



## **Analysis of Residential Home Foreclosure Patterns in Portland**

### **Presented by:**

**Joe Chan**

**Tyler Kunter**

**Margaret Seiler**

**GIS II**

**Spring 2009**

## **Background**

### **Research Question**

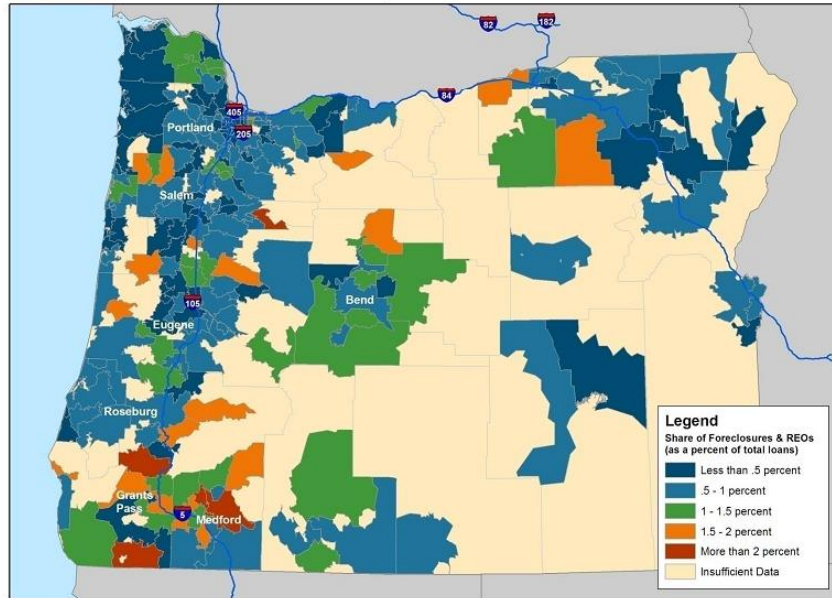
- **Is there a geographic concentration of foreclosures in Portland?**
- **Can foreclosures be correlated with certain socioeconomic factors?**

### **The Foreclosure Problem**

- **National foreclosure rates have been steadily increasing in 2008 due to poor macroeconomic conditions**
- **In Oregon, foreclosure rates have been rising but are still below the national average**
- **However, rising unemployment rates, softening of real-estate markets, and high-cost loans are contributing factors in rising foreclosure rates**

## Areas Affected by Concentrated Foreclosures

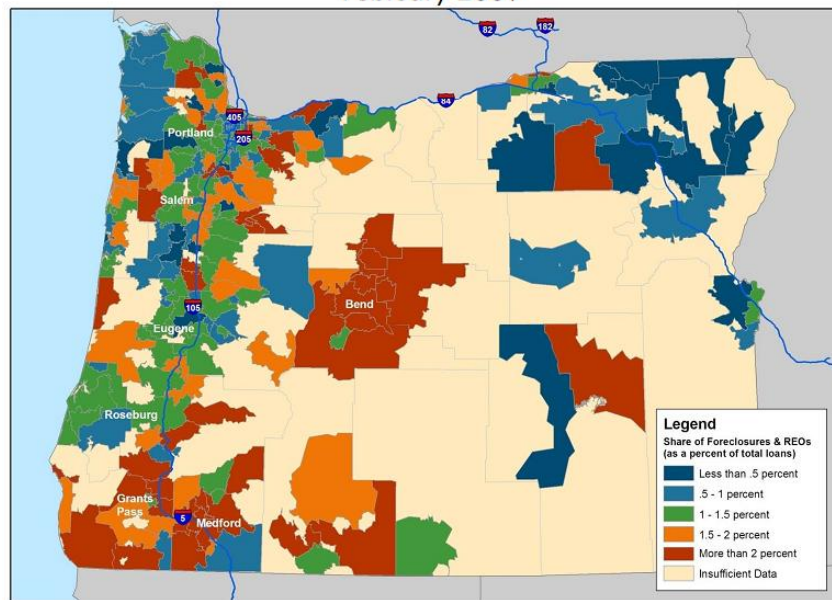
April 2008



Source: Federal Reserve Bank

## Areas Affected by Concentrated Foreclosures

February 2009



Source: Federal Reserve Bank

## **Background**

### **Relevance**

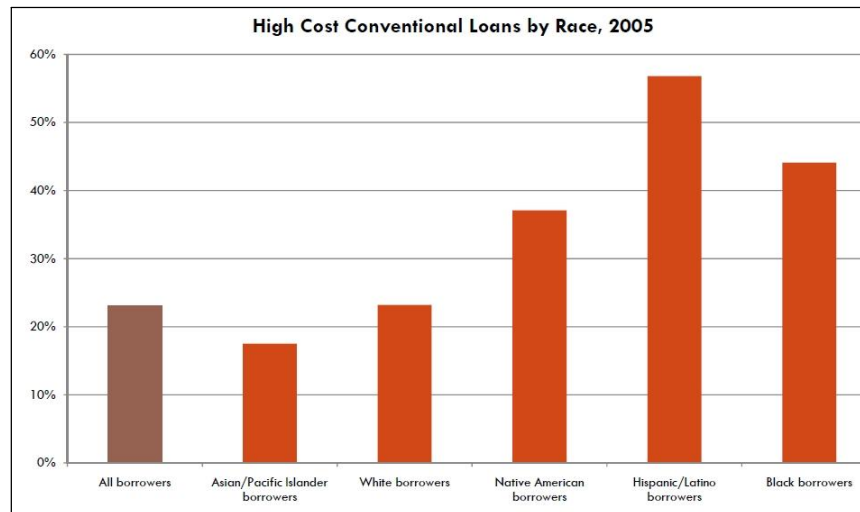
- **Concentrated foreclosures negatively affect the social and economic integrity of a neighborhood and metropolitan area**
  - **Decrease in property values**
  - **Loss of tax revenue**
  - **Vacant property may be associated with increased crime**
  - **Resident turnover**

