Hedonic Modeling of Open Space in James City County

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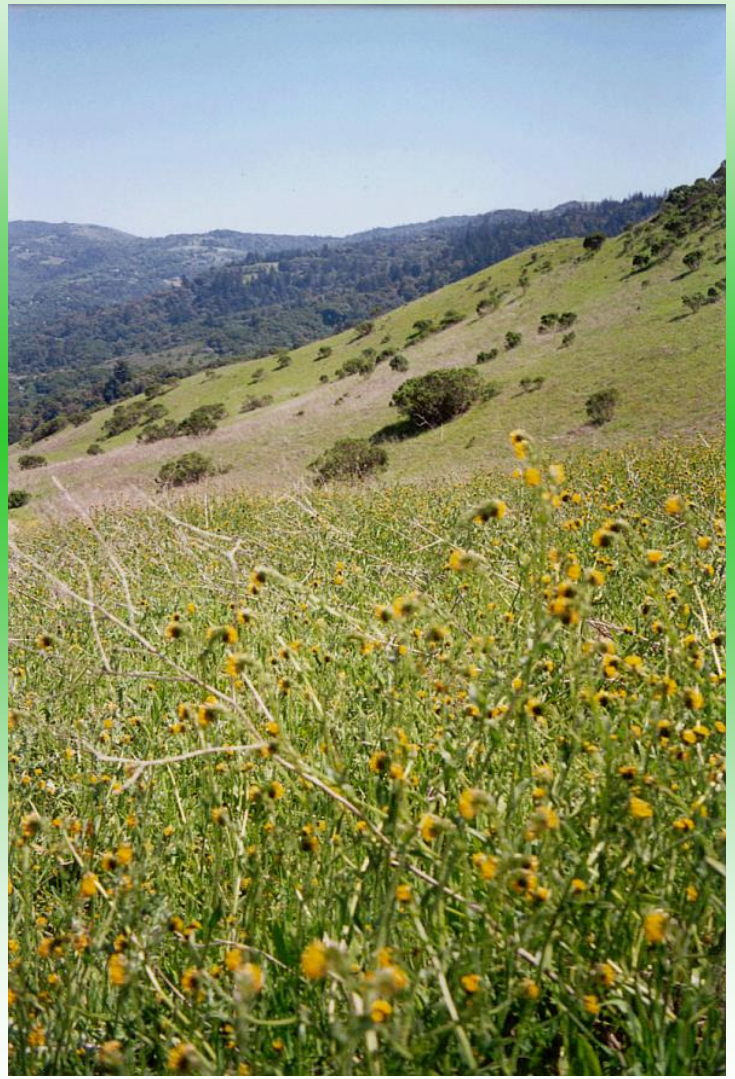
Open Space

- Undeveloped, unimproved land
- Types
  - Public/Private
  - Agricultural Land
  - Forests
  - Vacant Lots
- A Public Amenity



Hedonic Modeling

- Premise: Every commodity or service sold is a bundle of attributes with implicit values.
- Create a formula to describe how people value a specific attribute or amenity.
- Use market transactions by controlling for explanatory variables and drawing out implicit amenity value.

Application of Hedonics

- Wage rates
  - Wages (ideally) implicitly value occupational risks.
- House Prices
  - House prices implicitly value environmental quality factors such as proximity to parks, contaminated sites, air and water quality, etc.
  - This analysis will use the housing market as a vehicle for valuing open space.

Strengths and Limitations of Hedonic Modeling

Strengths:

- Use of actual market transactions.
- Transactions used represent large share of consumer welfare.
- Consumers have more information for these type of transactions.
- Breadth of statistical techniques available to manipulate this type of data.

from *Revealing the Economic Value of Protecting the Great Lakes.* Cangelosi, A. NEMW-NOAA (2001): pp. 80-81.

Strengths and Limitations of Hedonic Modeling (cont.)

Limitations:

- Limited data availability limits model's accuracy.
- Only accounts for amenity benefits that accrue to and are identified by homeowners.

from *Revealing the Economic Value of Protecting the Great Lakes.* Cangelosi, A. NEMW-NOAA (2001): pp. 82-83.

