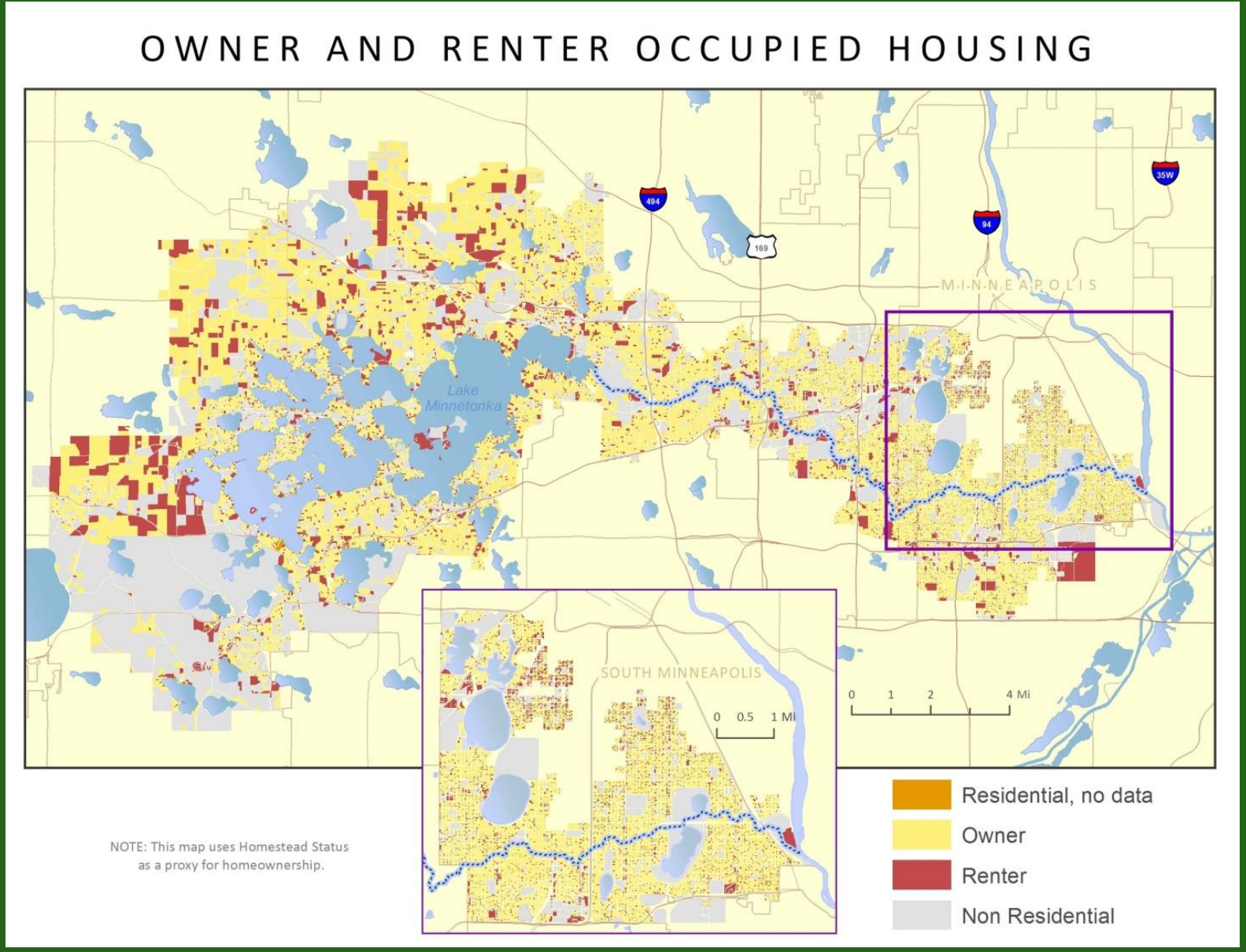
A clear majority of parcels are single-family residential, leaving the health of the watershed in the hands of those who live in a private home.

PARCEL TENURE: STANDISH, ERICSSON, AND SURROUNDING NEIGHBORHOODS, 2011

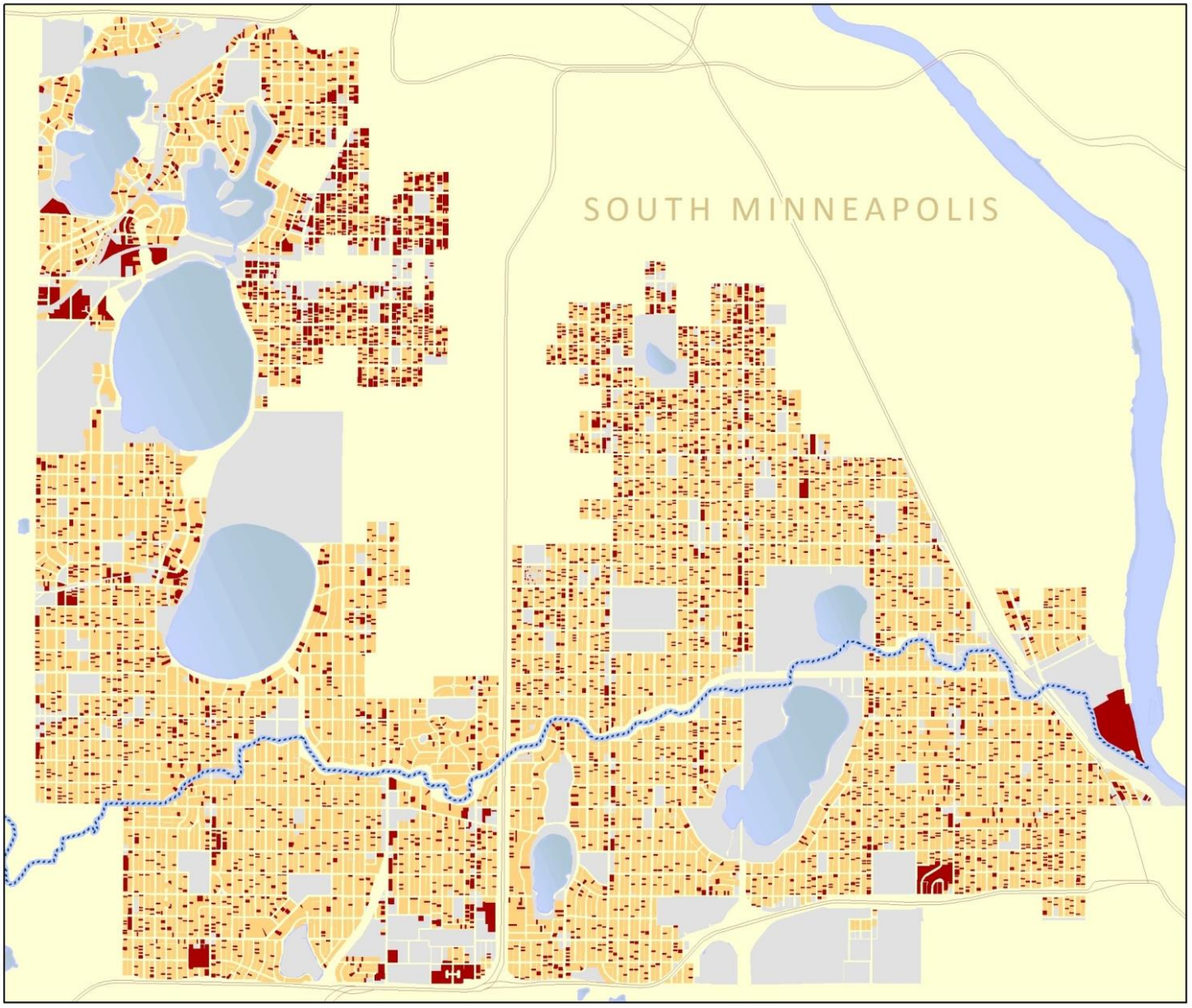




Private owners have the ability and the right to install a rain garden or other projects on their land, while publicly-owned land means working with local and state government entities.