## **Background**

### **Risk Factors Identified from Literature Review**

- **Median income**
- **Employment status**
- **Education level**
- **Percent vacant housing**
- **Population density**
- **Percent low-credit score (FICO)**
- **Percent of high-cost loans**
- **Percent minority**

## Background



Source: Federal Reserve Bank of San Francisco

## Data Sources

### Datasets

- **RLIS Feb 2009**

Mapping boundaries (census, city, and neighborhoods)

- **U.S. Census 2000**

Various socioeconomic variables at the census tract and block group levels

- **Citydata.com**

Aggregated neighborhood level data

- **RealtyTrac.com**

Foreclosure listings in Portland

## Data Collection Methods

Pre-foreclosure	Auction	Bank-Owned	Homes For Sale		
<div> <div> <b>Trintee Sale</b>  <i>123 Properties</i> </div> <div> <b>Live Auction</b>  <i>31 Properties</i> </div> <div> <b>Display</b> <input type="text" value="10 Properties"/> </div> </div>					
Address/City/State/Zip	# Auction Date	Bed	Bath	Deeds/Blk	Updated
 SE 14th Portland, OR 97208	10/22/2009	2	2	1,210	NA
 SE 168th Ave Portland, OR 97236	10/21/2009	4	2	748	\$119,500
 NE Corbett Ave Portland, OR 97211	10/19/2009	4	2	2,000	NA
 NE Wygant St Portland, OR 97211	10/14/2009	NA	NA	NA	NA

	A
1	
2	4805 NE Garfield Ave Portland, OR 97211
3	4632 SW 18th Pl Portland, OR 97239
4	1253 SW Spring Garden St Portland, OR 97219
5	3805 SE 10th Ave Portland, OR 97202
6	3114 NE 68th Ave Portland, OR 97213
7	6417 SE Dunbar Dr Portland, OR 97236
8	2534 NW Pettygrove St Portland, OR 97210
9	4004 SE 51st Ave Portland, OR 97206
10	18015 NE Stanton St Portland, OR 97230
11	18015 NE Stanton St Portland, OR 97230
12	7312 SE Harney St Portland, OR 97206
13	1115 SW Myrtle Ct Portland, OR 97201
14	12130 NE Freemont St # 1 Portland, OR 97220
15	2334 N Watts St Portland, OR 97217
16	4804 NE 52nd Ave Portland, OR 97218
17	5627 N Minnesota Ave Portland, OR 97217
18	18516 SE Mill St Portland, OR 97233

## Methods Overview

## I. Data Collection

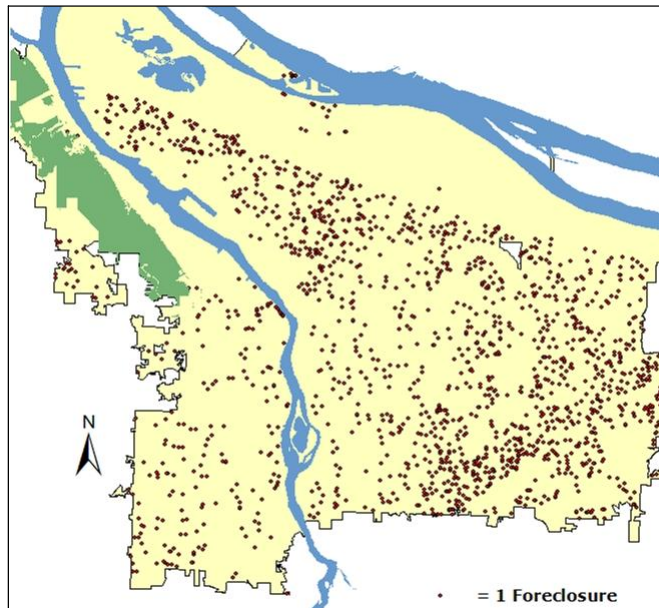
- **Compiled socioeconomic variables from U.S. Census website into a comma separate value (.csv) file**
- **Compiled foreclosure data from RealtyTrac.com into .csv**
- **Attribute join census data to mapping units to create socioeconomic dataset**
- **Geocoded foreclosure data to create a point dataset**
- **Imported all datasets into a geodatabase for analysis**

## II. Analysis

## Census tract analysis

- **Ripley's K**
  - **Point density**
  - **Moran's I**
  - **Rasterize data layers and reclassification**
- Neighborhood level analysis**
- **Hot-spot analysis**
  - **Kriging**
  - **Rasterize data layers and reclassification**

**Study boundary: Portland city limits**

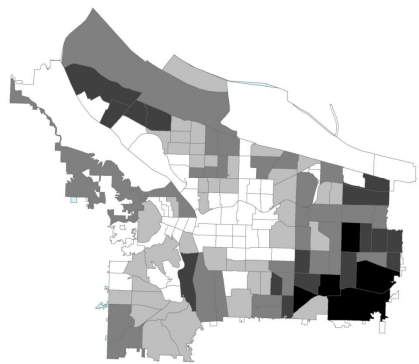


## **Analysis**

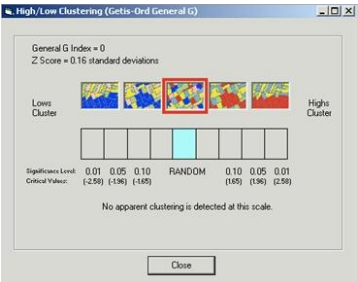
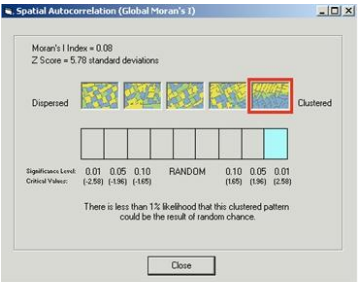
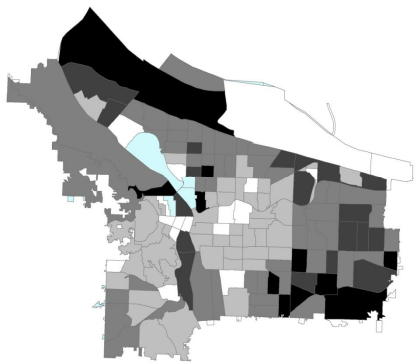
### **Census Tract Analysis**

