Analysis of Residential Home Foreclosure Patterns in Portland

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GIS II

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Background

Research Question

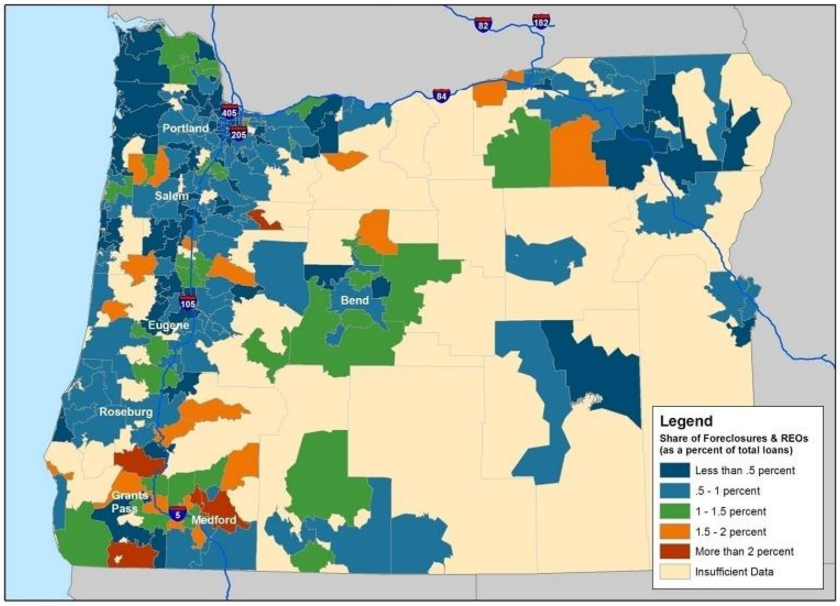
- **Is there a geographic concentration of foreclosures in Portland?**
- **Can foreclosures be correlated with certain socioeconomic factors?**

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

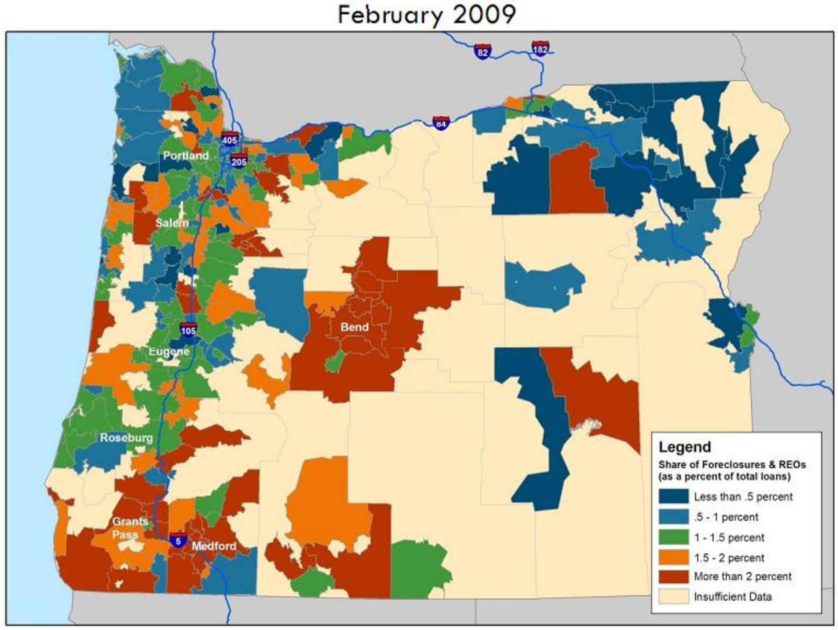
April 2008



Source: Federal Reserve Bank

Areas Affected by Concentrated Foreclosures

February 2009



Source: Federal Reserve Bank

Background

Relevance

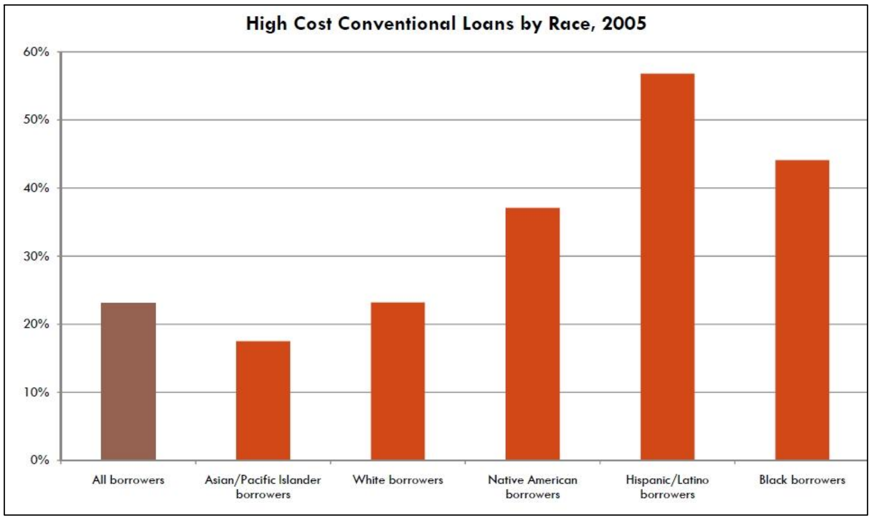
- Concentrated foreclosures negatively affect the social and economic integrity of a neighborhood and metropolitan area
  - Decrease in property values
  - Loss of tax revenue
  - Vacant property may be associated with increased crime
  - Resident turnover

