The Relevance of Distance and Accessibility to The Study of Voting

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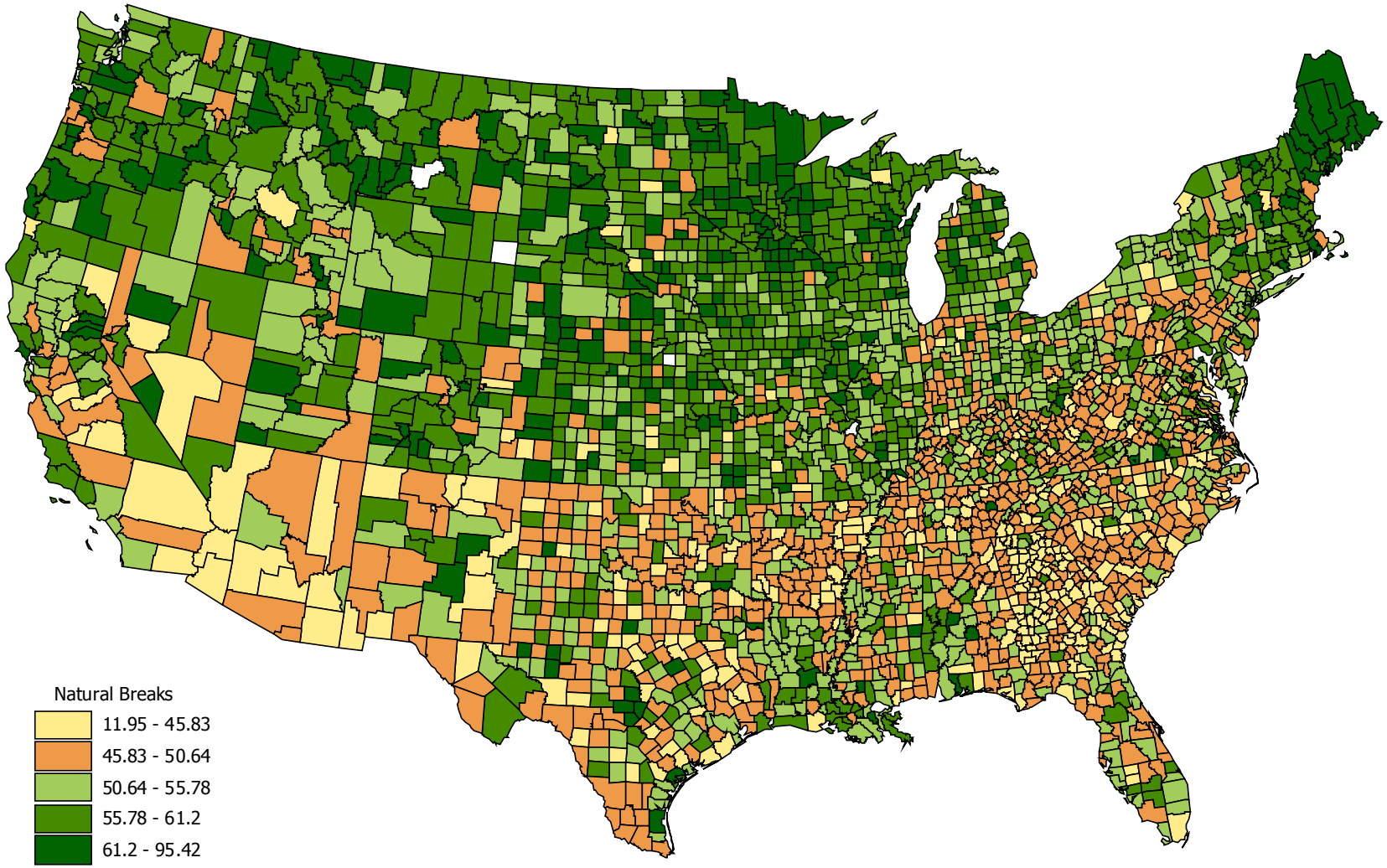
U.S. Voter Turnout is Low

- 49% in 1996
- 51% in 2000

Why does this matter?

Raises questions about representation and legitimacy of policy outcomes



Map 1. Voter Turnout in the 2000 Presidential Election, by County in the 48 Contiguous States

Reasons for Low Participation

- Low motivation and interest.
- Lack of awareness, civic education.
- High levels of cynicism.
- One-sidedness of elections.
- Absence of effort by parties and candidates.
- Various barriers to voter registration.
- Voting place hours
- Election day is a workday for most people
- Distance and accessibility of polling places.

Remedies 1: Motivation

- More and better civic education.
- Draw districts that promote political competition.
- Change campaign funding rules to promote competition, diminish incumbency advantage.

Remedies 2: Convenience

- Ease voter registration requirements.
- Move election day to a weekend. Also, early voting.
- More polling places.
- Vote by mail, internet voting.
- Provisional voting.

Accessibility and Convenience

- How much motivation and interest should someone be required to have? Hard to say.
- Some will not vote even if voting is easy.
- Others will vote in spite of substantial inconvenience.
- Still, for some, the costs of getting to and from a polling place on a busy weekday are decisive.

People Burdened by Distance to Polling Places

- Voters of Marginal Interest and Motivation.
- Young Voters, age 18-29.
- Single Parents.
- Long Distance Commuters.
- Those Without Private Transportation.

Concept of Accessibility

- Reciprocal of the costs of moving people and goods between points in space.
- Goal: use a general measure of accessibility in statistical models predicting turnout in precincts.

