STATE 4

Expert Report of Dr. Alan Murray
Expert in Spatial Geography for the
Louisiana Attorney General

Robinson v. Ardoin

and

Galmon v. Ardoin

April 29, 2022

EXPERT REPORT OF DR. ALAN MURRAY

I, Alan Murray, affirm the conclusions I express in this report are provided to a reasonable degree of professional certainty.

EXPERT QUALIFICATIONS

I am an expert in spatial analytics with 30+ years of experience. Described more fully below, I have been retained by the Louisiana Attorney General's office as an expert to provide redistricting analysis related to State Congressional, State Senate and State Legislative redistricting plans.

I am a Professor in the Department of Geography at University of California at Santa Barbara, with previous appointments at Ohio State University, Arizona State University and Drexel University. I have a Bachelor of Science in Mathematics (1990), a Master's in Statistics and Applied Probability (1992) and a Ph.D. in Geography (1995), all from the University of California, Santa Barbara.

My expertise is in the use and development of spatial analytics and GIS to address a range of substantive issues in population/demographics, equity, safety, health, land use, planning and public policy. I teach courses on: Technical issues in GIS, Locational Analysis, Spatial Statistics and Urban and Environmental Decision Making.

I have authored three books, 287 articles/book chapters/proceedings supported by over $7 million in competitive research funding. My research has been cited 16,590 times to date (GoogleScholar), with an h-index of 71 (meaning that 71 articles have been cited at least 71 times). I have received a number of awards and distinctions to date, including:

- Fellow of the American Association for the Advancement of Science
- Fellow of the Regional Science Association International
- Alonso Memorial Prize for Innovative Work in Regional Science, North American Regional Science Council
- Isard Award for Scholarly Achievement, North American Regional Science Council
- Hewings Award for Outstanding Young Scholar, North American Regional Science Council.

My consulting experience has included geographic socio-economic and demographic analysis in the areas of districting, crime, transit, homelessness and emergency response, primarily. In particular, work for the Lima Policy Department (2000-2001) examining spatial patterns of crime and subsequent analysis for the Hamilton County (Ohio) Prosecutor's Office (2005) followed by expert testimony in John Doe vs. Jim Petro et al. (2005), United States District Court for the Southern District of Ohio, Western Division (Case No. 1:05-CV-125). In 2006 I carried out service response districting efforts for the Elk Grove CSD Fire Department, and in 2010-11 undertook school districting analysis for Hillsborough County Public Schools through Seer Analytics. Recent activities include on demand service districting for Southwest Ohio Regional Transit Authority

through Alfred Benesch & Associates (2021-present) as well as spatial analytics for BryanGeoDemographics (2021-present), among others.

My full CV, including my 30+ years of spatial analytics, is attached as Appendix 1.

I am being compensated at my customary rate of $250/hour. My compensation is not dependent on my conclusions or opinions.

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I. EXECUTIVE SUMMARY

1. I was engaged by the Louisiana Attorney General's office to assess the characteristics of five Congressional redistricting plans and to determine the spatial distribution of the Black population in Louisiana, and whether it was distributed or clustered differently than the white population.

2. In this report, I explore the question of minority-majority spatial distributions, and whether there Black and white populations within the state exhibit co-variability. This is done using 2020 US Census data at the block level, focusing on Voting Age Populations of Black and white individuals across Louisiana.

3. The analysis finds that there are widespread and significant instances of clustering in the concentrations of white voting age population, resulting in neighborhood level majorities. Similarly, there are widespread and significant instances of clustering in the concentrations of Black voting age population, resulting in neighborhood level majorities. These clusters are however, far apart from each other in many instances.

4. This is confirmed through spatial statistical analysis. Particularly evident is the low number and/or concentration of Blacks in rural areas across the state and conversely the higher concentration of whites in rural areas.

5. Based on differences in the percentage concentration of each Census block, the clustering of high percentages of whites across the state is pronounced as is the clustering of low percentages. This is also true for Blacks across the state, with blocks of high percentages of Blacks across the state forming notable clusters and blocks of low percentages of Blacks also forming significant clusters.

6. Summaries for select cities, Alexandria, Baton Rouge, New Orleans, Lafayette, Monroe and Shreveport, highlight the differences in white and Black voting age populations within urban areas. There are notable shifts in the spatial concentrations of white and Black populations.