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



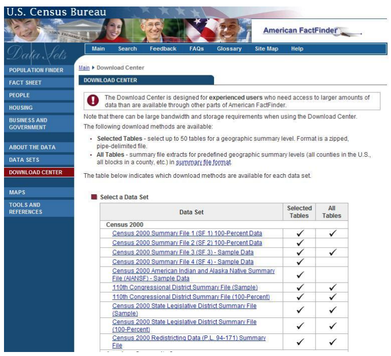
Source: Federal Reserve Bank of San Francisco

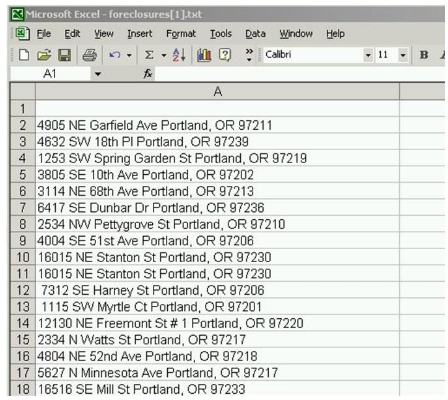
Data Sources

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





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

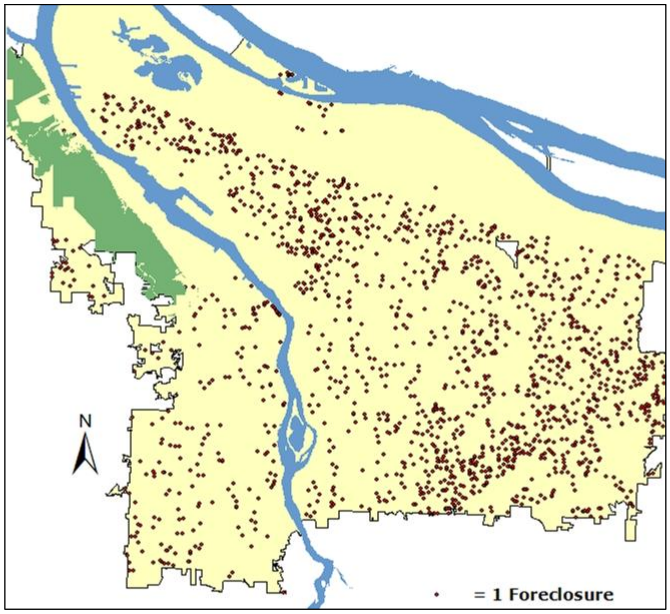
Census tract analysis

- 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

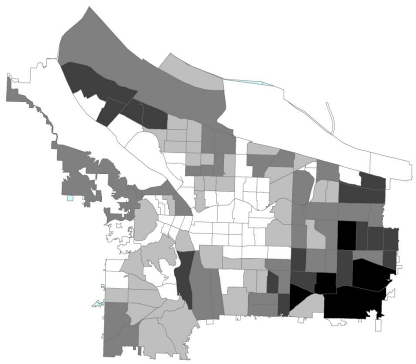
Census Tract Analysis

▪ In addition to the factors driving foreclosures nationally, are there socioeconomic variables that correlate to areas with high foreclosure rates in Portland specifically?

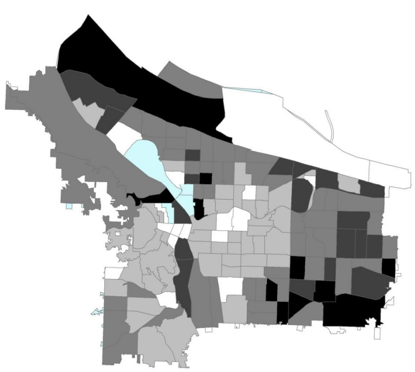
▪ What do current areas of high foreclosures tell us in terms of age, income, place of birth, race and ethnicity, and other factors?