- **In addition to the factors driving foreclosures nationally, are there socioeconomic variables that correlate to areas with high foreclosure rates in Portland specifically?**
- **What do current areas of high foreclosures tell us in terms of age, income, place of birth, race and ethnicity, and other factors?**
- **Can these socioeconomic information about these areas help us predict other census tracts that may be at risk for high foreclosure rates?**

# Raw Counts

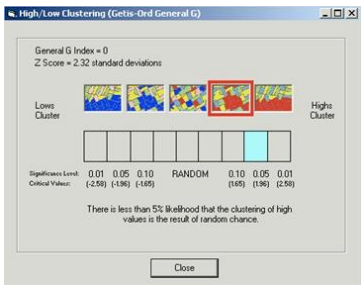
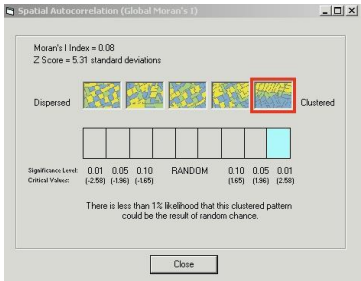
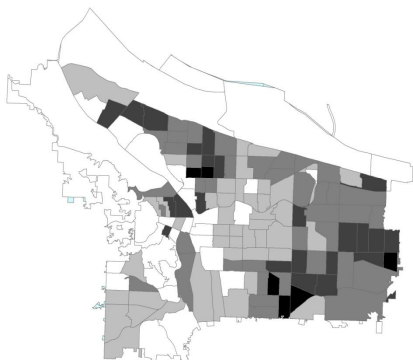


# Foreclosures per person

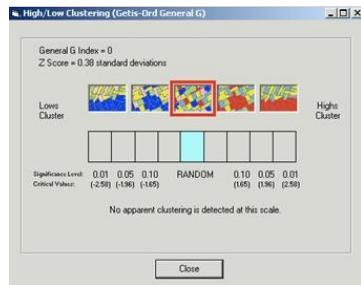
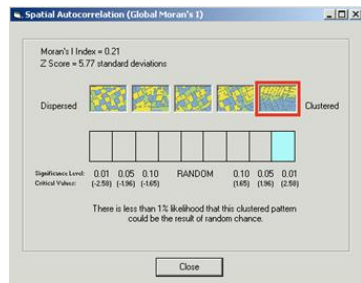
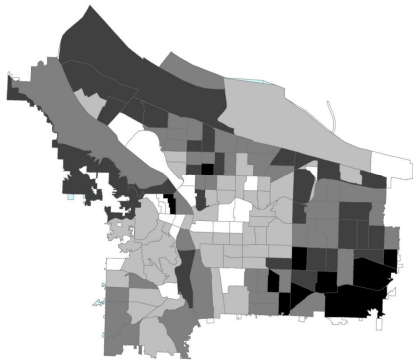




Foreclosures per square mile

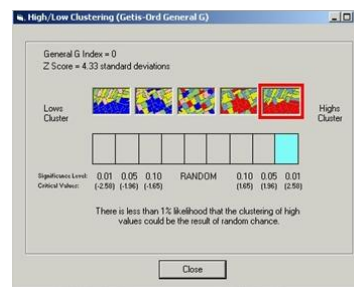
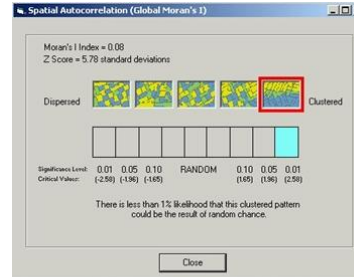
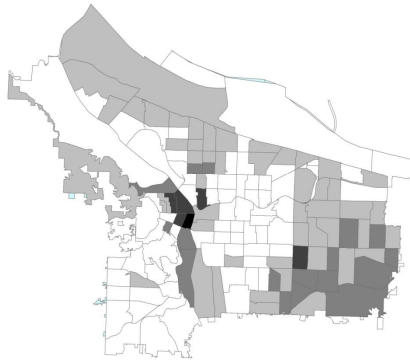


Foreclosures per housing unit

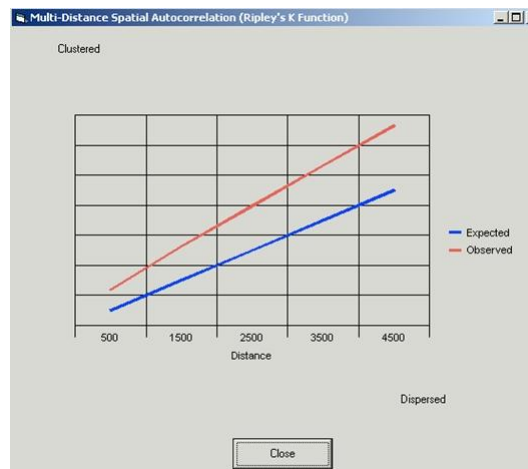




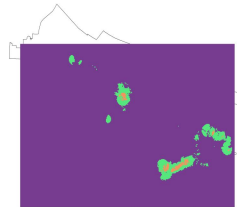
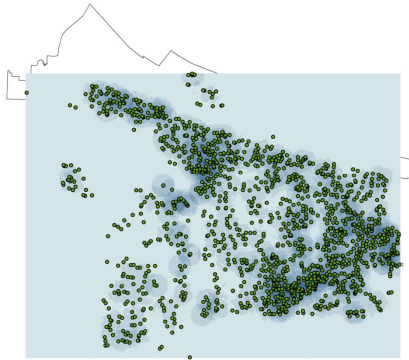
## per owner occupied unit



## Ripley's K Analysis



### Point Density (half-mile window)

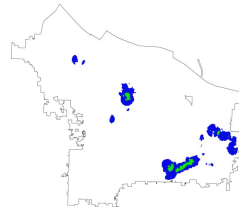


#### Reclassify

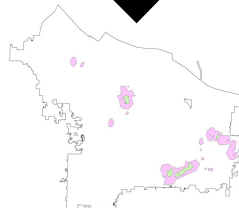
0-30 foreclosures in half-mile radius = 0