7. The implications of the spatial analysis are clear. The geographic distribution of white voting age populations is fundamentally different from the geographic distribution of Black voting age population, and the Black voting age population clusters are often not close together.

II. ASSIGNMENT

8. The Louisiana Attorney General has asked me to determine the spatial distribution of the Black population in Louisiana, whether it was distributed or clustered differently than the white population, and whether clusters of Black population are compact with each other.

9. In Section III, I present my spatial autocorrelation methodology (at A), my Louisiana statewide findings (at B) and my sub-state findings (at C).

10. In Section IV, I present my conclusions.

11. In forming my opinions, I have considered all materials cited in this report and the appendices. I have also considered some pleadings and other filings in this matter; as well as technical resources such as Morrison & Bryan, Redistricting: A Manual for Analysts, Practitioners, & Citizens (Springer 2019) and the U.S. DOJ, Guidance under Section 2 of the Voting Rights Act, 52 U.S.C. 1301, for redistricting and methods of electing government bodies (Sept. 1, 2021).

12. I reserve the right to further supplement my report and opinions.

III. Louisiana Racial Spatial Geography

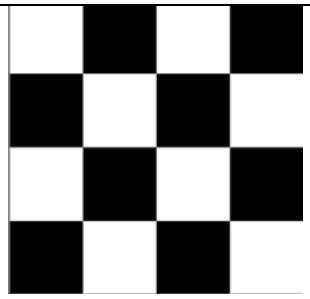
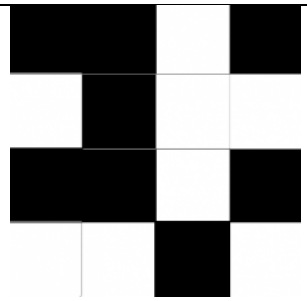
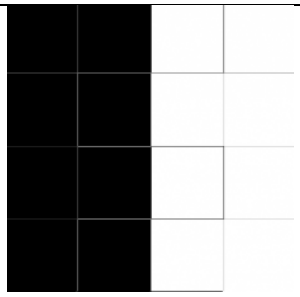
A. Geospatial Analysis

The analysis is premised geographic similarities and differences between two racial groups, as this is meaningful to redistricting efforts. In order to understand whether the Black voting age population is distributed differently than the white voting age population in Louisiana, a statistical technique called spatial autocorrelation is relied upon along with a measure of spatial centrality known as the weighted centroid. Spatial autocorrelation is multi-directional and multi-dimensional, making it useful for finding patterns in complicated geographic data. It is similar to the notion of correlation, but extends this by accounting for the deviation of a block and its neighbors. Traditional statistical correlation measures, like Pearson's, assume independence between Census blocks. However, it is well known that this assumption in violated in for spatial attributes, and Census counts in particular. That is, the attribute value for a given block (population) is generally similar in value to neighboring block attribute values. This is a property known as the First Law of Geography, or Tobler's Law, observing that nearby things are more related than thing further away. The Global Moran's I statistic was developed precisely to account for a lack of independence in spatial observations (blocks). Global Moran's I is a measure that reflects the overall spatial autocorrelation of an attribute value (population) across a region (state of Louisiana), and ranges in value between [-1, +1]. It measures how one Census block attribute is similar to attributes of blocks surrounding it. If neighboring observations are systematically similar each other, then they are not independent. Conversely, if neighboring observations are systematically not similar to each, then they are also not independent. Moran's I is one approach to statically measure and test for spatial autocorrelation.

- -1 is clustering of dissimilar values
- 0 is no clustering (randomness in block values)
- +1 indicates clustering of similar values (like valued blocks surrounding each other)

One can conceptualize what is happening with the Moran's I measure of spatial autocorrelation in Figure III.A.1.

Figure III.A.1 Moran's I Spatial Clustering Examples

Perfect Dispersion	Perfect Randomness	Perfect Clustering
		
In the above image, the black and white squares have a definite pattern and are perfectly dispersed. The Moran's value would equal -1.	If the squares were truly randomly dispersed, the Moran's value would be 0.	This is perfect clustering of similar values, which gives a Moran value of +1.

There are a number of methods for assessing spatial autocorrelation [1], but Moran's I is one of the most preferred givens it interpretability and comparability. If blocks are referred to by the index i, then the variable y_i can be used to reference the attribute value of block i. The global Moran's I is then defined as:

$$I = \frac{n \sum_i \sum_j w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\left(\sum_i \sum_j w_{ij}\right) \sum_i (y_i - \bar{y})^2}$$

where n is the number of blocks, w_{ij} is 1 if blocks i and j are neighbors, and $\bar{y}$ is the mean of attribute values (e.g., $y = \frac{\sum_i y_i}{n}$). A second measure of spatial autocorrelation was also evaluated, Geary's c, but is not described or reported because of similarity in findings.