- $P_i = \Sigma S_j / d_{ij}^2$

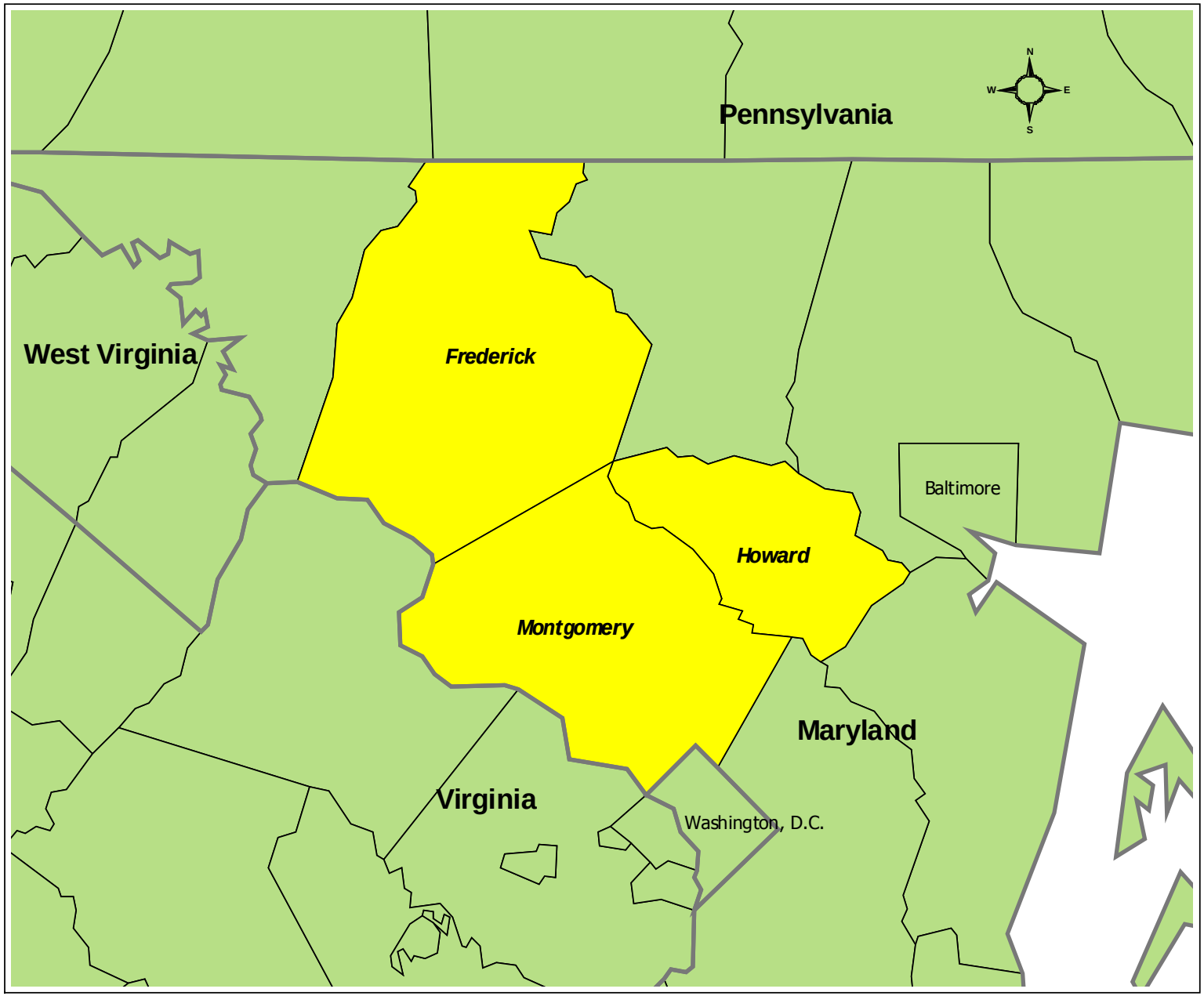
- Typically, above gravity model is used for multiple origins or multiple destinations or both (Kwan 1998; Haynes and Fotheringham 1984; Fotheringham and O'Kelly 1989).

Single Origin, Single Destination

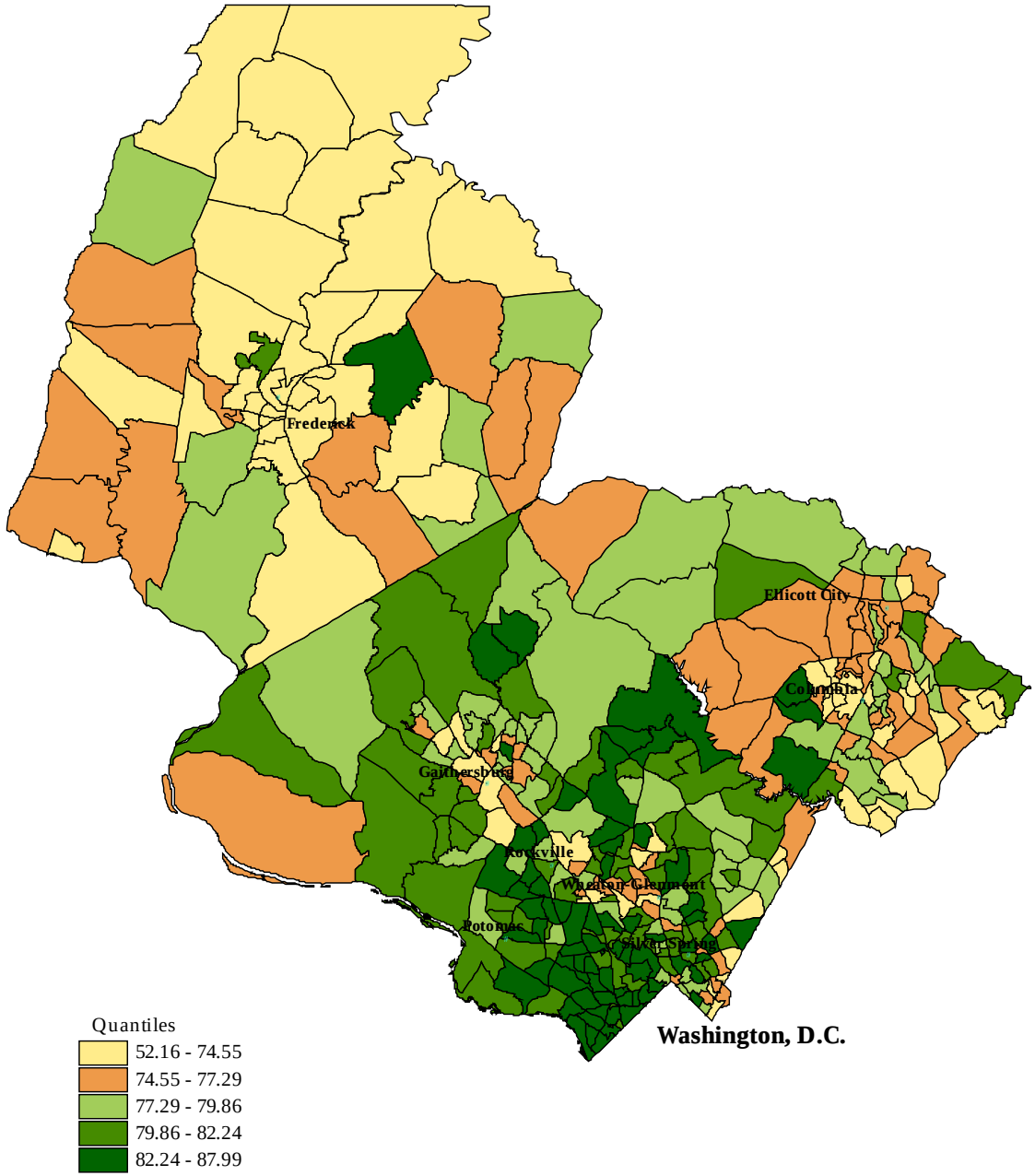
- $A_i = 1/d_{ij}$
- Inverse of the distance from precinct polling site *i* and population centroid of precinct *j*.
- $A_i = 1/d_{ij}^2$
- Distance decay, helps us specify non-linearity in the effect of accessibility (distance) on voter turnout.
- We also consider residential density as general impedance measure.

