



Putting **artists** on the Map

A five-part study of greater Cleveland artists' location decisions

Part 4: Predictive Analysis - Regression Modeling



Cleveland State
University
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Northern Ohio Data & Information Service



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Predictive Analysis: Regression Model

April 27, 2011

This document represents Part 4 in a series of five reports that will detail the residential and work space location preferences of Cuyahoga County's artists.



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Putting Artists on the Map is
supported by Leveraging
Investments in Creativity
(LINC) as part of its Creative
Communities program,
funded by the Kresge
Foundation and the Ford
Foundation.

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INTRODUCTION

This report provides an explanatory model of the neighborhood characteristics in which artists live in Cuyahoga County and indicates which residential neighborhoods have similar characteristics and thus might be appropriate for attracting artists. The model is built from data on demographic, socioeconomic and housing characteristics, as well as the concentrations of artistic venues and employment centers in the county.

METHODS

Multiple regression analysis was used to identify neighborhood variables that contribute to estimating the number of artists living in them. Census block groups with reported households in the 2000 Census were used as the unit of analysis. The analysis started with a large set of variables that were thought to possibly help explain the neighborhood location of artists in the county. Through multiple model specification, variables were systematically excluded based on both or either of their explanatory power and/or redundancy in contribution to the model. The final model was then used to calculate the estimated number of artists for each block group and, by comparison to the actual number, indicate which block groups in the county had fewer artists than expected.

The number of artists in each block group was computed after geocoding addresses of artists that were obtained from arts organizations (see Table 1). More than 5,000 records were reduced to 4,016 unduplicated artists in the county. It is understood that this is not a complete database of the county's artist community. Nevertheless, it is assumed that it is sufficiently comprehensive and adequate for the analysis.

Selected demographic, socioeconomic and housing data from the 2000 Census were evaluated, along with data from the Cuyahoga County Auditor's Office on property characteristics, which were aggregated to the block group level.

Additional variables evaluated included proximity to artist-employing establishments as identified in the state's ES202 database.¹ Industry types selected for this analysis included NAICS codes 7111 (Performing Arts Companies), 7113 (Promoters of Performing Arts, Sports, and Similar Events), 7114 (Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures), 7115 (Independent Artists, Writers, and Performers), and 712 (Museums, Historical Sites, and Similar Institutions). The list of establishments was edited to remove those establishments that were apparently sports-related and other industries that were apparently inappropriate for the analysis. The industry data was aggregated to the Cleveland Statistical Planning Area (SPA)² and suburban municipal/township level. Each block group was assigned the

¹ The ES202 database includes total employment by establishment and detailed industry type. The data are confidential and are provided by the Ohio Department of Jobs and Family Services to CSU for research purposes.

² The thirty-six Statistical Planning Areas of the City of Cleveland are generally recognized neighborhoods and are used by the Cleveland Planning Commission and other organizations to report a variety of neighborhood and housing conditions.

number of establishments and total employment in them within the SPA or suburban municipality/township in which it is located.

The assignment of SPA and suburban municipality/township to each block group in which it is located is used to test the hypothesis that housing choices are influenced by proximity to employment opportunities.³ To further measure proximity to these opportunities, additional variables were created that aggregated the establishment and employment data for adjacent SPAs and municipalities/townships. This produces a wider geographic area in which proximity to such opportunities may play a role in residential location decision making by the artist community.

Another set of variables was created and evaluated based on proximity to a variety of artist-related venues provided by CPAC. This database includes more than 500 organizations, such as churches and other religious organizations, schools, studios, cultural associations and institutions, performance halls, galleries, museums, theaters and other venues in which artists perform, work, congregate or are otherwise often associated.⁴ Like the industry establishment variables noted above, the number of artist-related venues in each SPA or municipality/township was assigned to each block group. Also similar to the process performed for the industry establishments, aggregated data on number of venues in adjacent areas (SPAs and municipalities/townships) provided another variable to evaluate.

Thus, the analysis used data from five sources:

1. 2000 Census of Population and Housing
2. Cuyahoga County property records from 2009
3. Artist-employing establishments from the ES202 database
4. Artist-related venues
5. Geocoded address lists of artists provided by arts organizations

The 2000 Census data were used since more current, small area (tract and block group) estimates from the Census Bureau were not available in time for the analysis. Tract and block group data from the 2005-2009 American Community Survey would be useful for updating and revising the analysis in the future.

Though there has been significant population loss in some Cleveland neighborhoods and the inner-ring suburbs, generally most neighborhoods and their characteristics are relatively unchanged. Exceptions include those neighborhoods in which there has been significant population loss or gain or where new construction or demolition has taken place. Unless there has been such change, the existing housing stock largely influences the demographic and socioeconomic composition of a neighborhood.

Nevertheless, the reader is cautioned to take into consideration possible changes that have occurred that might influence the results of the analysis.

³ Though these industries and their establishments employ non-artists as well as artists, it is assumed that their employment size generally reflects employment opportunities or other possible reasons for living near them.

⁴ Because multiple files were combined some redundancy in the data is possible.

Some 90 independent (explanatory) variables were evaluated, representing more than 25 different aspects of neighborhood demographics, socioeconomic status, housing and proximity to artist-related employers and venues.

Census variables included those pertaining to race (e.g., percent African American), Hispanic ethnicity, private and public school enrollment, income (both ranges and median), age of housing (all, owner and renter occupied), unemployment, percent in the labor force, major occupation category, poverty, educational attainment, household size (all, owner and renter households), number of rooms (all, owner and renter occupied), units in structure, median rent (contract and gross), value of owner occupied units, rent asked (unoccupied rental units), price asked (units for sale), mode of transportation to work, and place (city) of work (same as or different from place of residence).

Data from the Cuyahoga County property records included condition of structure, age of structure, number of rooms, square footage of living space, construction style (e.g., ranch, colonial, duplex, elevator, bungalow) and building value.

A full model was initially tested using all the assembled variables. Correlation (Pearson's r) was used in combination with the regression statistics (t -values and their probability of significance) to selectively reduce the model so that only contributing independent variables remained.⁵ Variables that were statistically significant at the 0.10 level were kept in the model.⁶

⁵ The selection of variables was only partially guided by an objective to reduce redundancy (high correlation) among variables. Strong correlation (multicollinearity) among the explanatory variables can result in unreliable parameter estimates, thus limiting the ability to discern which variables are more significant in explaining the dependent variable (number of artists in the block group). However, the predictive power of such a model is not lessened by multicollinearity, and we ignored some variable redundancy since the objective of the analysis was to identify neighborhoods with potential for enhanced concentration of artists.

⁶ This means that one is 90 percent confident that the variable contributes to the explanation of the dependent variable – number of artists.

RESULTS

Table 2 presents the results of the final regression model. The model explains (R-squared) almost half (48%) of the variation in the number of artists found in some 1,223 block groups for which there is data for all variables in the model.⁷ Nineteen variables are included, each significant at the 0.10 confidence level. A selection of these variables is shown in the maps found in Appendix A.

The model specifies that the number of artists in a block group can be reliably estimated and that they live in neighborhoods that have the following combination of characteristics:

- The median number of rooms is larger
- Household size is smaller
- Percent of owner occupied units is higher
- Housing is older – the percent of units built before 1940 is higher
- There are fewer 2-family homes
- There is a higher percentage of workers who are managers
- There is a higher percentage of persons in the workforce (percent not in labor force is lower)
- Household incomes are lower
- Workers either bike to work or work at home in larger numbers
- Workers work in the same place (municipality/township) as where they live in larger numbers
- There is a higher percentage of persons age 25 and older who have a graduate or professional degree
- Total population is greater
- The percentage of housing styles that are contemporary, ranch and elevator housing is higher
- Housing structures are rated among the worst categories of condition by the county assessor at a lower rate
- There are more artist-employing establishments and arts venues in the statistical planning area or municipality/township

However, it is also obvious that artists vary in the types of neighborhoods in which they live. The variables noted above help to explain the residential location (by block group) of all artists (in the research database) taken as a single group. However, as was shown in the “Geographic Analysis: Neighborhood Profiles” report (Part 2 of this research series), the geographic concentration of artists varies by discipline, and this should be taken into consideration when reviewing this regression model. Musicians, for example, are more concentrated in the eastern neighborhoods, nearby to the culturally and music-rich venues in and around University Circle. Artists in theater have high concentrations on the near west side of Cleveland and in Lakewood, and other disciplines have their own unique geographic areas of concentration. Thus

⁷ Explained variance of this magnitude in social science research, using secondary data of this kind, is generally very good.

a single model for all artists can be perhaps somewhat misleading if not understood for what it is.

Nevertheless, the model can be used to suggest some neighborhoods in which there are fewer artists (of any discipline) than what one would expect based on the explanatory model presented here. The regression model includes parameter estimates that constitute a formula for calculating the expected number of artists in each block group, given the variables used in the model. By subtracting the expected number of artists from the actual, we derive the residual – which is the number of additional artists expected in each neighborhood.

Map 1 shows actual number of artists per block group, Map 2 shows the expected number, and Map 3 shows the residual (estimated minus actual).

The blue areas on the map indicate block groups that are expected to have more artists than are (apparently) present, based on the regression model and the variables noted above.⁸ The darker blue areas represent a deficit of 5-to-10 artists and are mostly found in the suburban areas of the county. A significant number are found in and adjacent to neighborhoods identified in the “Geographic Analysis: Neighborhood Profiles” report (Part 2 of this research series) noted above. Map 4 shows the residuals with those neighborhoods. Red colored block groups indicate that the model predicts fewer artists than are found there. However, that simply suggests that artists have been attracted to those neighborhoods in even greater numbers than the general model predicts.

The concentration of dark and light blue colored block groups around University Circle, Cleveland Heights, Shaker Heights, University Heights, South Euclid and Beachwood suggests that the strength of these communities to attract even more artists than they currently have.

Tremont, Detroit-Shoreway and Edgewater SPAs on the near west side of Cleveland have higher concentrations of artists than the model predicts. Otherwise the City of Cleveland has only small and mostly isolated pockets of potential expansion of artist concentrated neighborhoods.

LIMITATIONS

Several limitations have been noted in this report. They merit repeating along with other limitations that include the following:

- I. Comprehensiveness and accuracy of the data
 - The artists list used may exclude significant groups of artists
 - Census data are 10 years old, and those used in the analysis are only estimates themselves

⁸ The reader is cautioned that geographically larger block groups are mostly found in the suburbs and particularly in the outer reaches of the county and distort the perception of the data being mapped, visually outweighing the smaller block groups regardless of the number of artists or other mapped variable.

- County property records, ES202 data, and data on venues may be incomplete, out-of-date or inaccurate
- Artists, like other groups, are not homogeneous in their residential needs and preferences – the presence of subgroups, such as those represented by artistic discipline, should be included in a more comprehensive analysis
- Other variables that influence all residents, all artists, or subgroups of artists may be important
- The unit of analysis – census block groups – are used for convenience and may not adequately provide a good way of capturing neighborhood characteristics

2. Modeling with regression analysis

- Some variables may have been unnecessarily excluded or included in the model specification process
- The complexity of the interaction of the predictor variables may not be captured by the linear model approach used
- The residuals only indicate the difference between expected and actual values in a static, sum-to-zero fashion
- Without inclusion of process and temporal variables of change, regression analysis does not permit prediction of the future

In other words, the residential location of artists is determined by many and very complex factors, and the data methods used here represent only one relatively simple approach to addressing the question of why artists live where they do and what factors might attract them to other places.

Thus, this analysis should be understood to provide a general and limited, though hopefully valuable, contribution to better understanding where artists live in Cuyahoga County and what neighborhoods might be further investigated for additional policy and program development to attract and accommodate the artist community in Cuyahoga County.