While the Global Moran's I is informative, it does not identify specific instances of significant cluster, plus an observed value of $I = 0$ may reflect a cancelling of positive and negative levels of spatial correlation. It is therefore more meaningful and informative to also consider the Local Moran's I measure, effectively a decomposition of the Global Moran's I. The Local Moran's I is defined mathematically as:

[1] These are methods for assessing spatial autocorrelation in a variate. Details regarding the methods can be found in Anselin (1995, "Local indicators of spatial association—LISA". Geographical Analysis, 27(2), 93-115), among others. The methods can be implemented using a preferred programming language, or are accessible through developed packages in R and Python as well as select software such as ArcGIS and GeoData. The analysis relied on GeoData for spatial autocorrelation analysis, along with ArcGIS for shapefile manipulation and cleaning, including attribute cleaning and removal of blocks, as well as mapping.

$$I_i = n(y_i - \bar{y}) \sum_{j \neq i} w_{ij}(y_j - \bar{y})$$

There are also other local measures of spatial autocorrelation that have been evaluated in this analysis, such as the Local Geary's c, but is not described or reported because of similarity in findings.

An appealing aspect of the Local Moran's I is the ability to interpret the so called scatter plot, where the following relationships are evident for each Census block:

- "High-High" – A high block attribute value surrounded by high attribute values (neighboring blocks)
- "High-Low" – A high block attribute value surrounded by low attribute values (neighboring blocks)
- "Low-High" – A low block attribute value surrounded by high attribute values (neighboring blocks)
- "Low-Low" – A high block attribute value surrounded by high attribute values (neighboring blocks)

High-High represents positive spatial autocorrelation, or clustering of like attribute values. Low-Low also represents positive spatial autocorrelation, or clustering of like attribute values. In contrast, High-Low as well as Low-High represent instance of negative spatial autocorrelation.

A final spatial analytic method used in this analysis was a summary measure for a geographic distribution, namely the weighted mean center (also known as the centroid). The weighted mean center $(\bar{X}, \bar{Y})$ is defined as:

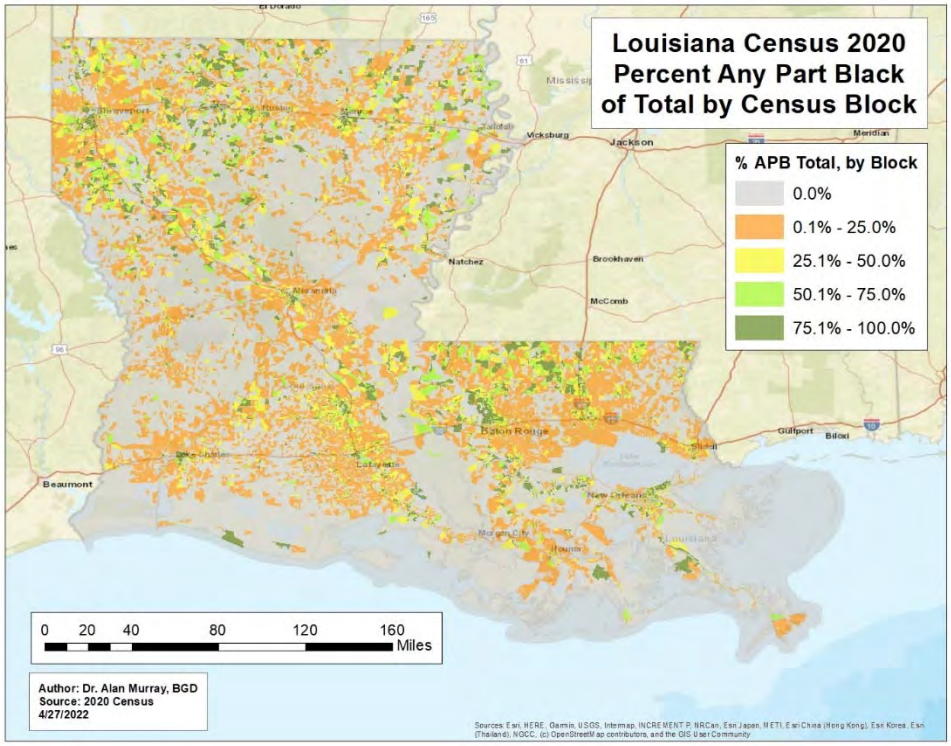
$$(\bar{X}, \bar{Y}) = \left(\frac{\sum_{i=1}^{n} y_i \phi_i}{\sum_{i=1}^{n} y_i}, \frac{\sum_{i=1}^{n} y_i \lambda_i}{\sum_{i=1}^{n} y_i} \right)$$