Other Precinct Characteristics to Consider

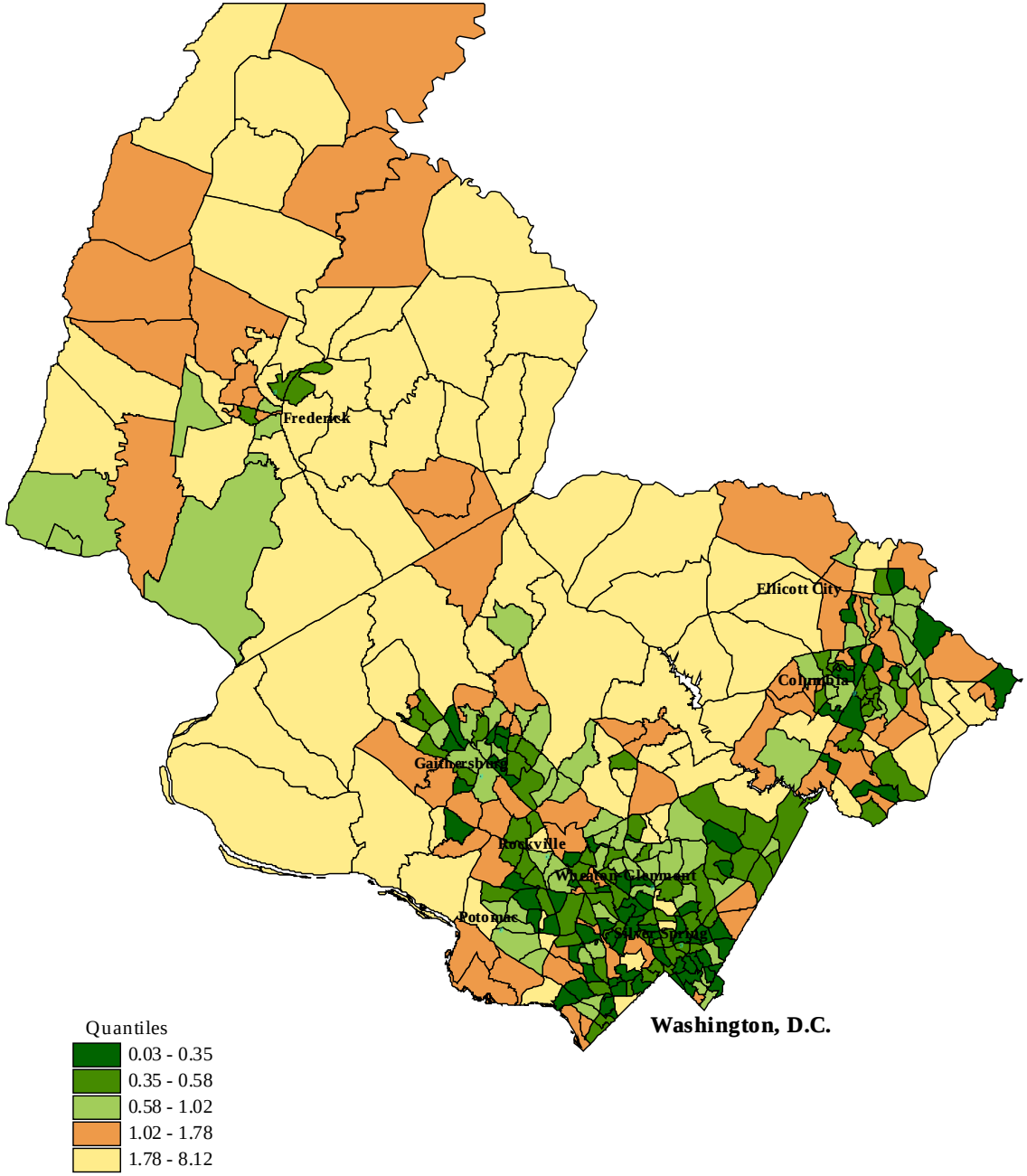
- Education Level of Residents.
- Percentage of Single Parent Households.
- Percentage of Young Voters.
- Percentage of Residents New to their Precinct.
- Turnout Levels in Adjacent Precincts (Spatial Dependence).



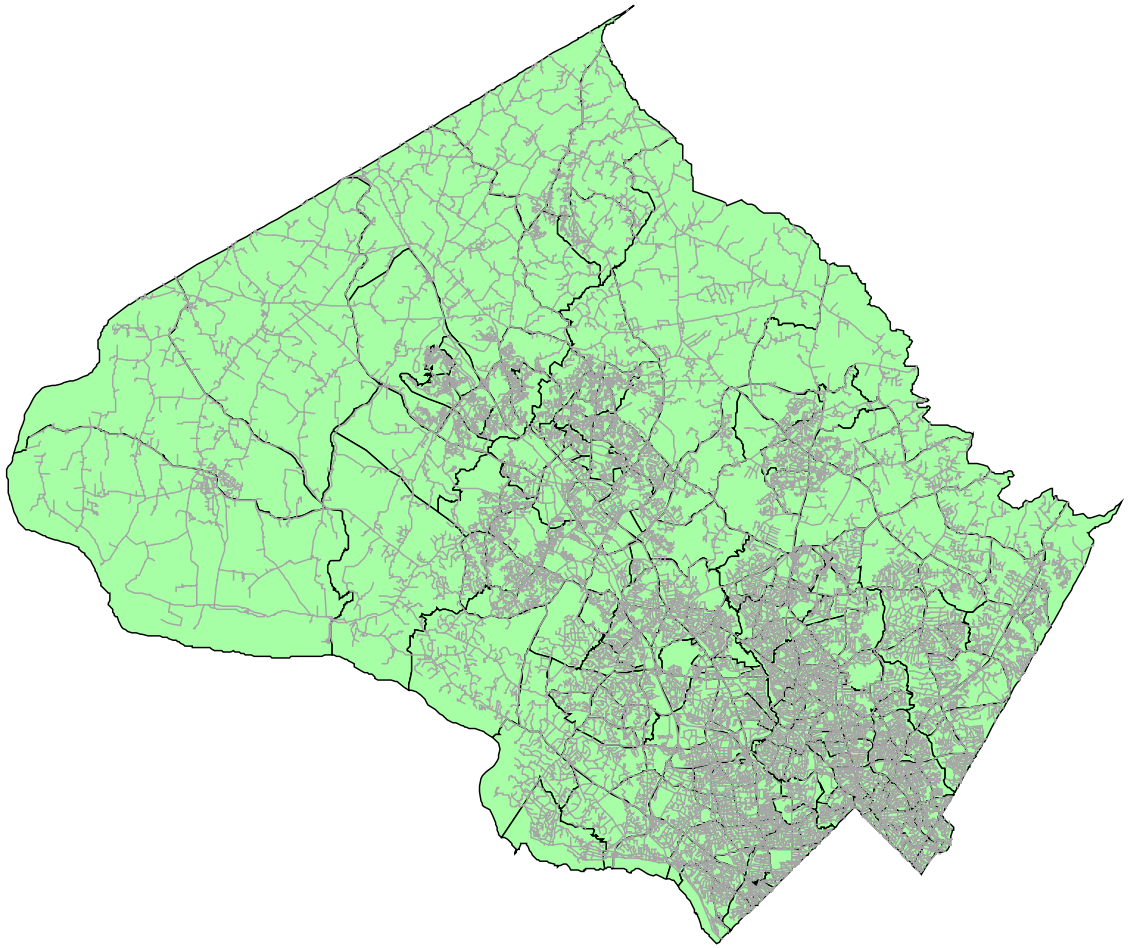
Map 1. Location of Three Maryland Suburban Counties Relative To Washington, D.C. and Other States



