Growth Patterns in Portland

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Introduction

The Original Idea

- Examining the impact of changes in density on water run off in a Seattle Washington watershed
- Using rainfall data, permeable surfaces, watershed maps and a hydrology model

Problems

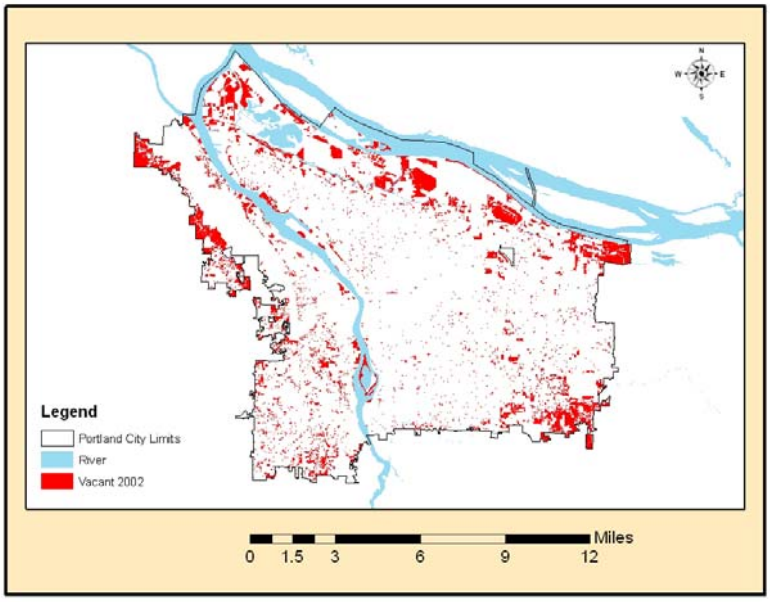
- No access to parcel information
- Difficult access to most Seattle shapefiles
- No hydrology model

New Idea

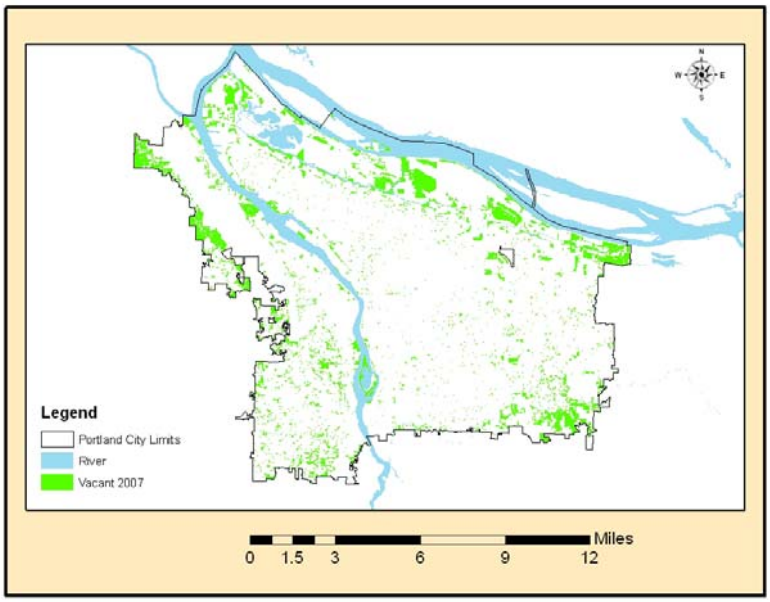
- Using similar data, and the much more accessible RLIS system, we came up with comparing development patterns in Portland, using vacant land data from 2002 and 2007
- Additionally, we will compare the development patterns to land cover and analyze runoff data.