Table I: Organizations Providing Geocodable Email Addresses⁹

SOURCE	Original lists geocoded		After removing duplicates	
	Count	Percent	Count	Percent
Apollos Fire	21	0.4	19	0.5
Art House	200	3.9	155	3.9
Cleveland Artists Foundation--Cleveland's Center for Regional Art	30	0.6	23	0.6
Cleveland Public Theatre	207	4.1	181	4.5
Community Partnership for Arts and Culture	609	12.0	608	15.1
Cuyahoga County Artists - Creative Writer's Directory	21	0.4	21	0.5
Independent Pictures	1	0.0	1	0.0
Ingenuity	362	7.1	291	7.2
Ohio Arts Council - Creative Writers	47	0.9	47	1.2
Ohio Arts Council - Individual Excellence Award Applicants	369	7.2	368	9.2
Ohio Arts Council - Online Visual Artist Registry	97	1.9	96	2.4
Opera Cleveland - Lucia Chorus	36	0.7	20	0.5
Opera Cleveland - Orchestra	40	0.8	34	0.8
Opera Cleveland - Production Staff	15	0.3	9	0.2
Rainey Institute	27	0.5	27	0.7
SPACES	1,293	25.4	878	21.9
The Cleveland Institute of Art	1,525	29.9	1,081	26.9
The Music Settlement	141	2.8	121	3.0
Young Audiences of Northeast Ohio	53	1.0	36	0.9
Total	5,094	100.0	4,016	100.0

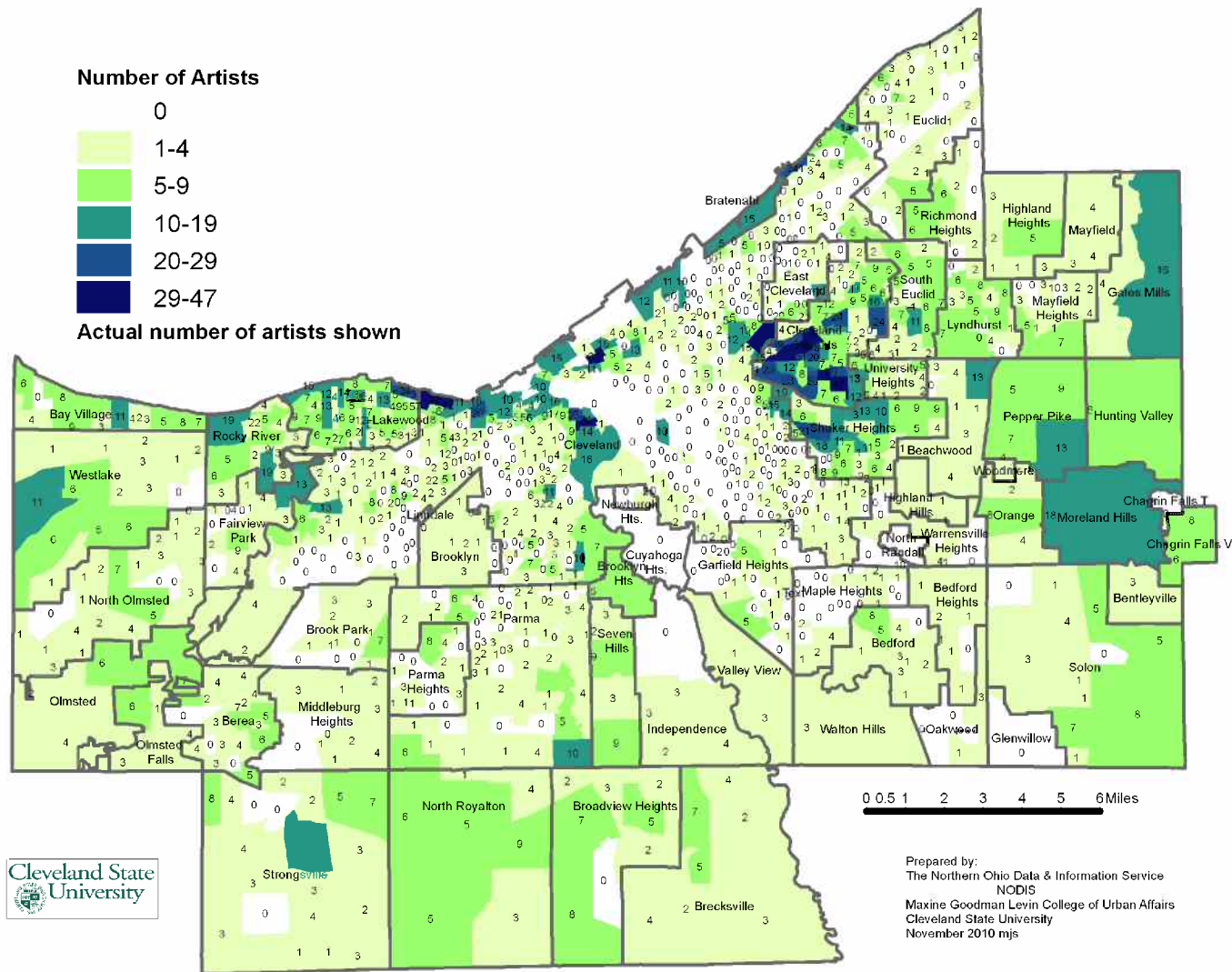
⁹ In addition to the above organizations, CPAC would also like to thank the Beck Center for the Arts for its support and assistance in helping to spread the word about the data collection effort supporting this work. CPAC also wishes to thank BAYarts, which provided a listing of contacts that were used for the survey component of the research. These contacts included only email addresses and not geocodable residential addresses. Therefore, these contacts do not appear in Table I.

Table 2: Regression Results

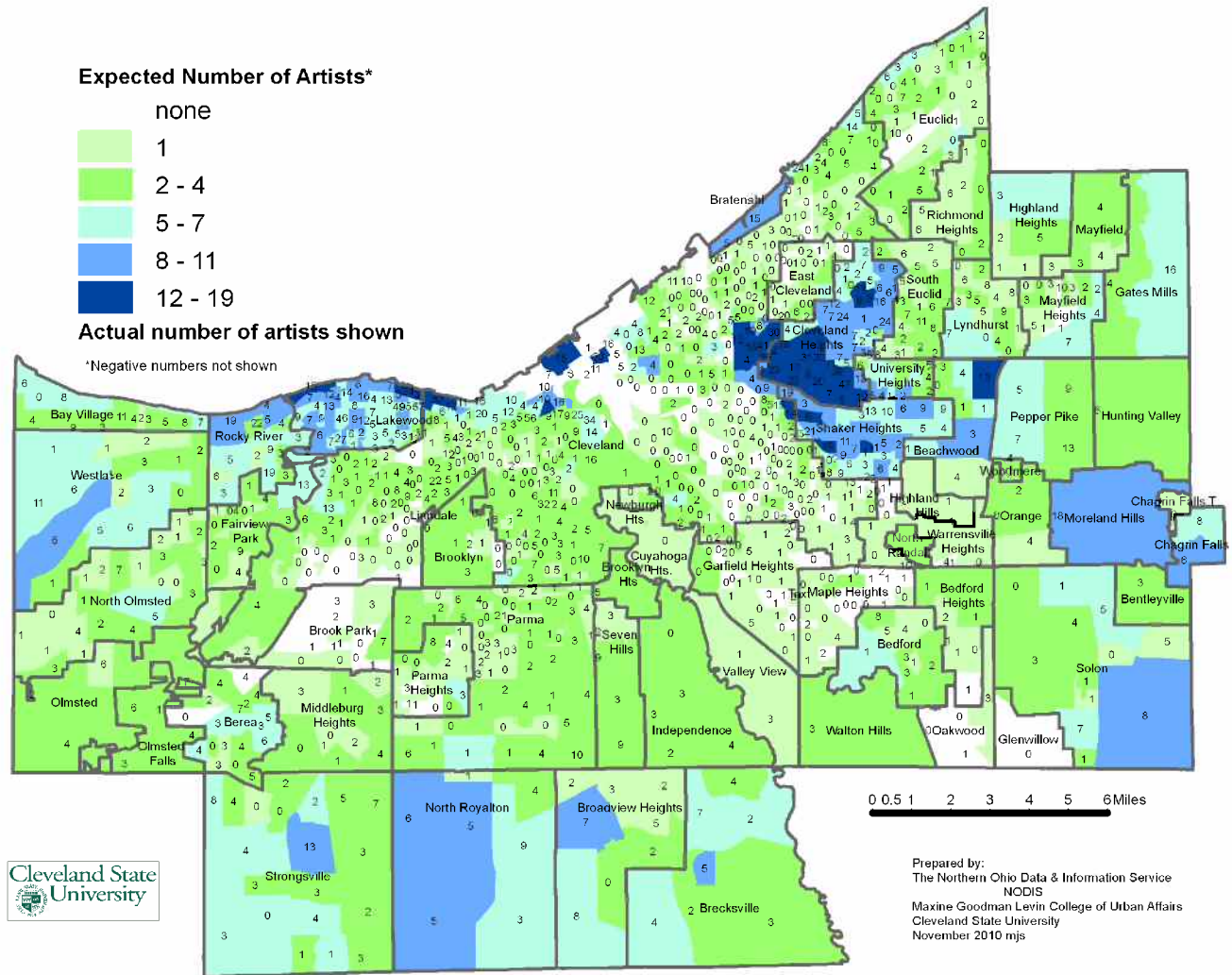
Dependent Variable = Number of Artists per Census Block Group						
R-square = 0.483638 F value = 59.35 Prob > 0 <0.001						
n (census block groups) = 1,223						
Independent Variable	Source	Variable Name	Estimate	Standard Error	t value	Probability > 0
Intercept		Intercept	-0.2536434	1.29128	-0.20	0.8443
Average household size	Census	avhhsiz	-2.5529142	0.38021	-6.71	<.0001
Median household income	Census	medhhinc	-0.0000389	0.00001	-3.54	0.0004
Median number of rooms	Census	mednrooms	0.4832168	0.17249	2.80	0.0052
Percent in 2-family structures	Census	pct2unit	-0.021922961	0.01198	-1.83	0.0674
Percent managers	Census	pctmanager	0.0295538	0.01414	2.09	0.0369
Percent not in labor force	Census	pctnotinl	-0.0286581	0.01158	-2.48	0.0135
Percent owner occupied	Census	pctowner	0.0180917	0.00715	2.53	0.0115
Percent units built before 1940	Census	pctbltpre40	0.0570578	0.00699	8.16	<.0001
Percent who use a bike to get to work	Census	pctbike	0.5629512	0.15339	3.67	0.0003
Percent who work at home	Census	pctworkhome	0.0758405	0.04544	1.67	0.0954
Percent who work in the place of residence	Census	pctworkinplace	0.0289331	0.00693	4.17	<.0001
Percent with graduate or professional degree	Census	pctgsgrad	0.1326040	0.02402	5.52	<.0001
Population	Census	Pop100	0.0017376	0.00017	10.00	<.0001
Percent housing style is contemporary	County Property Records	pctStylecon	0.194731511	0.08990	2.17	0.0305
Percent housing style is elevator apartment	County Property Records	pctStyleele	0.0369073	0.01664	2.22	0.0268
Percent housing style is ranch	County Property Records	pctStyleran	0.0160791	0.00702	2.29	0.0222
Percent in poor-to-worst condition	County Property Records	pctrpoorcond	-0.025629252	0.01345	-1.91	0.0570
Number of artist-employing establishments	ES202	employers	0.1645369	0.07134	2.31	0.0213
Total number of arts venues in the community*	CPAC	total_venues	0.0732638	0.01564	4.68	<.0001

* Arts venues include all those that are in the municipality or Statistical Planning Area in which the block group is located.