30-50 foreclosures = 1

50-72 foreclosures = 2

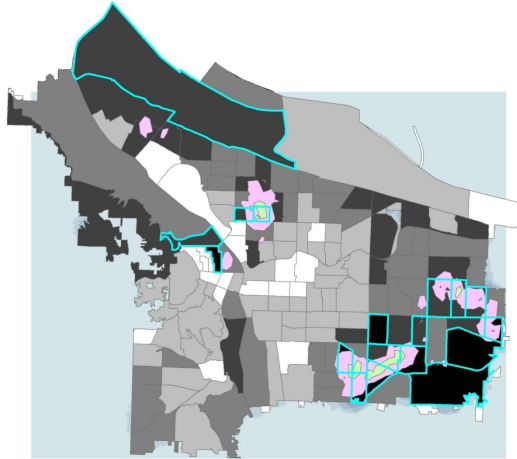


#### Majority filter



#### Convert raster to features

**The per-unit density captures most of the clustering. The highlighted tracts had foreclosure rates of 1.5% or higher**



**What do these census tracts have in common?**

- **Compared high-foreclosure census tracts to the Portland mean or median for more than 60 socioeconomic variables**
- **For 23 variables, more than 75% of the tracts were all above or all below the mean or median for Portland**

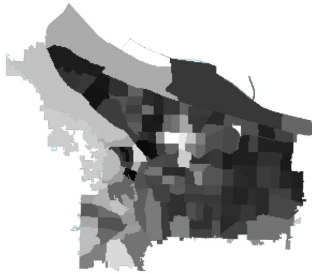
### **Possible Correlation**

- Below average educational attainment
- Below average now married
- Below average percent age 45 to 54
- Below average percent white
- Below average percent Korean
- Below average in same house as 5 years before
- Below average in a different county 5 years before
- Below average born in another state
- Below average foreign-born from North America or Latin America
- Below median income

### **Possible Correlation**

- Above median age of home
- Above average Asian
- Above average Vietnamese
- Above average family size
- Above average in a different house in same county 5 years before
- Above average foreign-born
- Above average arrived in U.S. in past decade
- Above average foreign language at home
- Above average Asian language at home and poor English
- Above average Russian ancestry

### Convert to raster, reclassify



Reclassify

Input raster: white

Reclass field:

Set values to reclassify

Old values	New values
27.799999 - 84.5	1
84.51 - 100	0
NoData	NoData

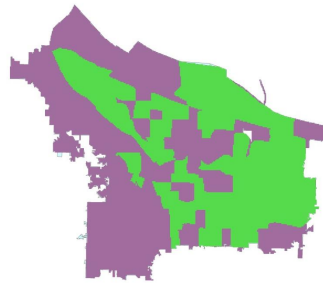
Classify...  
Unique  
Add Entry  
Delete Entry

Load... Save... Precision...

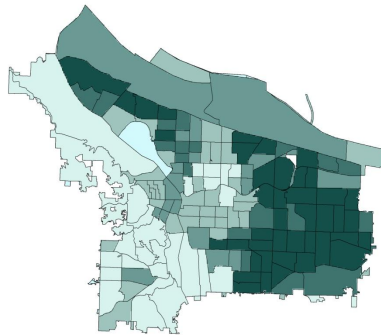
☐ Change missing values to NoData

Output raster: <Temporary>

OK Cancel

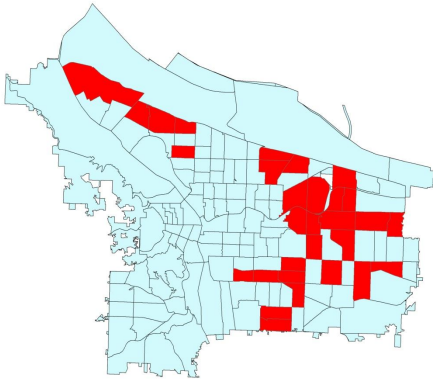


### Add up the 1's with the raster calculator:



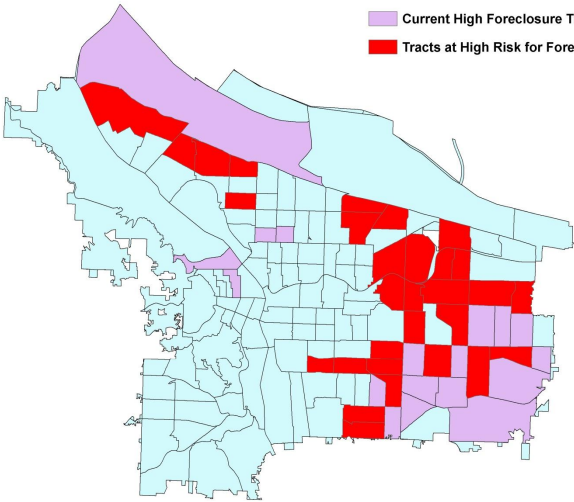
**Darkest green:**  
Values for 19 or  
more out of the  
23 variables are  
above the city  
mean or median