where (ϕ_i, λ_i) are the center coordinates of the block i and y_i is the attribute, as defined above. This is a point based summary, and can be used to evaluate two different attribute distributions. In this case, one can examine white voting age population and Black voting age population to assess whether their central tendencies are the same.

B. Statewide Analysis

I begin my analysis with an examination of the statewide distribution of the white, non-Hispanic (WNH) and the Any Part Black (APB) total and Voting Age population (VAP)[2]. The maps in Figure III.A.2 and Figure III.A.3 show the spatial distribution of the APB population around Louisiana – and that they are identical for all intents and purposes. Similarly, Figure III.A.4 and Figure III.A.5 show the spatial distribution of the WNH population around Louisiana. Again – the spatial distributions are nearly identical. As I will show – the conclusions based on the total population by race are definitive and generalizable. This statewide introduction is followed by a statewide spatial autocorrelation analysis.

Figure III.A.2 Spatial Distribution of Any Part Black Total Population



[2] This definition counts a minority by race alone or in combination with other races – no matter how many other races are mentioned. If someone responds to the census by self-identifying as Black, white, Asian, Native Hawaiian Pacific Islander, American Indian Alaskan Native and "some other" – then by the "Any Part Black" definition they are counted as Black even though it was only one of six races reported. For the purposes of the Louisiana analysis - we use this definition to refer to Any Part Black (or "APB"). I am aware that there is a dispute in this case about whether to use "DOJ Black" or Black-Alone Non-Hispanic, but for the purposes of my analysis I used the broader category to make my assessment.