Why Do We Care?

- Hedonic models are useful for indicating the willingness of the public to pay for the costs of a given policy.
- Despite the stated concern of individuals for environmental quality, economic cost-benefit decisions are implicit in their support or opposition for environmental policy.

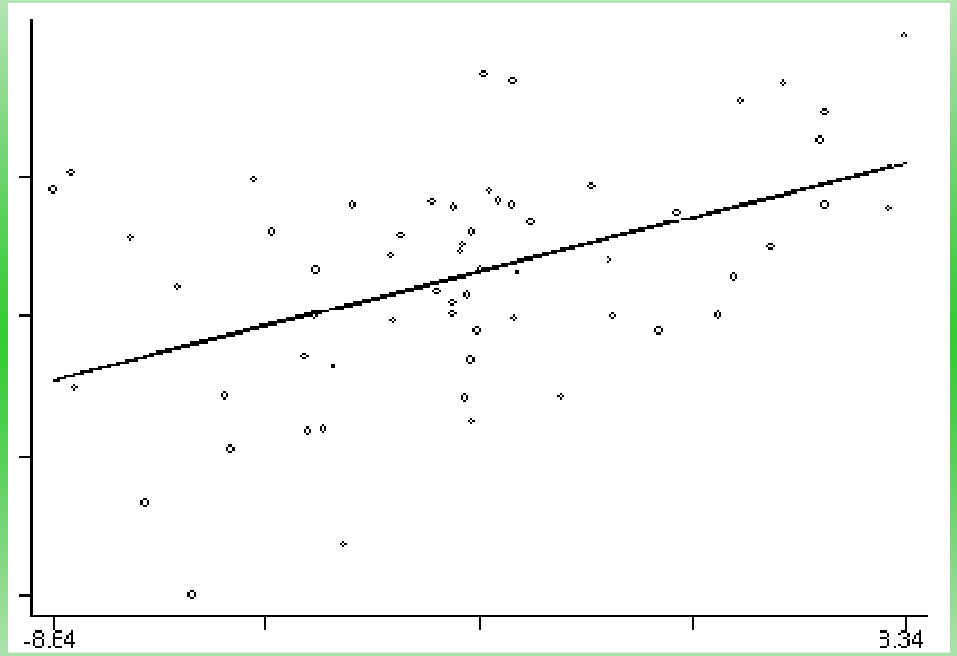
Basic Questions We Want to Ask

- How do James City County residents define open space?
- What housing, neighborhood, and environmental, characteristics do JCC homebuyers value?
- Is proximity to open space an important one of these housing characteristics in JCC?

Recipe for Hedonic Model

- Gather data set
- Collect explanatory variables
  - Housing characteristics
  - Neighborhood characteristics
  - Spatial relation to important features
  - Spatial relation to open space features
- Run regression to relate price to variables
- Examine data