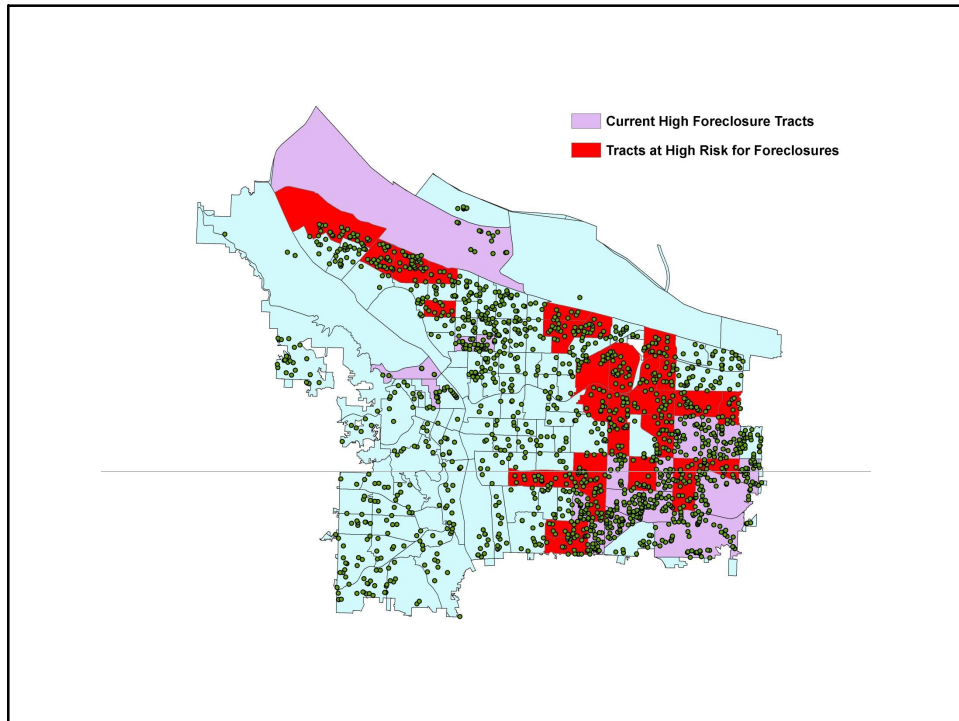
High-risk tracts



64	Count	FCPERUNIT	F
3.3	8	3.405705	
3.2	5	3.472222	
2.6	5	3.568879	
1.5	1	3.676471	
2.7	7	3.827228	
2.2	1	3.891051	
3.1	11	3.934192	
4.3	4	3.948667	
3.1	6	4.02955	
2.7	8	4.058853	
3.5	6	4.285714	
5.8	7	4.337051	
3.1	8	4.592423	
2.6	6	4.761905	
2.4	12	4.778973	
2.7	10	4.840271	
3.5	13	4.924242	
3.1	16	5.40358	
3.2	14	5.424254	
4.5	4	5.464481	
4.5	8	5.471956	
3.7	7	5.564388	
5.5	6	5.665722	
3.3	9	6.06878	

Current High Foreclosure Tracts  
Tracts at High Risk for Foreclosures





## Part II : Neighborhood Analysis



## Neighborhood Level Analysis

- What neighborhood socioeconomic variable may be driving foreclosures?
- Such as the following variables:
  - Age
  - Poverty
  - Job
  - Birthplace (foreign born?)
  - Median Home Value

## Process Outline

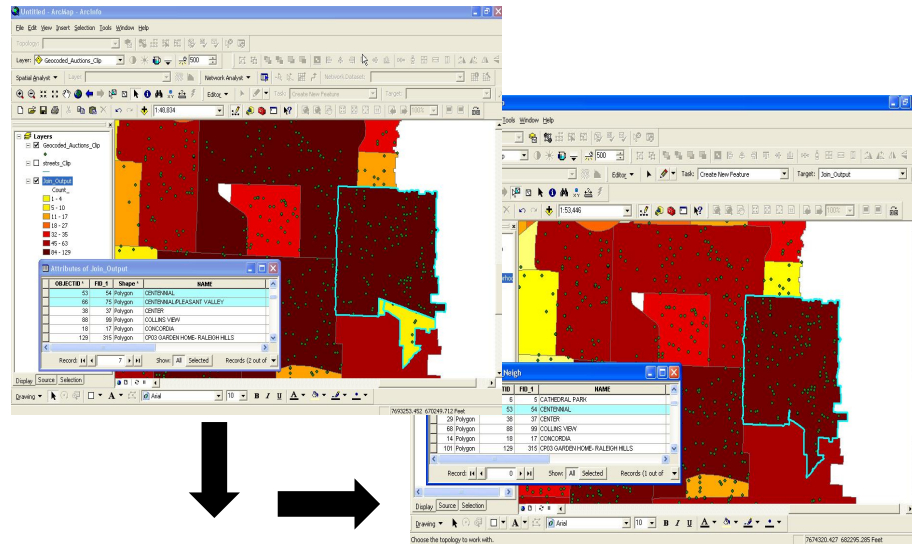
- Gather all Data (city-data.com)  
VERY TEDIOUS WORK....
- Prep the Neighborhood (RLIS)
  - Edit to fit dataset (Delete/Merge)
  - Join Foreclosures sites to dataset = COUNT
- Visualize Spatial Distribution
  - Foreclosures
  - Socioeconomic (S.E.) distributions
- Test Interpretations
  - Hot Spot Analysis + Regression Testing
  - Transform data if needed

## Process Outline

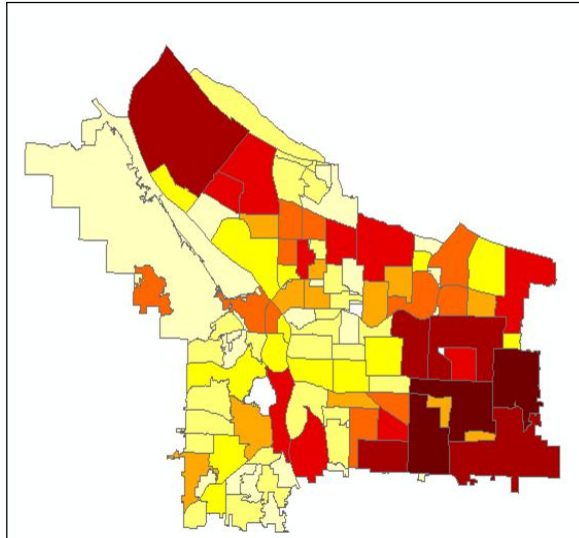
- **Rasterize “Contributors”**
  - **Convert + Reclassify**
- **Create Test Surface**
  - **Raster Calculator**
- **Create Prediction Surface**
  - **Kriging**
- **Finally....Analyze Prediction to Site Relationship**

# Editing the Neighborhood

The screenshot shows the ArcGIS Desktop interface with the 'Editing the Neighborhood' task. The main map window displays a land use map with a yellow polygon selected. The 'Layers' panel on the left shows the 'Neighborhood' layer. The 'Attribute Table' for the 'Neighborhood' layer is open, showing a list of records with columns 'OBJECTID', 'FID', 'NAME', and 'SHAPE'. The 'Neighborhood' layer is highlighted in the 'Layers' panel. The 'Attribute Table' shows records for 'CATHEDRAL PARK', 'CENTRAL', 'COLLEGE VIEW', 'CONCORDIA', and 'OPUS GARDEN HOME - RALEIGH HILLS'. The 'Neighborhood' layer is highlighted in the 'Layers' panel. The 'Attribute Table' shows records for 'CATHEDRAL PARK', 'CENTRAL', 'COLLEGE VIEW', 'CONCORDIA', and 'OPUS GARDEN HOME - RALEIGH HILLS'.