Figure III.A.3 Spatial Distribution of Any Part Black Voting Age Population

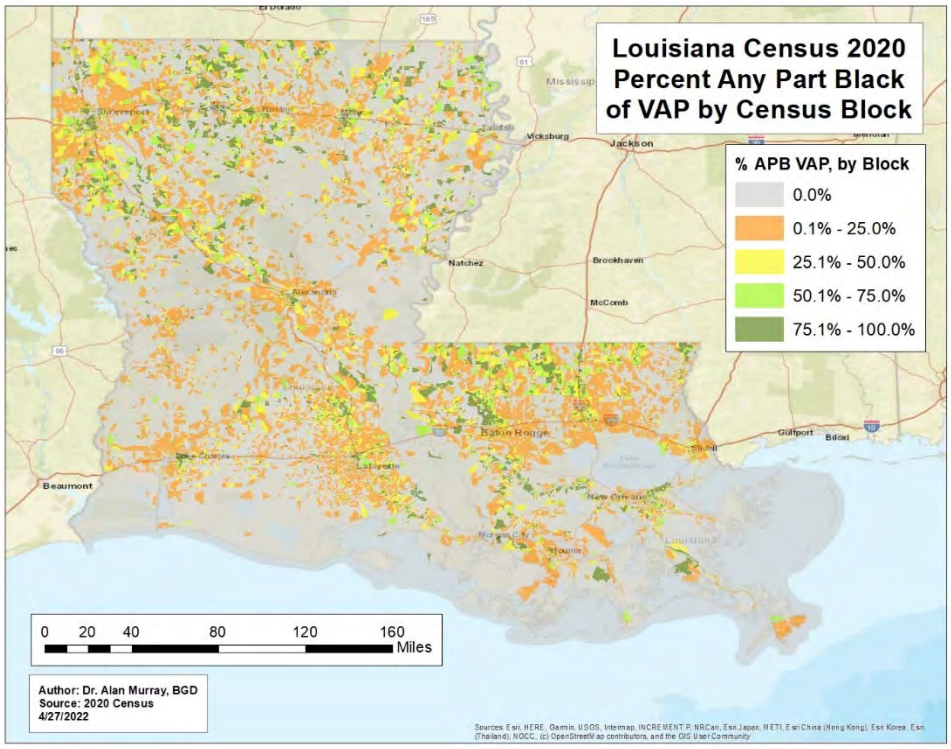