Both renters and owners are dispersed throughout the watershed, but there is a larger concentration of owners around the Chain of Lakes and Lake Minnetonka.



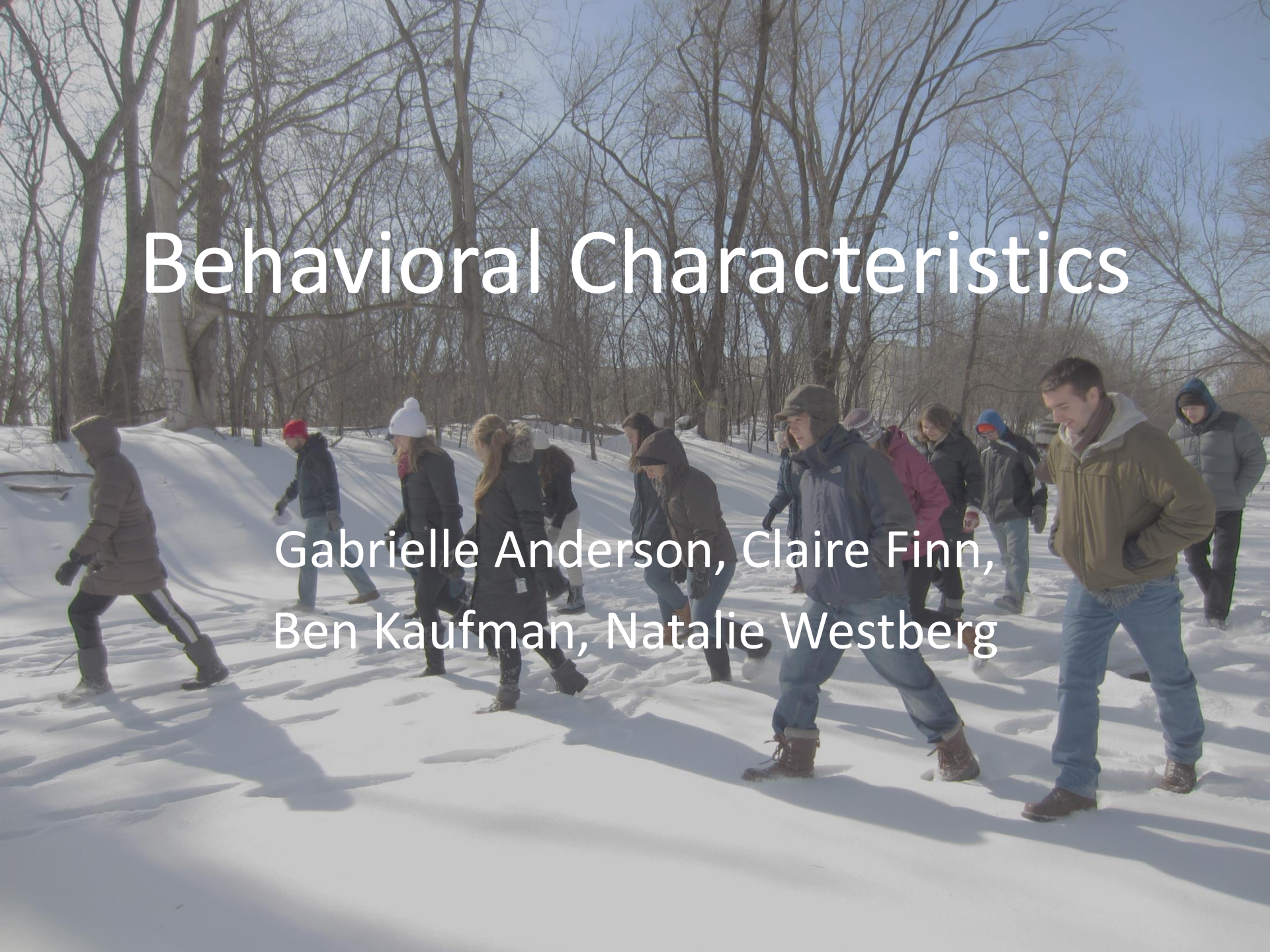
South Minneapolis has many residential parcels, the majority of which are owner occupied.

Conclusions

- Population and land use data show general trends in the watershed
  - Parcel-level land use data indicate that significant land is privately owned and residential; many residential parcels are owner occupied
  - “Prosperous Empty Nester” and “Up and Coming Families” block groups are concentrated in the southeastern portion of the watershed

Recommendations

- Population and land use data can show where multivariable analysis should occur
- Future projects should:
  - Analyze land use more fully
  - Find more specific income data
  - Create more neighborhood-level maps



Behavioral Characteristics

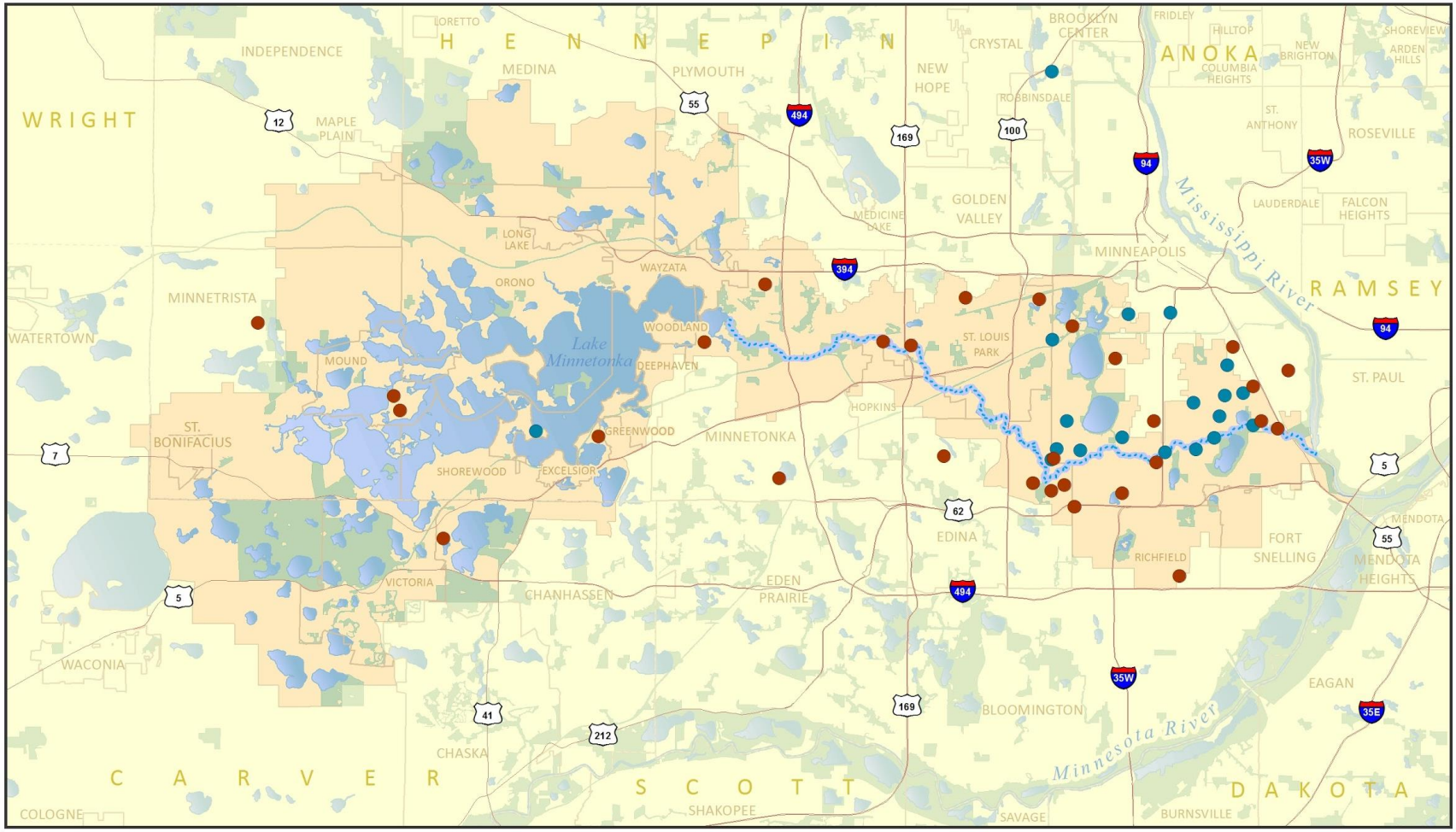
Gabrielle Anderson, Claire Finn,
Ben Kaufman, Natalie Westberg