## Finalized Neighborhoods



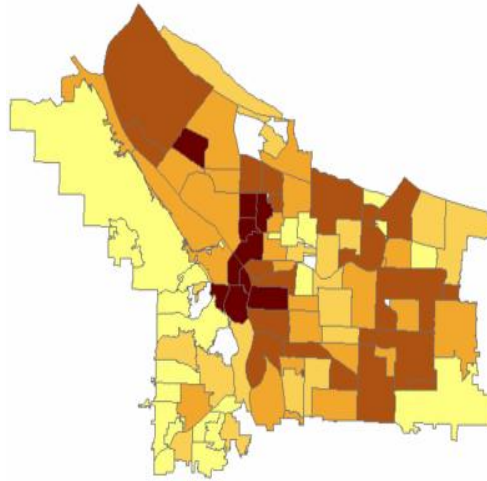
## What's Driving Foreclosures?

### Noticed Visual Correlation to Foreclosures from

- % Below Poverty Level
- % Foreign Born
- Home Value
- Job Type (% job type per Neighborhood)

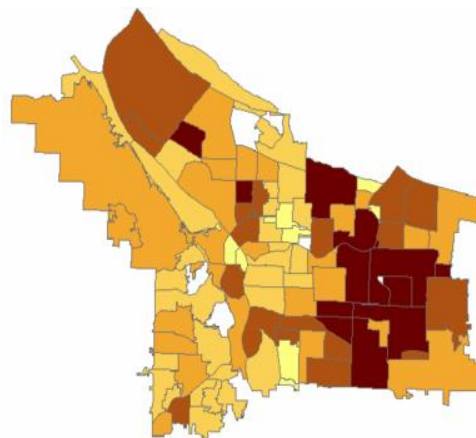
### **% Below Poverty Level**

- Areas of mid to high poverty show relation to foreclosures sites



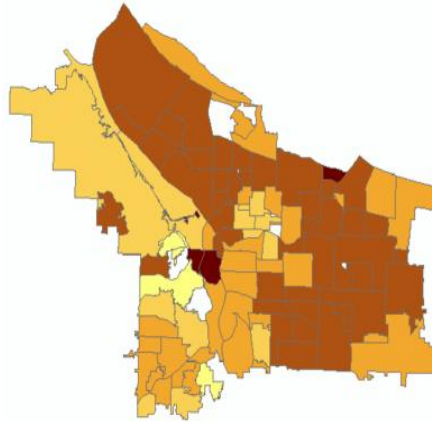
### **% Foreign Born**

- Areas of mid to high % of foreign born residents show relation to foreclosures



## **% Median Home Value**

- Areas of lower home values follow trend of foreclosure
- Least Correlation



## **Job Types Analysis**

### **Created two base job types**

#### **▪ Blue collar:**

Construction, Production, Transportation, and Service Jobs

#### **▪ White collar:**

Sales/Office, Management, Entertainment, Computer/Math,  
Education, Architects, Engineers

## Employment Trends by Industry in Oregon

Oregon	Total Employed (thousands)	Percent Change		
	Feb-09	1-mo.	3-mo.	12-mo.
Total	1,654.9	-14.5	-10.2	-4.7
Trade, Transportation & Utilities	317.5	-11.7	-12.5	-6.9
Government	301.4	3.2	-0.1	2.1
Educational & Health Svcs.	223.6	-11.6	0.7	3.1
Professional & Business Svcs.	185.4	-19.6	-12.9	-6.6
Manufacturing	175.9	-28.1	-25.4	-12.4
Leisure & Hospitality	168.2	-15.6	-9.6	-3.6
Financial Activities	96.7	-26.4	-11.1	-7.0
Construction	82.5	-39.3	-24.8	-17.3
Other Services	61.1	-3.8	3.3	0.2
Information	34.7	-8.8	-13.6	-4.9
Natural Resources & Mining	8.1	0.0	-17.5	-8.0

Source: Bureau of Labor Statistics

## Blue Collar

The screenshot shows a database application window with a table named 'BLUE\_COLLAR'. The table has columns: F\_ED, F\_SALES, F\_SERVICE, POP, BLUE\_COLLAR, WHITE\_COLLAR, and COL\_DIFF. The 'Field Calculator' dialog box is open, showing the following fields: M\_MAN, M\_COM\_MTH, M\_ARC\_ENG, M\_ED\_LIB, M\_ENTER, M\_SERVICE, M\_SAL\_OF, M\_CONST, M\_PROD, M\_TRANS, F\_MAN, and F\_ED. The 'Type' is set to 'Number'. The 'Functions' list includes: Abs(), Atn(), Cos(), Exp(), Fix(), Int(), Log(), Sin(), and Sqr(). The 'Advanced' checkbox is checked. The formula entered is:  $BLUE\_COLLAR = [M\_TRANS] + [M\_PROD] + [M\_CONST] + [M\_SERVICE]$ . The 'Calculate selected records only' checkbox is unchecked. The 'Options' dropdown is set to 'Options'.