Figure III.A.4 Spatial Distribution of White, Non-Hispanic Total Population

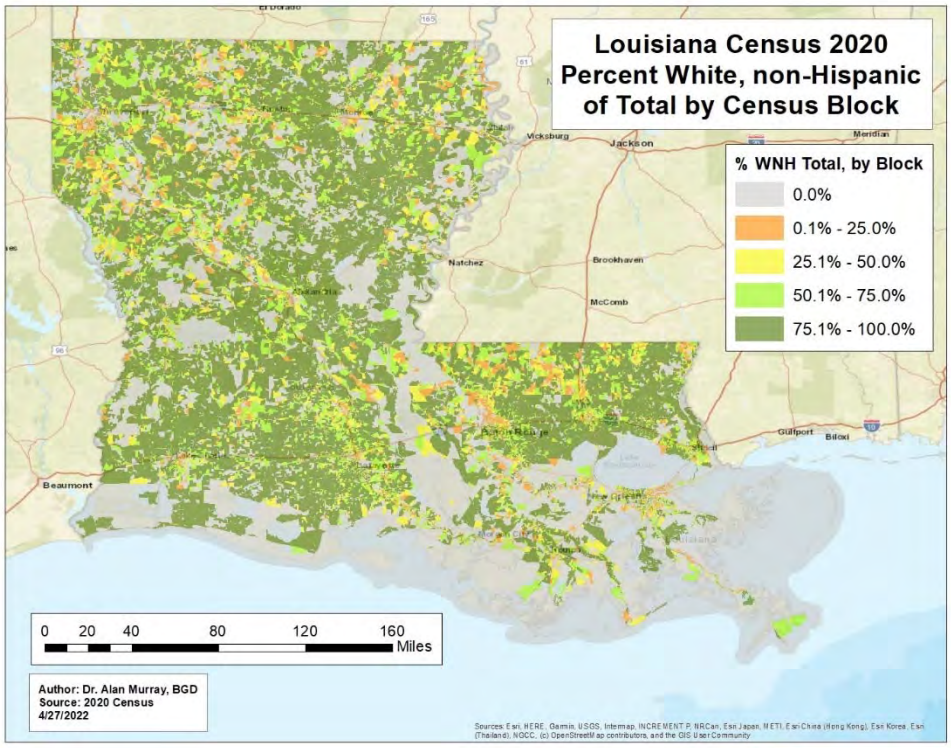
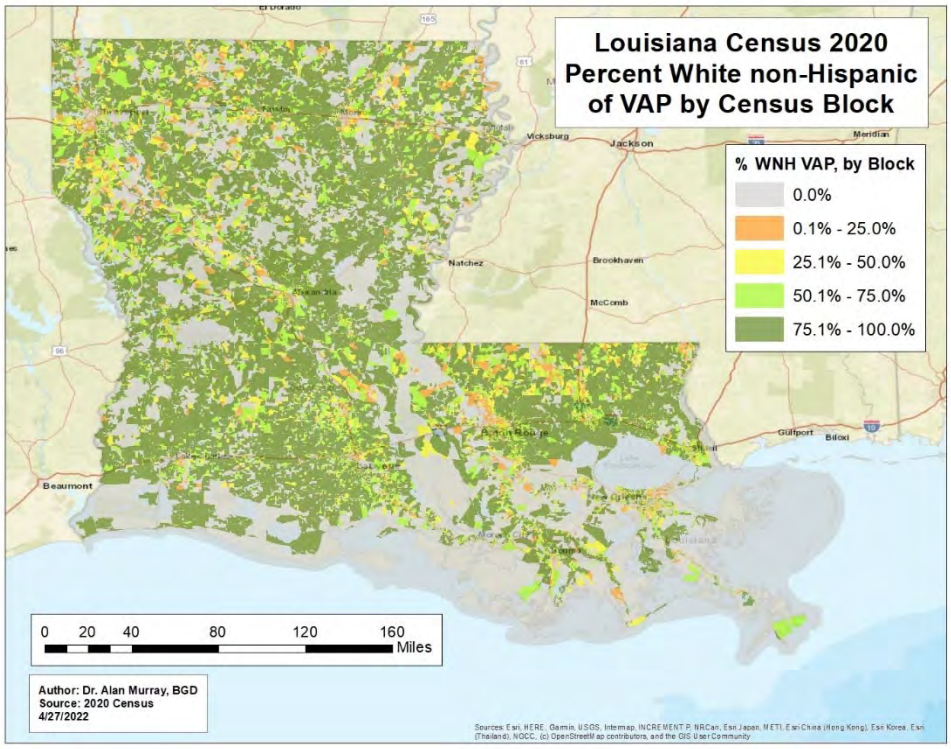


