MODELS, METRICS, SCENARIOS

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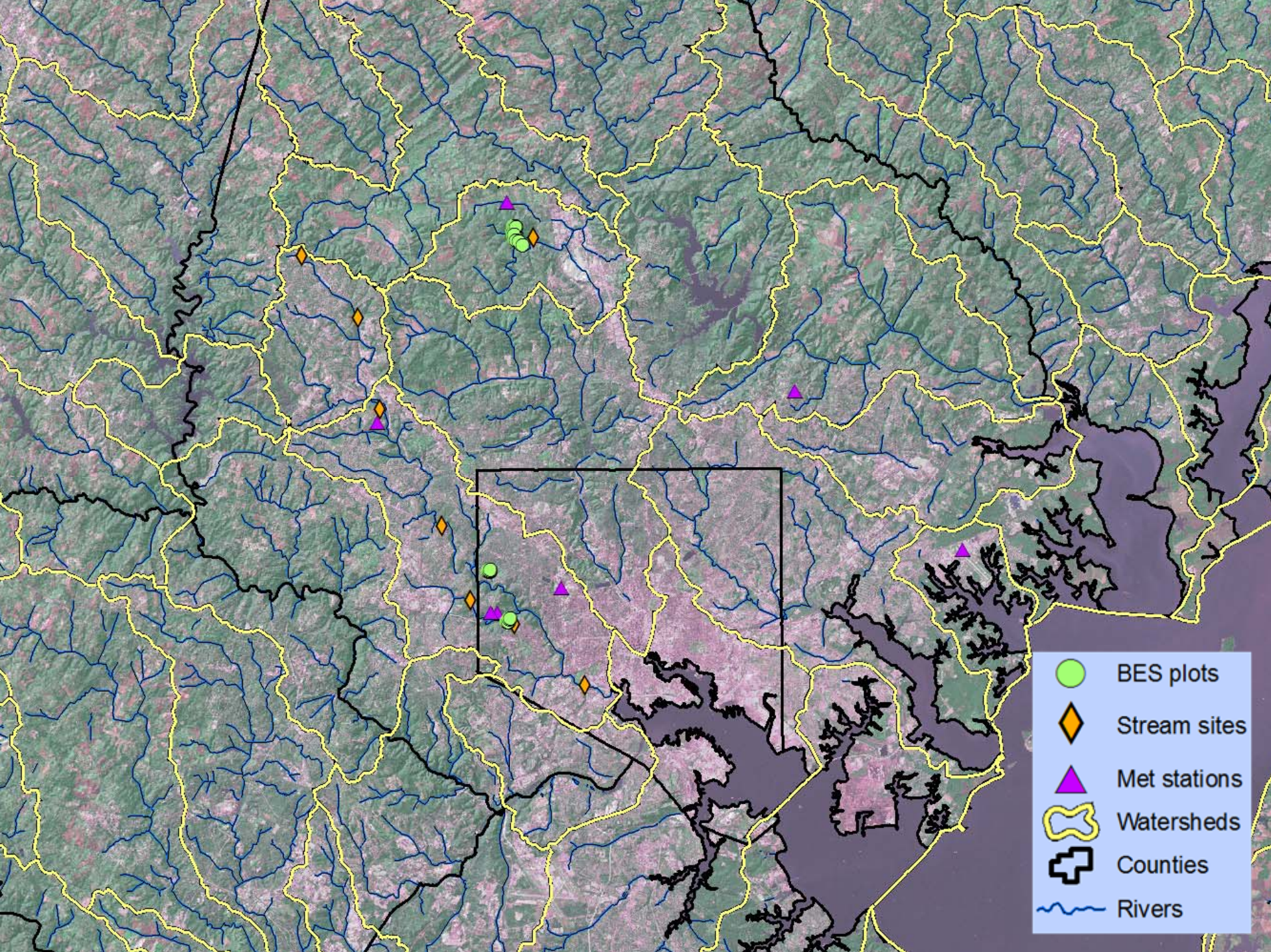
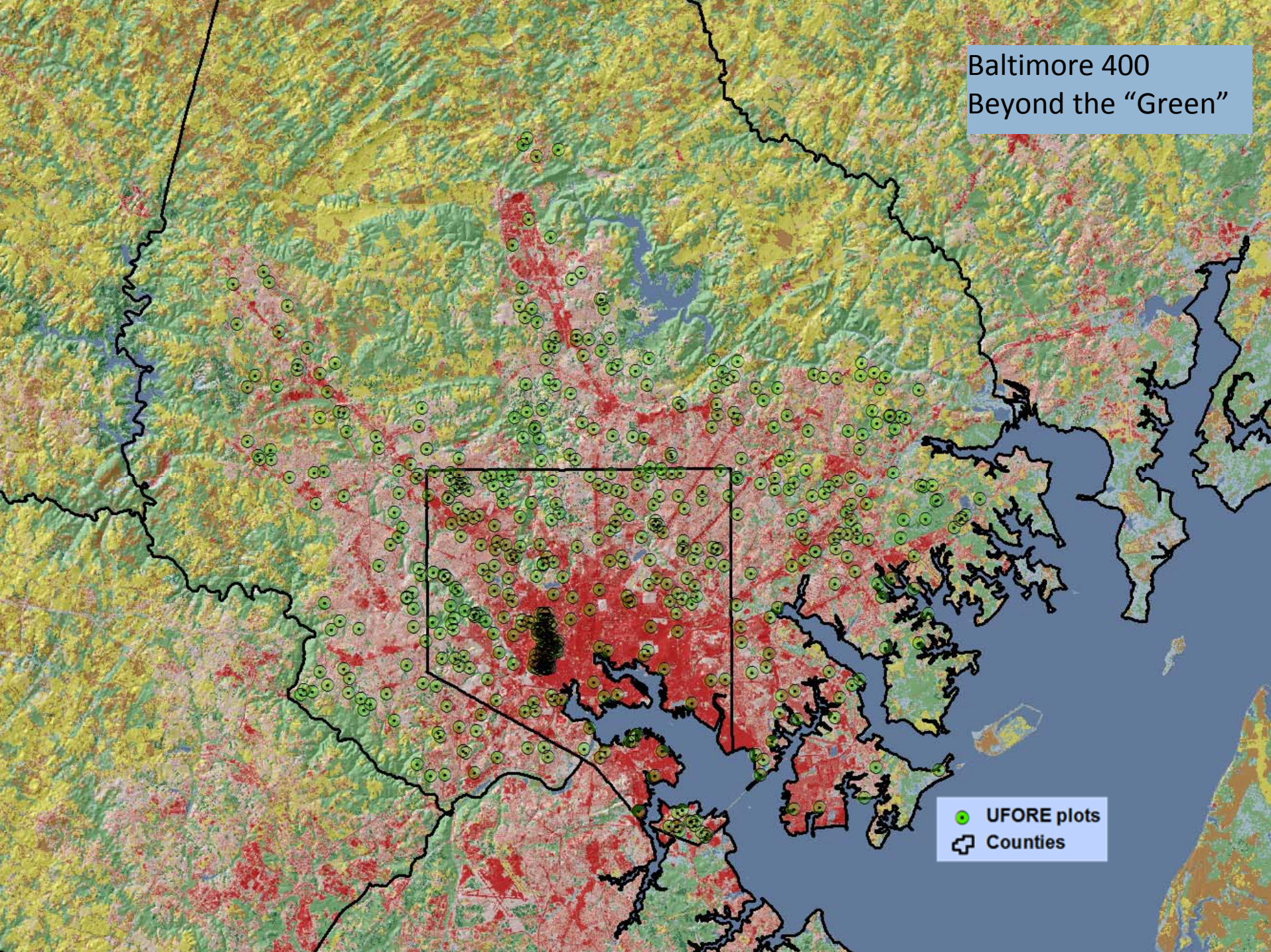
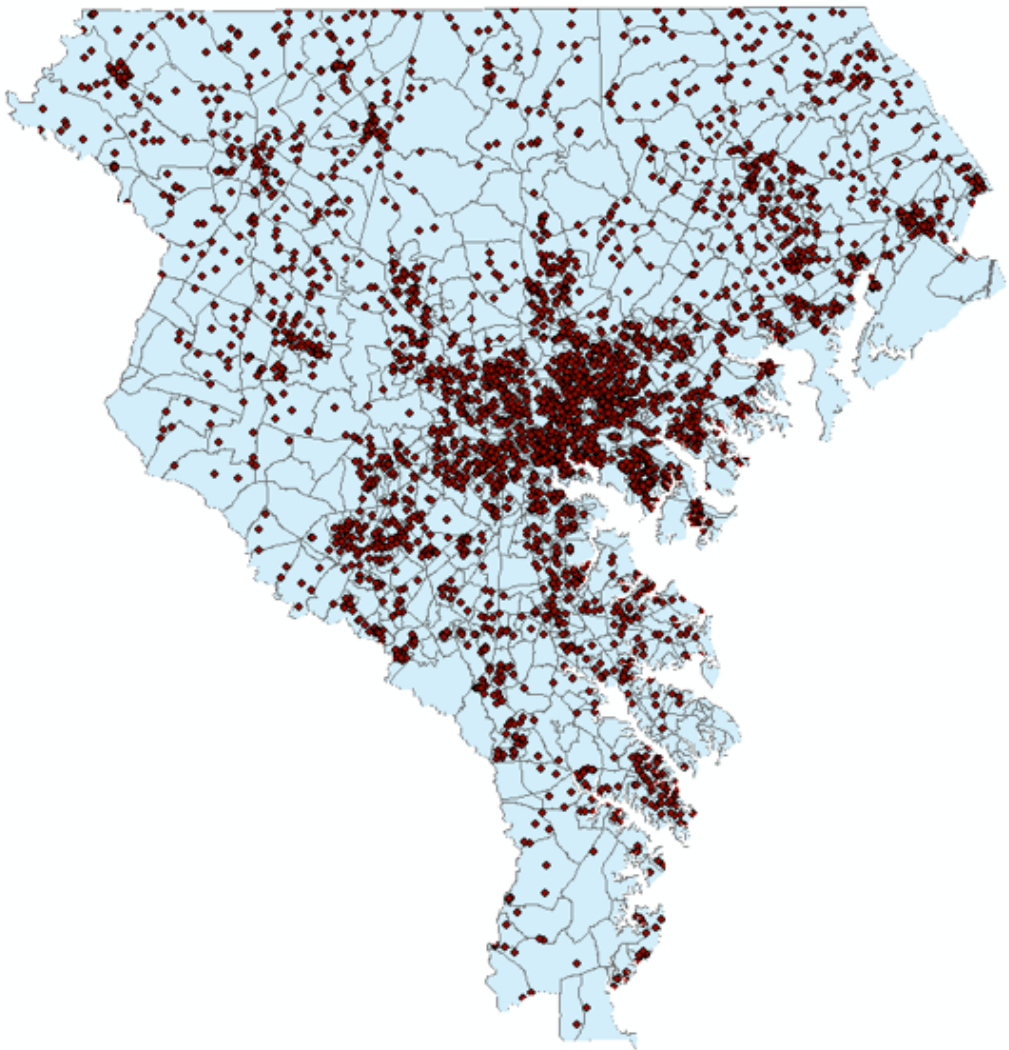
Baltimore Ecosystem Study LTER

- Est. 1997: Long-Term Ecological Research (LTER)
- Structure and process in urban ecosystem
- Use of ecological information
- Member institutions
  - Cary Institute
  - USDA Forest Service
  - University of Maryland, Baltimore County
  - Parks & People Foundation
  - Listing at http://beslter.org/