Goals

- Produce a baseline set of maps about the case study of behaviors in the Standish/Ericsson neighborhood
- Map current extent of efforts to improve water quality
- Generate educational materials for the Water Stewards

Master Water Steward Program

MASTER WATER STEWARD RESIDENCES

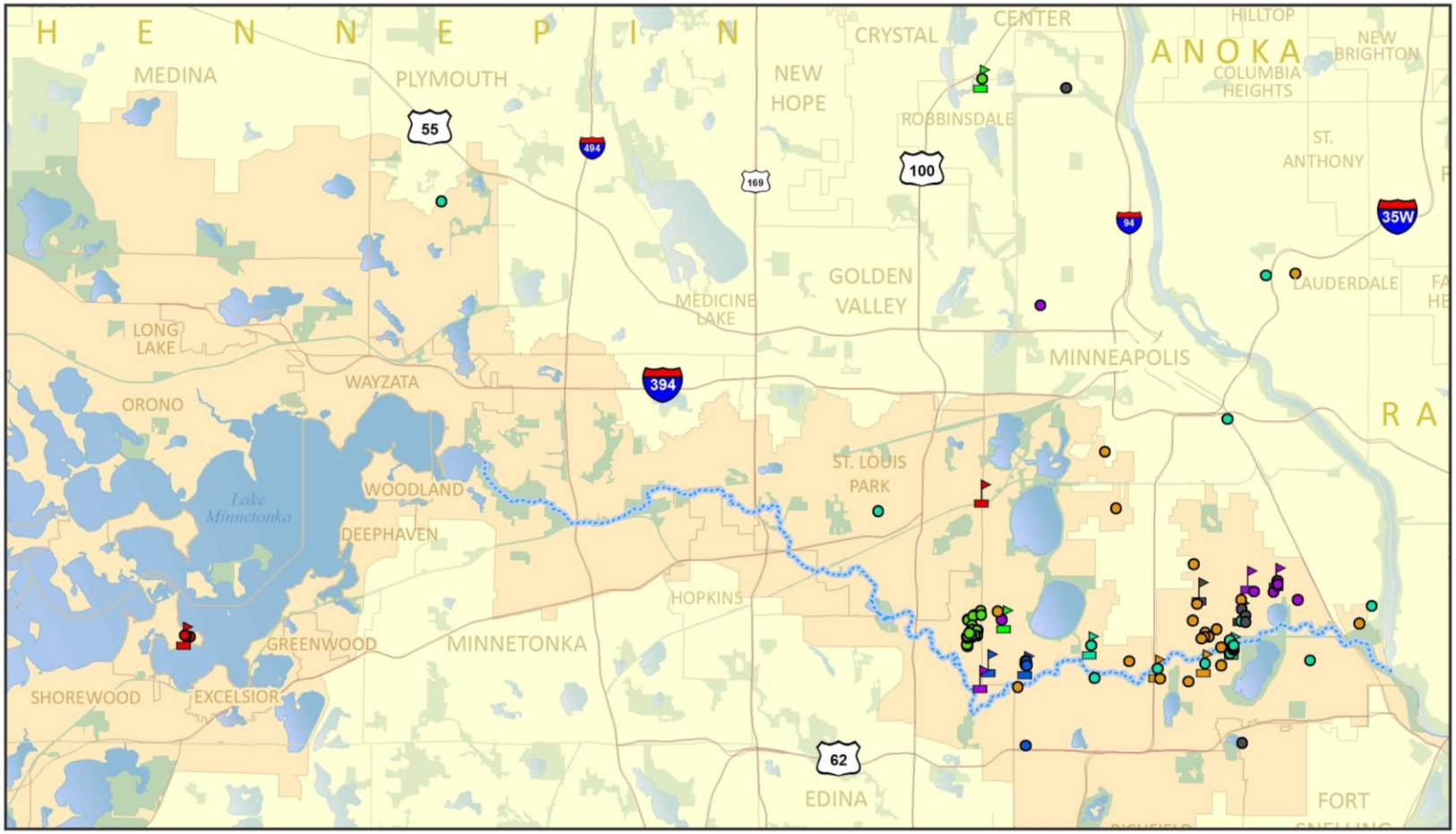


- 2014 Steward Residence
- 2013 Steward Residence

0 2.5 5 10 Mi

The 2014 stewards cover a wider area of the watershed than the 2013 stewards meaning a greater potential for behavior influence.