The Data

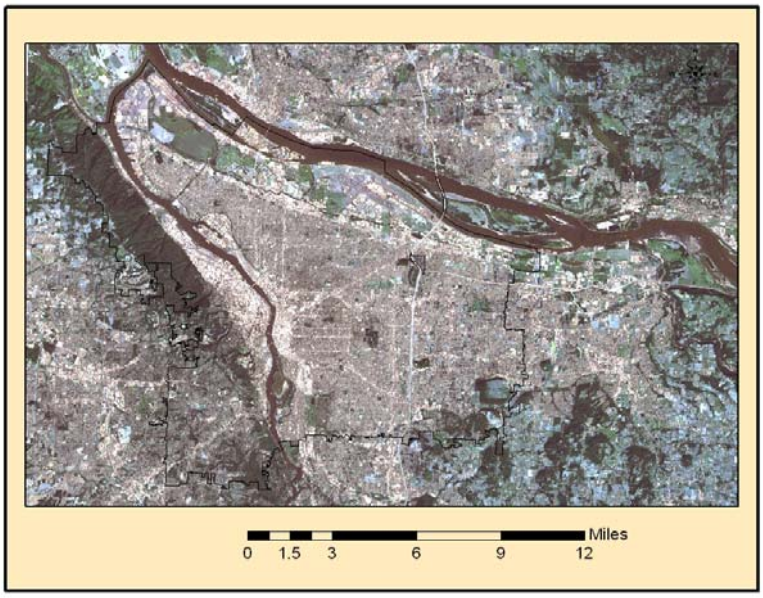
Vacant Land, Portland, November 2002



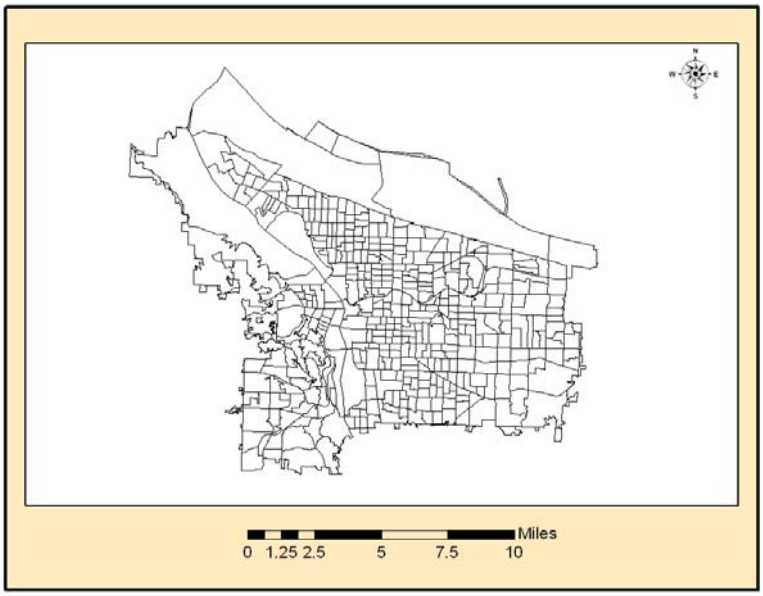
Vacant Land, Portland, May 2007



Satellite Image of Portland

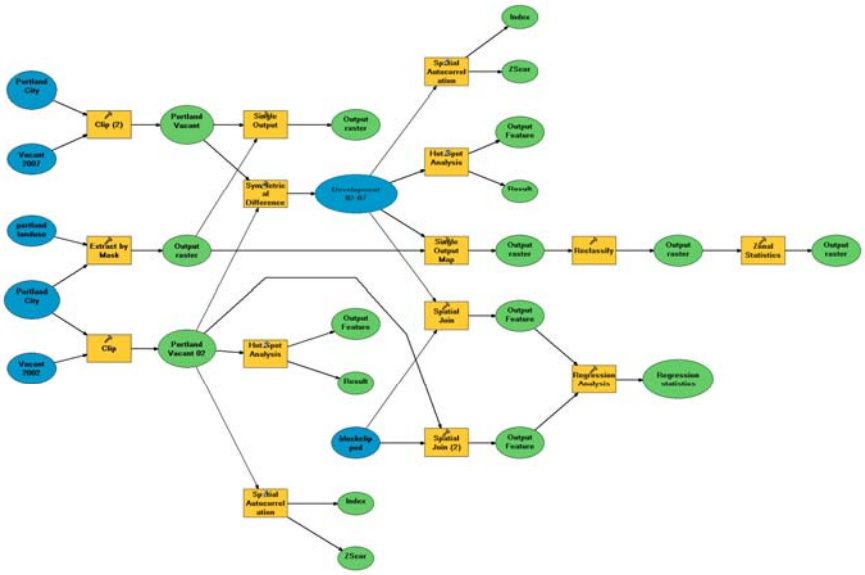


Block Groups