## Creating Collar Difference

ED	F_SALES	F_SERVICE	POP	BLUE_COL	WHITE_COL	COL_DIFF
5.2	36	20.3	4880	58	37	21
4.7	37	17.9	364	47	44	3
0	0	0	0	0	0	0
7	40.3	18.5	3126	56	31	25
4.3	37.8	18.7	526	53	41	12
0	0	0	0	0	0	0
6.3	36.8	24.8	8231	68	27	41
9	42.7	19.1	1881	46	46	0
10.1	29.4	22.4	86	25	65	40
6	34.4	23.1	6421	51	40	11
5.8	35.3	22.6	4916	54	38	16
4	35.1	26.8	12916	67	26	41
5	38.1	25.1	6093	52	42	10
5.2	31.9	24.5	6118	49	44	5
9.5	34.1	20.2	9546	46	42	4
8.8	28.2	13.4	11668	25	60	35
10.1	29.4	22.4	86	25	65	40
10.1	31.6	13.9	3159	51	46	5
9.9	27.3	9.9	3471	27	54	27
0	0	0	0	0	0	0
7.7	27.9	17.2	1120	35	52	17
15.1	25.6	16.1	270	25	70	45
2.3	45.3	20	268	62	27	35
0	0	0	0	0	0	0
6.7	38.9	23.3	16108	56	36	20
14.4	23.3	8.3	4601	19	59	40
8.8	21.9	7.3	541	18	53	35
9	31.6	16.5	5119	42	48	6

Field Calculator

Fields: M\_SAL\_OF, M\_CONST, M\_PROD, M\_TRANS, F\_MAN, F\_ED, F\_SALES, F\_SERVICE, POP, BLUE\_COL, WHITE\_COL, COL\_DIFF

Type: Number

Functions: Abs(), Atn(), Cos(), Exp(), Fix(), Int(), Log(), Sin(), Sqr()

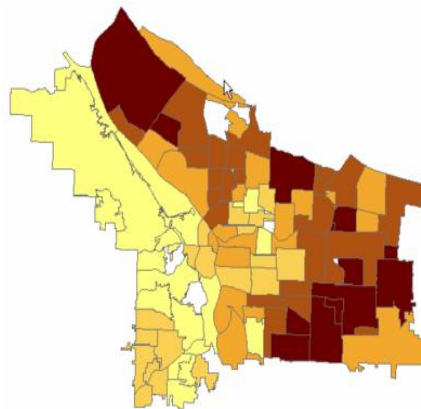
COL\_DIFF = [BLUE\_COL] - [WHITE\_COL]

Calculate selected records only

OK Cancel

## Collar Difference

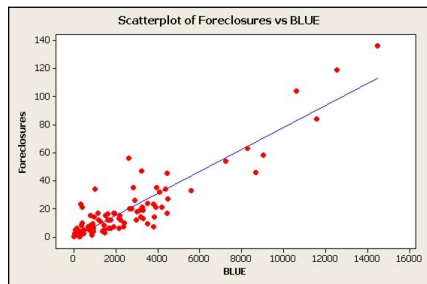
- High Correlation to "Blue" collar neighborhoods
- Lower Correlation to "White" collar neighborhoods
- Highest Correlation



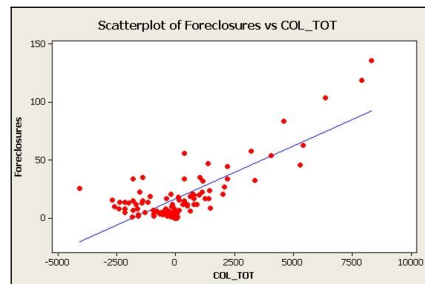


## Data Analysis

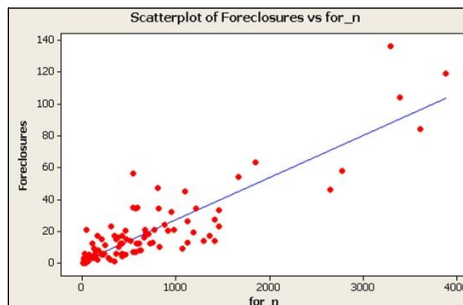
- **Data Testing**
  - Regression Testing – Minitab + Excel
  - Multi-linear Regression Testing – Minitab
  - Histograms + Scatterplots - Minitab + Excel
- Transform data from % to # of people
  - (Data x Pop.)



$$R^2 = .837$$



$$R^2 = .627$$



$$R^2 = .770$$

## Final Dataset

- **Raster Calculator**

Used formula based on regression results

Base = 100%

$(\text{Col Diff} * 60) + (\text{Foreign} * 20) + (\text{H Val} * 10) + (\text{Poverty} * 10)$

Get "Preference Raster"

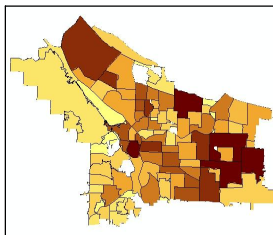
- **Kriging**

Ordinary Kriging – Trend adjusted

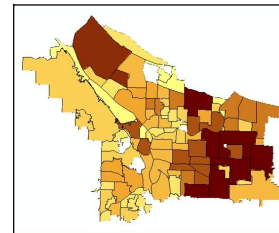
Create Prediction Map

- **Analyze**

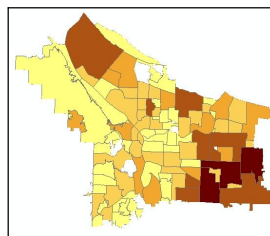
Overlay Foreclosures and Interpret Predictions