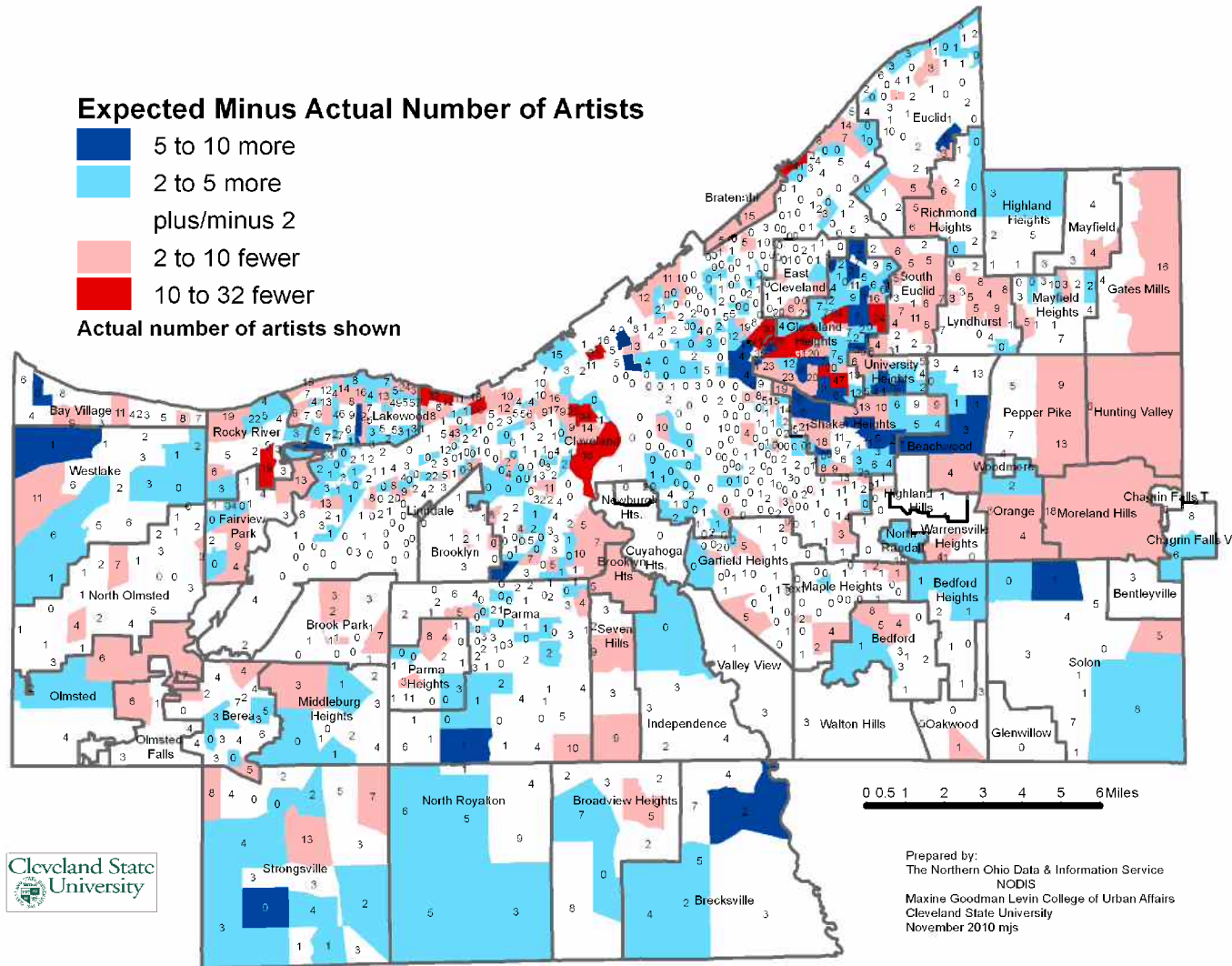
Map I: Number of Artists per Census Block Group



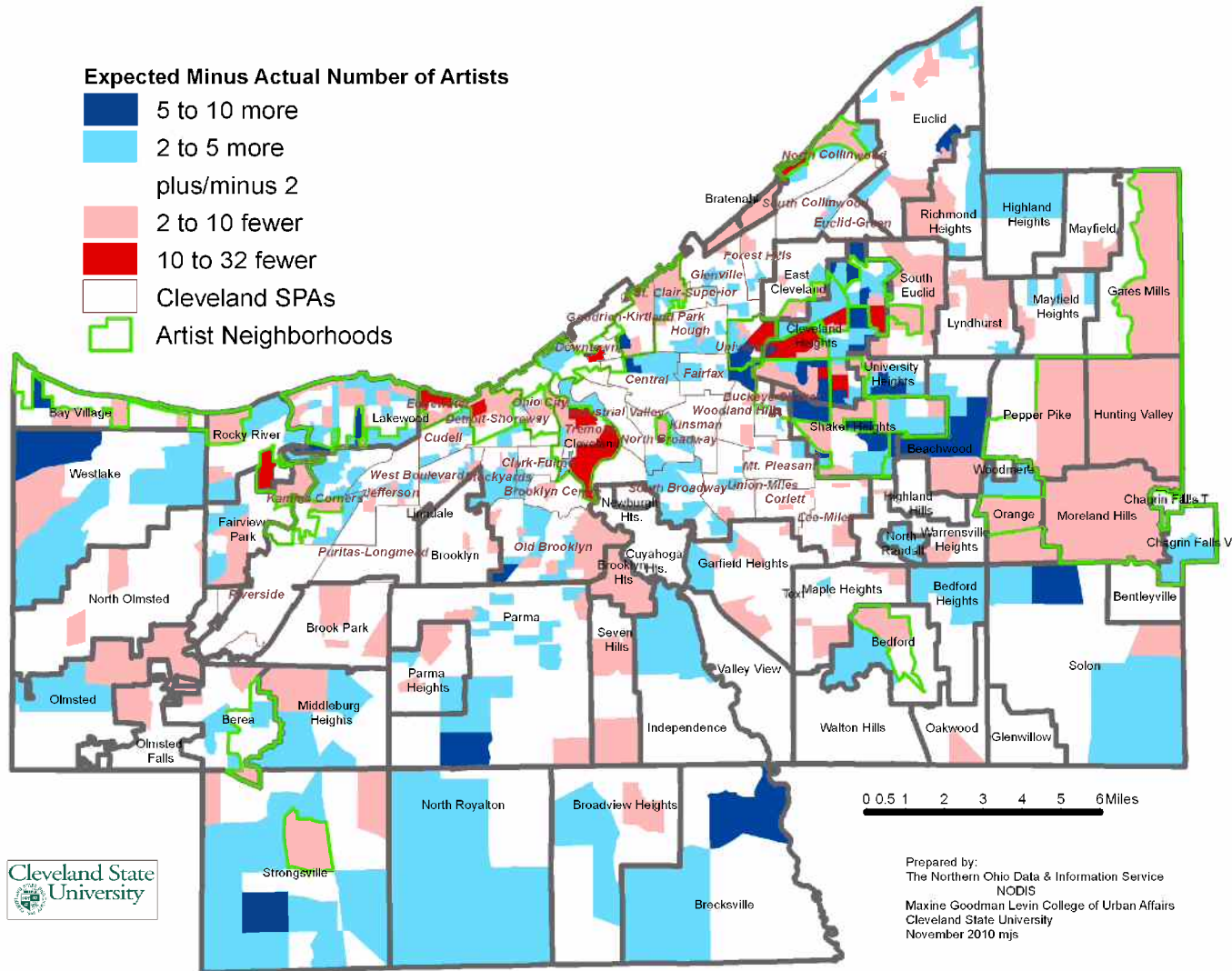
Map 2: Expected Number of Artists per Census Block Group



Map 3: Residual Number of Artists per Census Block Group



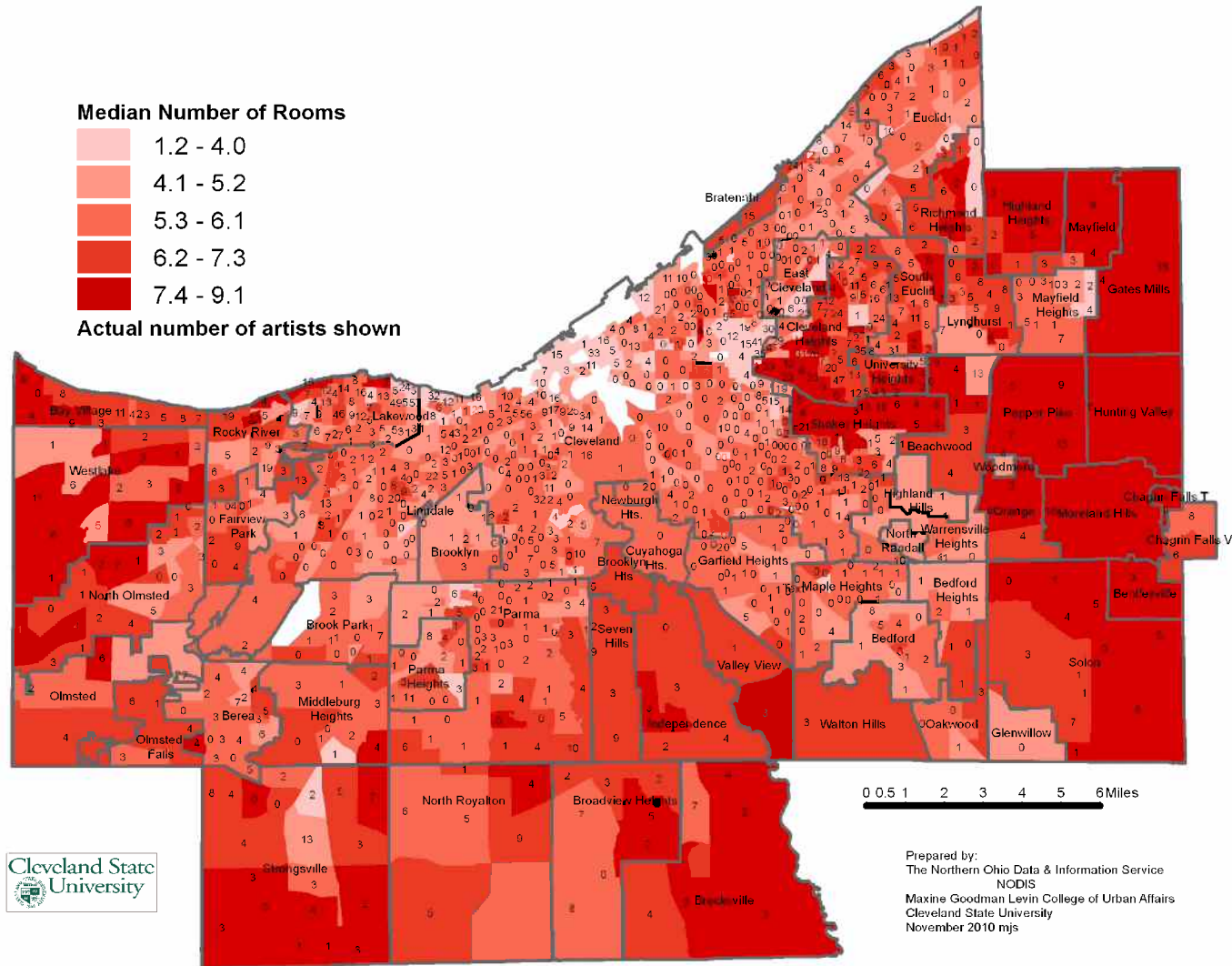
Map 4: Residual Number of Artists with Artist Neighborhoods and Cleveland SPAs