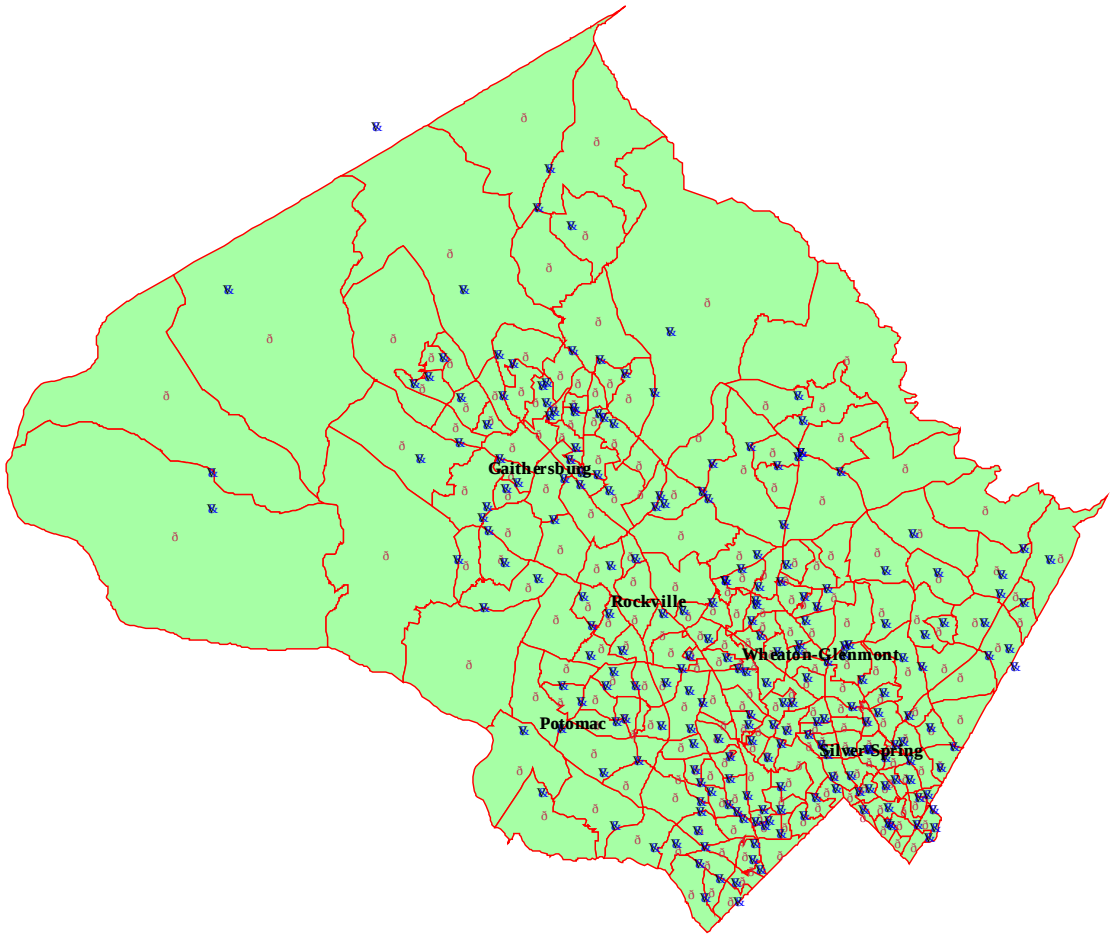
Map 2. Voter Turnout as Percent of Registered Voters in Three Suburban Maryland Counties, by Precinct
Moran's I=.44



Map 3. Distance to and from Precinct Sites in Three Maryland Counties



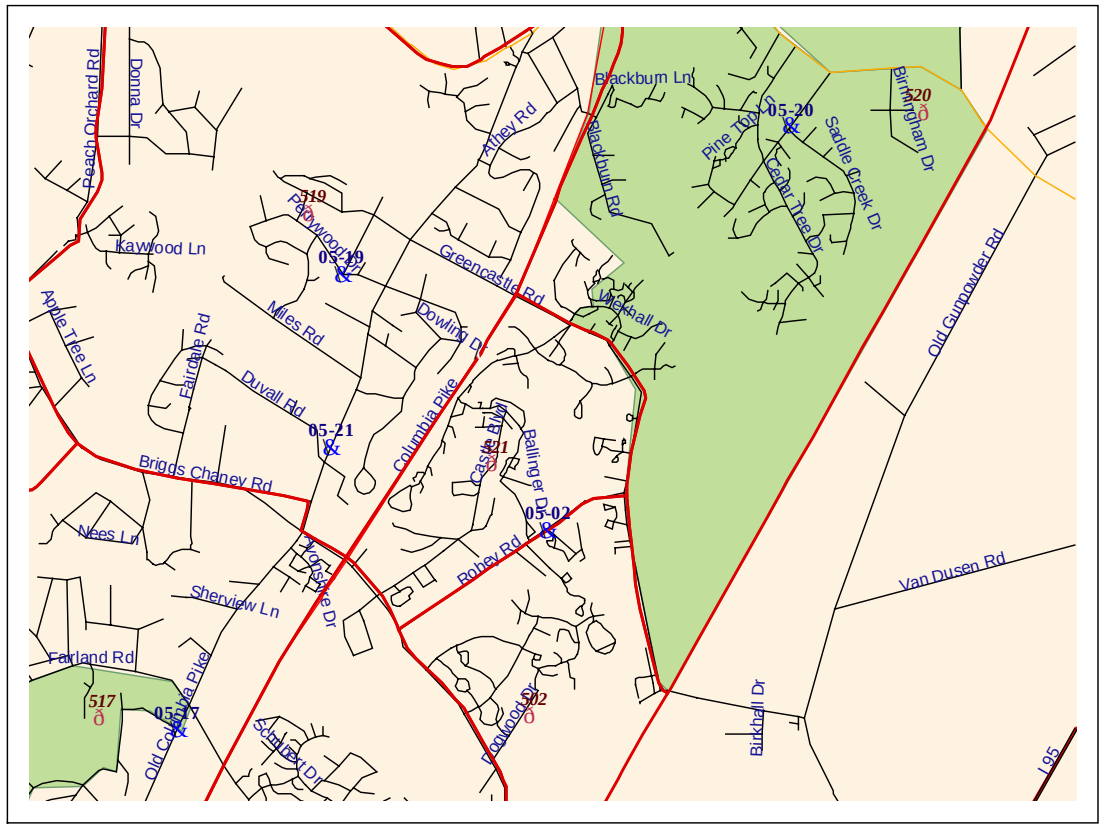
Map 4. Road Network Density in Montgomery County, Maryland