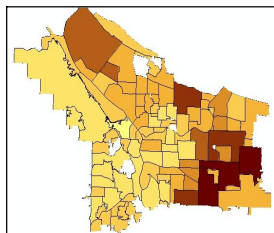
**Poverty Raster**



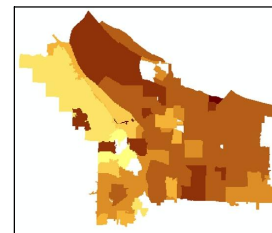
**Foreign Raster**



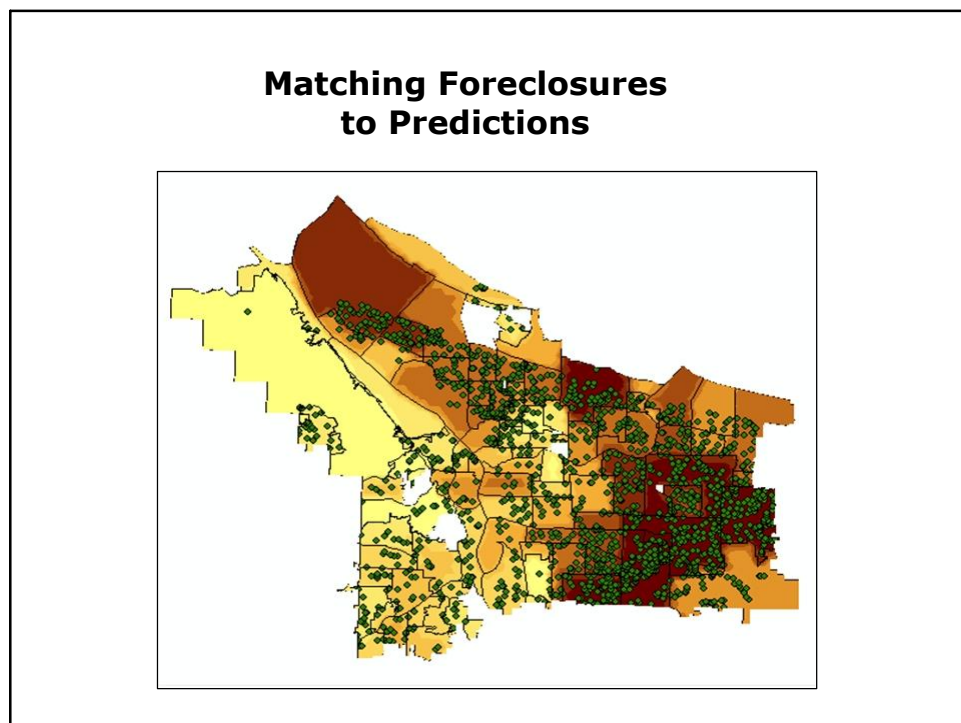
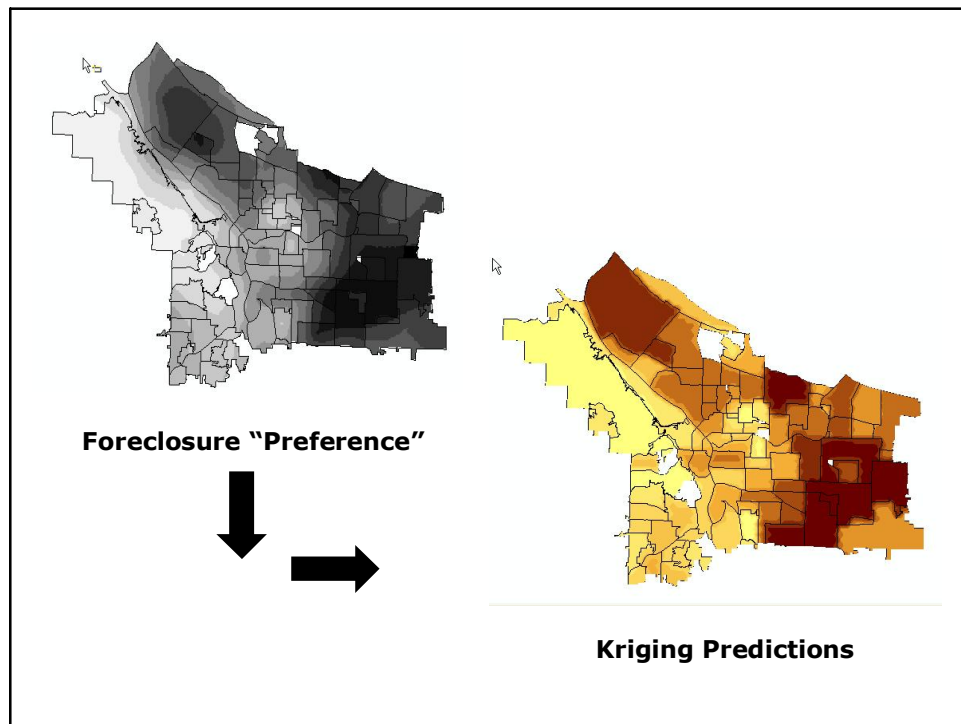
**Foreclosures Raster**



**Collar Raster**



**Value Raster**



## Conclusions

### Results Discussion

▪ Based on the foreclosure risk factors identified in various literature there is some correlation found at the Census tract and neighborhood level

At the census tract level:

- % minority (though nationally affected groups didn't stand out)
- migration factors
- education

Based on the neighborhood analysis (Most to Least):

- Collar Type
- % Foreign Born
- % Below Poverty
- Home Value

## Conclusions

### Relevance

- High-risk areas could be targeted for aid and outreach
- Correlating variables could raise social justice or neighborhood planning issues
- Developers and investors can think of where to look next for cheap foreclosed properties

## Limitations

### Data Issues

- Dated socioeconomic variables from the U.S. Census 2000
- Did not have access to key financial variables (credit scores and loan types)
- Information used was about whole block groups, tracts or neighborhoods, not actual households in foreclosure
- Variables singled out for analysis were chosen subjectively
- Temporal resolution: six-month window of auctions only provides a snapshot

## Questions ?



## References

Federal Reserve Bank of San Francisco. *Trends in Delinquencies and Foreclosure in Oregon*. April 2009.

Kaplan H. David, Gail G. Sommers. *An Analysis of the Relationship Between Housing Foreclosures, Lending Practices, and Neighborhood Ecology: Evidence from a Distressed County*. February 2009.

Powell, Michael, and Janet Roberts, "Minorities Affected Most as New York Foreclosures Rise," *The New York Times*, May 16, 2009.

Li Yanmei. *The Dynamic Interaction Between Residential Mortgage Foreclosures, Neighborhood Characteristics, and Neighborhood Change*. 2006.