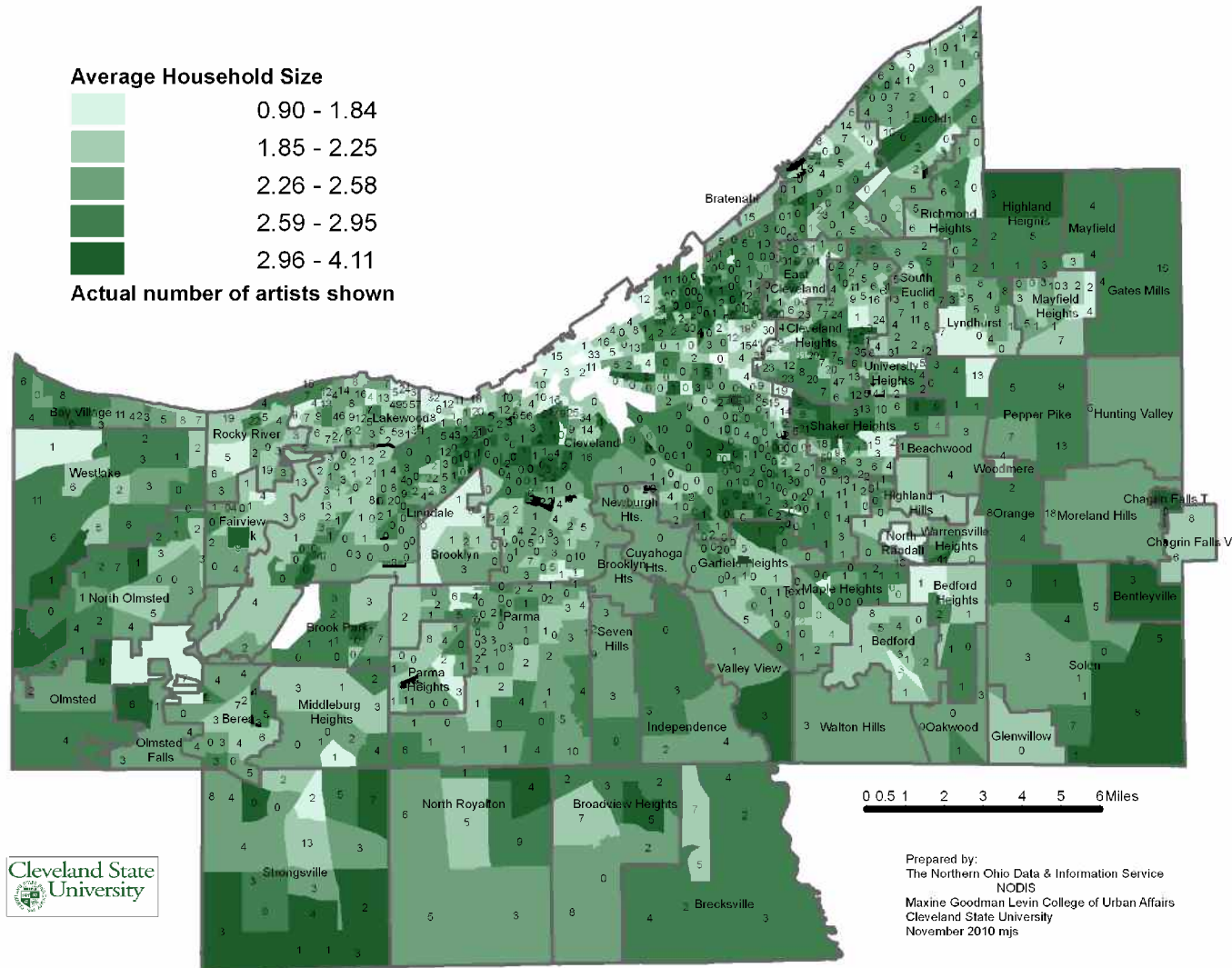
APPENDIX A

Maps of Explanatory Variables

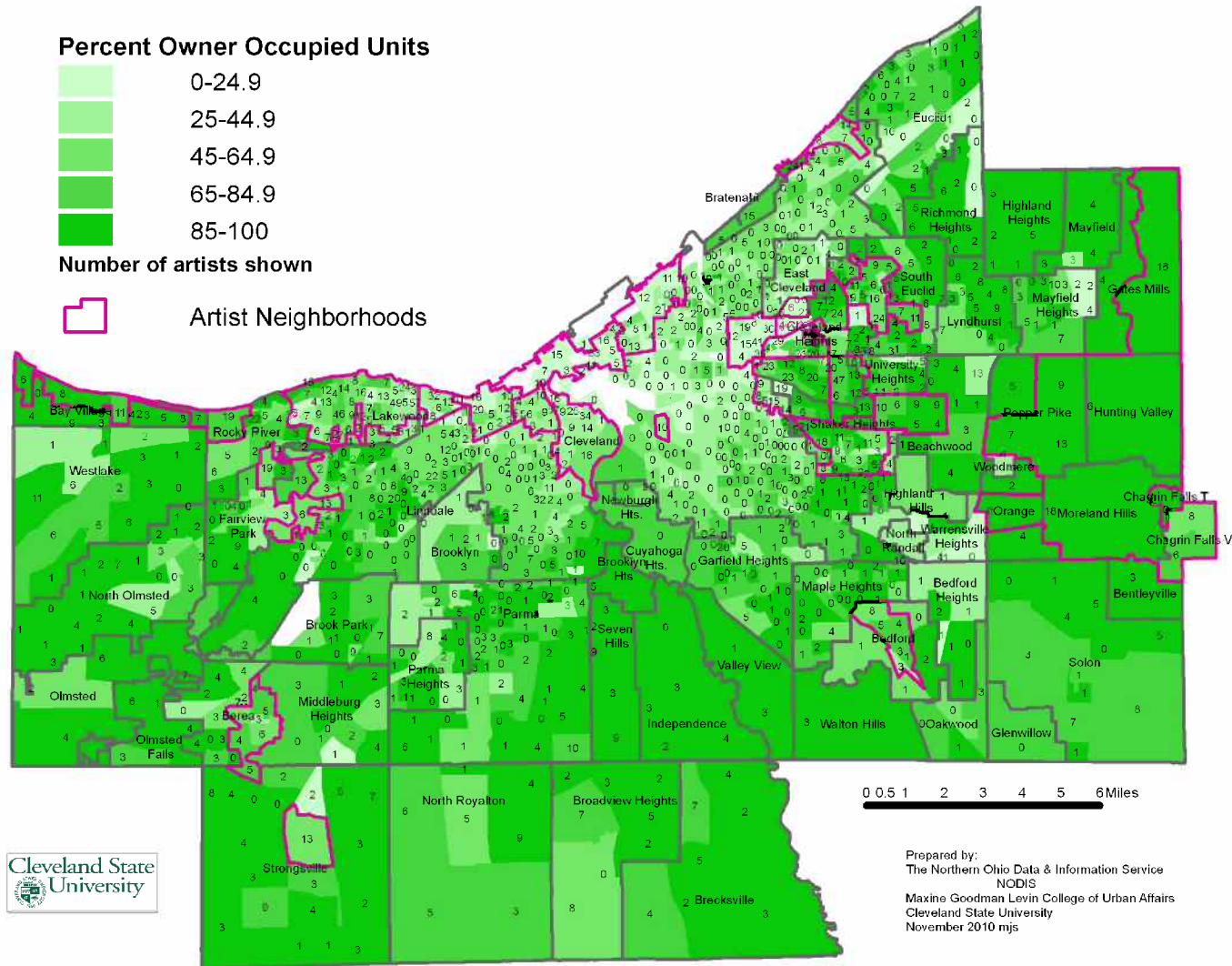
Map A-I: Median Number of Rooms



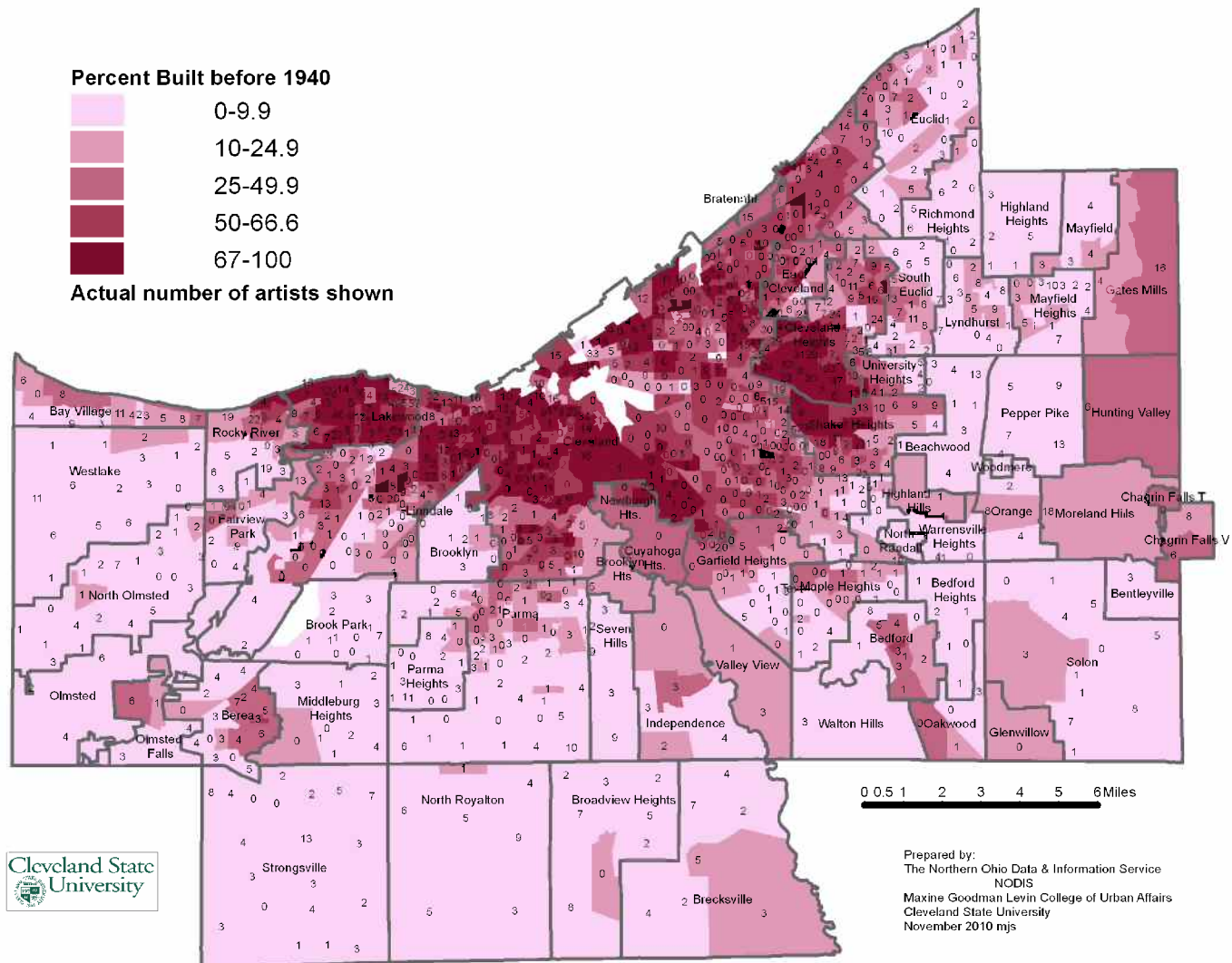
Map A-2: Average Household Size



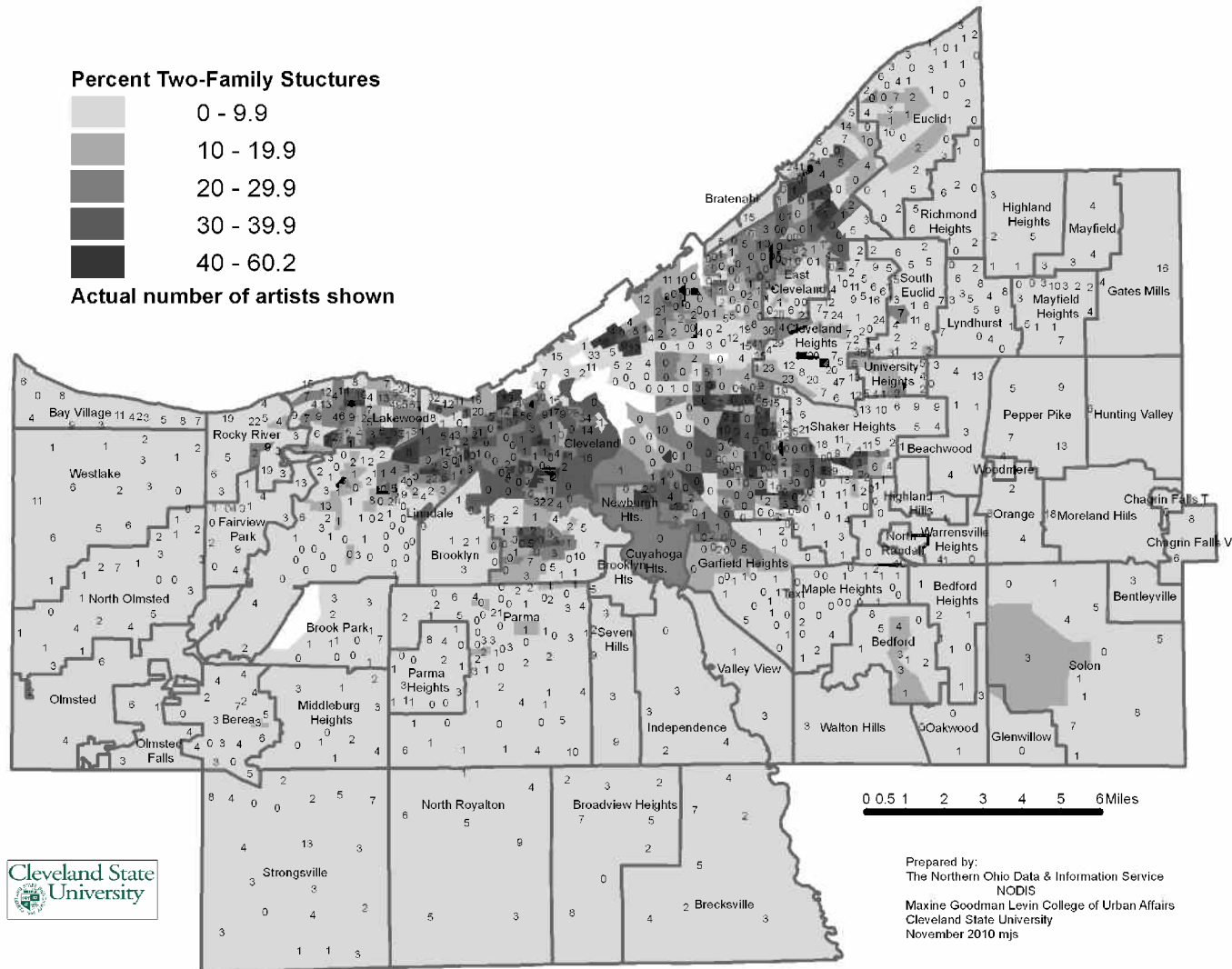