Map 5. Precinct Sites vs. Precinct Centroids in Montgomery County, Maryland

Measures of Distance

- Euclidean = $d_{ij} = \text{Sqrt}[(x_i - x_j)^2 + (y_i - y_j)^2]$
- Manhattan Block $d_{ij} = |x_i - x_j| + |y_i - y_j|$
- Network or route distance



& Precinct Sites

ð Precinct Centroids

Map 6. Precinct Sites vs. Precinct Centroids Along U.S. Route 29
in Montgomery County, Maryland

Statistical Model of Turnout

- Why do the statistical analysis?

1. Political science is not much interested in specific sites. We usually ask for a more general picture.

2. We want to rule out alternative explanations.

3. We want to test our preferred explanation: accessibility may not be an issue everywhere.

Appropriate Models

- Ordinary Least Squares (OLS):

$Y_i = \beta_0 + \beta_1 X_1 + \varepsilon_i$

Or

Y = XB + e *(in matrix form)*

OLS assumptions may not hold, especially about errors being i.i.d.

Spatially Weighted Regression

- **$Y = \rho Wy + XB + e$**

The above formula adjusts standard OLS model for spatial autocorrelation (Anselin 1988, 34)

ρ is the coefficient of the spatially lagged dependent variable.

W is an N x N spatial weights matrix specifying relationships among units of analysis (precincts).

e is an error with a spatially autoregressive component:

$$e = \lambda We + \mu$$

Table 1. Estimates of the Impact of Accessibility on Precinct Turnout in the 2000 U.S. Presidential Election, Controlling for Related Variables.

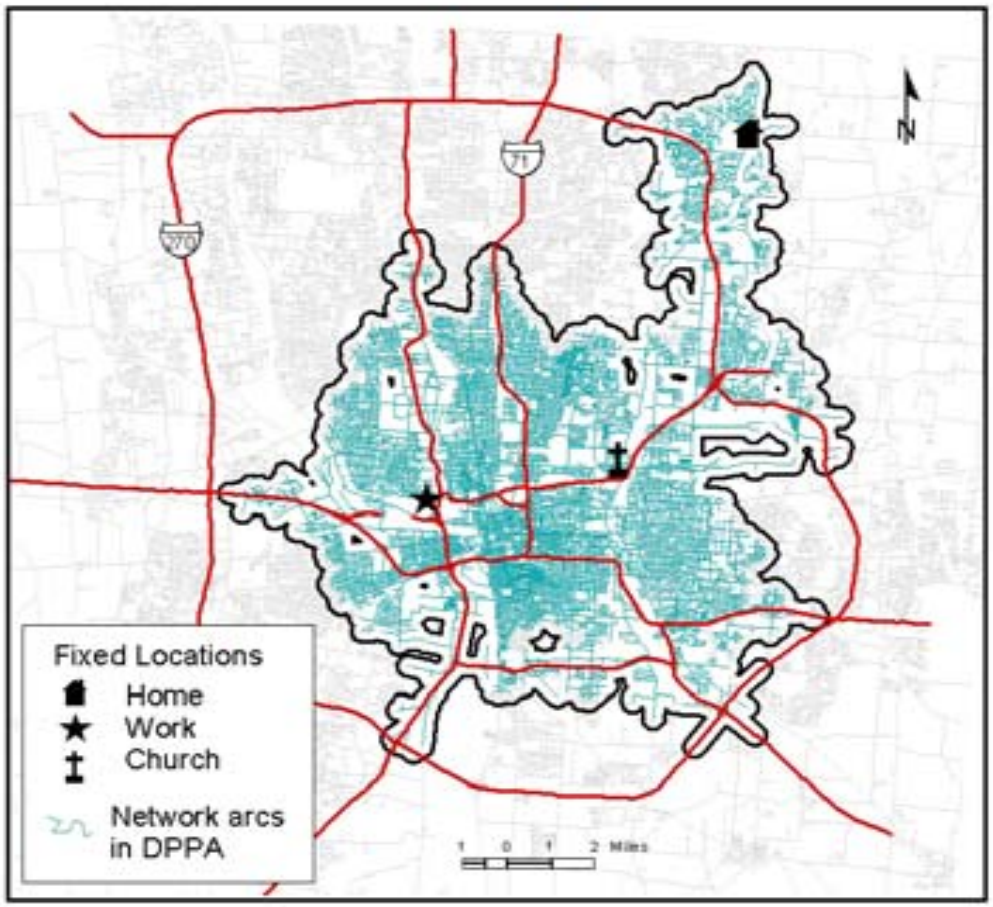
Variable	*Column 1* OLS	*Column 2* Spatial Autoregressive	*Column 3* OLS	*Column 4* Spatial Autoregressive
Constant	76.402 (.432)	14.341 (4.539)	76.966 (.964)	28.098 (4.725)
Spatial Lag of Turnout	--	.811*** (.058)	--	.674*** (.062)
Accessibility (inverse of miles)	1.015*** (.216)	.453*** (.169)	.641*** (.169)	.348*** (.137)
Accessibility (inverse of miles squared)	-.041*** (.010)	-.022*** (.008)	-.022*** (.008)	-.014** (.006)
Residential Density (1000s)	-.022 (.108)	-.185*** (.084)	.017* (.009)	.037 (.072)
% Age 18-29	--	--	-.348*** (.051)	-.318*** (.041)
% Female Headed Households	--	--	-.287*** (.081)	-.309*** (.074)
% Migrants (last five years)	--	--	.036 (.371)	.054* (.033)
Percent with 4 Years College +	--	--	.097*** (.114)	.032*** (.012)
R^2 N= Moran's I for Residuals= Significance level for Moran's I=	.062 363 .047 p≤.002	.341 363 -.042 p≤.01	.465 363 .057 p≤.0001	.612 363 -.023 p≤.18

Maximum Likelihood Estimation of Spatial Lag Model. Unstandardized regression coefficients (standard errors). Significance test of Moran's I is based on normal approximation. *p≤.10; **p≤.05; ***p≤.01