2013 MASTER WATER STEWARD OUTREACH



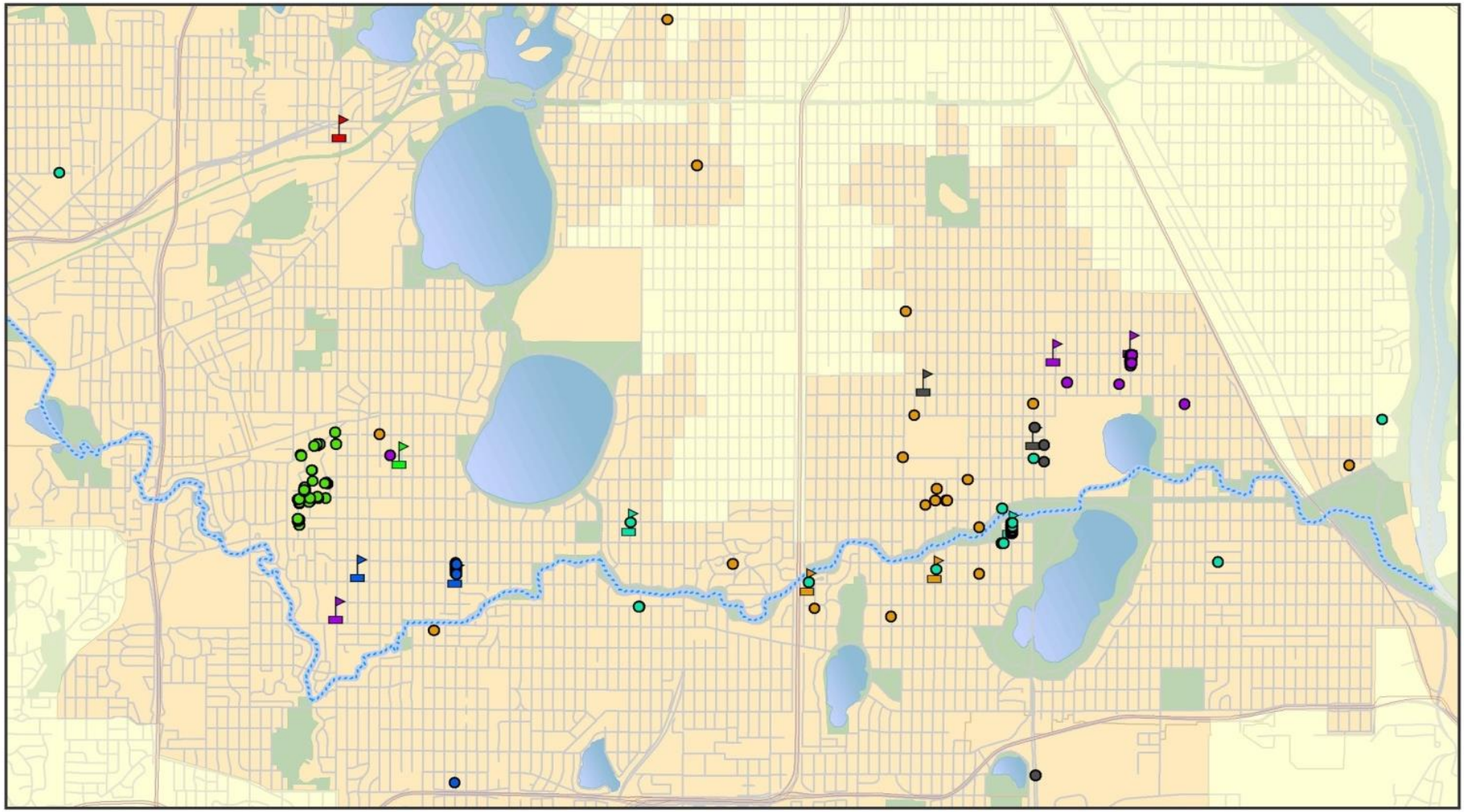
Outreach Location (by steward team)

- Sue R. & Bruce
- Betsy & Mike
- Katharine & Dave
- Carol & Kristina
- Terry & Sheila
- Roxanne, Sue T. & Erika
- Jackie & Meghan
- Steward Residence

0 1.25 2.5 5 Mi

The majority of the 2013 steward outreach is in the eastern portion of the watershed.

2013 MASTER WATER STEWARD OUTREACH



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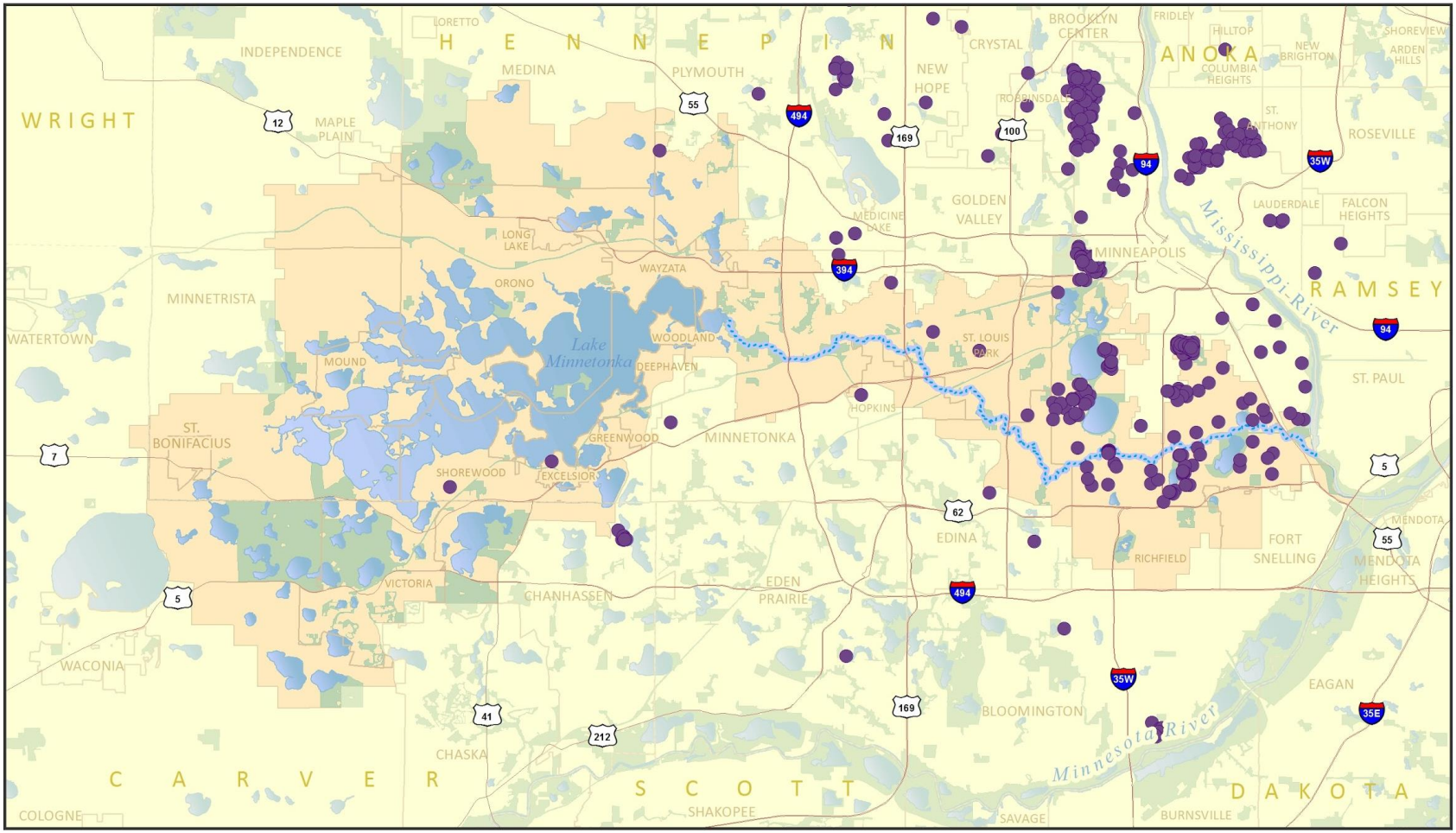
0 0.5 1 2 Mi