Map A-3: Percent Owner Occupied



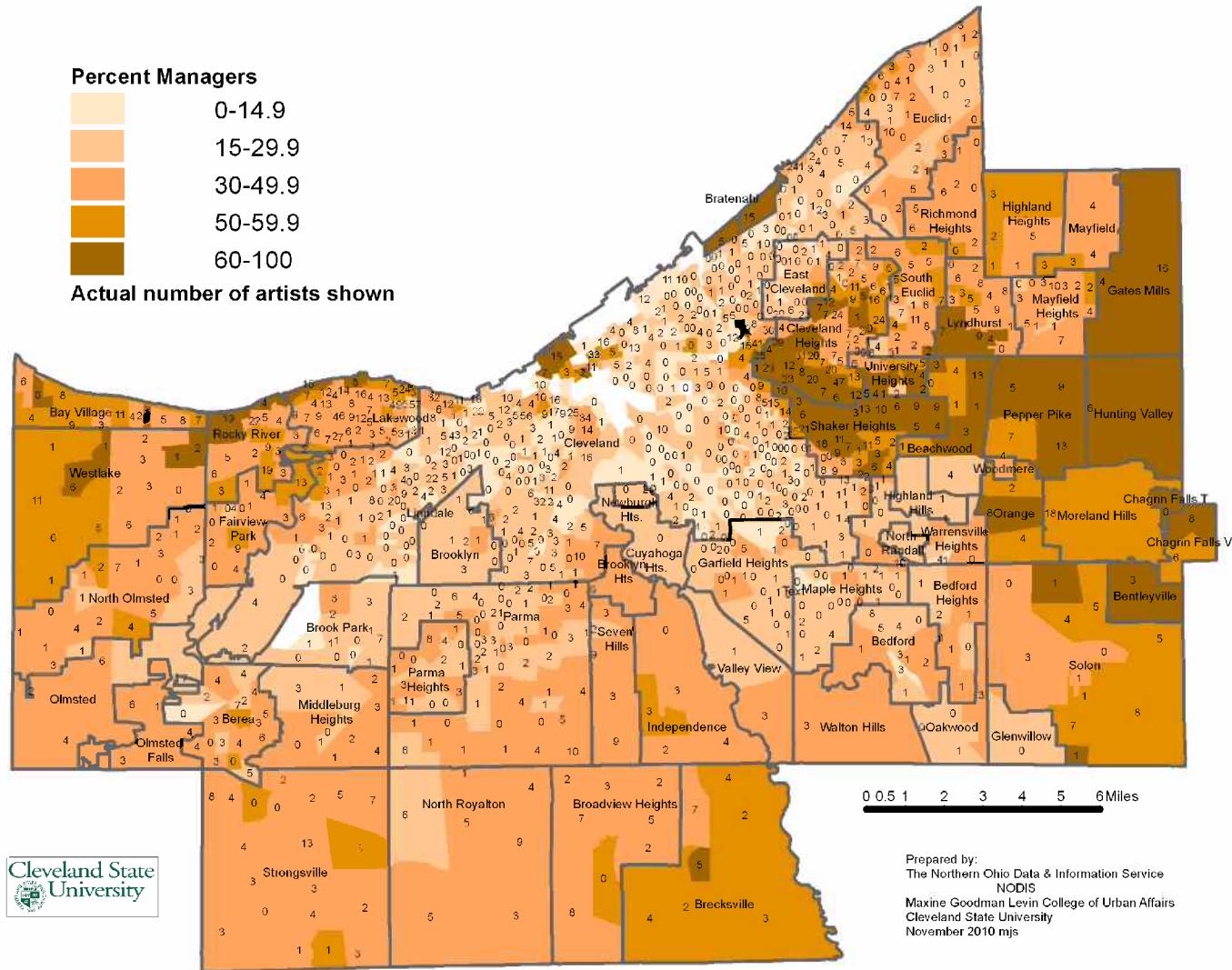
Map A-4: Percent Units Built Before 1940



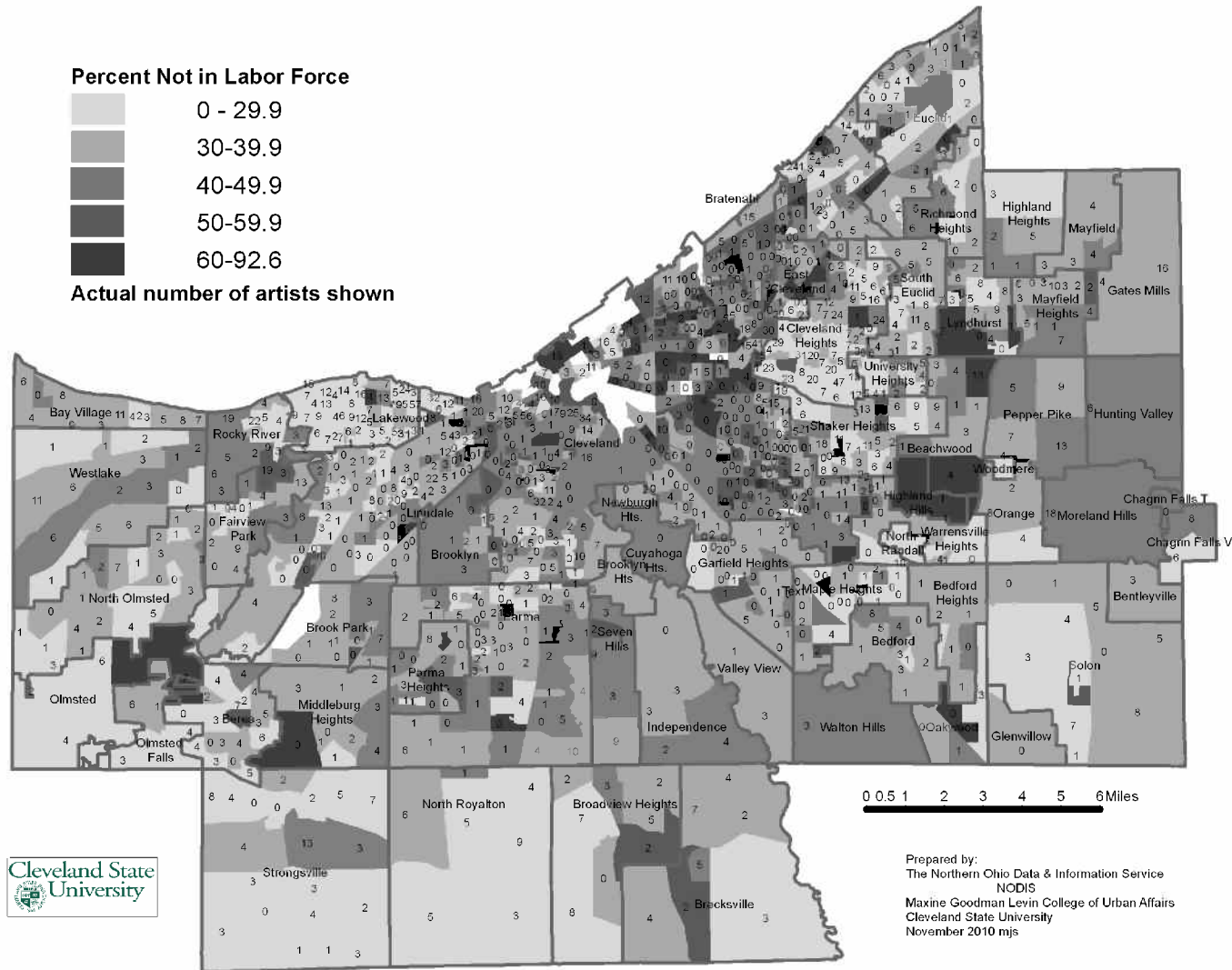
Map A-5: Percent 2-Family Homes



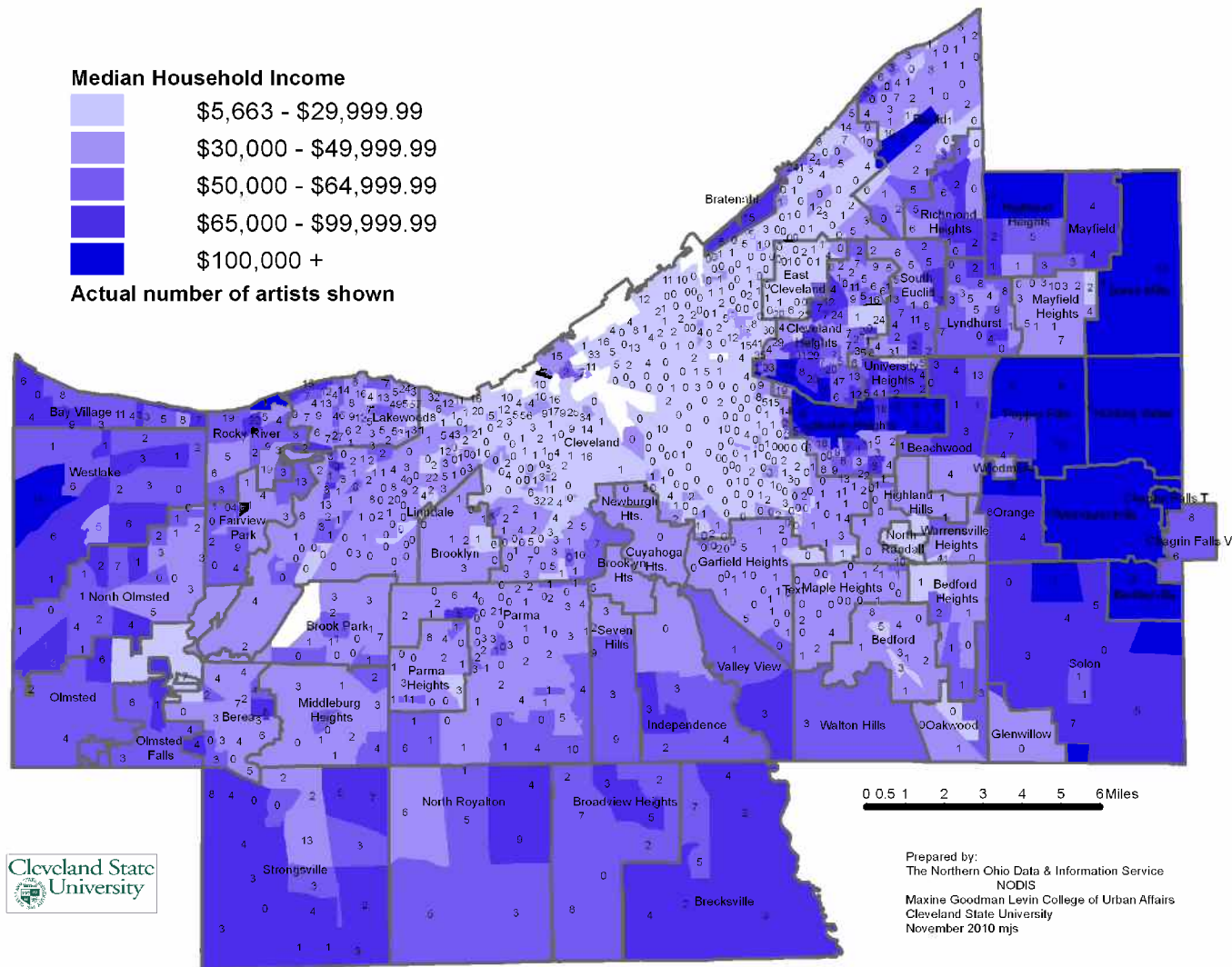
Map A-6: Percent of Workers who are Managers