Conclusions

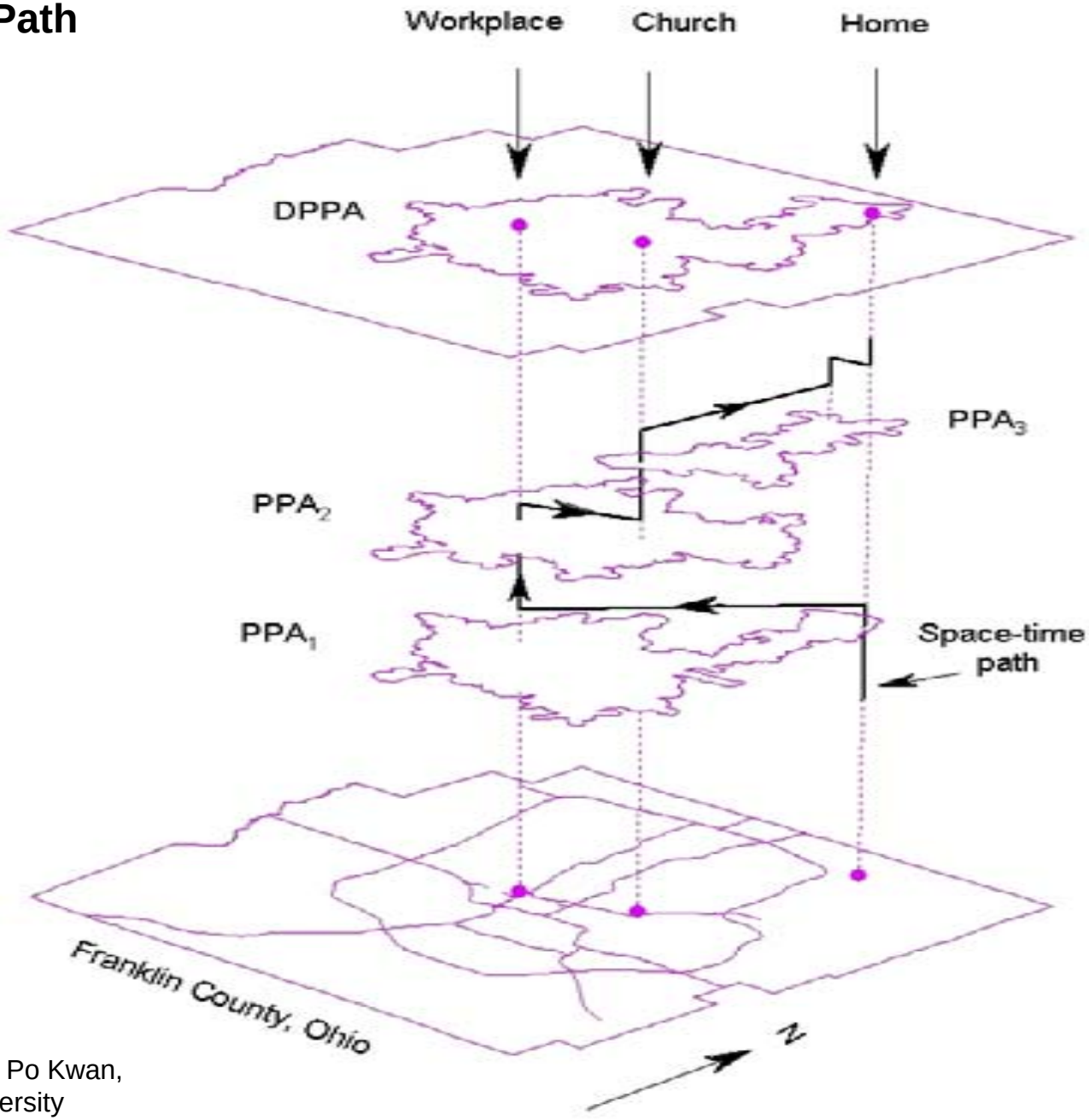
- Distance to precinct sites is a problem mostly in middle ranges, where commuting to and from work is a burden on a busy weekday on top of getting to the polling place.
- Five mile increase in accessibility increases turnout by ≈ 2% (in Maryland suburbs)
- Effects hold controlling for other aspects of precinct population.

As a voter of only marginal interest, will I get to the polling place on Tuesday?



Courtesy of Mei Po Kwan
Ohio State University

Potential Path Analysis



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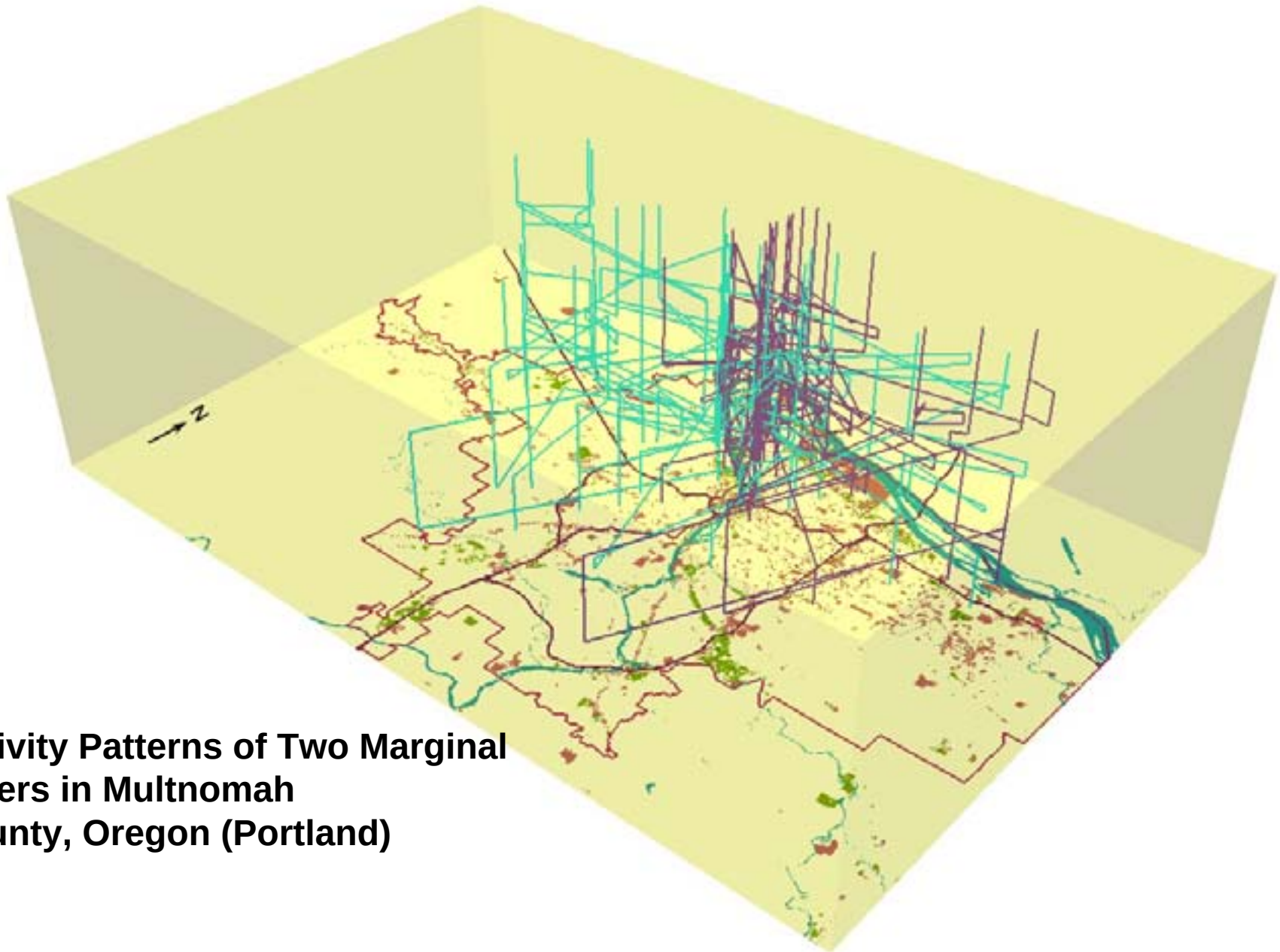