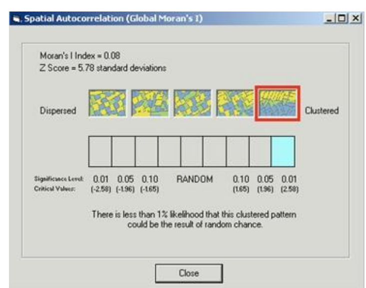
▪ Can these socioeconomic information about these areas help us predict other census tracts that may be at risk for high foreclosure rates?

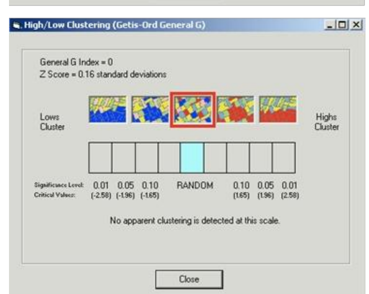
Raw Counts



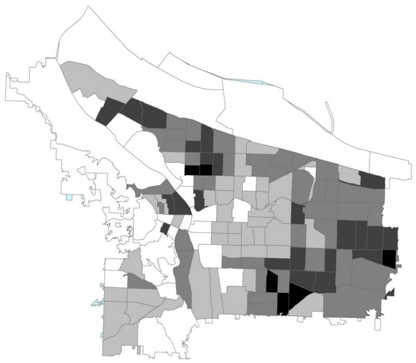
Foreclosures per person

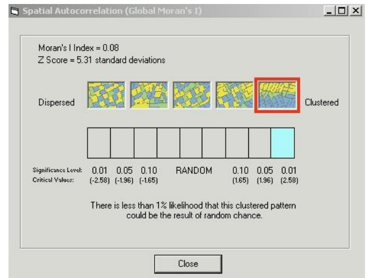


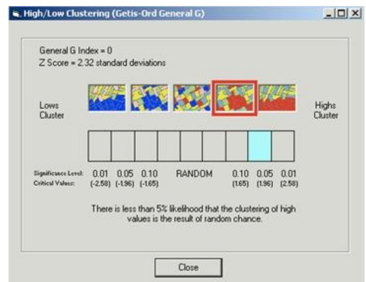




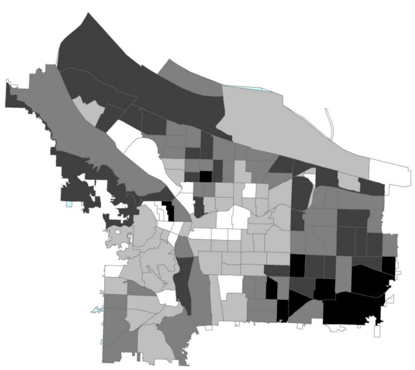
Foreclosures per square mile

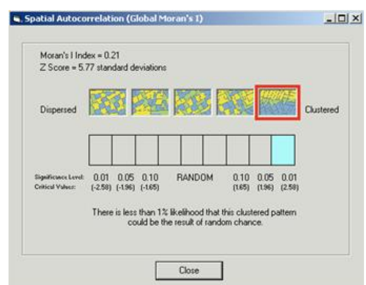


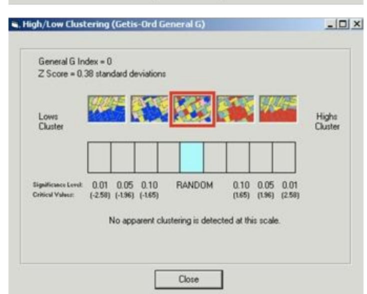




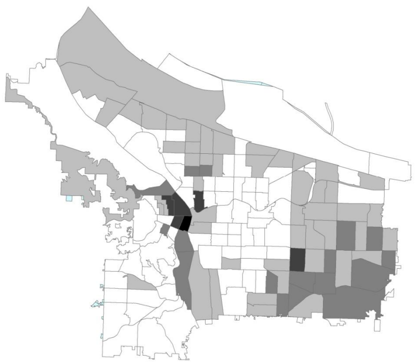
Foreclosures per housing unit

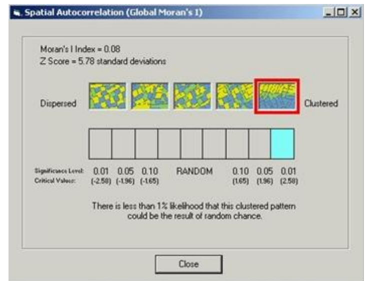


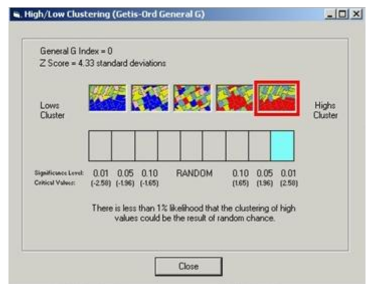




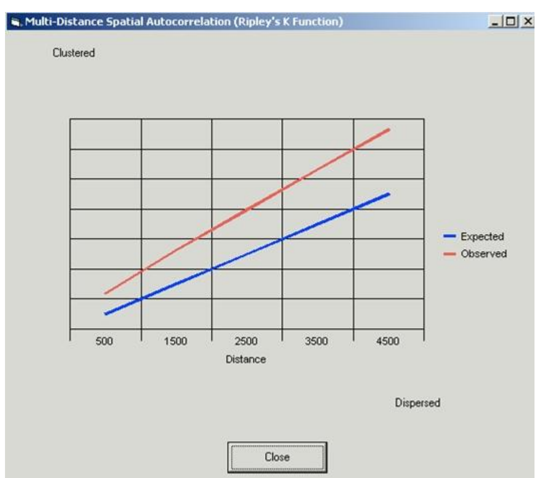
per owner occupied unit



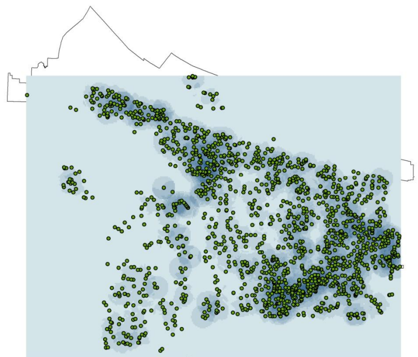


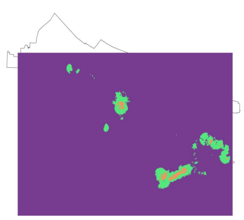


Ripley's K Analysis

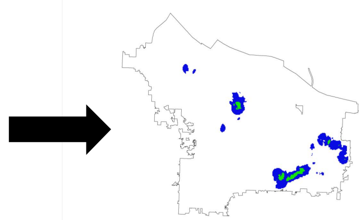


Point Density (half-mile window)





Reclassify

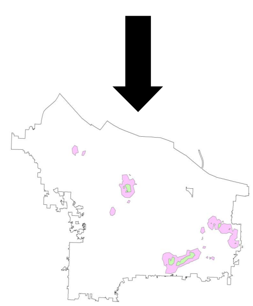


Majority filter