BES plots
Stream sites
Met stations
Watersheds
Counties
Rivers

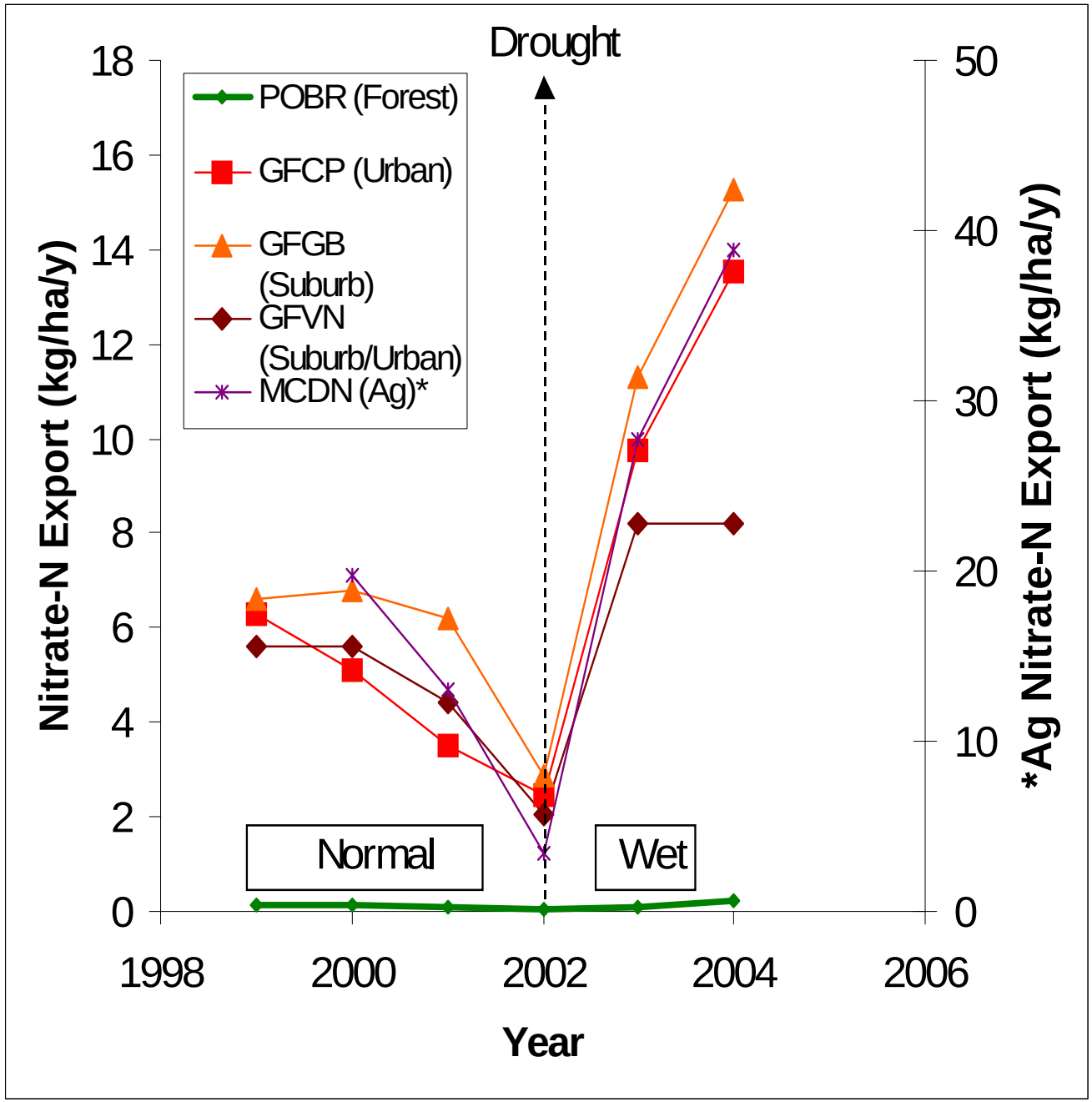

Baltimore 400
Beyond the “Green”
UFORE plots
Counties

Geo-coded Social Survey



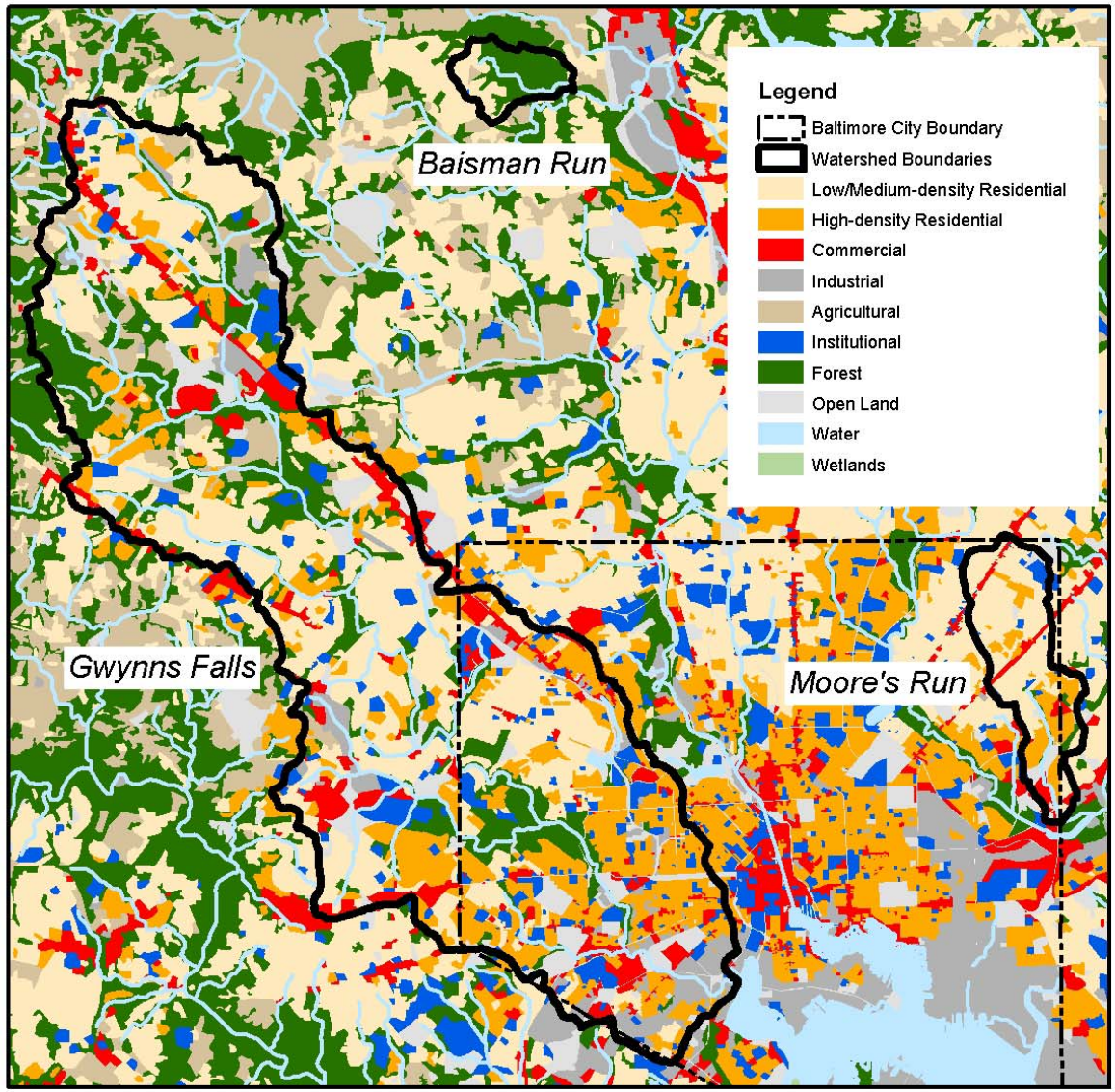
n = 3316

Watershed Processes

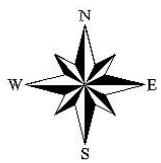


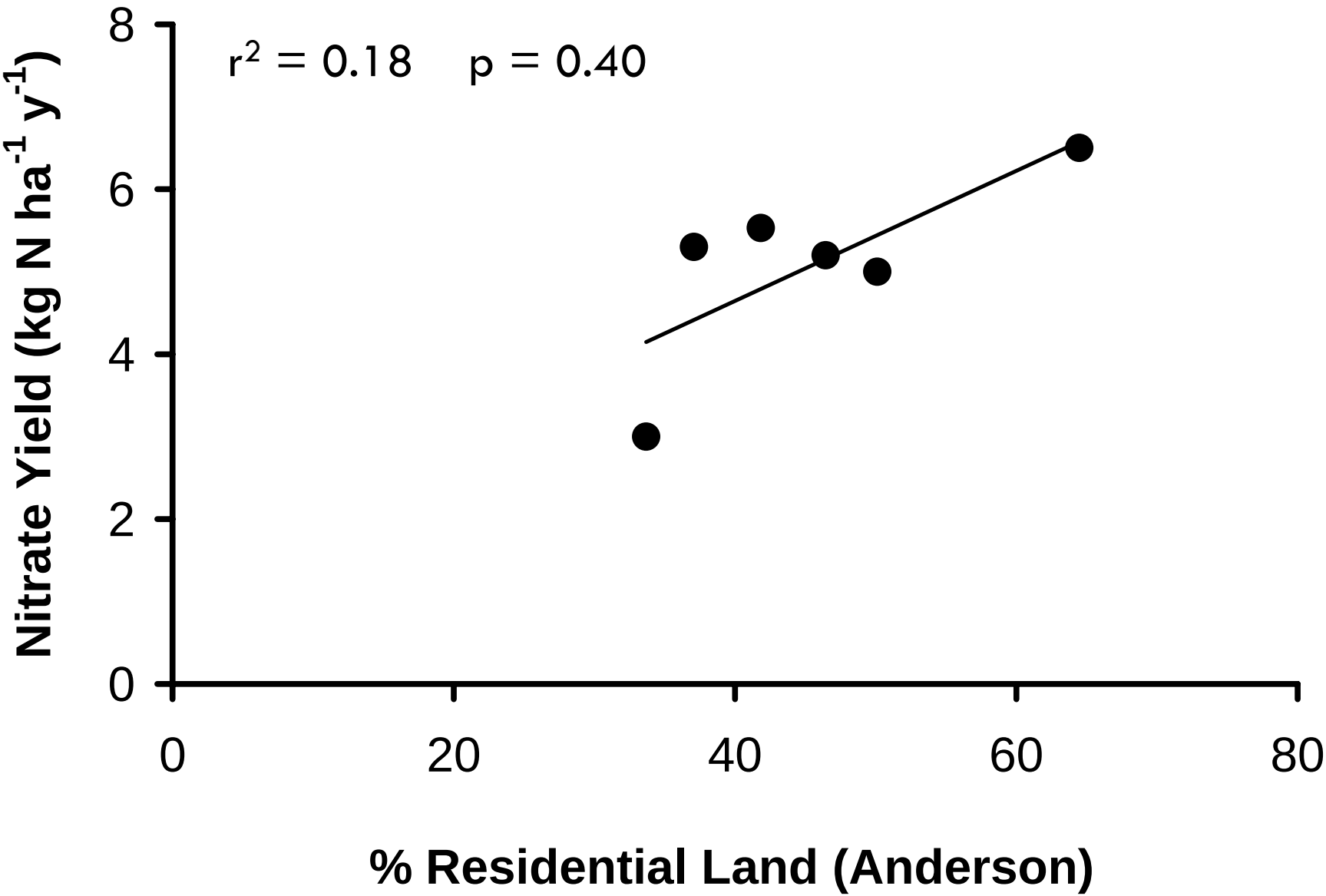
Source: Kaushal et al. (2008)