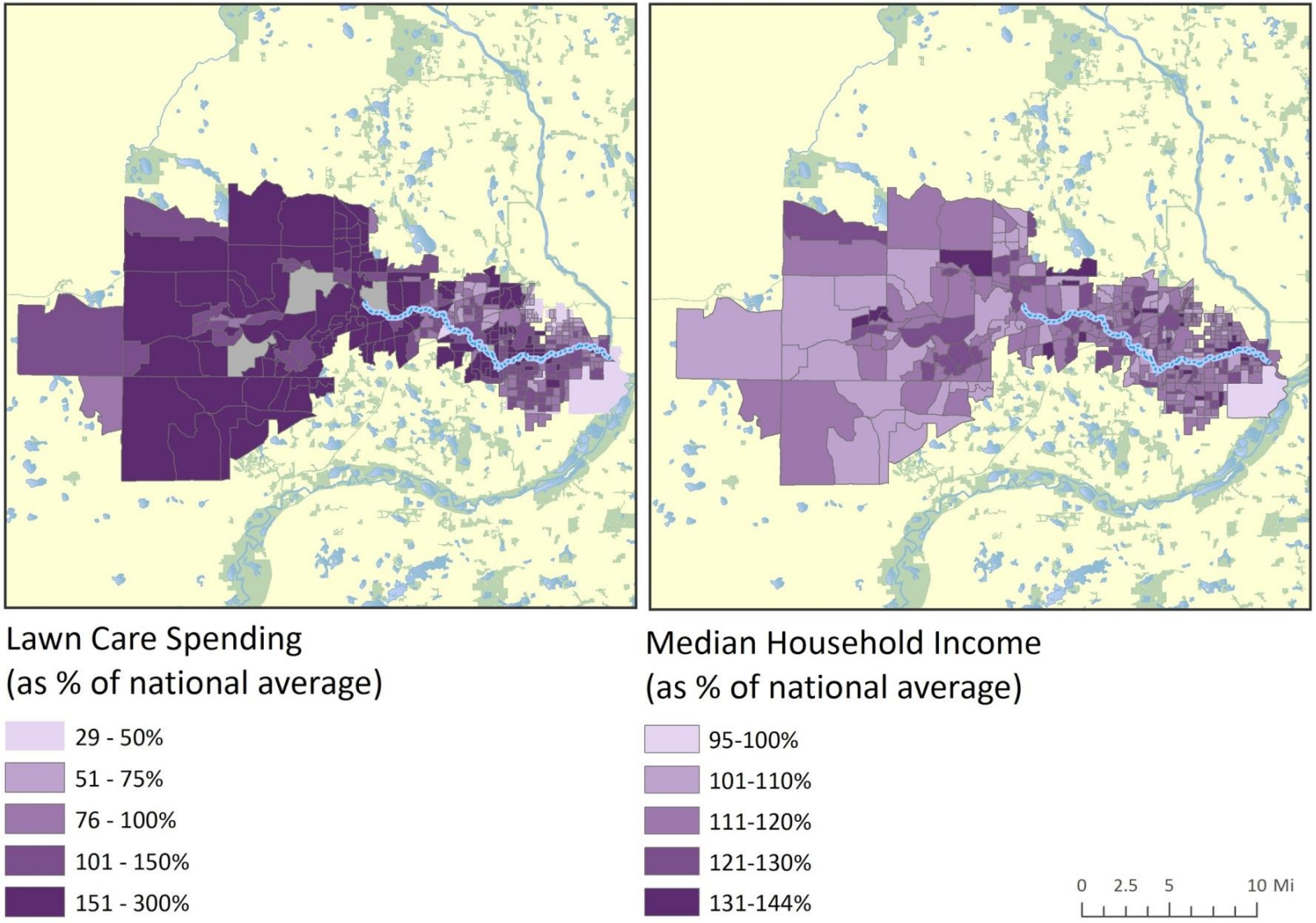
Metro-Wide Installations

LOCATIONS OF RUNOFF-PREVENTING INSTALLATIONS



The majority of the existing projects are concentrated on the east side of the watershed, generally near Water Stewards.

LAWN CARE SPENDING AND INCOME

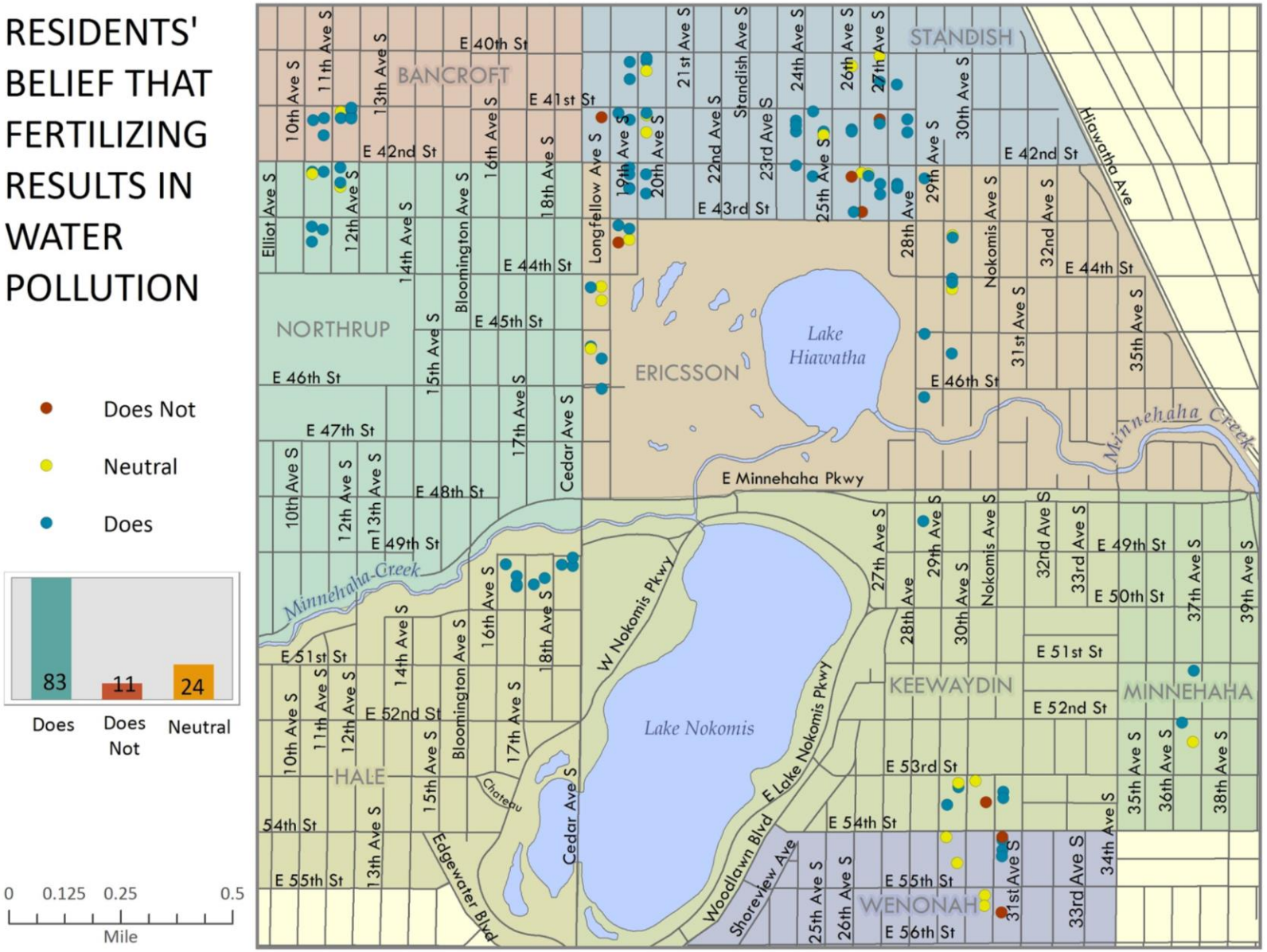


Lawn care spending and income do not seem to be correlated at the watershed scale.