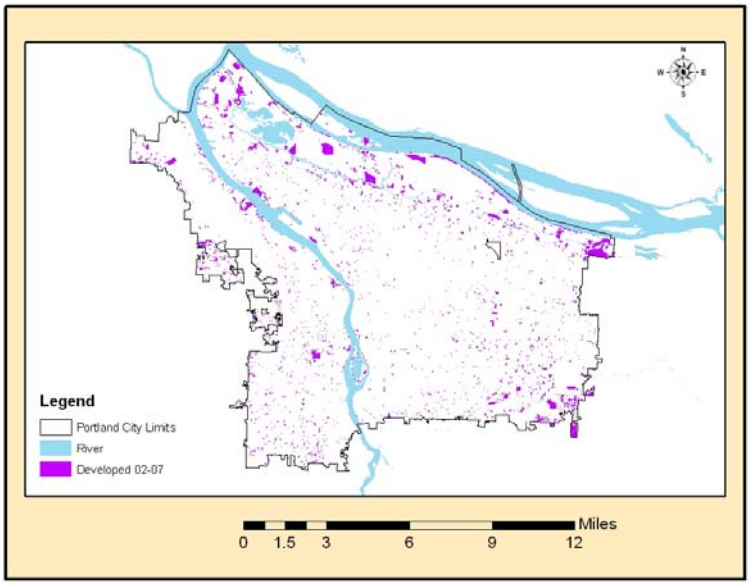


The Analysis

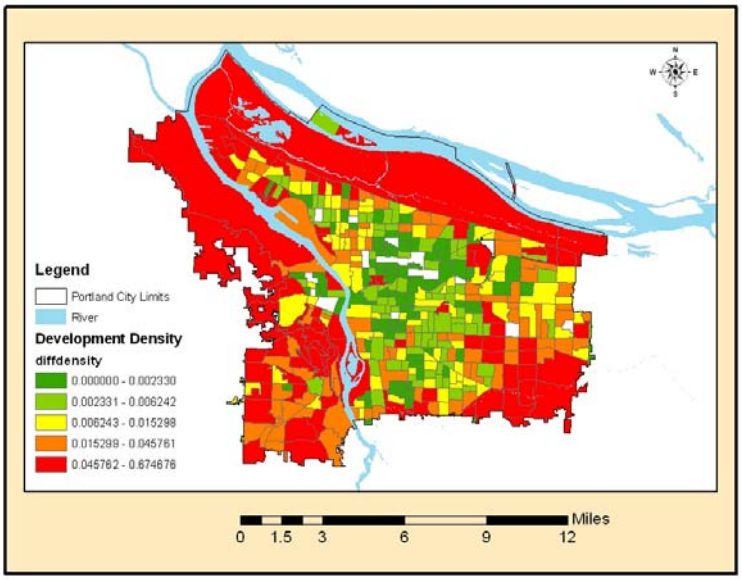
Model



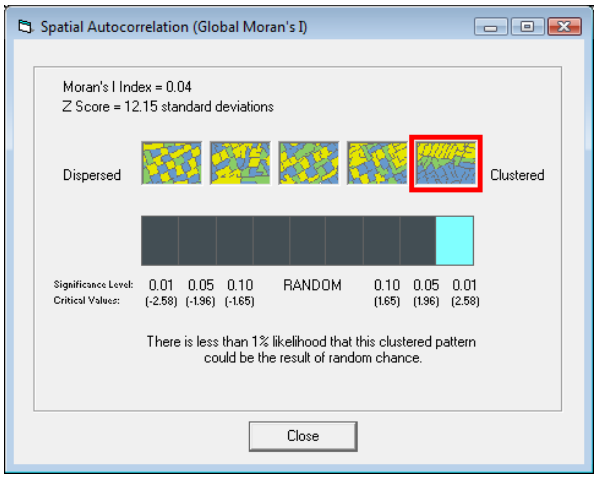
Symmetrical Difference of Vacant Lands, Portland, Vacant Land November 02 – Vacant Land May 2007