0-30 foreclosures in half-mile radius = 0

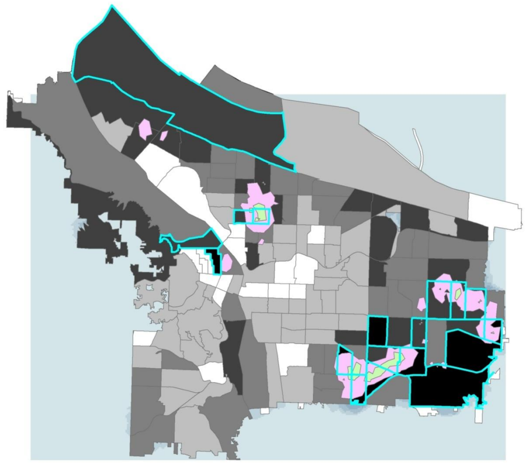
30-50 foreclosures = 1

50-72 foreclosures = 2



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**

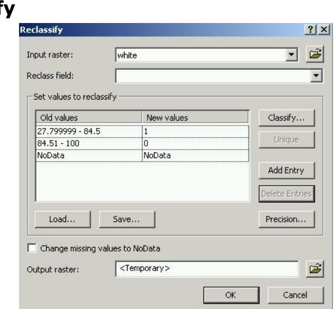
Possible Correlation

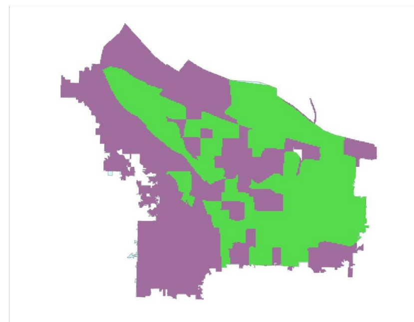
- Below average educational attainment
- Below average now married
- Below average percent age 45 to 54
- Below average percent white
- Below average percent Korean
- Below average in same house as 5 years before
- Below average in a different county 5 years before
- Below average born in another state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

Possible Correlation

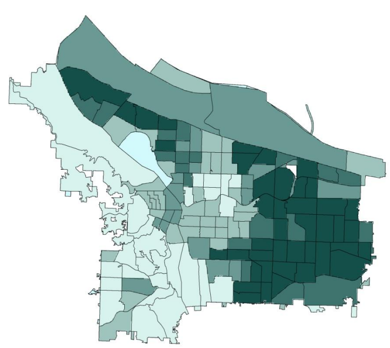
- Above median age of home
- Above average Asian
- Above average Vietnamese
- Above average family size
- Above average in a different house in same county 5 years before
- Above average foreign-born
- Above average arrived in U.S. in past decade
- Above average foreign language at home
- Above average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