Land Use



Source: Maryland Department of Planning, 2000

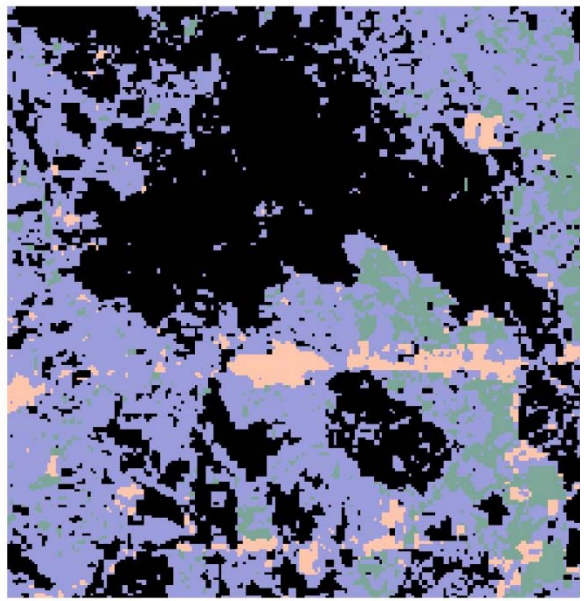



$r^2 = 0.18$ p = 0.40
Nitrate Yield (kg N ha^{-1} y^{-1})
8
6
4
2
0
0
20
40
60
80
% Residential Land (Anderson)

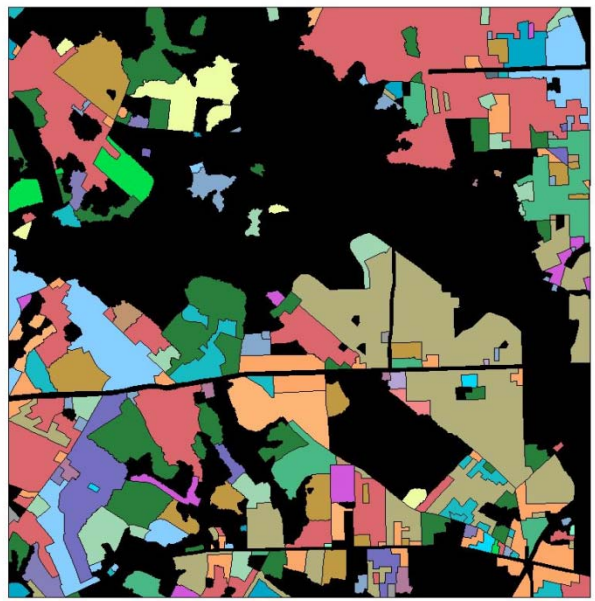
Needs:

More biophysical sample locations

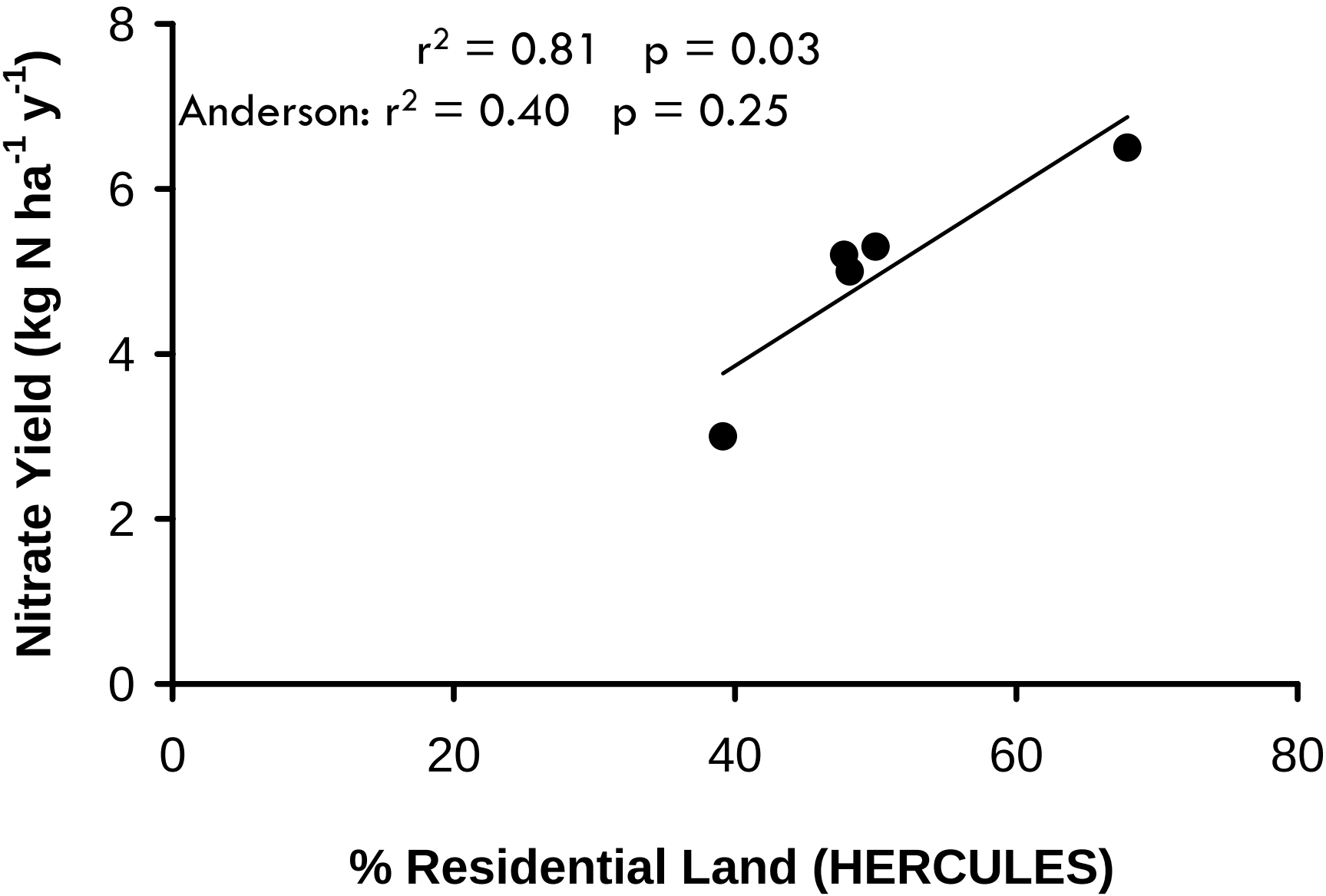
Refined classification

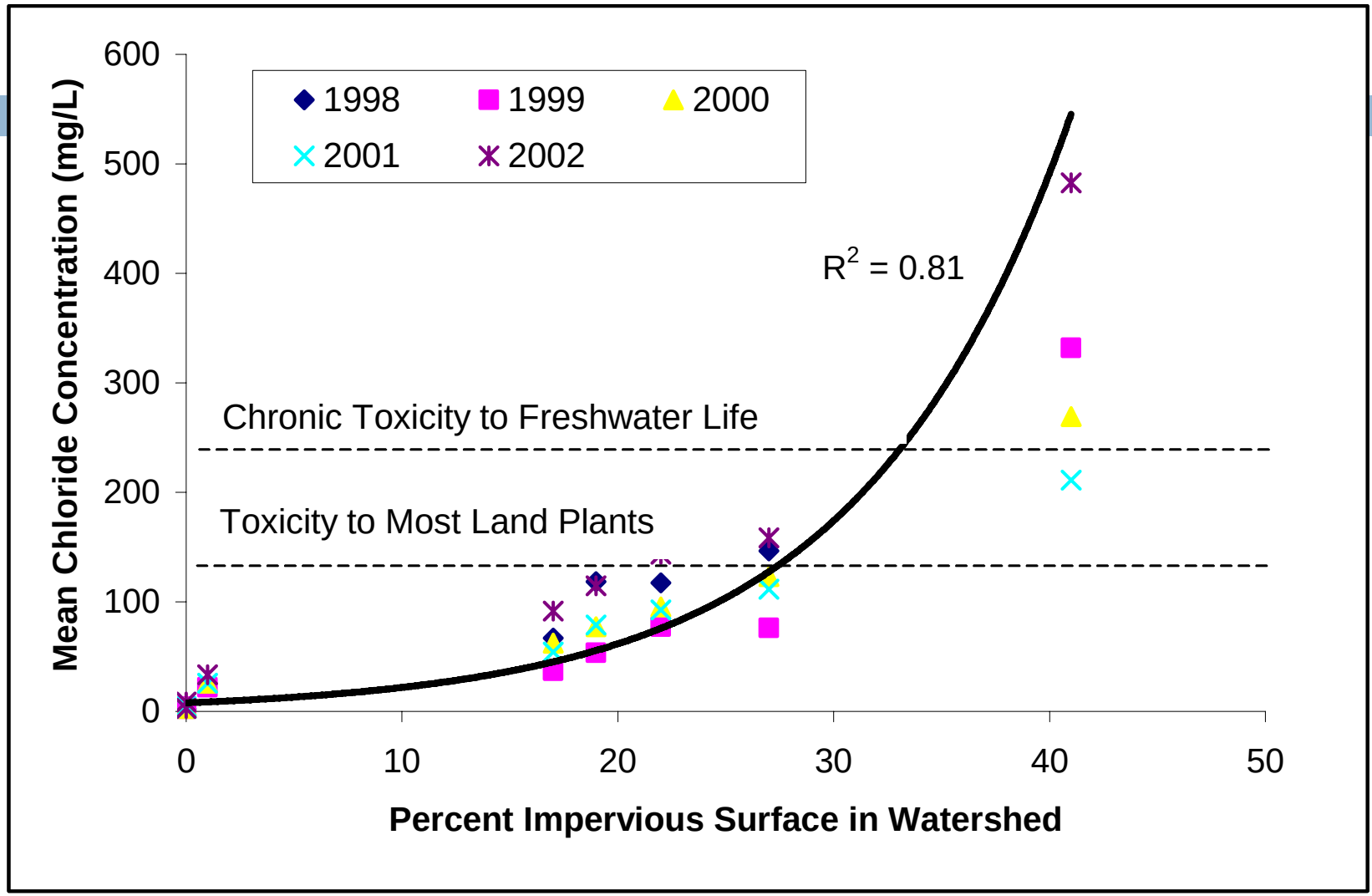


MRLC 1999



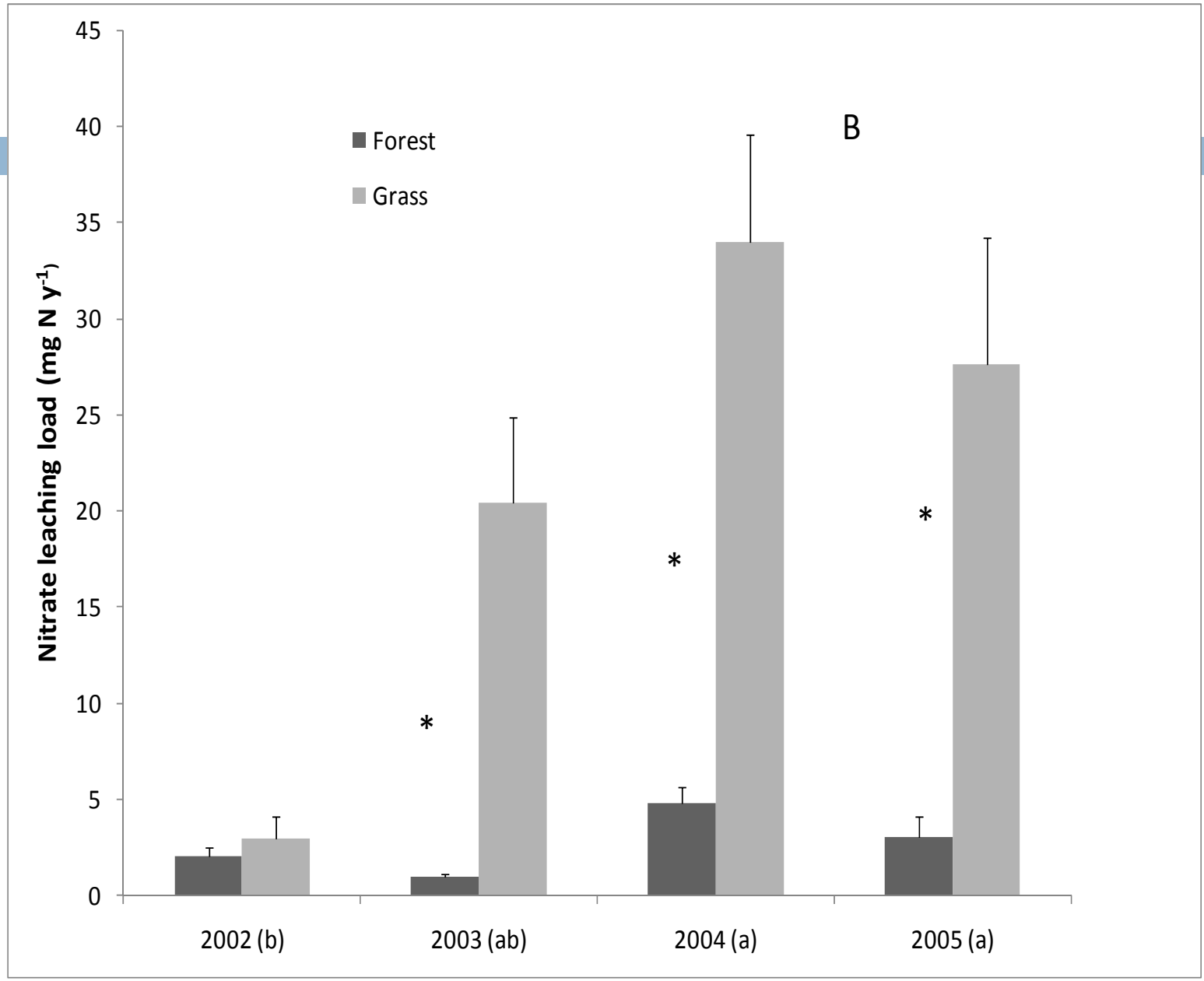
Cadenasso et al. 2007


$r^2 = 0.81$ $p = 0.03$
Anderson: $r^2 = 0.40$ $p = 0.25$
Nitrate Yield (kg N ha^{-1} y^{-1})
0
2
4
6
8
0
20
40
60
80
% Residential Land (HERCULES)

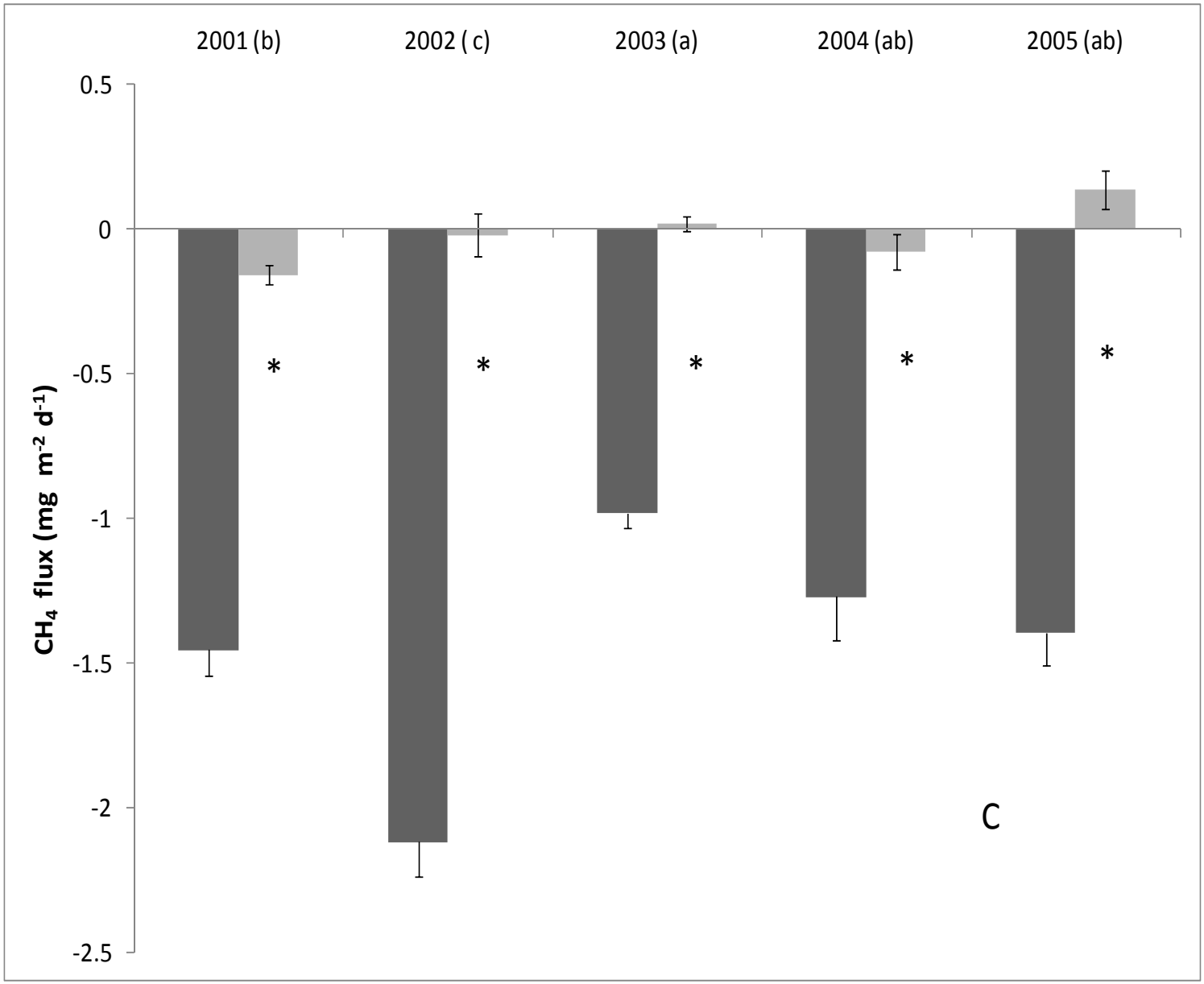

Mean Chloride Concentration (mg/L)
600
500
400
300
200
100
0
1998
1999
2000
2001
2002
R^2 = 0.81
Chronic Toxicity to Freshwater Life
Toxicity to Most Land Plants
0
10
20
30
40
50
Percent Impervious Surface in Watershed

Kaushal

Landscape Processes



Groffman et al. (2009)



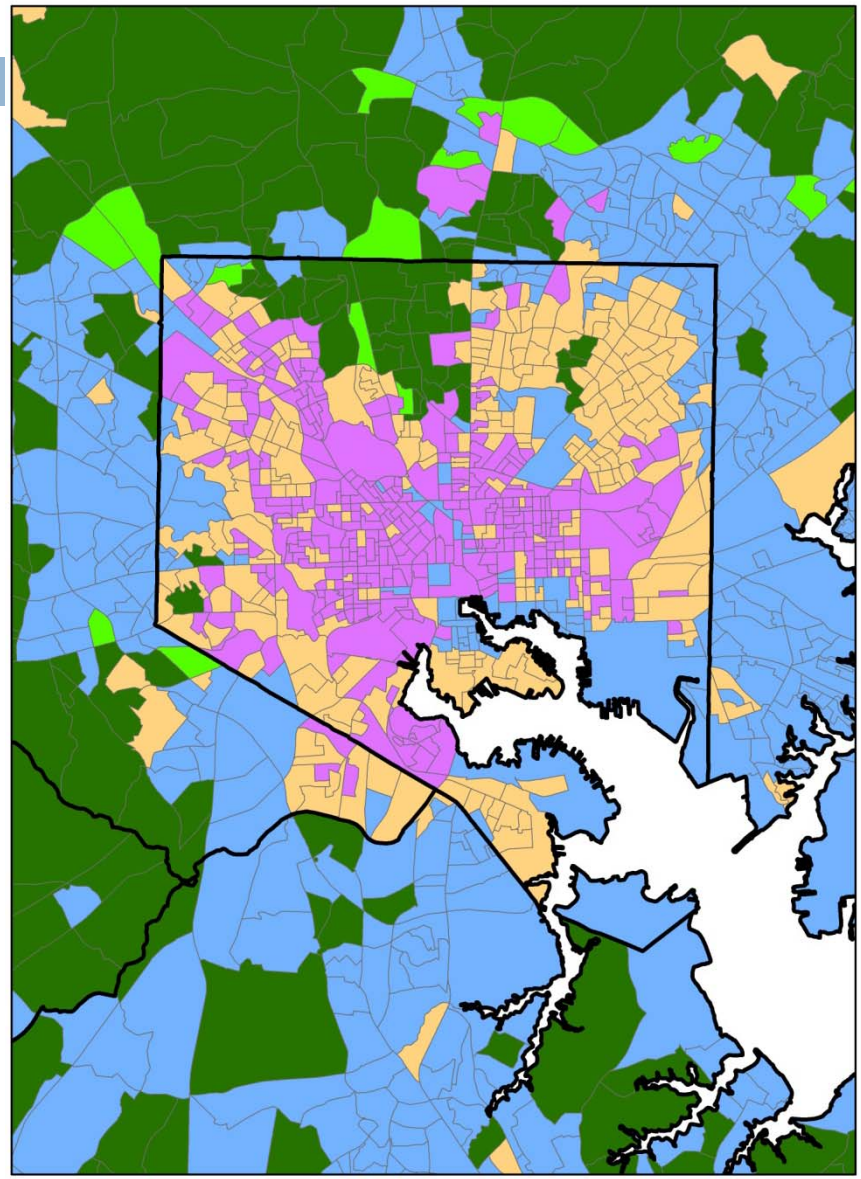
Source: Groffman and Pouyat (2009)