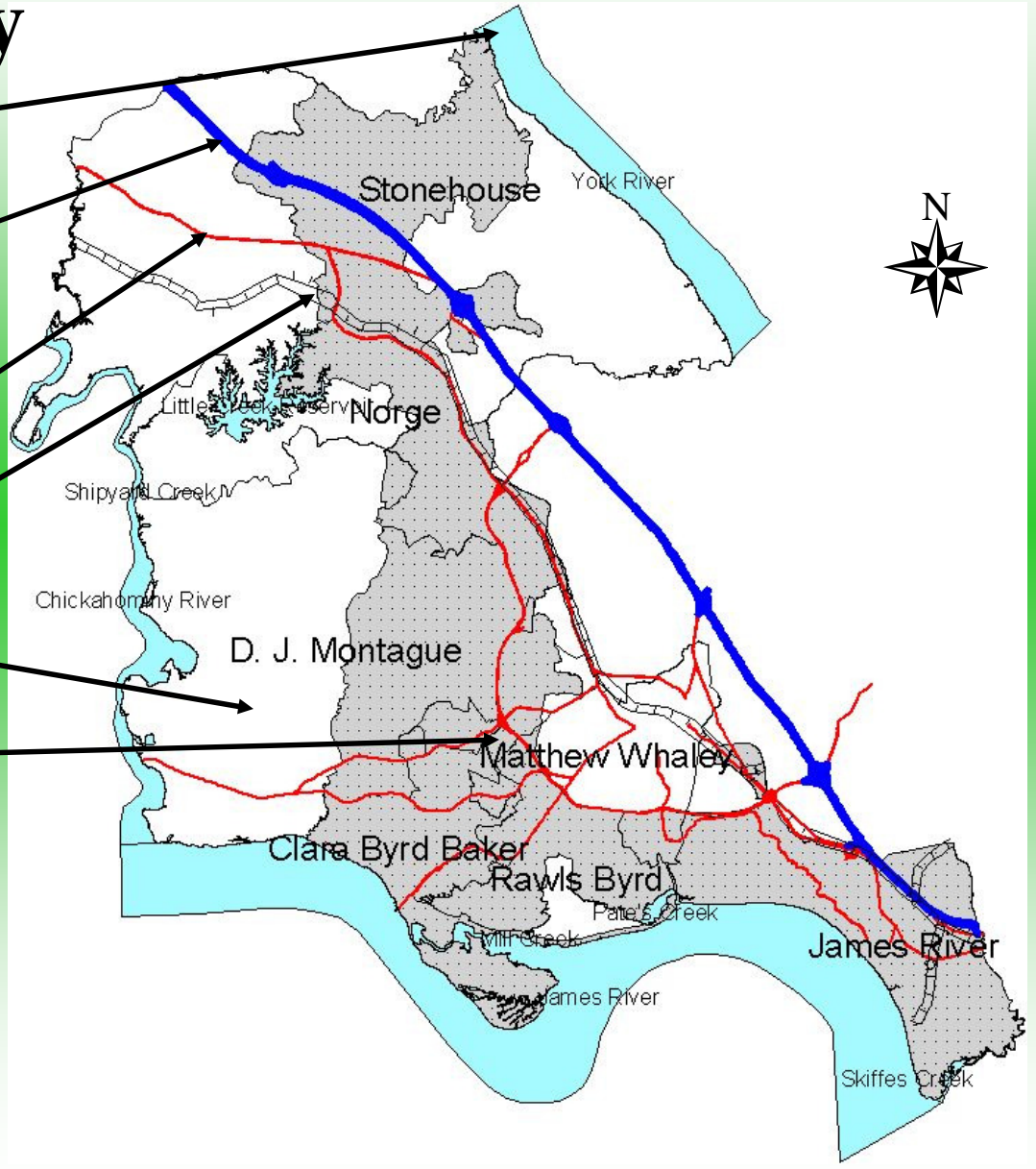
Regression



- Fit a curve to a data set
- Many types
  - Ordinary Least Squares (OLS)
  - Log-linear, log-log
  - Quadratic, Gaussian,etc.

Defining Explanatory Variables Spatially in James City County

- Distance to Open Water
- Distance to I-64
- Distance to Highway
- Distance to Railroad
- School District
- Within the Primary Service Area
- Neighborhood Characteristics (eg. Median Household Income)