Convert to raster, reclassify



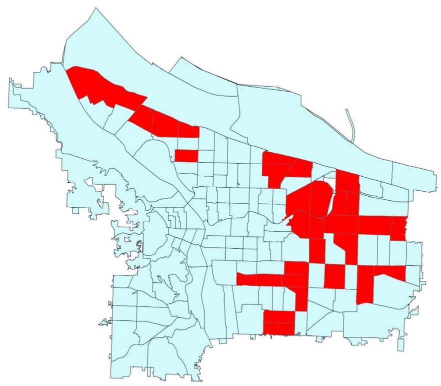


Add up the 1's with the raster calculator:

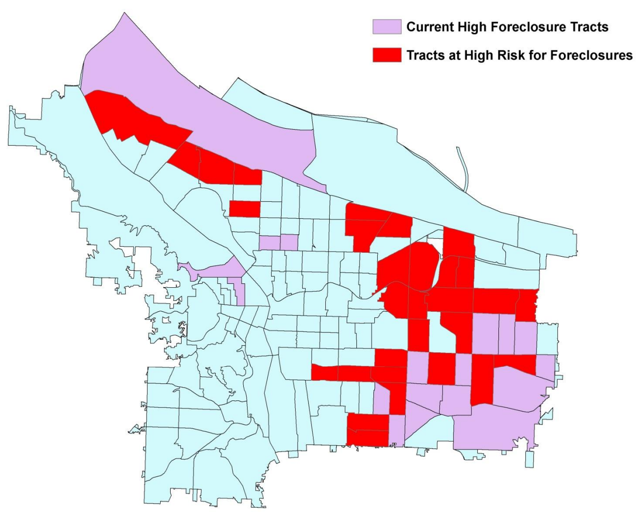


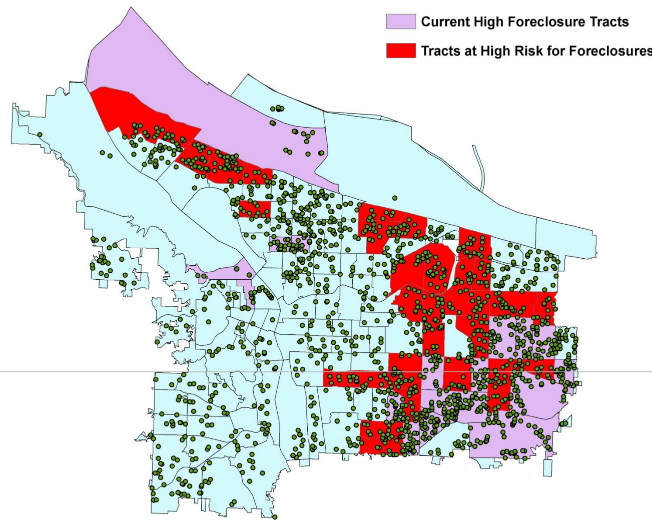
Darkest green: Values for 19 or more out of the 23 variables are above the city mean or median