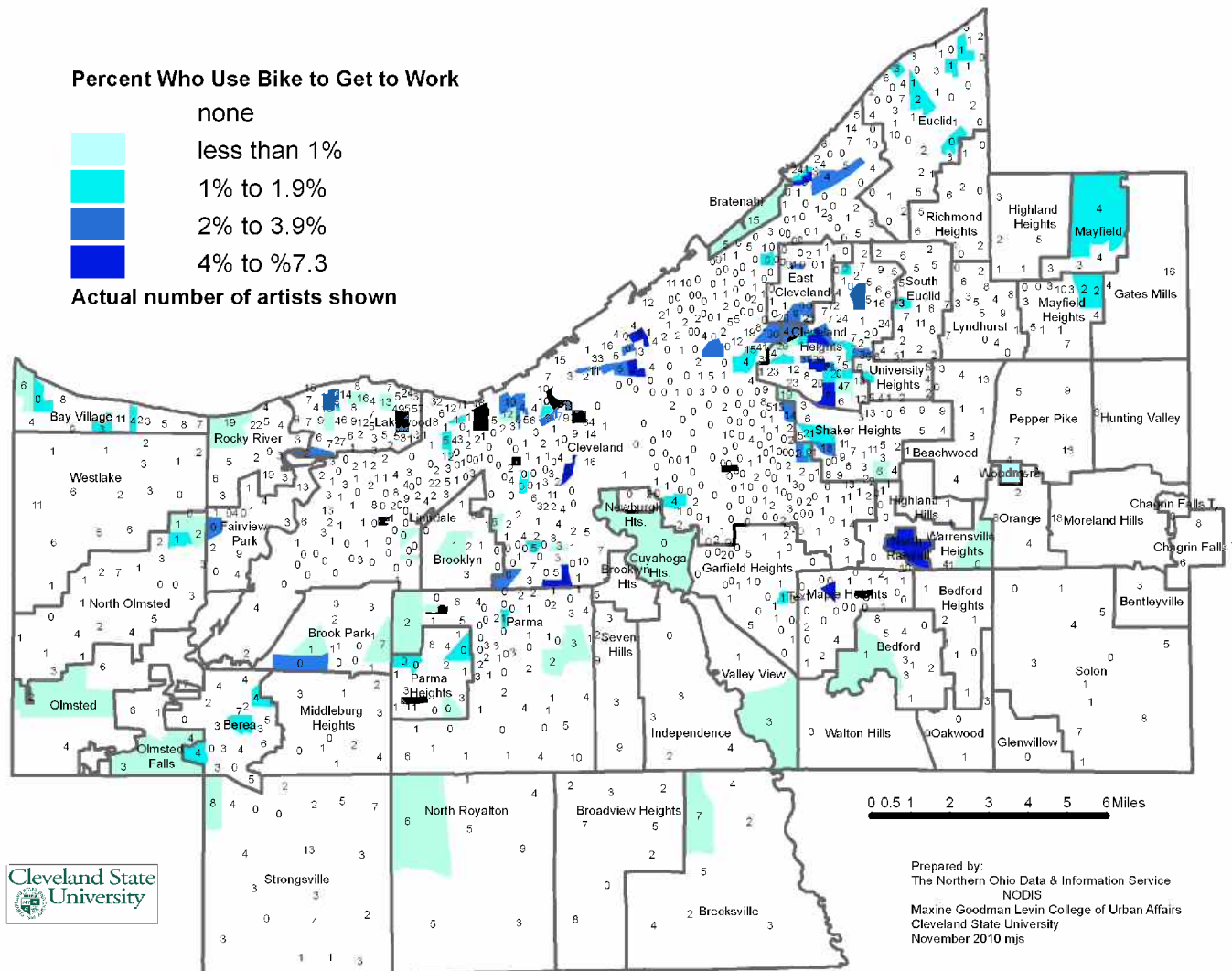
Map A-7: Percent Not in Labor Force



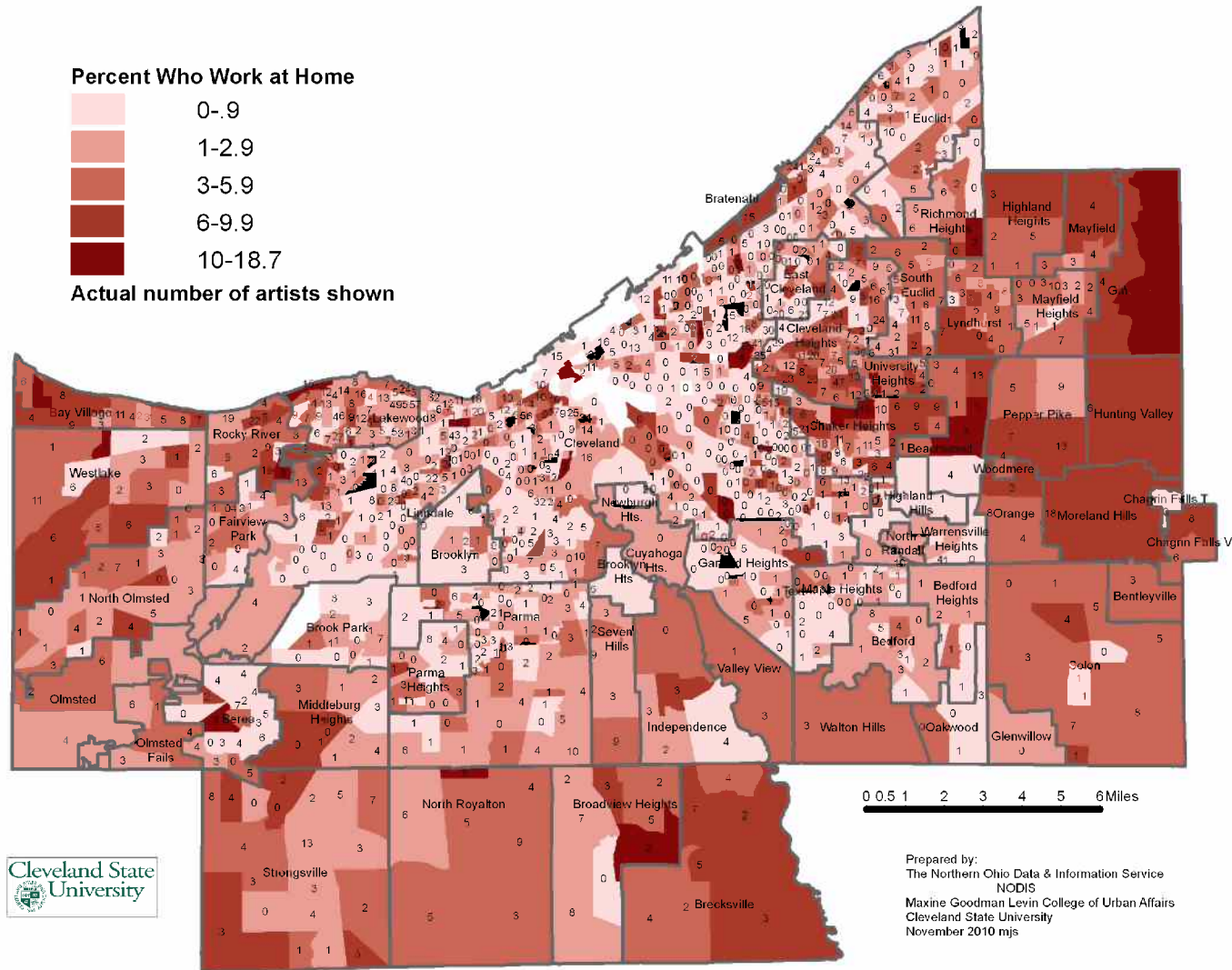
Map A-8: Median Household Income



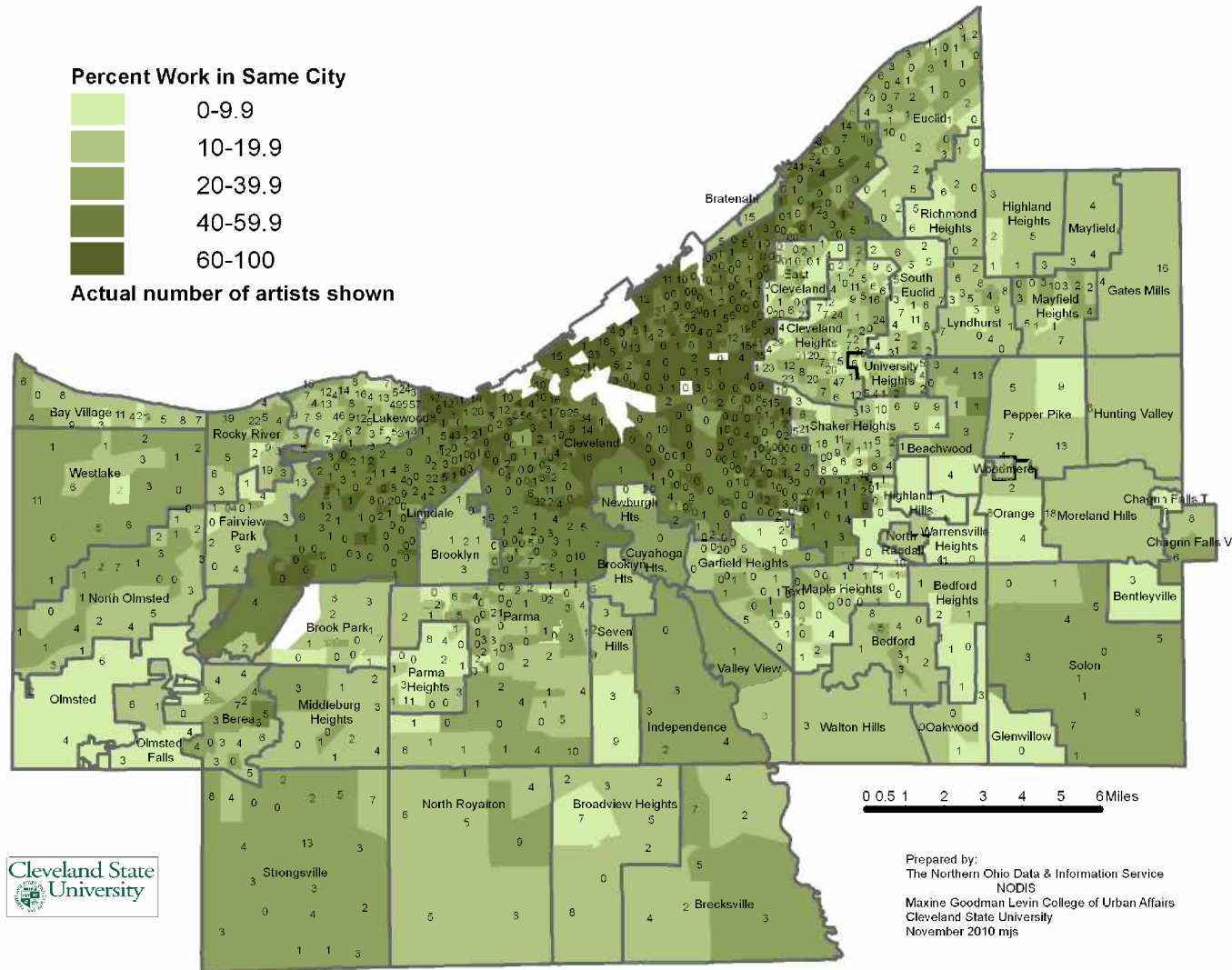
Map A-9: Percent of Workers who Bike to Work