Standish-Ericsson Case Study

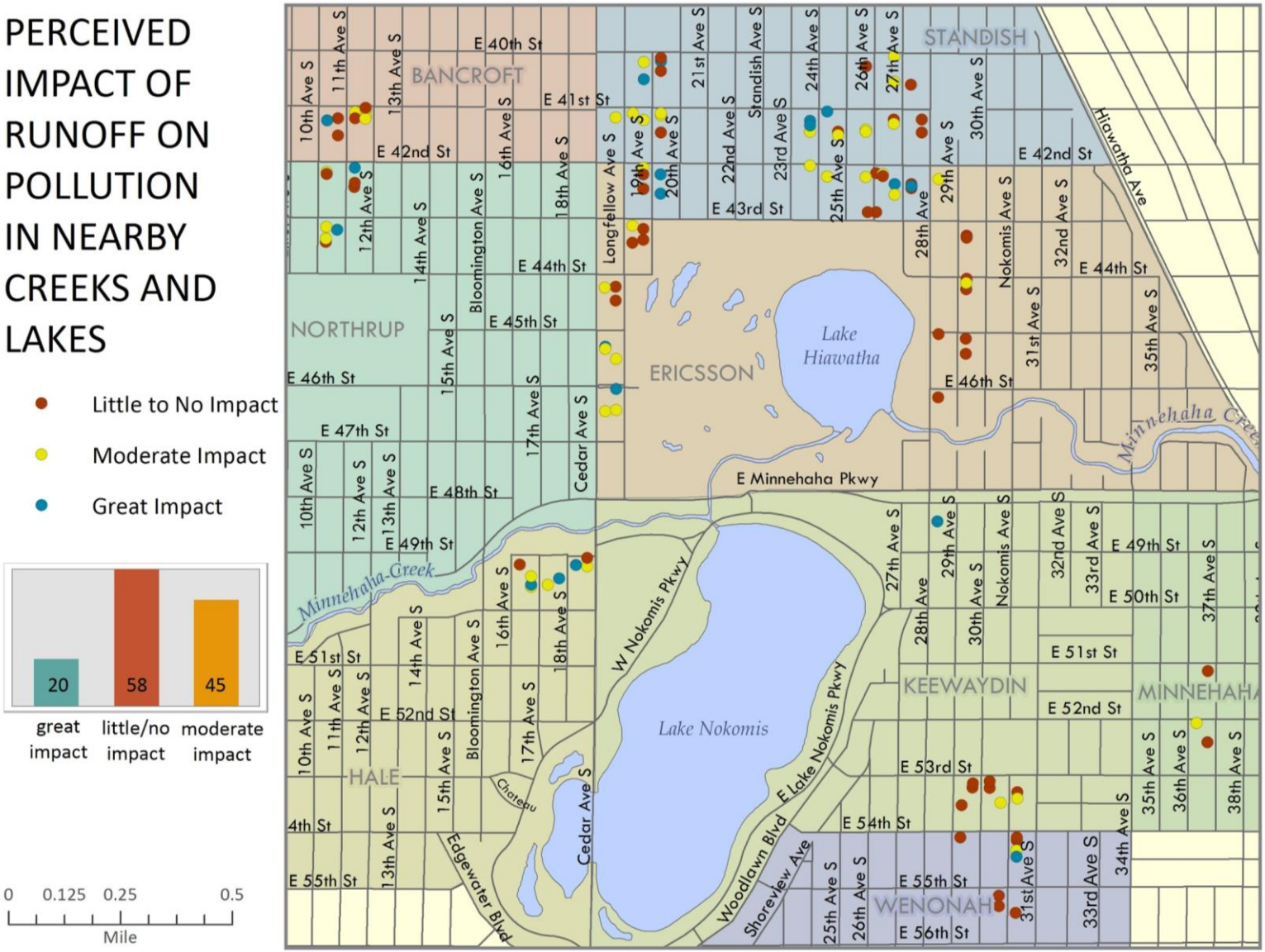
Qualitative Research Methods Data Set

RESIDENTS' BELIEF THAT FERTILIZING RESULTS IN WATER POLLUTION



A majority of the resident respondents in the Standish-Ericsson neighborhood believe that fertilizing does result in water pollution.

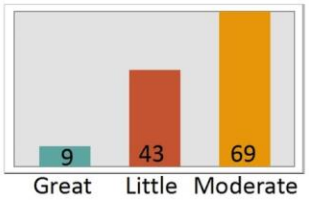
PERCEIVED IMPACT OF RUNOFF ON POLLUTION IN NEARBY CREEKS AND LAKES

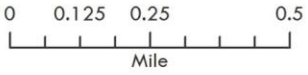


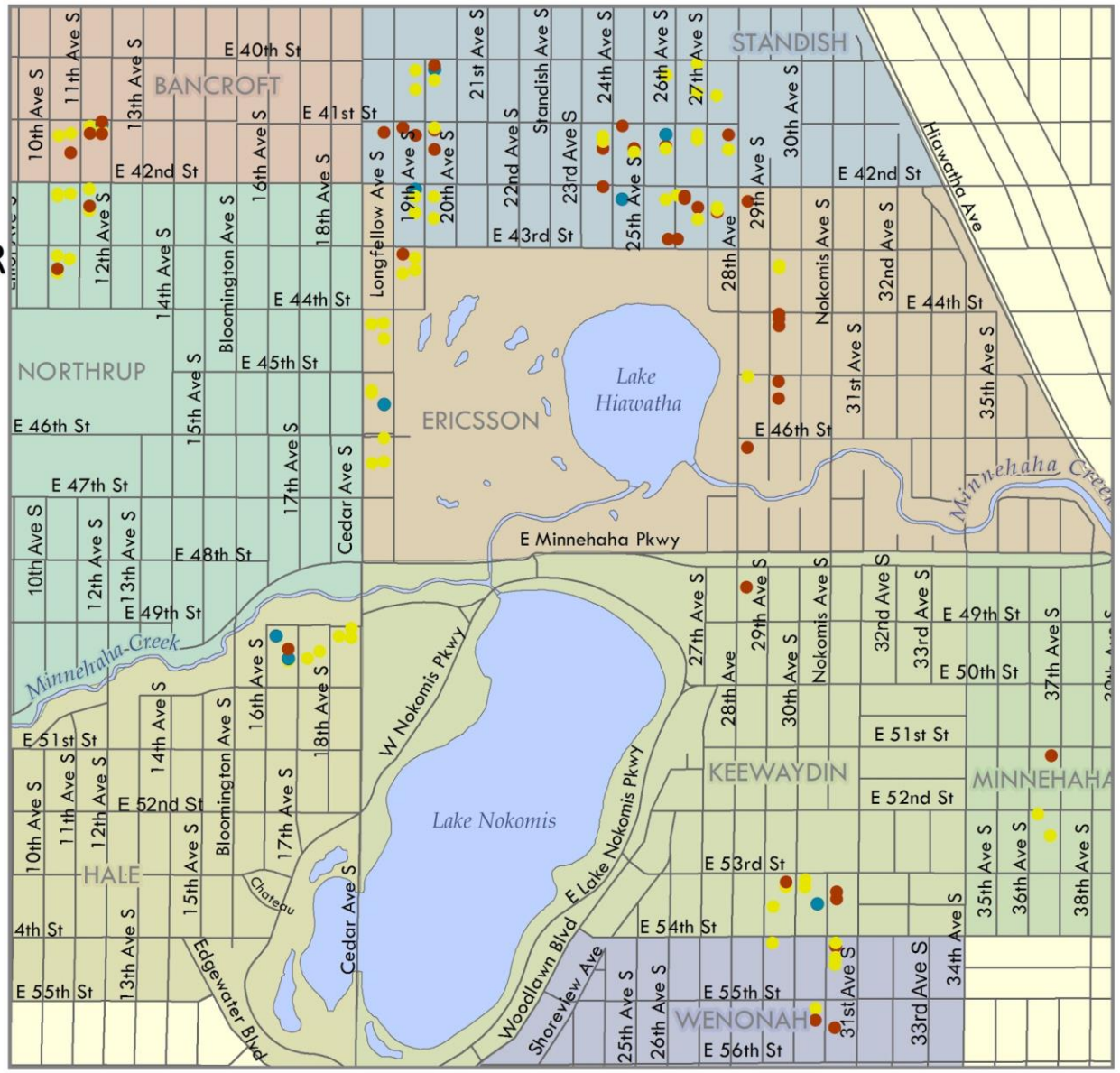
There is not a clear consensus among resident respondents about whether or not lawn runoff pollutes nearby lakes and creeks. Most believe that it has little to no impact on water pollution.