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	





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

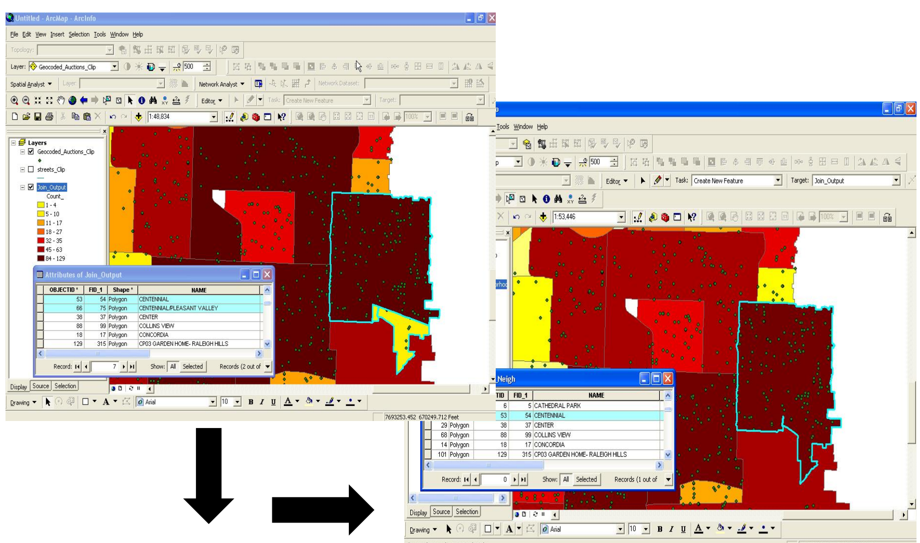
Process Outline

- 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

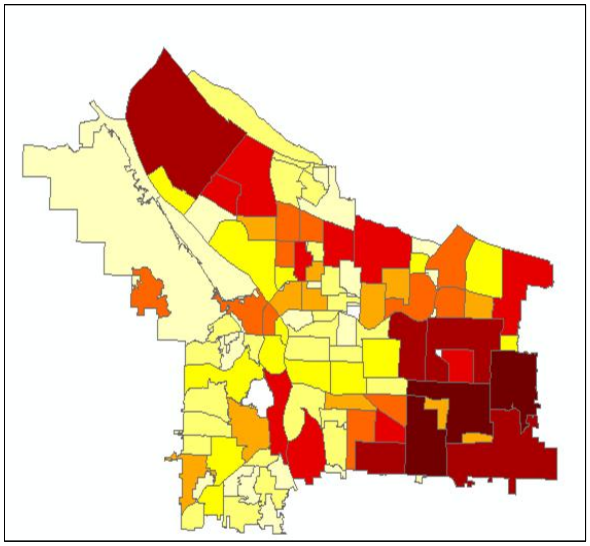
Process Outline

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

Editing the Neighborhood



Finalized Neighborhoods



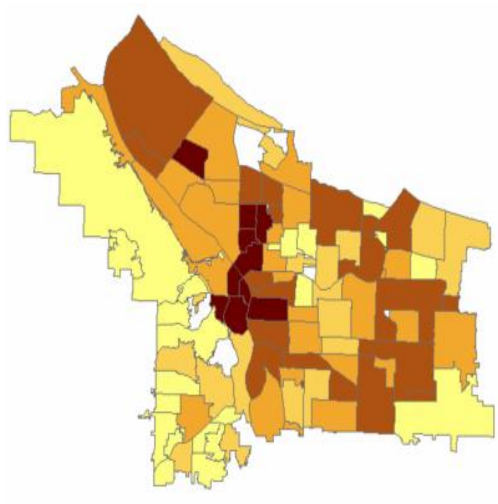
What’s Driving Foreclosures?

Noticed Visual Correlation to Foreclosures from

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

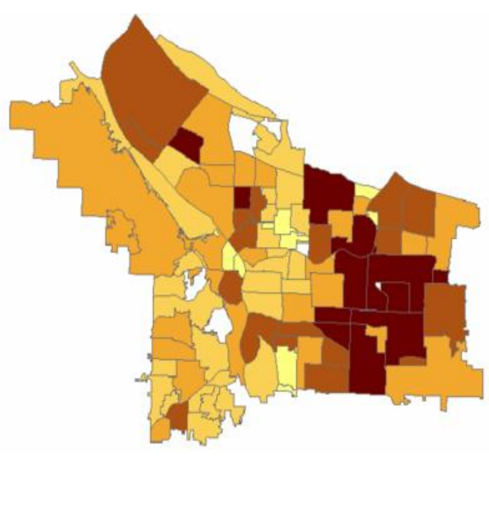
% Below Poverty Level

- **Areas of <u>mid to high</u> poverty show relation to foreclosures sites**



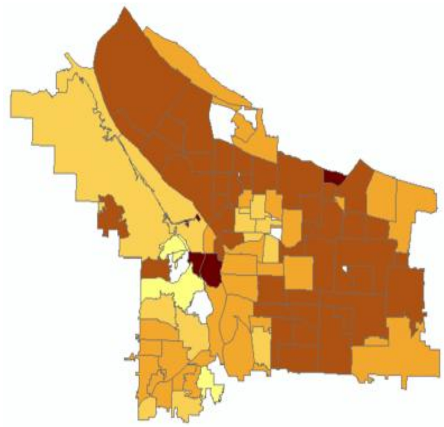
% Foreign Born

- **Areas of <u>mid to high</u> % of foreign born residents show relation to foreclosures**



% Median Home Value

- Areas of <u>lower</u> home values follow trend of foreclosure
- Least Correlation