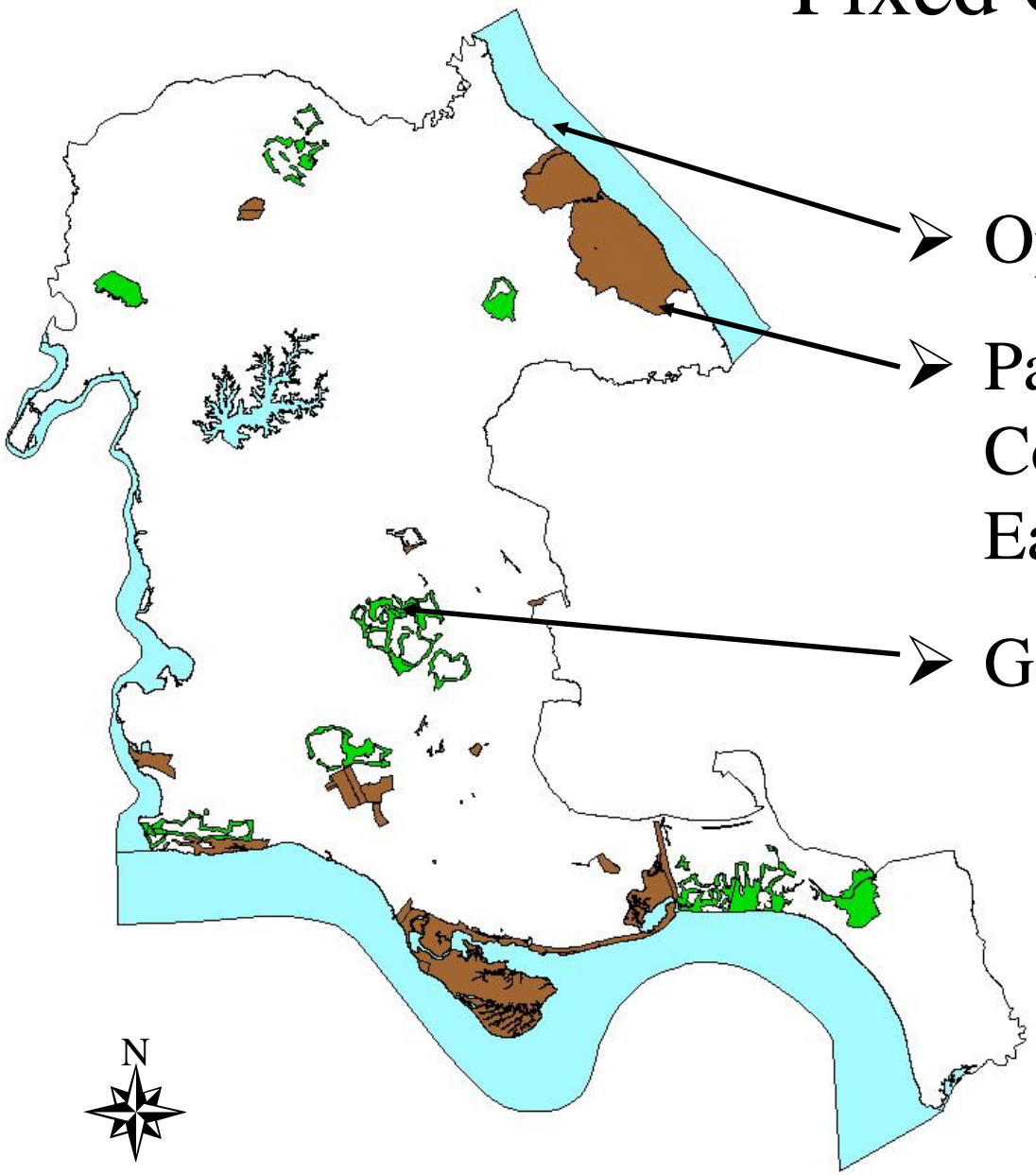


Different Spaces, Different Phases

Bockstael & Irwin (2000) show that open spaces seem to have different hedonic effects

One important consideration is whether an open space could be developed in the near future. This "adjustable" open space will have less (if any) of an amenity effect than a "fixed" open space like a public park or a permanent easement.

Fixed Open Spaces



- Open Water
- Parks, Land Conservancies, Easements
- Golf Courses

Defining Adjustable Open Spaces

- Agricultural Land
- RPAs, RMAs, Buffers
- Vacant Lots

The PSA!

Primary Service Area (PSA)

- Development restrictions outside of this area and no public sewer system or water system
- Question: How has the establishment of the PSA in 1991 affected the valuation of open space in James City County?

Our Hedonic Model: Explanatory Vars.