Figure III.A.5 Spatial Distribution of White, Non-Hispanic Voting Age Population



The analysis that follows assumes a spatial neighbor of a block shares a common point or edge, the so called Queen criterion. The analysis considered 92,180 blocks in the state with non-zero population values. The global Moran's I for white, non-Hispanic is 0.283, with the block population mean=22.58 and standard deviation=48.26. This is a moderate, but significant, level of positive spatial autocorrelation. Further investigation using the Local Moran's I scatter plot is shown in Figure III.A.6, indicating the 25,144 blocks with significant positive spatial autocorrelation (8,369 High-High plus 16,775 Low-Low). This offers a geographic explanation of the positive spatial autocorrelation suggest by the global value of 0.238. Figure III.A.7 shows the significance level for each indicated instance. All are significant, but with 6,618 blocks are significant at the p=0.001 level.

Figure III.A.6 White, non-Hispanic Population Spatial Autocorrelation

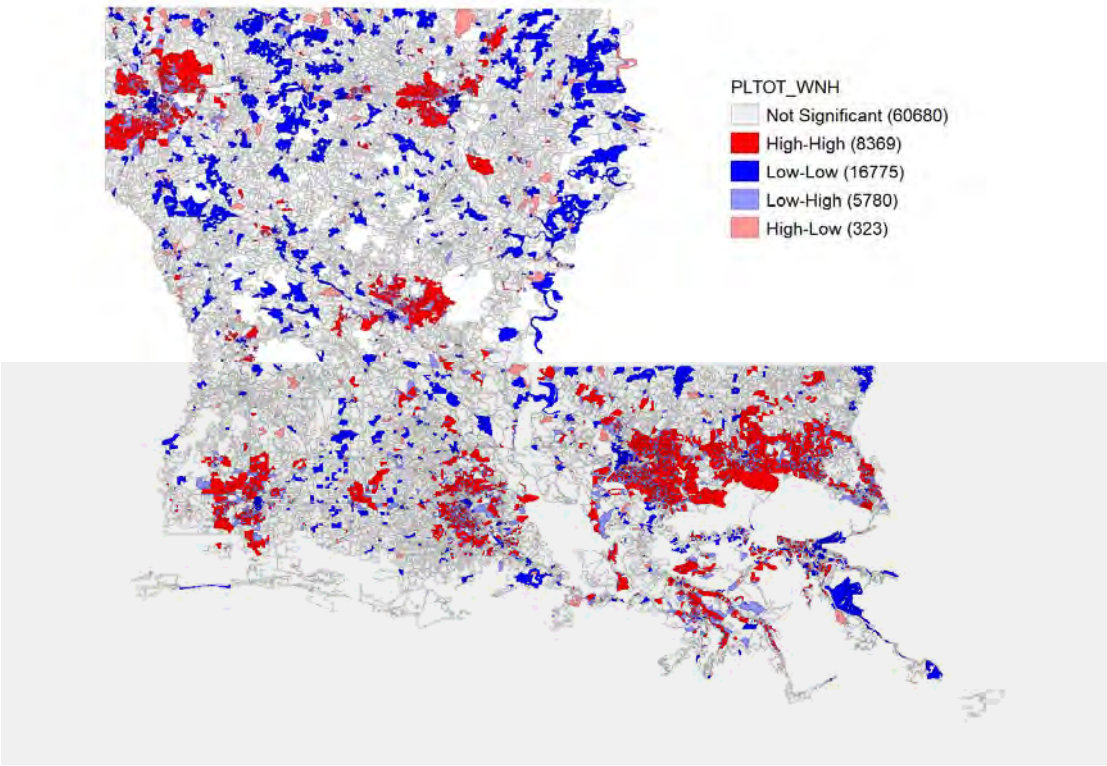
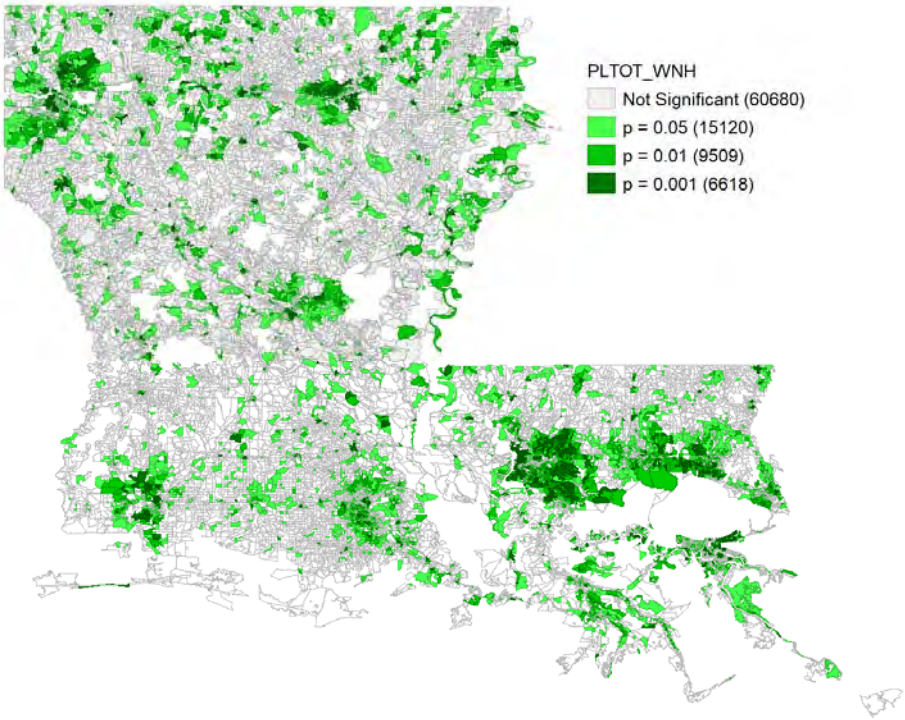