Job Types Analysis

<u>Created two base job types</u>

- **Blue collar:**

  Construction, Production, Transportation, and Service Jobs

- **White collar:**

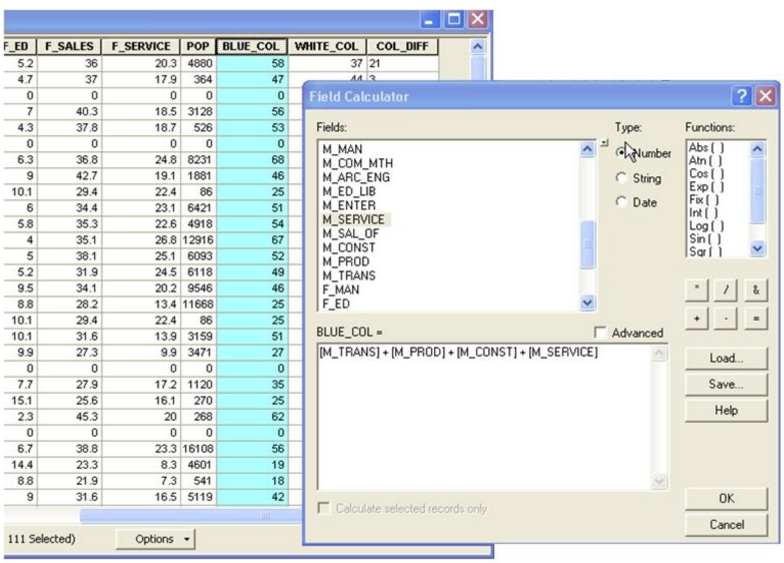
  Sales/Office, Management, Entertainment, Computer/Math, Education, Architects, Engineers

Employment Trends by Industry in Oregon

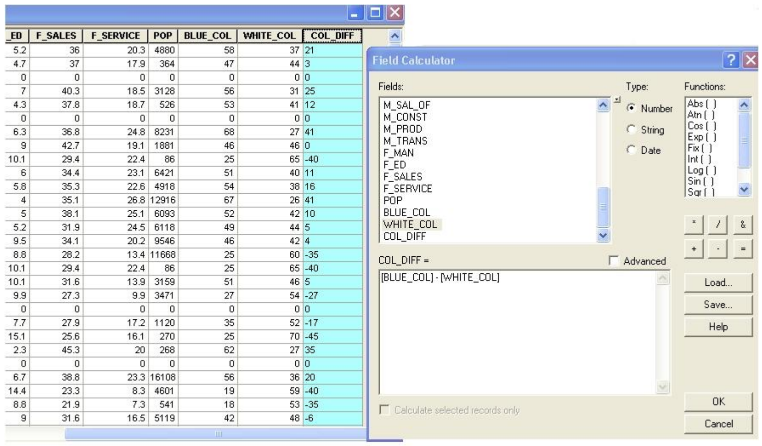
Oregon	Total Employed (thousands) Feb-09	Percent Change 1-mo.	3-mo.	12-mo.
Total	1,654.9	-14.5	-10.2	-4.7
Trade, Transportation & Utilities	317.5	-11.7	-12.5	-6.9
Government	301.4	3.2	-0.1	2.1
Educational & Health Srvs.	223.6	-11.6	0.7	3.1
Professional & Business Svcs.	185.4	-19.6	-12.9	-6.6
Manufacturing	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



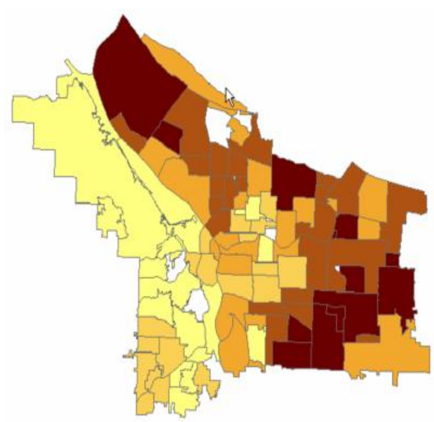
Creating Collar Difference



_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	3128	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	4918	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	38.8	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

Collar Difference

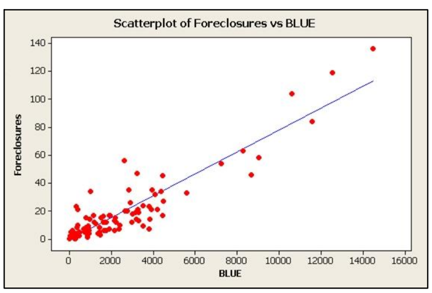
- **High Correlation to “Blue” collar neighborhoods**
- **Lower Correlation to “White” collar neighborhoods**
- **Highest Correlation**



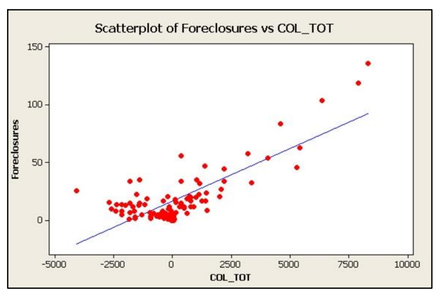
Data Analysis

- <u>**Data Testing**</u>
  - **Regression Testing – Minitab + Excel**
  - **Multi-linear Regression Testing – Minitab**
  - **Histograms + Scatterplots - Minitab + Excel**