Variable		Effect		Signigicant?
A/C		0.21502		Y
Elem. School Dist.				
1		-0.04316		Y
2		0.13228		Y
3		0.07855		Y
4		0.10255		Y
5		0.12867		Y
6		0.10851		Y
7		0.25954		Y
Building Size (sqft)		0.00047082		Y
Property Size (sqft)		-0.0000029		Y
Median HH Inc.		0.00000628		Y
Dist. Indust. Zn.		4.03E-07		N
Dist. Bus. Zn.		6.70E-07		N
# Bedrooms		-0.04819		N
Baths		0.05808		N
Year Built		0.73382		Y
Condition		0.02569		N
PSA?		0.10614		Y
Year Sold		0.04146		Y

Open Space Effects

		Non-PSA			PSA	
	Effect		Significant?	Effect		Significant?
Dist. Adjust. OS	0.00005041		N	-0.00037546		Y
Dist. Fix. OS	-0.00000979		Y	-0.00002541		Y
Dist.Open H2O	-1.15E-07		N	-0.00001933		Y

Elasticity

$$\frac{\%\Delta Q}{\%\ \Delta P}$$

Measure of rate of change:

For 1% change in Q, what % does P change?

Open Space Effects as Elasticities

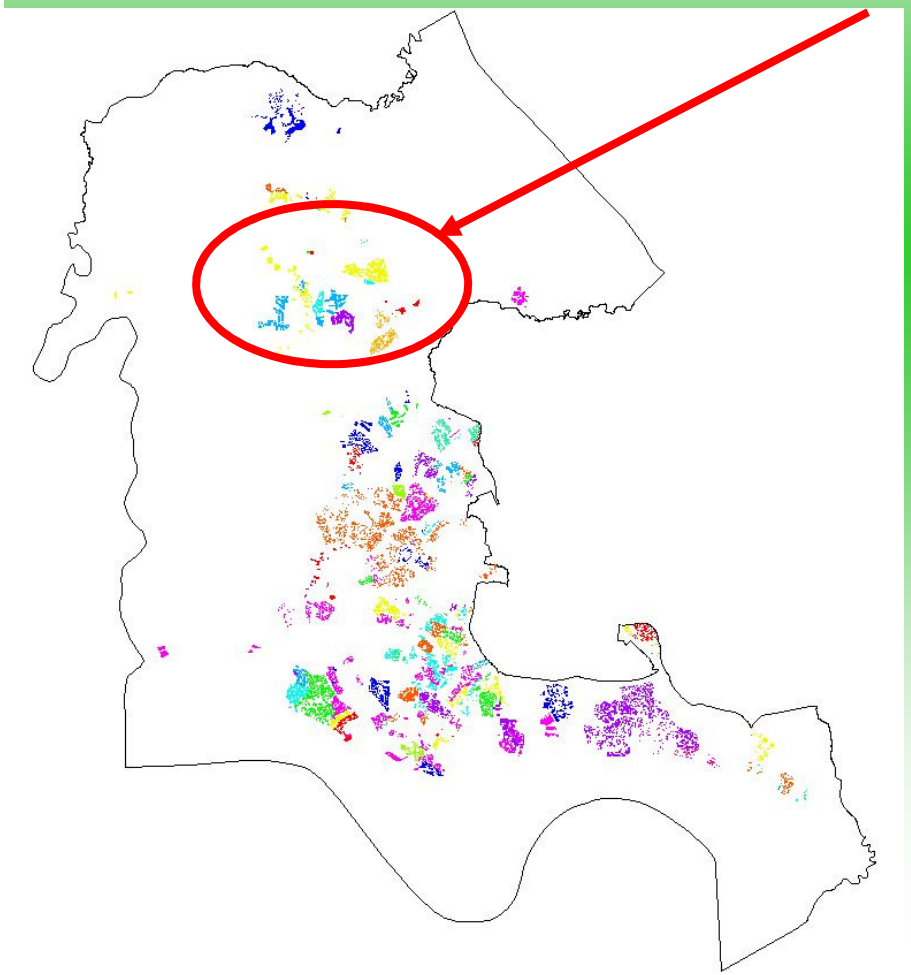
			Mean		PSA?
Elasticity Dist. to Adjust. OS			**0.000676604**		**N**
Elasticity Dist. to Fix. OS			**-0.0238778**		**N**
Elasticity Dist. to Adjust. OS			**0.0021173**		**Y**
Elasticity Dist. to Fix. OS			**-0.001018**		**Y**