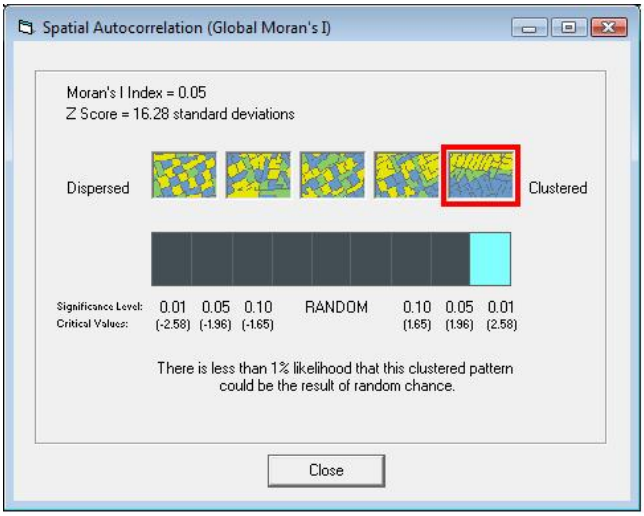
Development Density



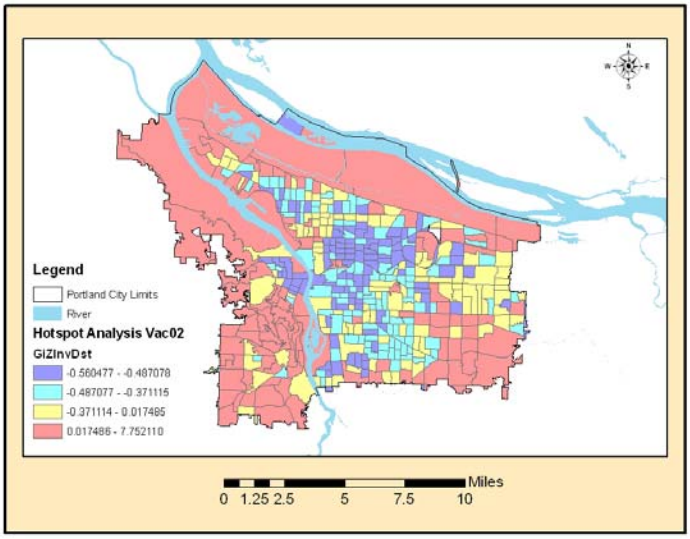
Moran's I of Development



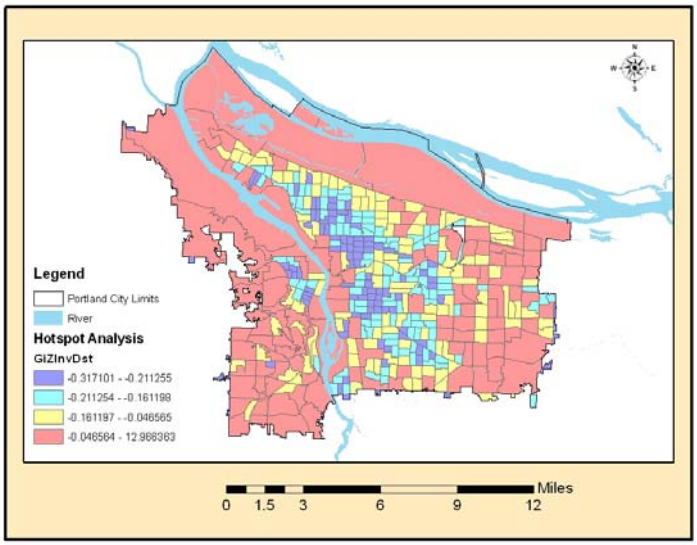
Moran's I of Vacant Land '02



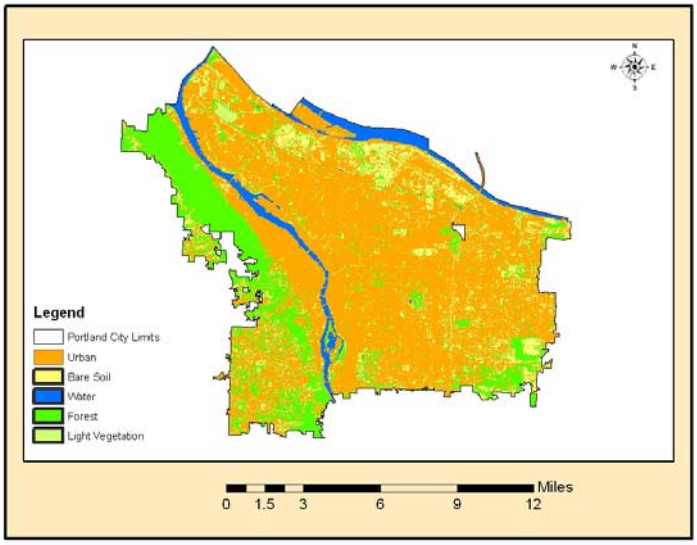