Social and Natural Capital

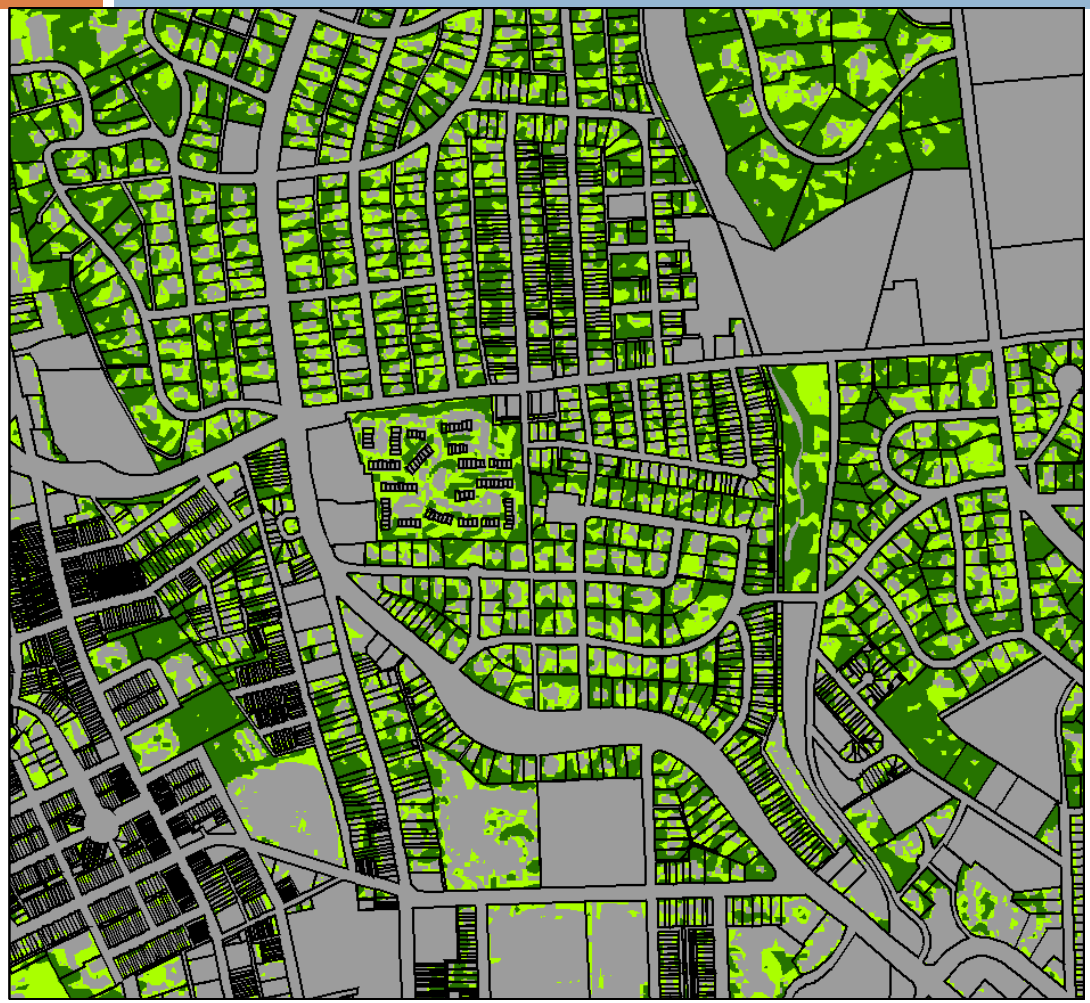
Variables

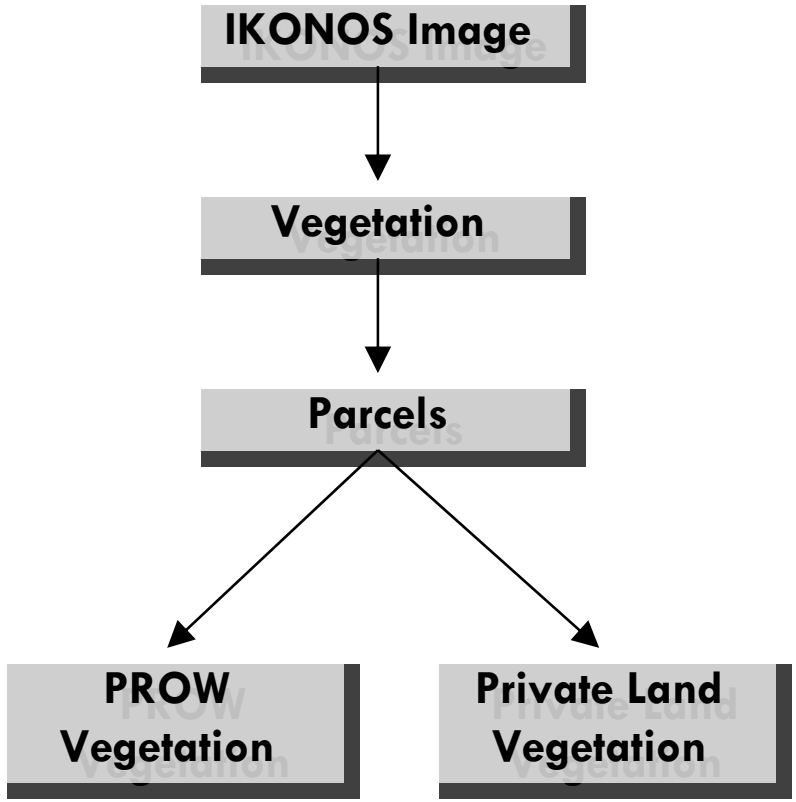
- % Canopy Cover
- Social Capital
  - Neighborhood collective action
- Willingness to Volunteer
- Move Away

Cluster (count)	**Variable**			
	Canopy	Capital	Volunteer	Move
1 (533)	38%	75%	51%	27%
2 (560)	15%	66%	50%	52%
3 (111)	30%	82%	45%	21%
4 (354)	1%	54%	58%	57%
5 (311)	5%	56%	41%	55%

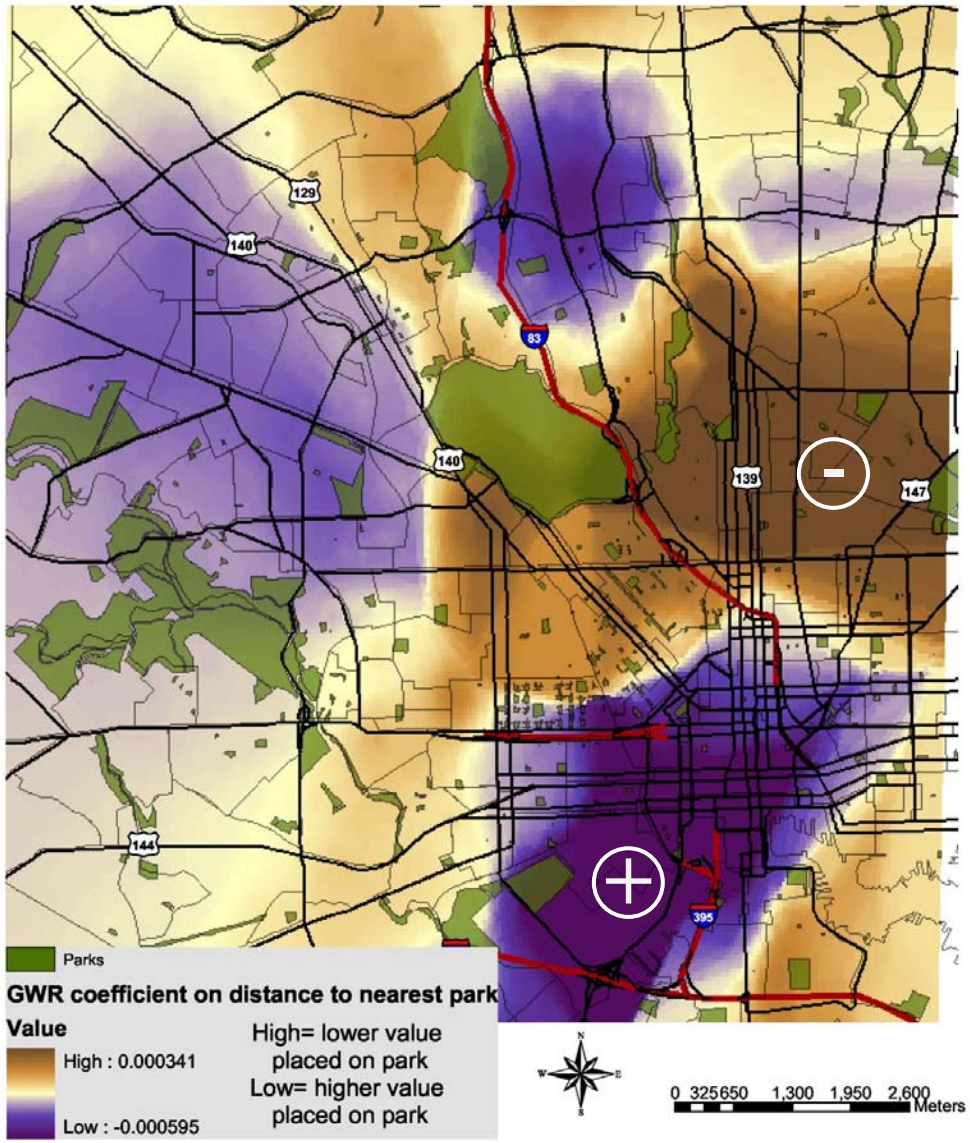


Property Regimes & Parcels





Parks and Property Values



Sustainability Efforts

- Maryland Office for Sustainable Futures
- Baltimore County Office of Sustainability
- Baltimore City Sustainability Plan