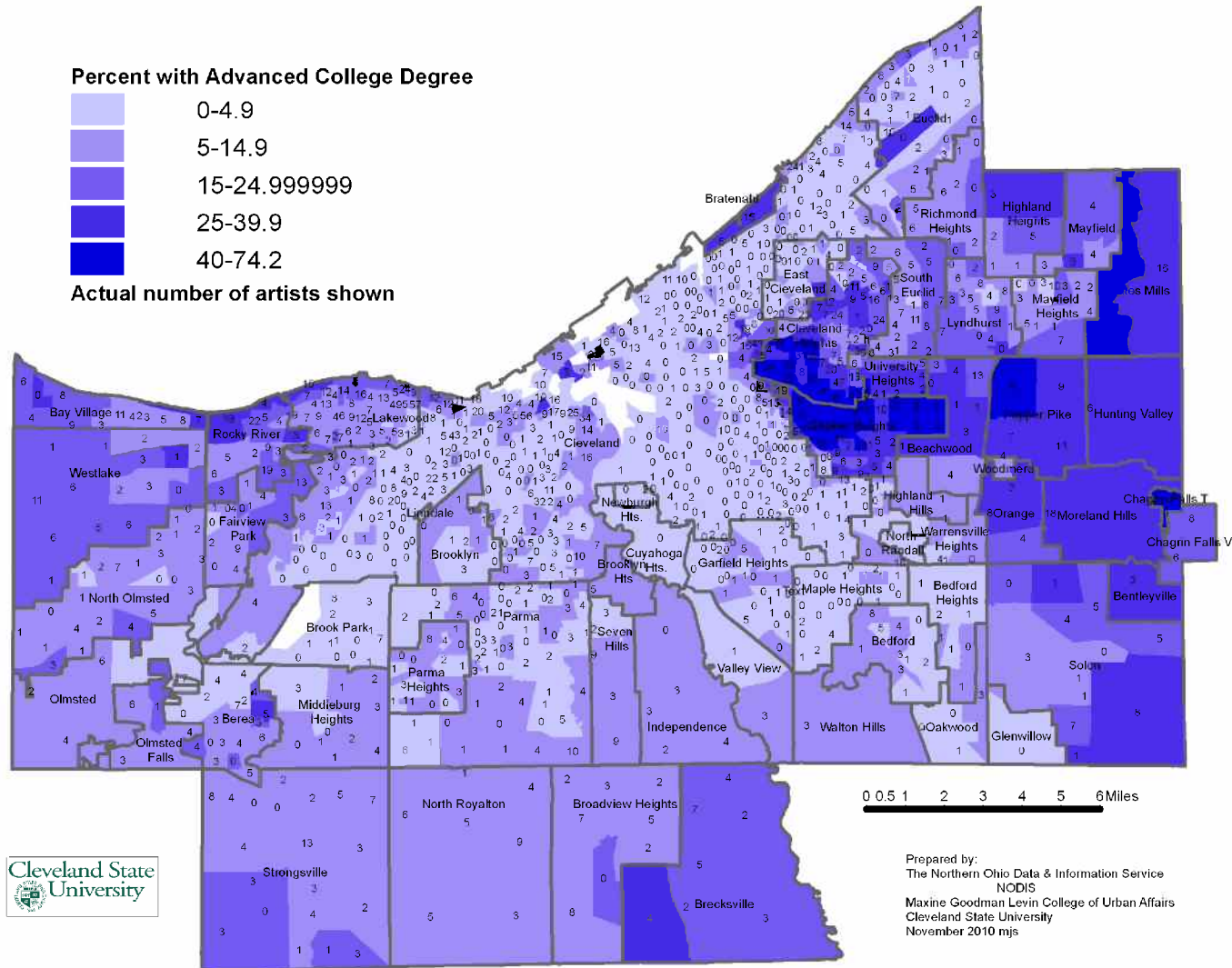
Map A-10: Percent of Workers who Work at Home



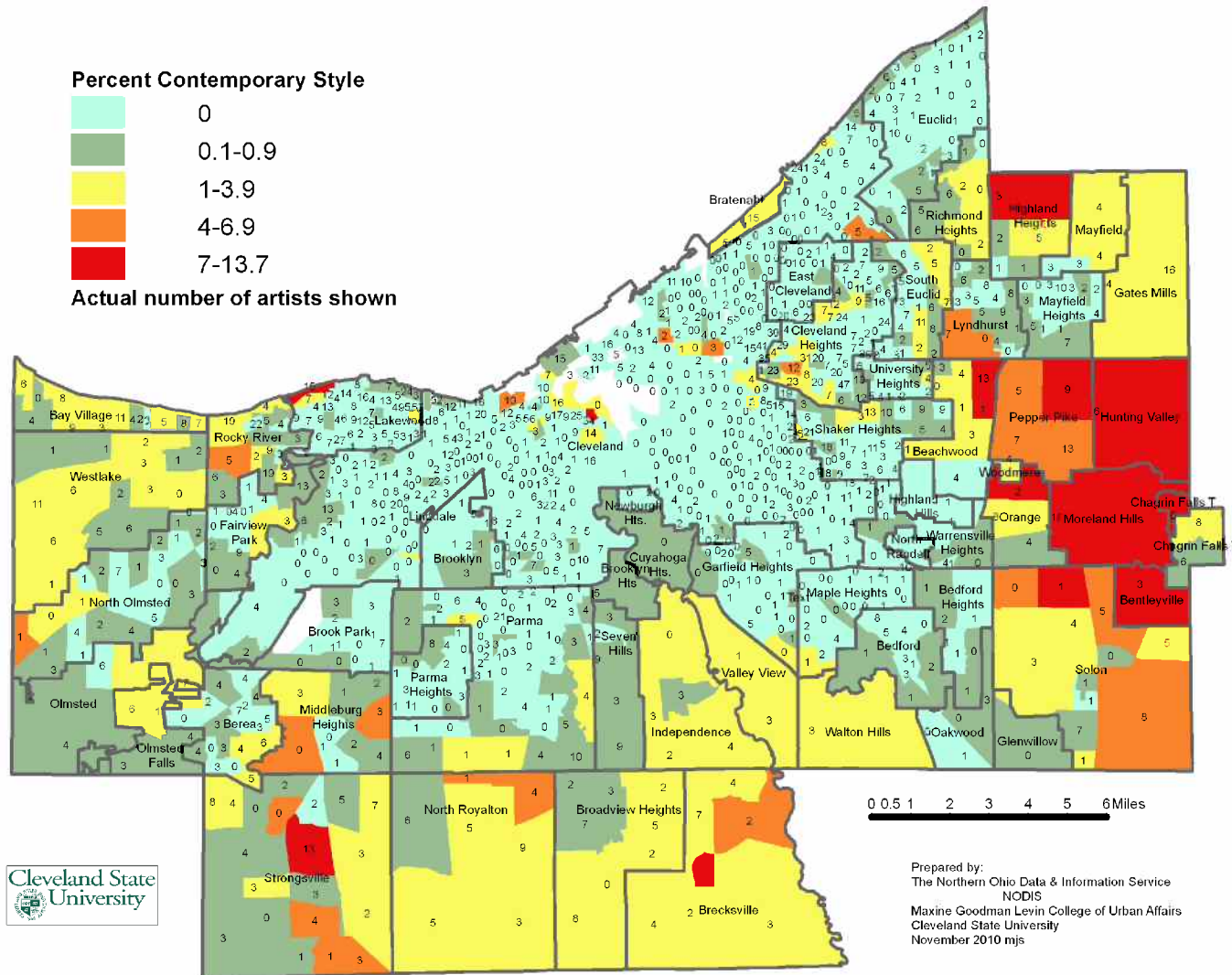
Map A-11: Percent Working in Same Place (Municipality/Township)



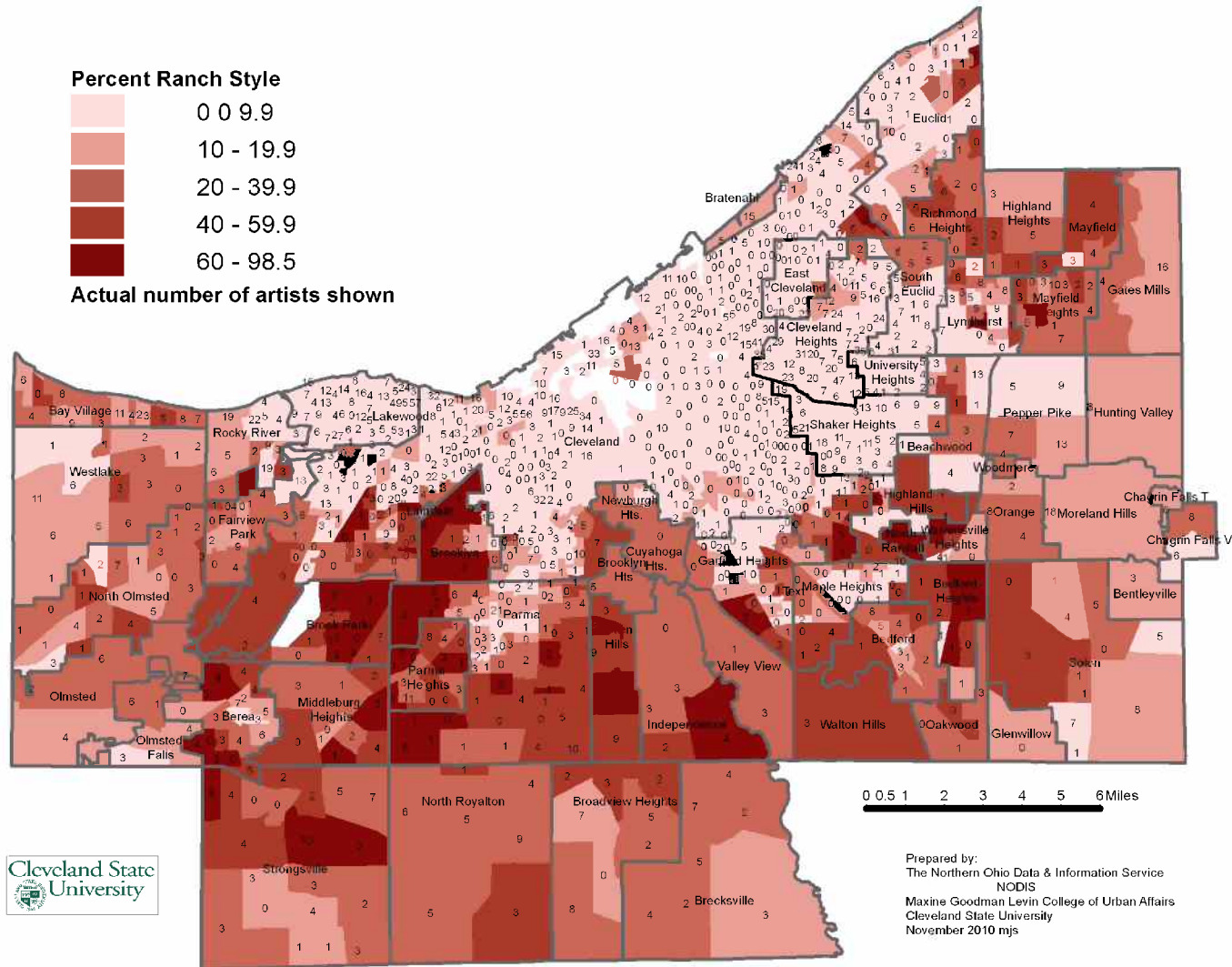
Map A-12: Percent of Persons Age 25 and Older who have a Graduate or Professional Degree



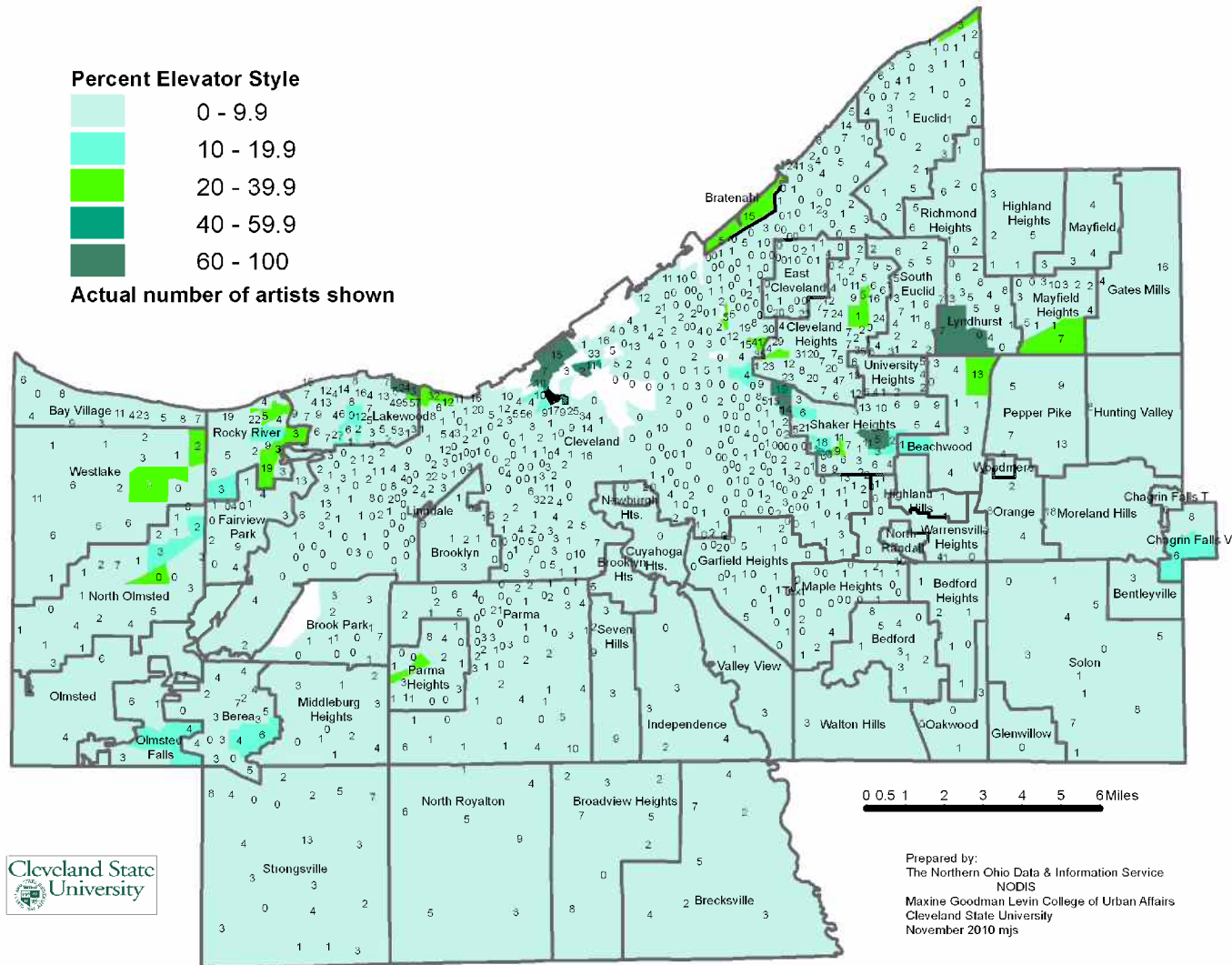
Map A-13: Percentage of Housing Units with a Contemporary Style