Hot Spot Analysis of Vacant Land ’02



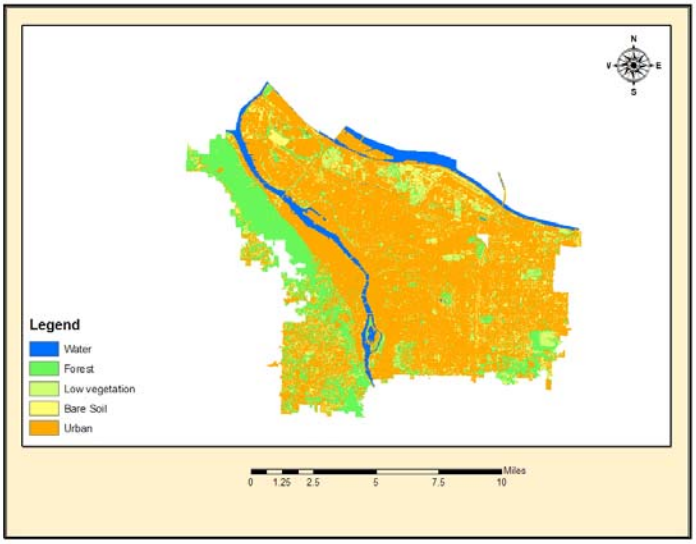
Hot Spot Analysis of Development



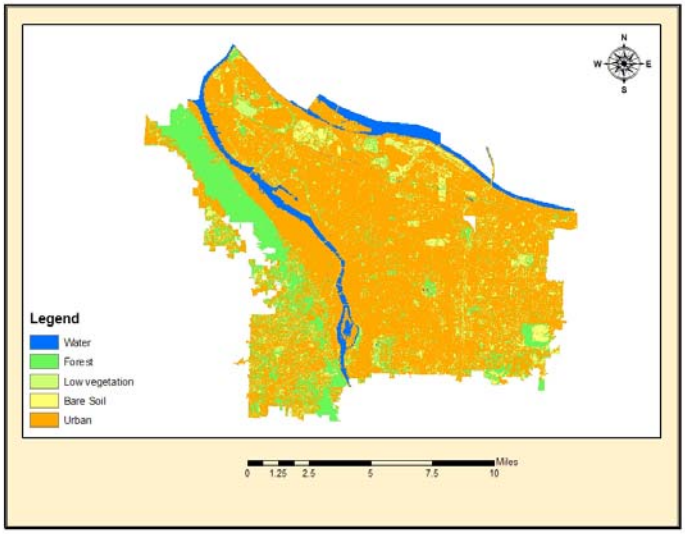
Land cover 1999 Unsupervised Classification of Satellite Image