RESIDENT PERCEPTION OF PERSONAL INFLUENCE ON CLEAN WATER

- Very Little Influence
- Moderate Influence
- Great Influence

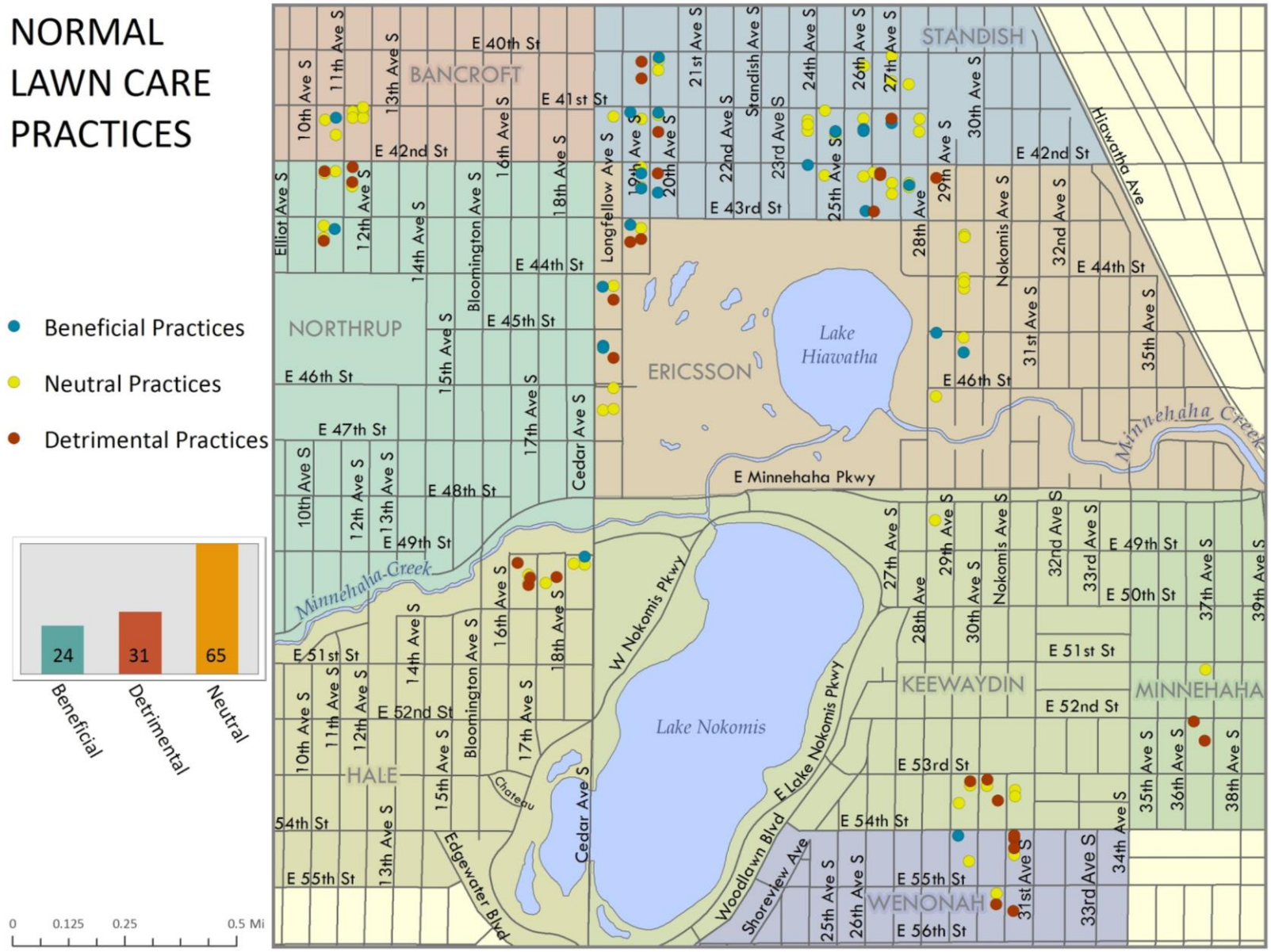






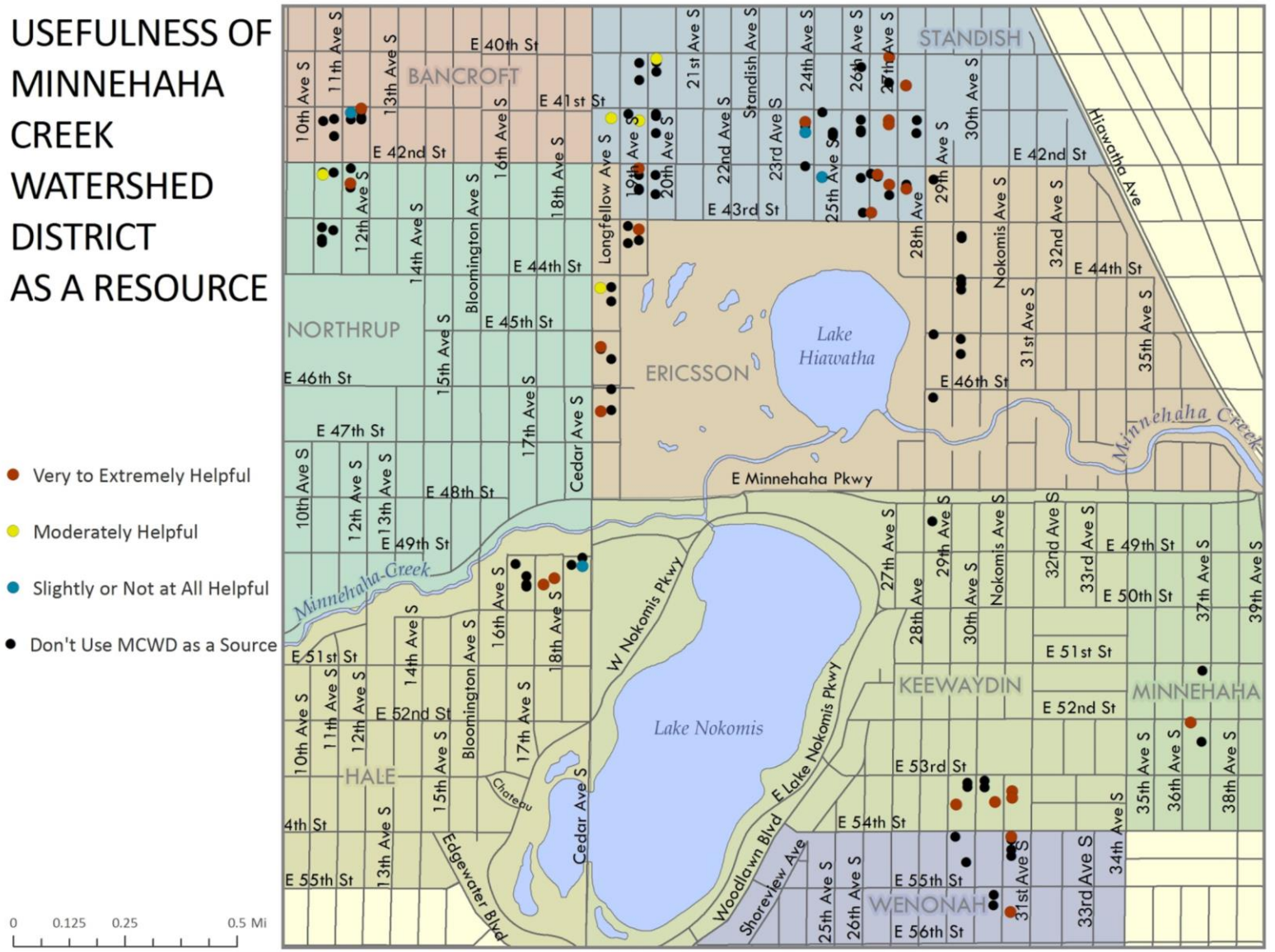
The majority of the resident respondents believe that they have very little to moderate influence on the health of their water.