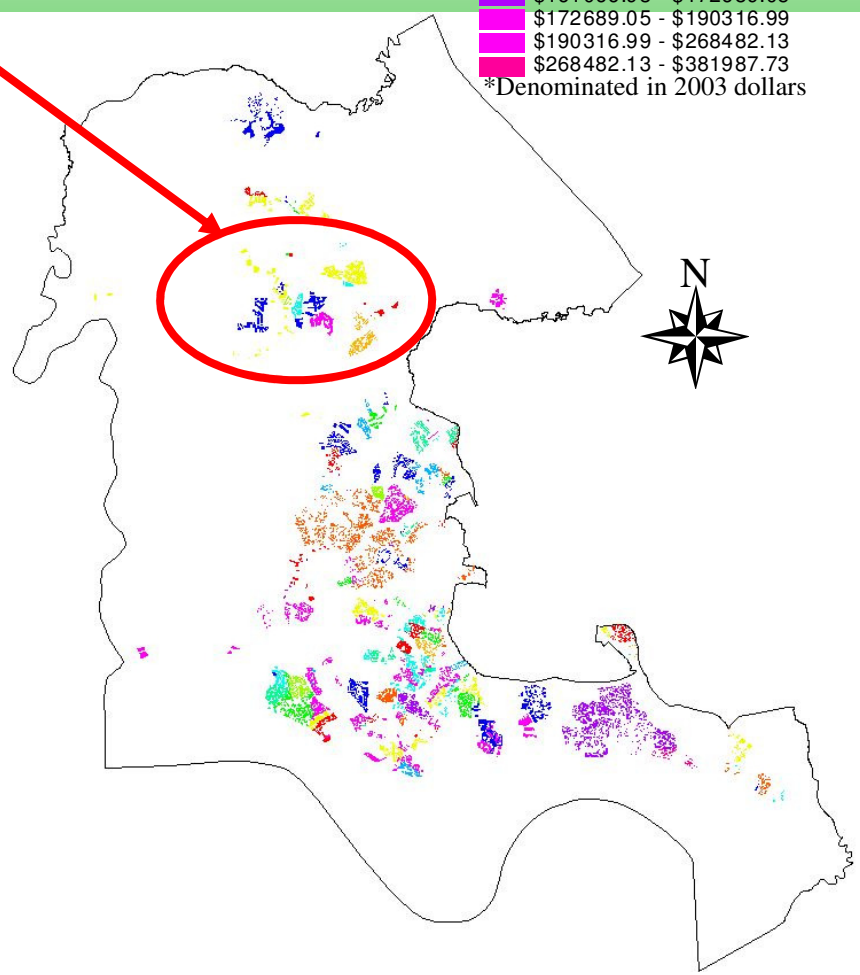
Predicted Values of Residential Parcels

Before Policy Change:
Use current distances

With Policy Change:
Reduce distances by 20%

area of greatest change



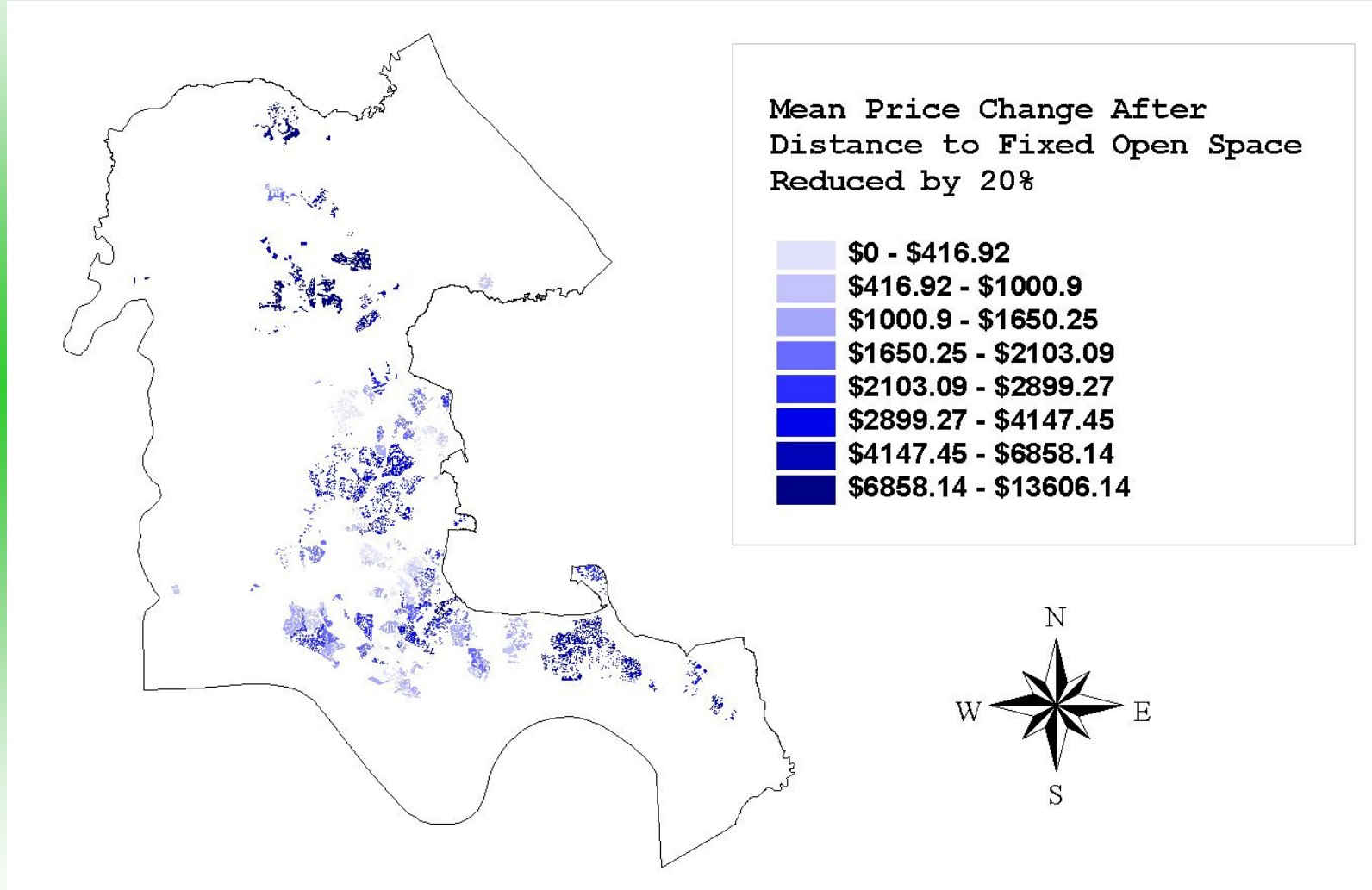


Predicted Property Value*

- $44008.74 - $47593.44
- $47593.44 - $58568.69
- $58568.69 - $69546.3
- $69546.3 - $77076.03
- $77076.03 - $81593.89
- $81593.89 - $87519.66
- $87519.66 - $94514.03
- $94514.03 - $103146.2
- $103146.2 - $110225.27
- $110225.27 - $115702.3
- $115702.3 - $121053.81
- $121053.81 - $125977.98
- $125977.98 - $131482.35
- $131482.35 - $147304.57
- $147304.57 - $154485.42
- $154485.42 - $161066.93
- $161066.93 - $172689.05
- $172689.05 - $190316.99
- $190316.99 - $268482.13
- $268482.13 - $381987.73

*Denominated in 2003 dollars

Mean Difference in Price with Distance Change



Where Do We Go From Here?

- Finalize current model.
- Use marginal valuation of open space to evaluate an open space trading policy.
- Test hypotheses about the way individuals define open space.
  - Density vs. Distance vs. Adjacency vs. Buffers
  - Ag. Land Vs. Water vs. Golf Courses

Acknowledgments

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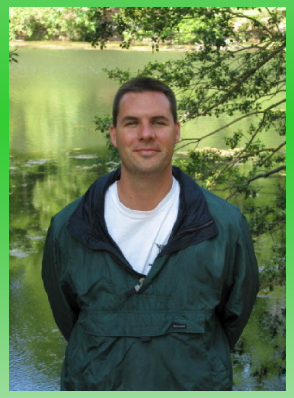

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