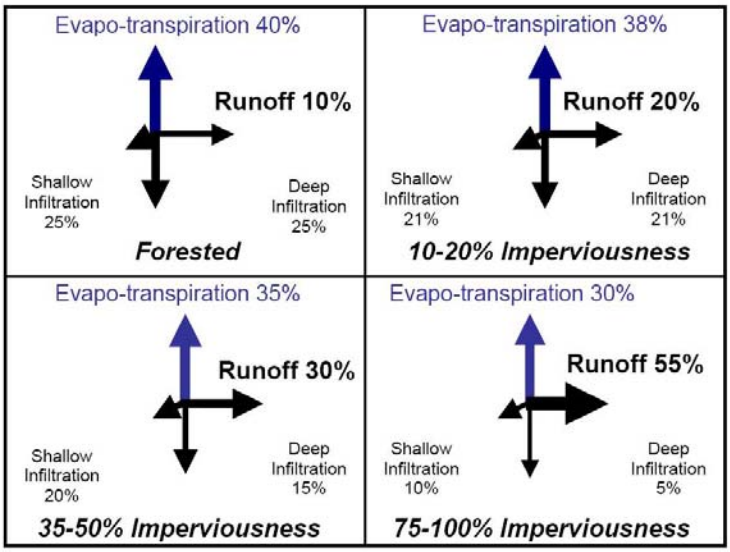
Land Cover 2007



If all vacant land were developed



C Value



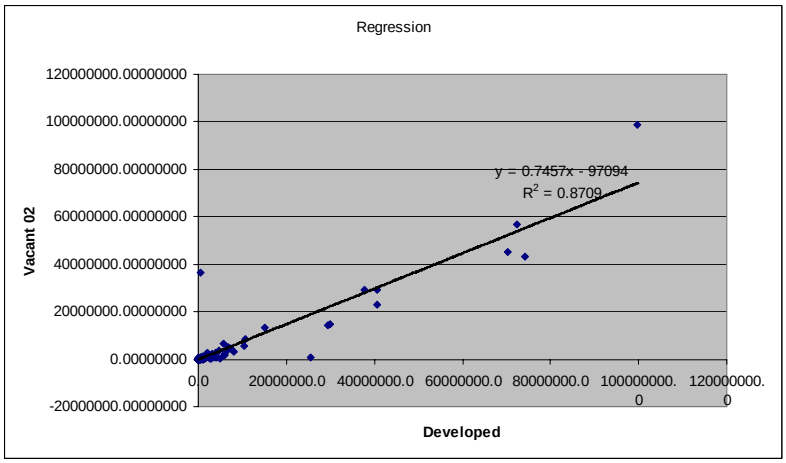
C Value

- R = C A I
- where R is the peak rate of runoff in cfs, A is area in acres, I is rainfall intensity in inches per hour, and C is the weighted C factor for the entire basin
- As Impervious surface increases 10-20%, runoff increases*2, 35-50% *3, 75-100%,*5

C Value

	Land Classes 07	If all vacant lands were developed
Water	5 %	5 %
Forest	16.8 %	14 %
Light Vegetation	6 %	5.8 %
Bare Soil	6.5 %	4.9 %
Urban	65.7 %	70.3 %

Regression analysis



Regression analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.93319526
R Square	0.87085339
Adjusted R	0.87057743
Standard E	3003577.26
Observatio	470

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regressior	1	2.84699E+16	2.85E+16	3155.788	3.8896E-210
Residual	468	4.22205E+15	9.02E+12		
Total	469	3.26919E+16			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	322295.968	140450.4535	2.294731	0.02219	46304.39809	598287.5	46304.39809	598287.537
X Variable	1.16776053	0.020787385	56.1764	3.9E-210	1.126912372	1.208609	1.126912372	1.2086087

Conclusions

- The amount of vacant land in 2002 in an area is related to how much development occurs in that area.
- Development is changing the permeability of the area, causing increased run off in clustered areas.
- Vacant land layers are not the best measure of development
- Our classification method was not precise enough

Next Steps?

- Track down actual rain fall data
- Using taxlot data, building foot print data and higher resolution satellite imagery, it would be possible to show more precise and accurate patterns in development.
- Track down a surface runoff model (expensive and need lots of data inputs)

Data sources

- RLIS
- Landsat data - Earth Science Data Interface (ESDI) at the Global Land Cover Facility
- Arnold CL, Gibbons CJ. 1996 Impervious surface coverage: the emergence of a key environmental indicator. American Planners Association Journal. 62:243-58.