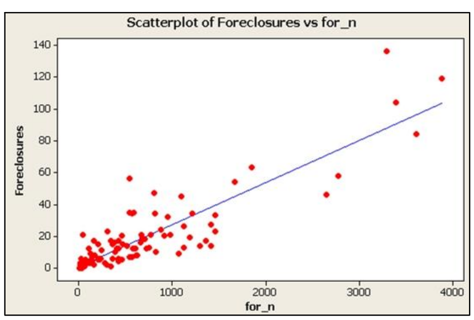
- **Transform data from % to # of people**
  - **(Data x Pop.)**



R^2 = .837



R^2 = .627



R^2 = .770

Final Dataset

- **Raster Calculator**

  Used formula based on regression results

  Base = 100%

  (Col Diff *60)+(Foreign*20)+(H Val *10)+(Poverty*10)

  Get "Preference Raster"

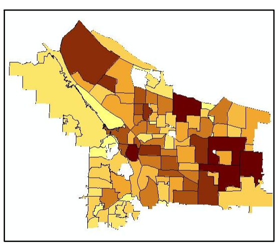
- **Kriging**

  Ordinary Kriging – Trend adjusted

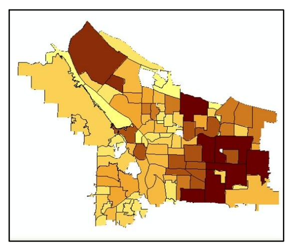
  Create Prediction Map

- **Analyze**

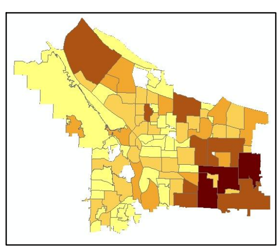
  Overlay Foreclosures and Interpret Predictions



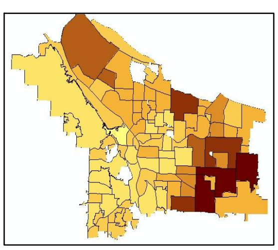
Poverty Raster



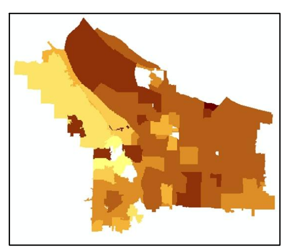
Foreign Raster



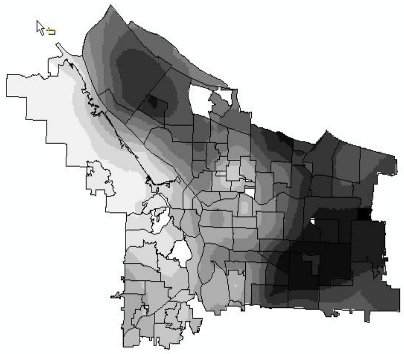
Foreclosures Raster



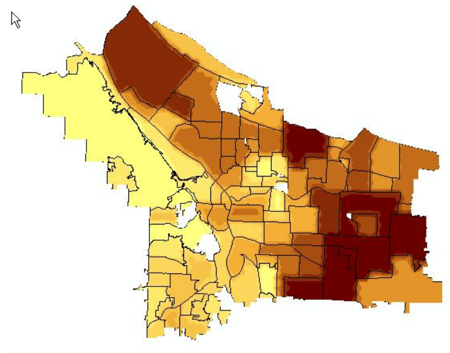
Collar Raster



Value Raster

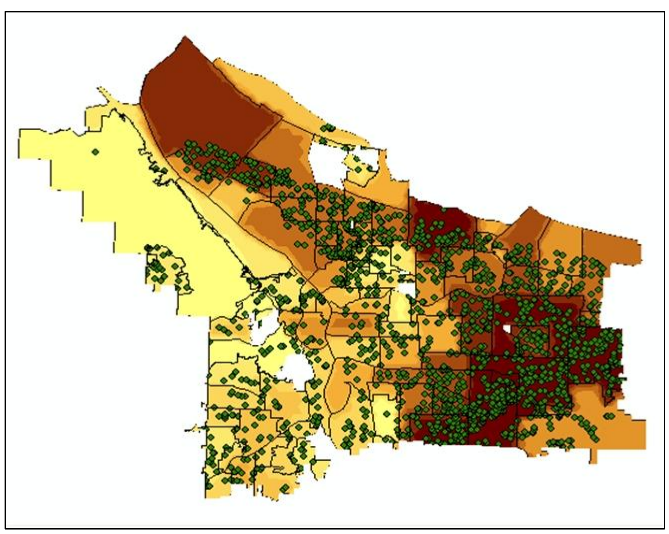


Foreclosure “Preference”



Kriging Predictions

Matching Foreclosures to Predictions



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

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