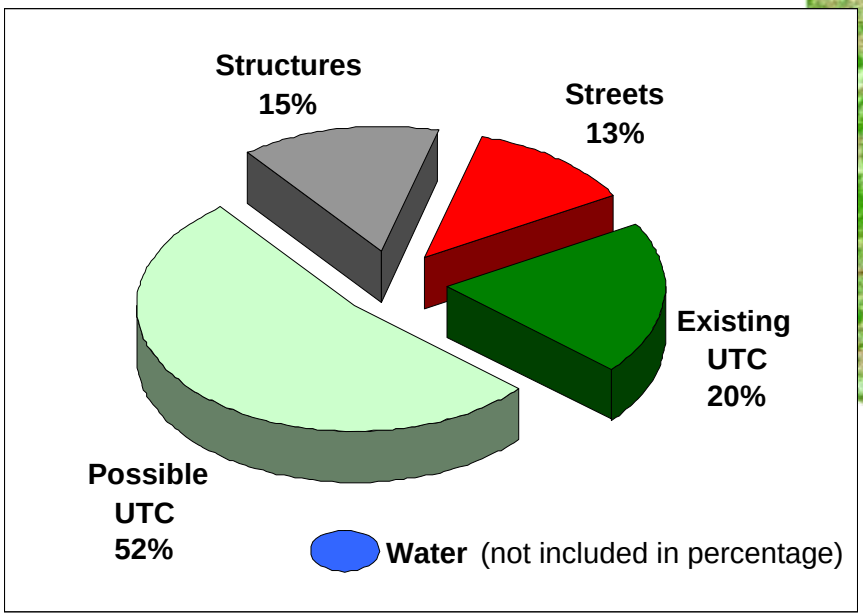
Baltimore City Sustainability Plan

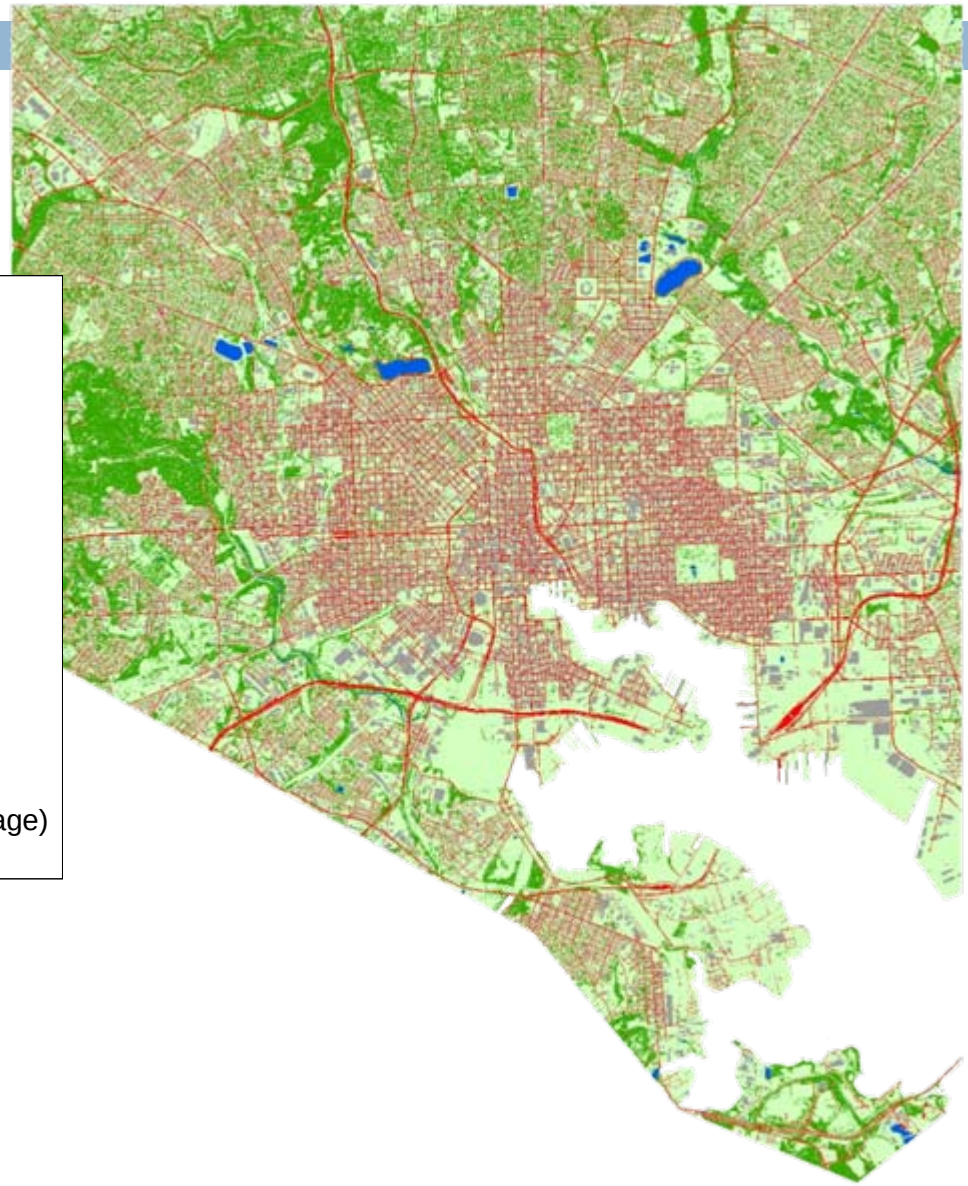
- Cleanliness
- Pollution prevention
- Resource conservation
- Greening
- Transportation
- Education and awareness
- Green economy
- http://www.baltimorecity.gov/government/planning/sustainability/

Greening Goals (Strategies)

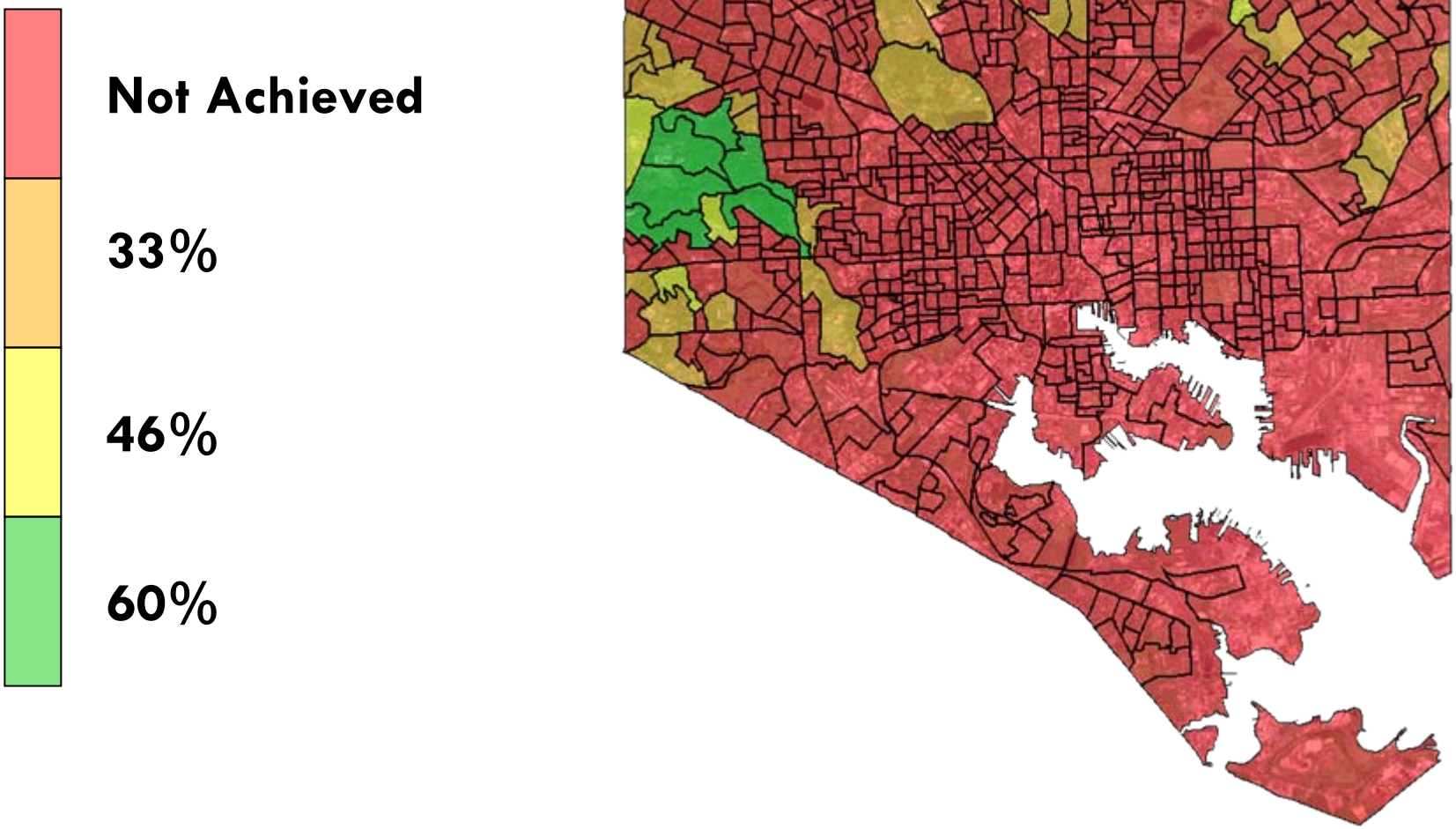
- Double Baltimore's tree canopy by 2037 (7)
- Establish Baltimore as a leader in sustainable food systems (6)
- Provide safe, well maintained public recreational space within ¼ mile of all residents (3)
- Protect Baltimore's ecology and biodiversity (5)

Current Canopy (UTC)





Block Group Goals – Existing UTC



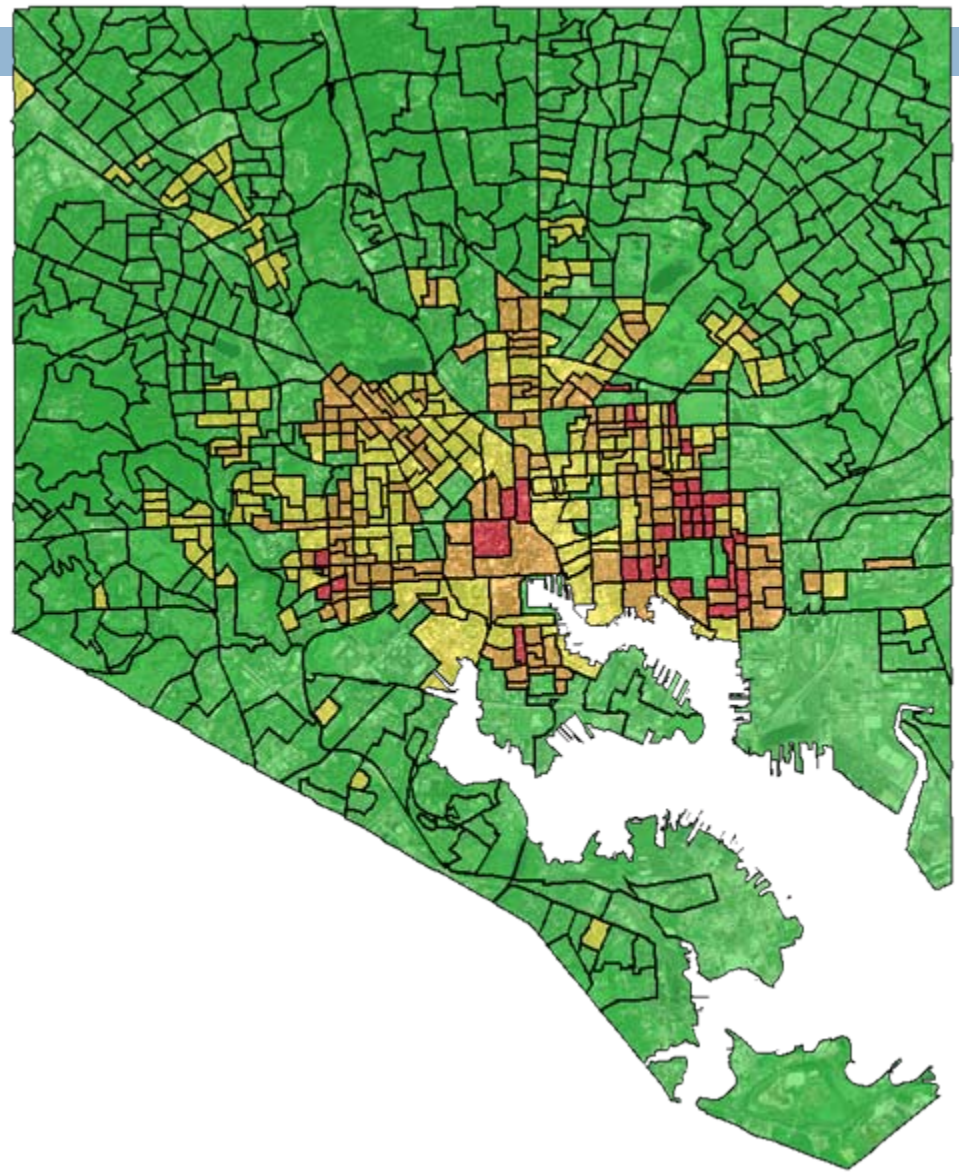
Block Group Goals: Existing & Possible UTC