Activity Patterns of Two Marginal Voters in Multnomah County, Oregon (Portland)

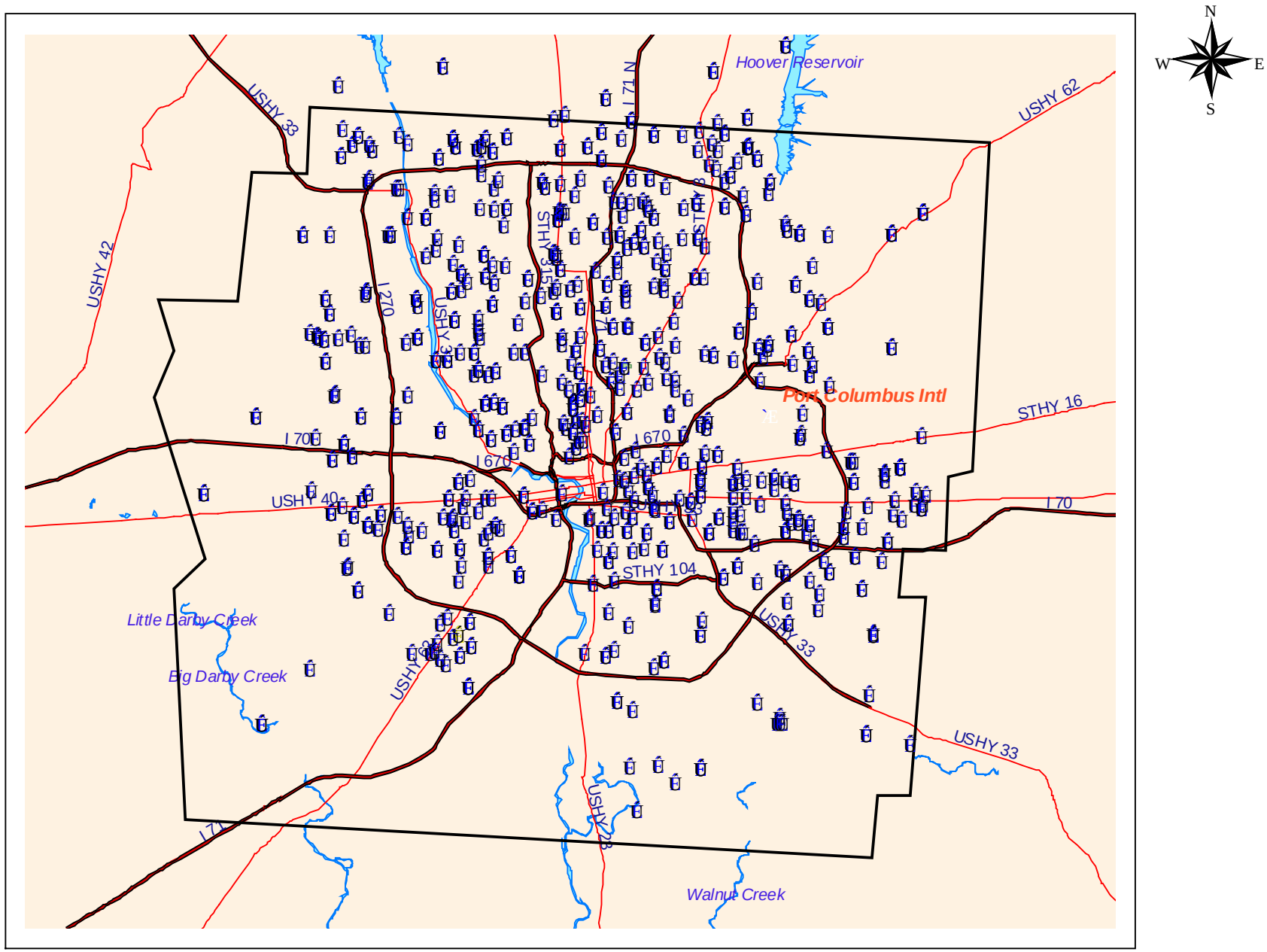
Courtesy of Mei-Po Kwan,
Ohio State University