NORMAL LAWN CARE PRACTICES



There are beneficial lawn care habits in this area, but the majority of the practices are non-beneficial (neutral or detrimental).

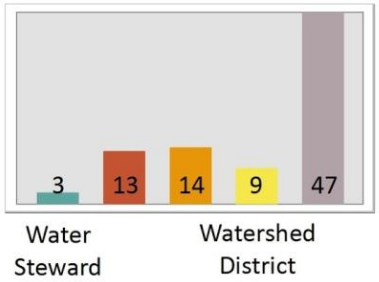
USEFULNESS OF MINNEHAHA CREEK WATERSHED DISTRICT AS A RESOURCE

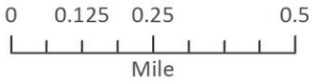


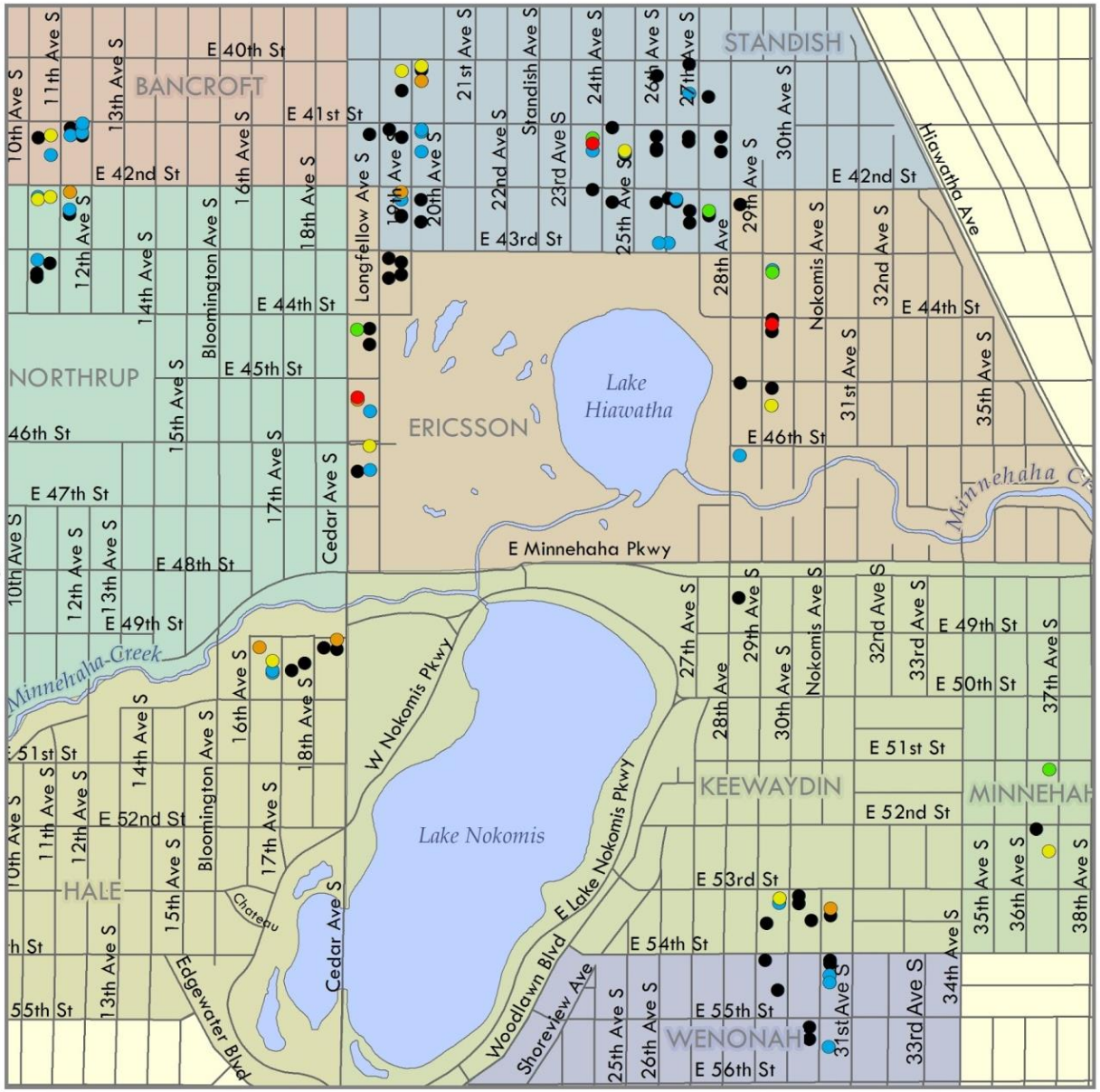
Most respondents do not use the Minnehaha Creek Watershed District as a lawn care information resource, but those who do generally find it very to extremely helpful.

CONTACTED OR ATTENDED EVENT ORGANIZED BY

- Water Steward
- Master Gardener
- City or District Council
- Watershed District
- Neighborhood Assoc.
- Attended No Meetings







Resident respondents have attended meetings or been contacted by various entities, but a majority have attended no meetings.

Conclusions

- Extent of current knowledge
- Extent of current practices
- Extent of influence after first year
- Applying findings from Standish-Ericsson to other neighborhoods

Project Conclusions

- Our research…
  - Provides a basis for continued work with the Master Water Stewards Program on issues of water quality and runoff mitigation.
- GIS helps to…
  - Visualize the interactions between physical features and social characteristics within the watershed.
  - Display these data visually to Master Water Stewards and residents alike.
- Future Directions
  - Analyze the expansion of the Master Water Stewards program and its influence over time.
  - Integrate physical, social, and behavioral characteristics more fully to elicit stronger conclusions

Recommendations

- Continued expansion into the western regions of the watershed.

- Further research on the same variables in order to track progress of the program, and to identify negative behaviors to be improved.

Acknowledgements

- Our Community Partners
  - Freshwater Society
  - Minnehaha Creek Watershed District

- Professor Laura Smith
- Professor Ashley Nepp
- Professor Dan Trudeau

- Macalester College
  - Civic Engagement Center