Not Achievable

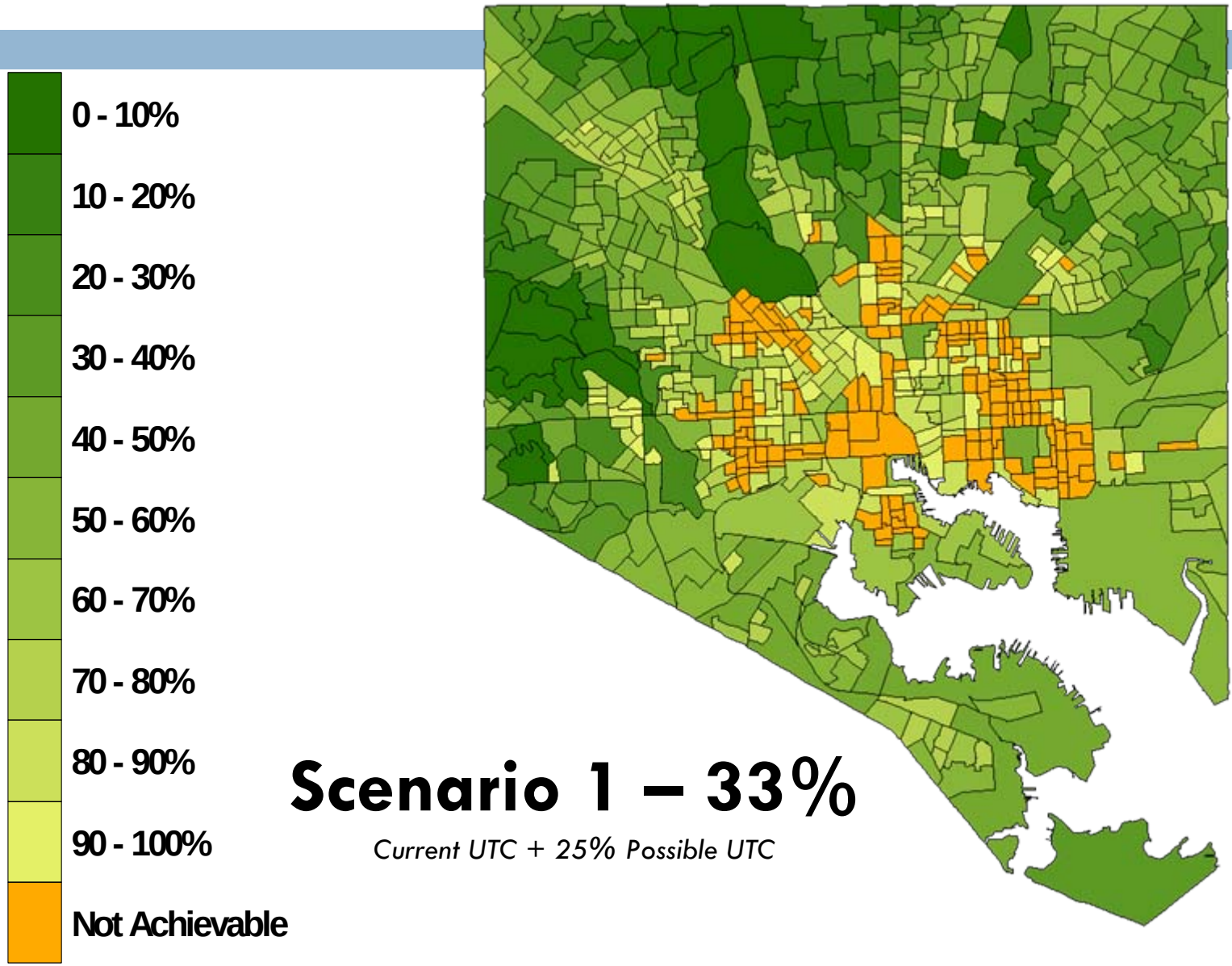
33% *Existing + All Possible*

46% *Existing + All Possible*

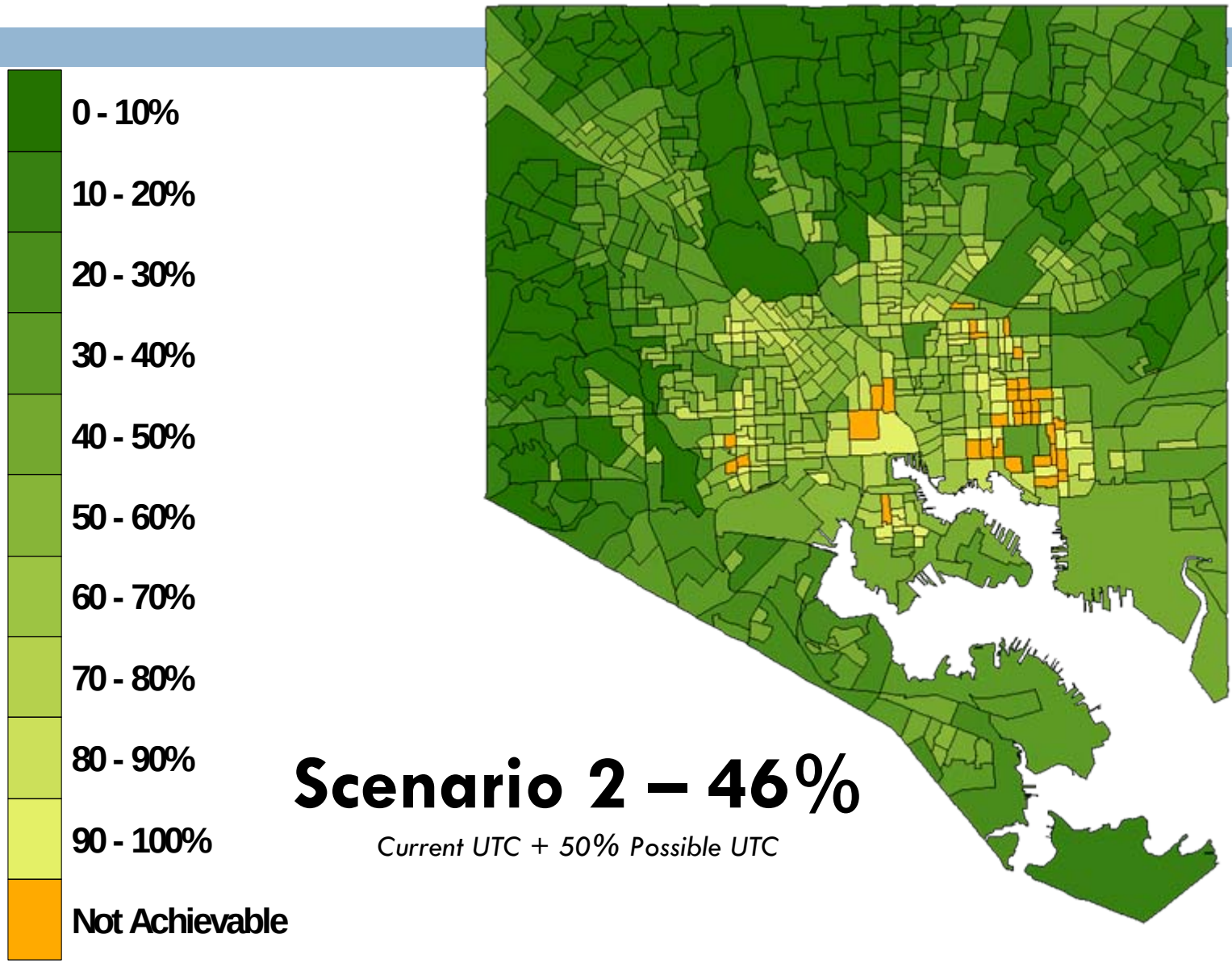
60% *Existing + All Possible*



Percent Possible Canopy to Achieve Goal



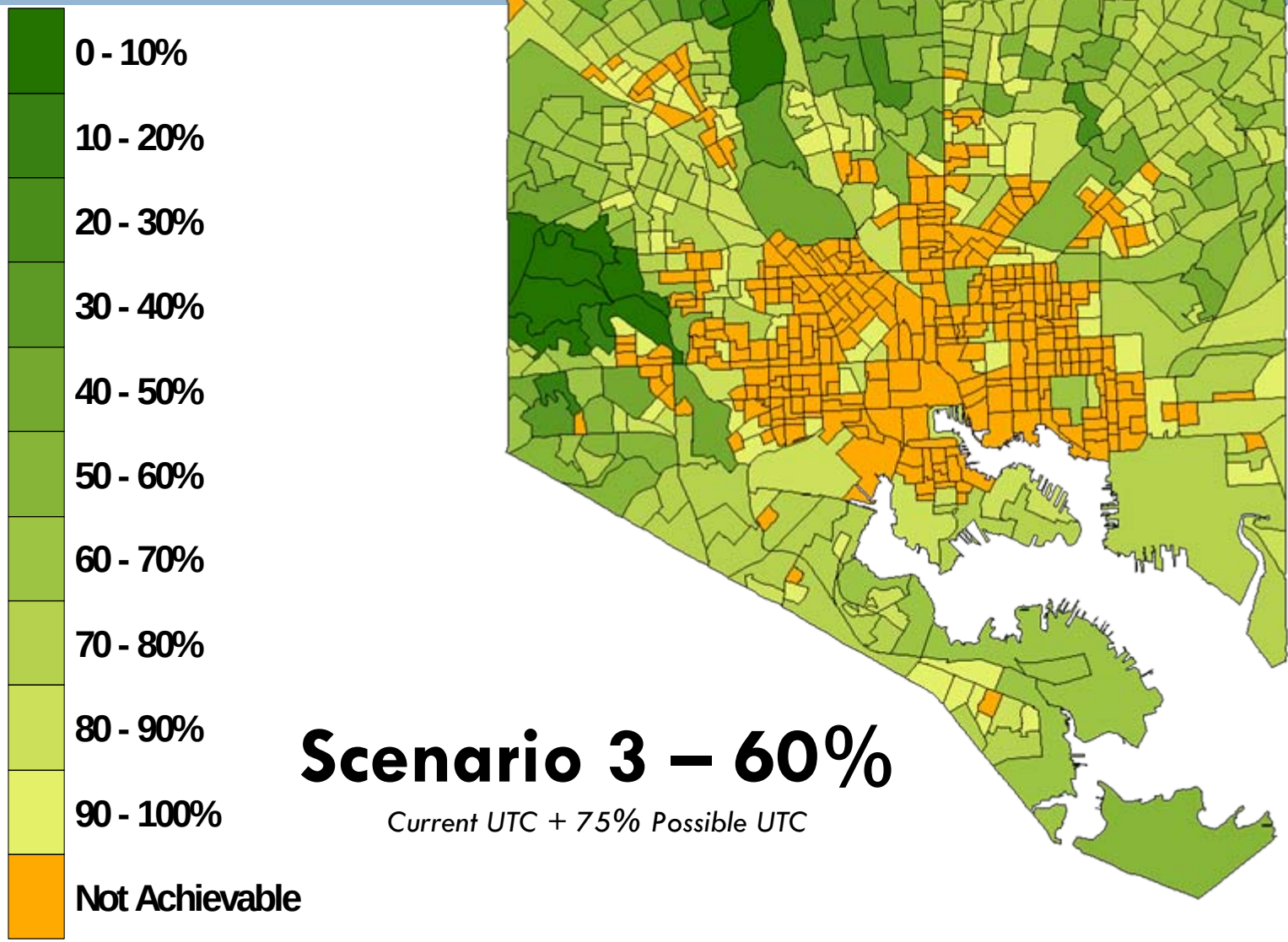
Percent Possible Canopy to Achieve Goal



Scenario 2 – 46%

Current UTC + 50% Possible UTC

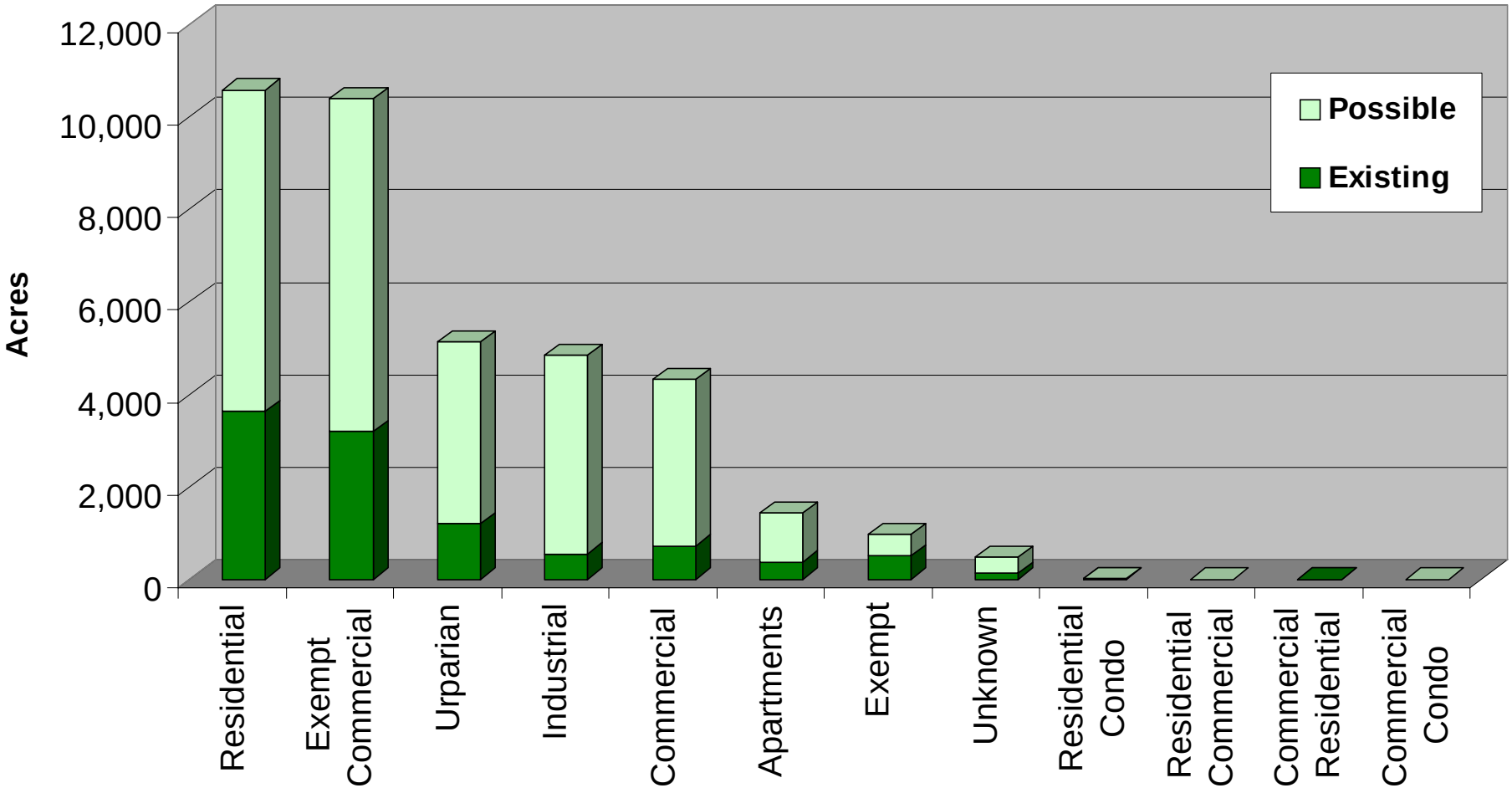
Percent Possible Canopy to Achieve Goal



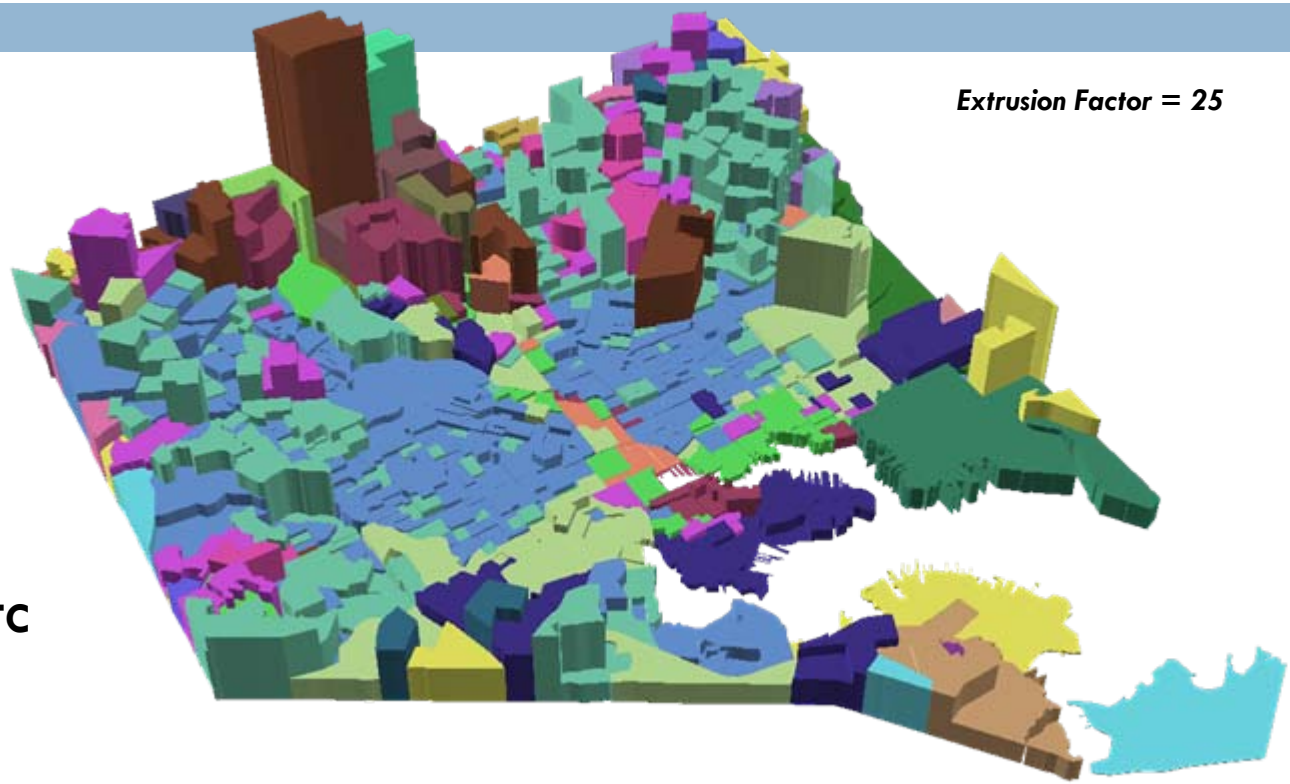
Scenario 3 – 60%

Current UTC + 75% Possible UTC

Existing and Possible by Land Use



Possible UTC & Lifestyle



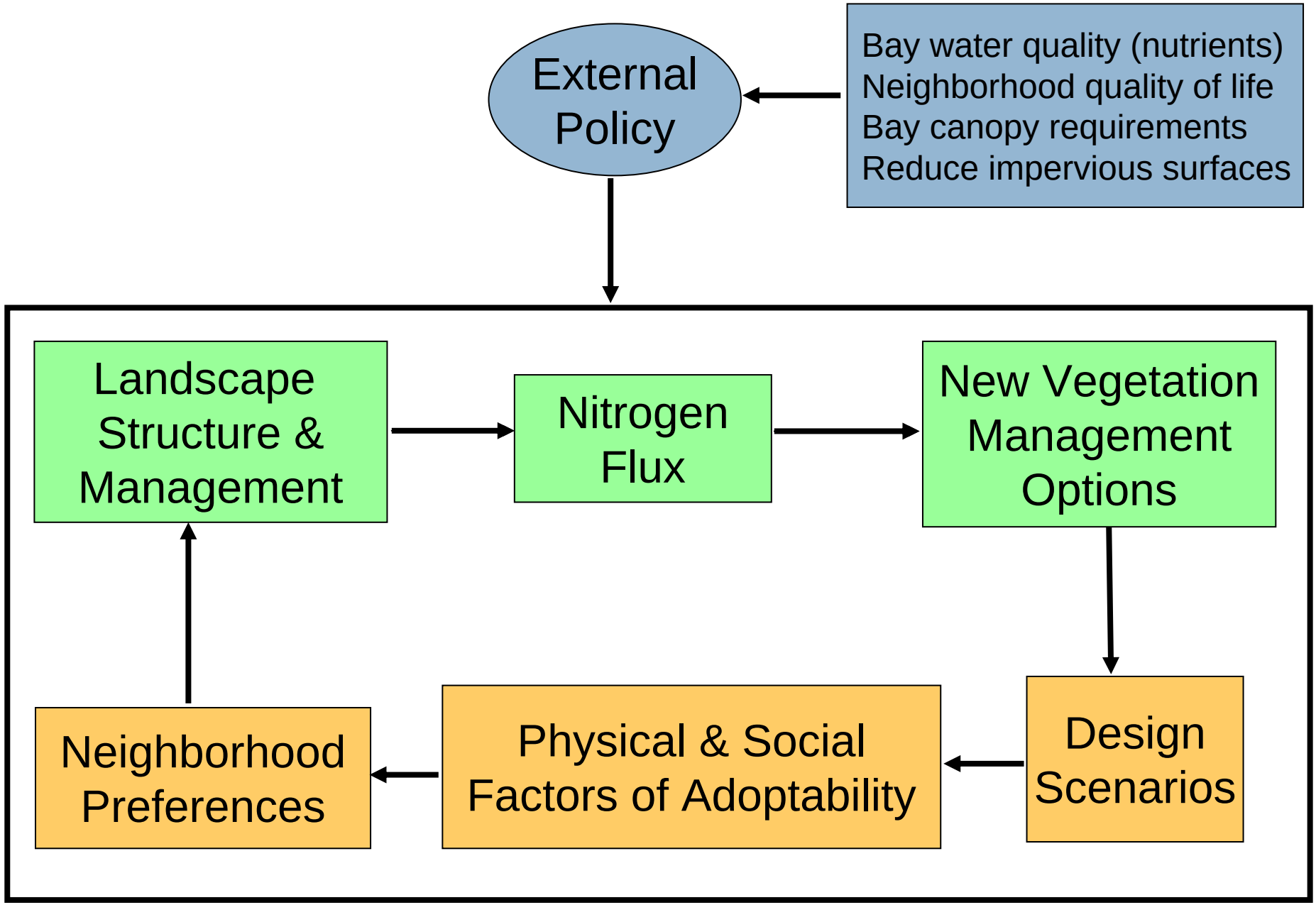
Area of Residential Possible UTC by Block Group

PRIZM 62 Lifestyle Classification

- American Dreams
- Big City Blend
- Blue Blood Estates
- Blue-Chip Blues
- Bohemian Mix
- Fmaily Scramble
- Gray Collars
- Gray Power
- Hometown Retired
- Inner Cities
- Mid-City Mix
- Military Quarters
- Mobility Blues
- Money & Brains
- New Beginnings
- New Empty Nests
- Old Yankee Rows
- Pools & Patios
- Single City Blues
- Smalltown Downtown
- Southside City
- Suburban Sprawl
- Towns & Gowns
- Upstarts & Seniors
- Urban Achievers
- Urban Gold Coast
- Winner's Circle
- Young Influentials
- Young Literati

Neighborhood Greening

Outcomes?


External Policy
Bay water quality (nutrients)
Neighborhood quality of life
Bay canopy requirements
Reduce impervious surfaces
Landscape Structure & Management
Nitrogen Flux
New Vegetation Management Options
Design Scenarios
Physical & Social Factors of Adoptability
Neighborhood Preferences

Conclusions

- BES platform for scenario modeling
- Existing: Focused greening scenarios
- Linkage with state and municipal sustainability
- Linkage with local communities
- Indicators:
  - Watershed processes
  - Land cover processes
  - Social cohesion
- Planned scenarios: land cover & locational choice models
- Sources: Administrative, commercial, LTER
- Gap: Fine scale, extensive biogeophysical data