Busy Lives Tax Turnout

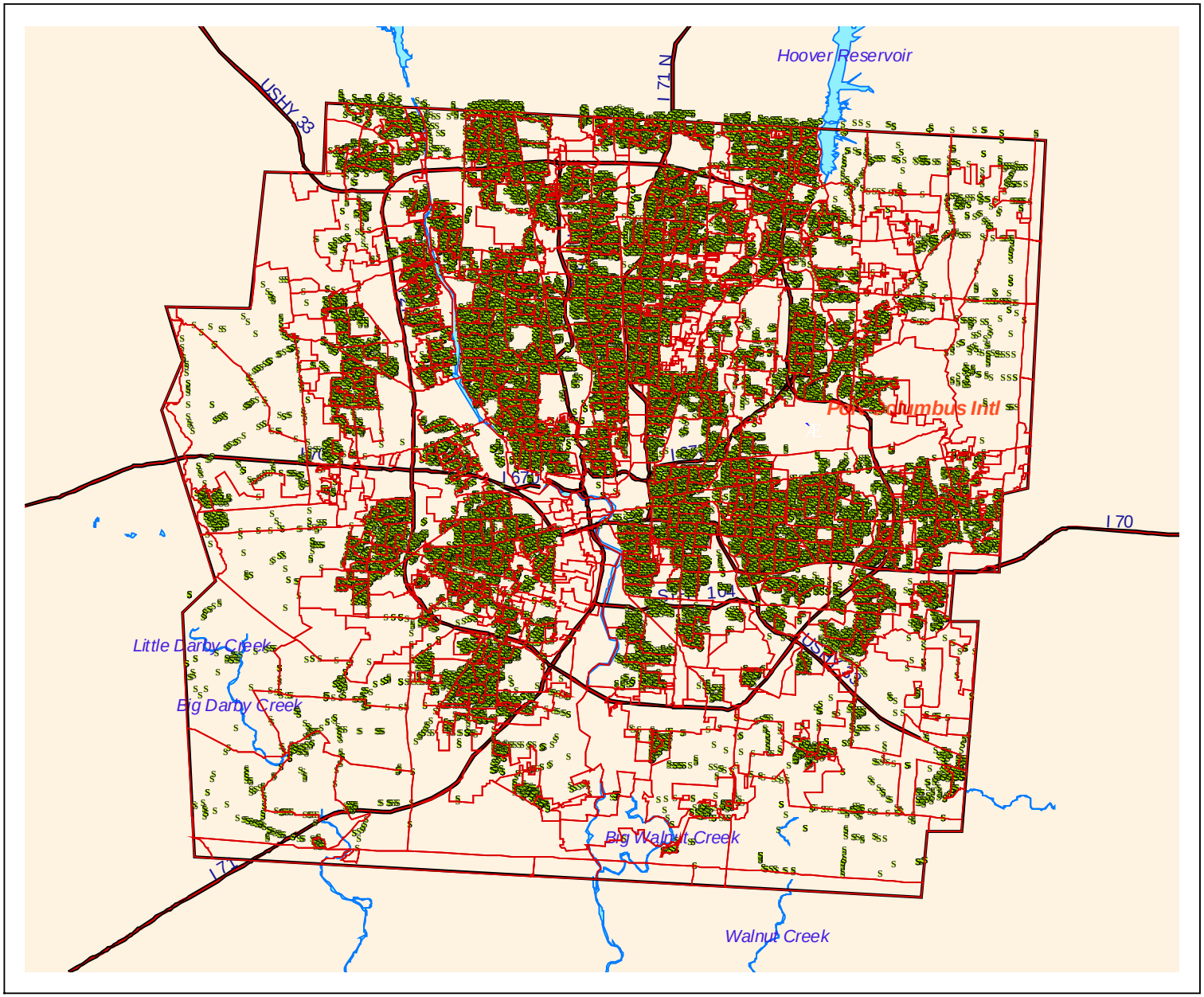
- Commuters (How often do you drive by your precinct site on a weekday?)
- Would-be Voters Are Busy – Jobs, Family, Church (How many know where their precinct site is? What about if they're new residents?)
- Longer Travel Times Leave Narrow Windows to Vote Before and After Work

Policy Implications

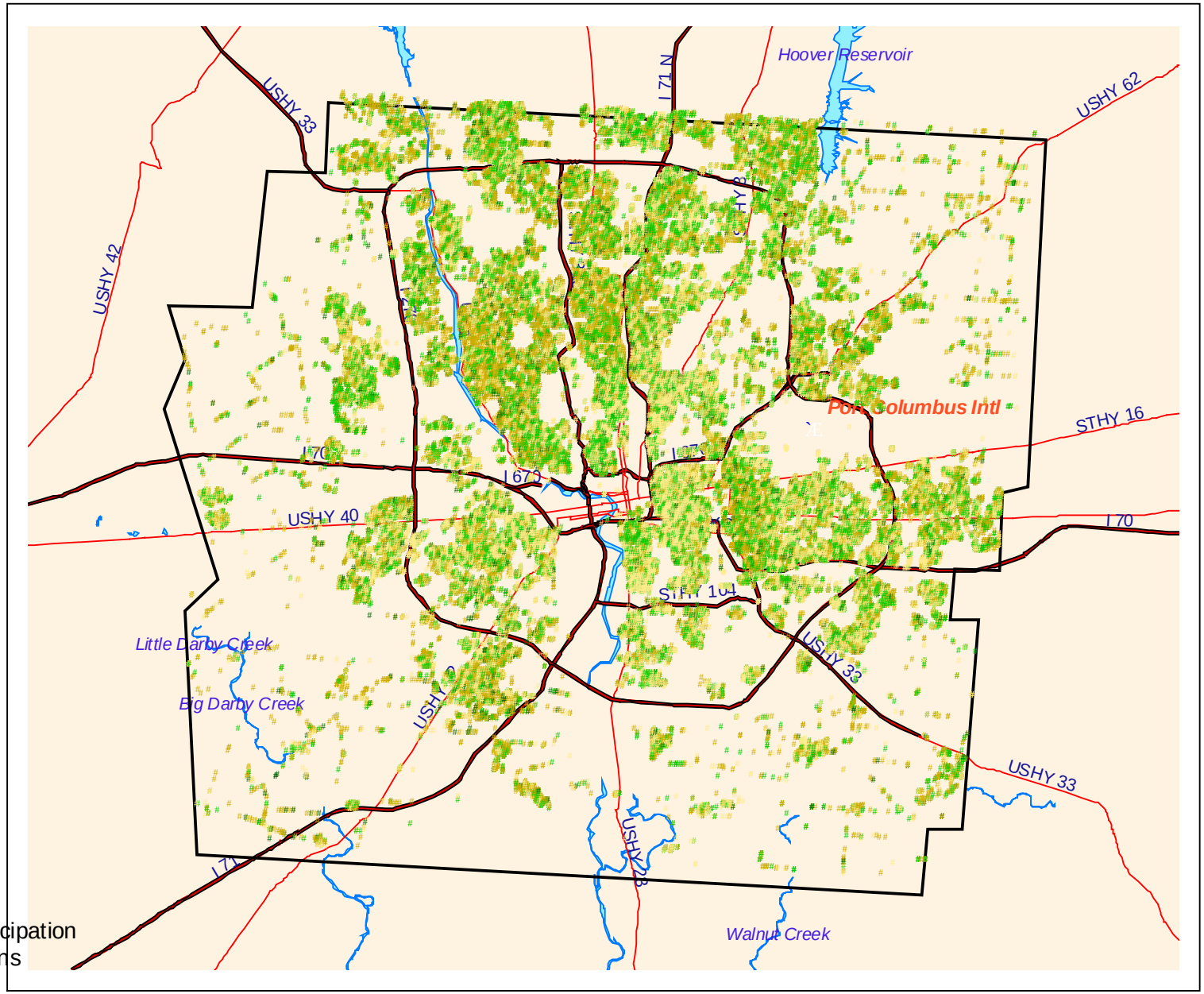
- Add more sites based on accessibility studies.
- Vote by mail, internet.
- Education/information about site locations.
- Move election day to weekend, or make it a national holiday.
- Controversies about ADA site requirements.



Map 1. Franklin County and Columbus, Ohio, Precinct Polling Sites, 2000



Map 2. Geographic Distribution of Registered Voters
Franklin County and Columbus, Ohio, 2000



Map 3. Franklin County and Columbus, Ohio Turnout of Registered Voters 1998, 2000 Primary and 2000 General

Future Projects and Challenges

- Mastering Accessibility Studies with Voter Lists for many precincts (batch processing)
- Studying Subgroups of Voters: commuters, single headed households, young voters, the elderly
- Use of Cluster Detection Software
- Hierarchical Linear Modeling of Voting Behavior (realizing that voters are nested in neighborhoods)

Geography Rules!! The End