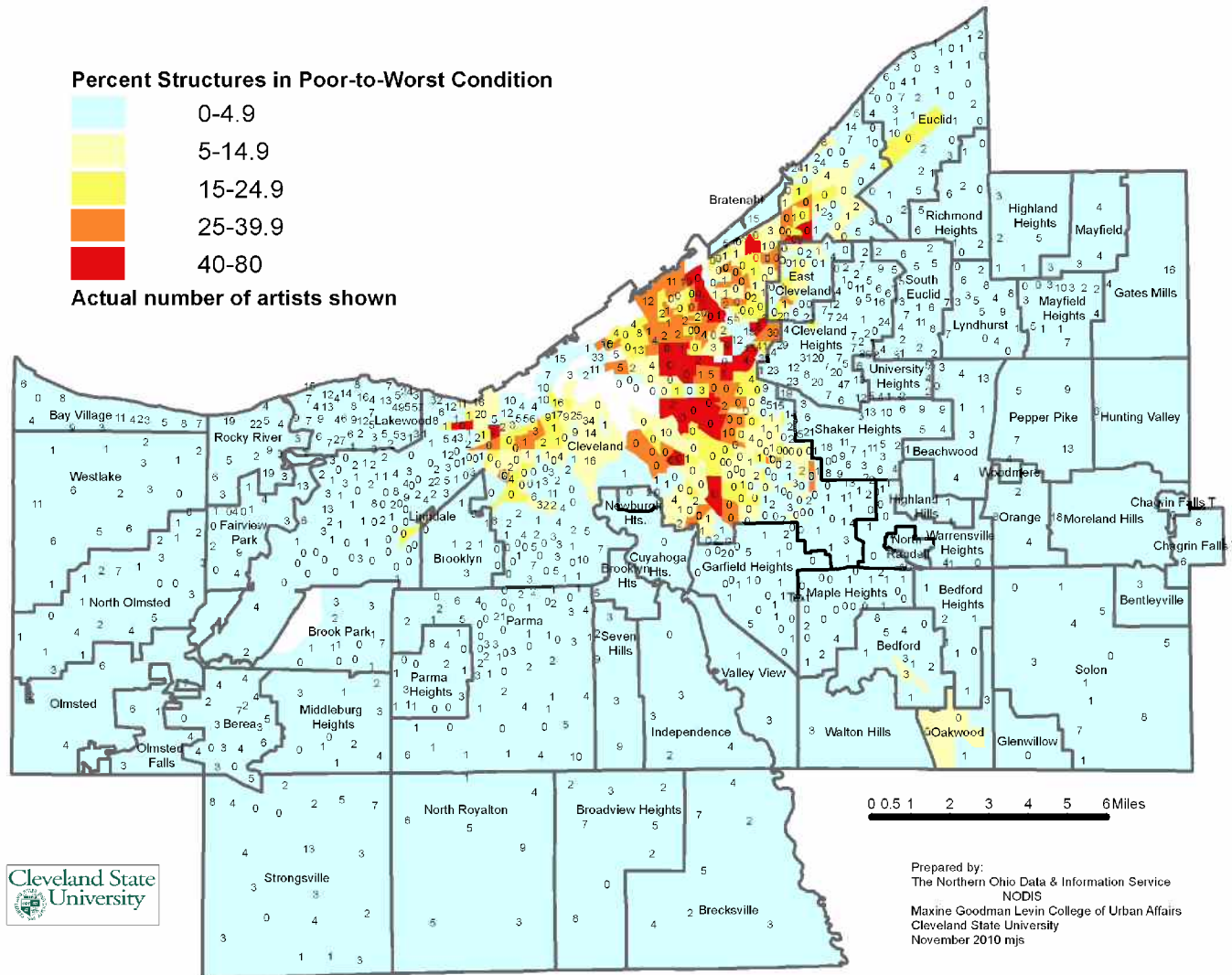
Map A-14: Percentage of Housing Units with a Ranch Style



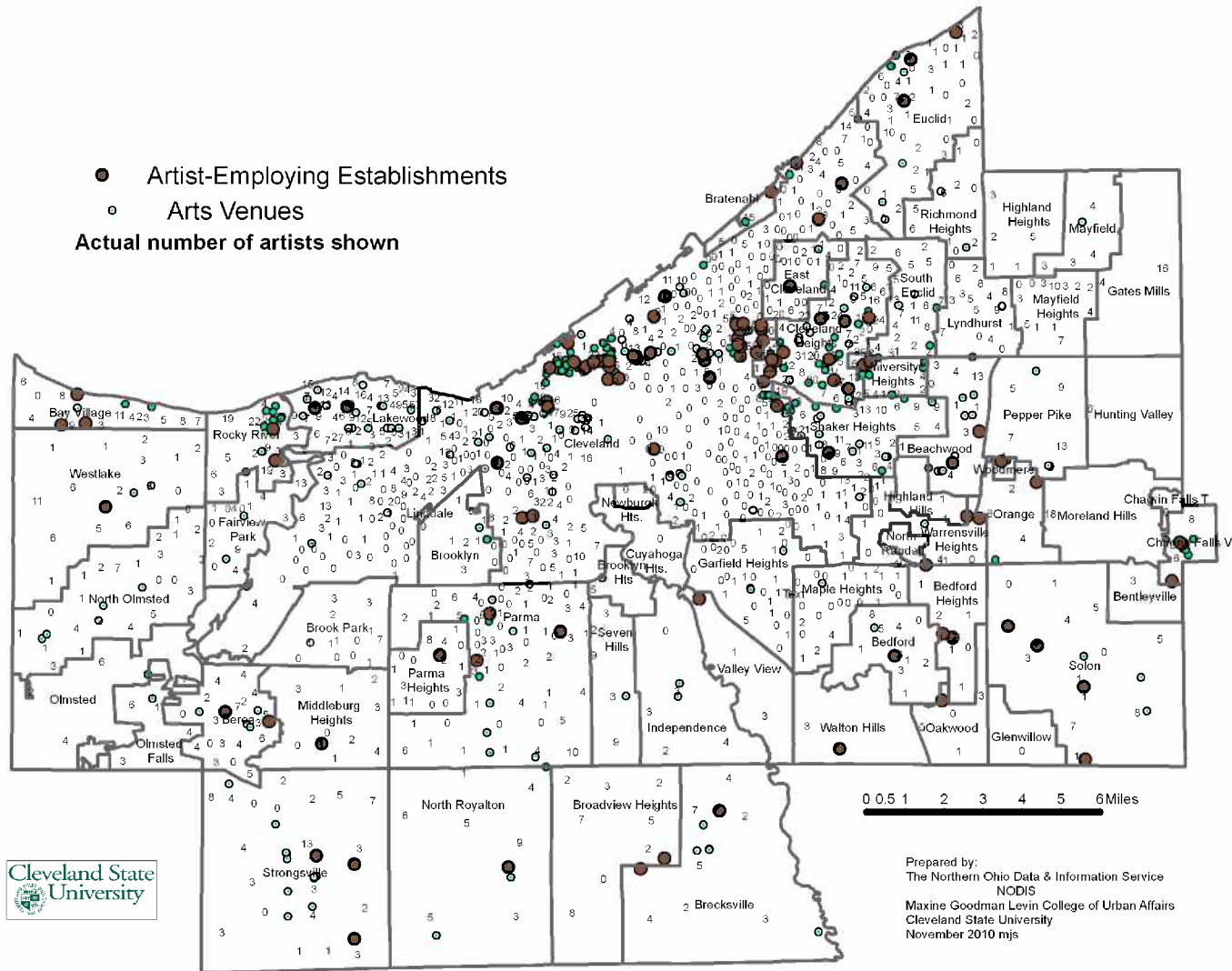
Map A-15: Percentage of Housing Units that are in Elevator Apartment Buildings



Map A-16: Percentage of Housing Structures Not Rated Among the Worst Categories of Condition by the County Assessor



Map A-17: Artist Employing Establishments and Arts Venues



About the Community Partnership for Arts and Culture:

Vision

The powerful competitive advantage generated by our distinctive arts and culture sector is widely recognized and supported both publicly and privately.

Mission

To strengthen and unify greater Cleveland's arts and culture sector.

Guiding Principles

In pursuing its vision and mission and acknowledging its beliefs, CPAC will:

- ◆ **LEAD:** Set direction with the arts and culture sector based on shared interests and potential impact on arts and culture organizations and individual artists.
- ◆ **ADVOCATE:** Position arts and culture as a driving force in building a vibrant community, particularly where community priorities and funding decisions are determined.
- ◆ **EDUCATE:** Inform community decision-making through credible research that identifies solutions for evolving needs and demonstrates the contribution arts and culture makes to the economy, education and quality of life.
- ◆ **CONVENE:** Provide opportunities for the community's diverse arts and culture constituencies to join together to learn about and take collective action on shared interests and objectives.

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History

Community Partnership for Arts and Culture (CPAC) was formed by The Cleveland Foundation and The George Gund Foundation in 1997 to develop a regional, community-wide, strategic cultural plan. Northeast Ohio's Arts & Culture Plan (the Plan), released in May 2000, was the culmination of 9 major analytical studies and 42 regional public forums representing 30 months of quantitative and qualitative research. Upon delivery and implementation of the seven-county plan CPAC evolved into a service provider focused on filling functional gaps identified through the planning process: capacity building, public policy and research.

In 2003, CPAC launched its first capacity building program designed for individual artists, The Artist as an Entrepreneur Institute, which has served 345 artists locally and has subsequently been licensed by organizations in Florida, North Carolina and South Carolina. In 2004, through an innovative partnership with the Council of Smaller Enterprises (COSE), CPAC helped to launch the Arts Network, a program of COSE offering professional development resources, education and networking events, benefits programs and business savings to those in the creative industries.

CPAC's research and public policy initiatives led to the formation of Cuyahoga County's first regional arts and cultural district, Cuyahoga Arts and Culture, in 2005. In 2006, CPAC's public policy work led to the successful passage of Issue 18, a dedicated revenue stream of public sector support for Cuyahoga County's arts and culture sector, which generates \$19.5 million annually. In 2006, CPAC also designed and implemented a joint marketing group of twelve arts and cultural organizations in an effort to increase the profitability of direct marketing efforts. CPAC's continued efforts on behalf of individual artists led to the development of the first nationwide conference on artist-based community development in 2008 entitled, From Rust Belt to Artist Belt, and the first individual artist fellowship program in Cuyahoga County, the Creative Workforce Fellowship, in 2009.



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CPAC would like to thank these funders for their operating support:



The George Gund Foundation