Figure III.A.7 White, non-Hispanic Population Spatial Autocorrelation Significance



The global Moran's I for Black, non-Hispanic is = 0.342, with the block population mean=11.57 and standard deviation=31.19. This is again a moderate, but significant, level of positive spatial autocorrelation. Further investigation using the Local Moran's I scatter plot is shown in Figure III.A.6, indicating the 26,759 blocks with significant positive spatial autocorrelation (7,908 High-High plus 18,851 Low-Low). This offers a geographic explanation of the positive spatial autocorrelation suggest by the global value of 0.342. Figure III.A.7 shows the significance level for each indicated instance. All are significant, but with 2,770 blocks are significant at the p=0.001 level.

Figure III.A.8 Black, non-Hispanic Population Spatial Autocorrelation

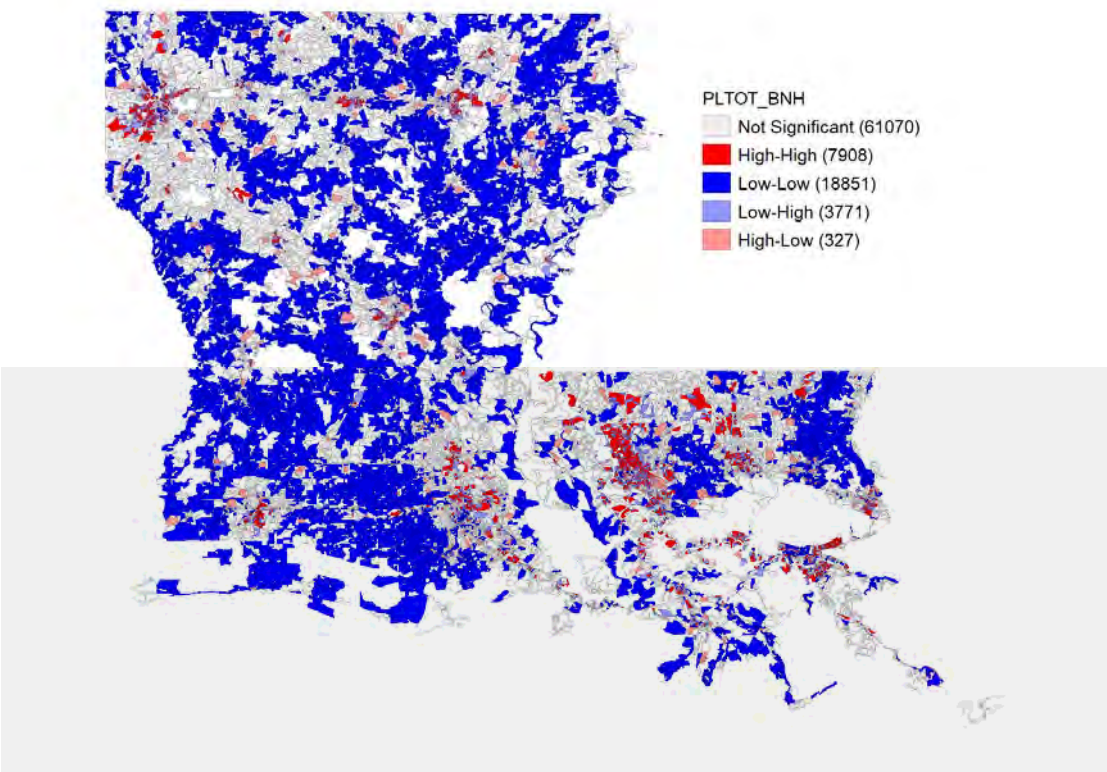
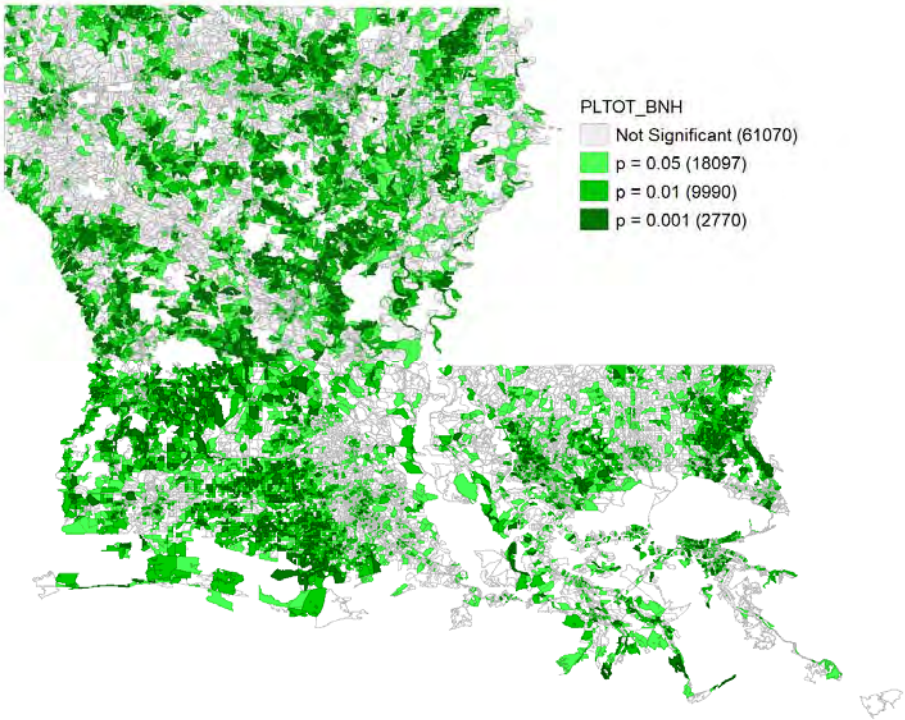


Figure III.A.9 Black, non-Hispanic Population Spatial Autocorrelation Significance



The above analysis is repeated for voting age population using standardized block population percentages, with the observed attribute count in a block divided by the total voting age population of the block. In percentage terms, the attribute of each block now ranges from [0, +1], where 0 indicates no Voting Age Population white, non-Hispanic and 1 represents 100% Voting Age Population white, non-Hispanic, as an example. The global Moran's I for Percent Voting Age Population white, non-Hispanic is 0.565, with the block population mean= 0.55 and standard deviation=0.37. This is a high, and significant, level of positive spatial autocorrelation. Further investigation using the Local Moran's I scatter plot is shown in Figure III.A.10, indicating the 37,496 blocks with significant positive spatial autocorrelation. This offers a geographic explanation of the positive spatial autocorrelation suggest by the global value of 0.565. Figure III.A.11 shows the significance level for each indicated instance. All are significant, but with 9,832 blocks are significant at the p=0.001 level.

Figure III.A.10 Percent White, non-Hispanic Population Spatial Autocorrelation

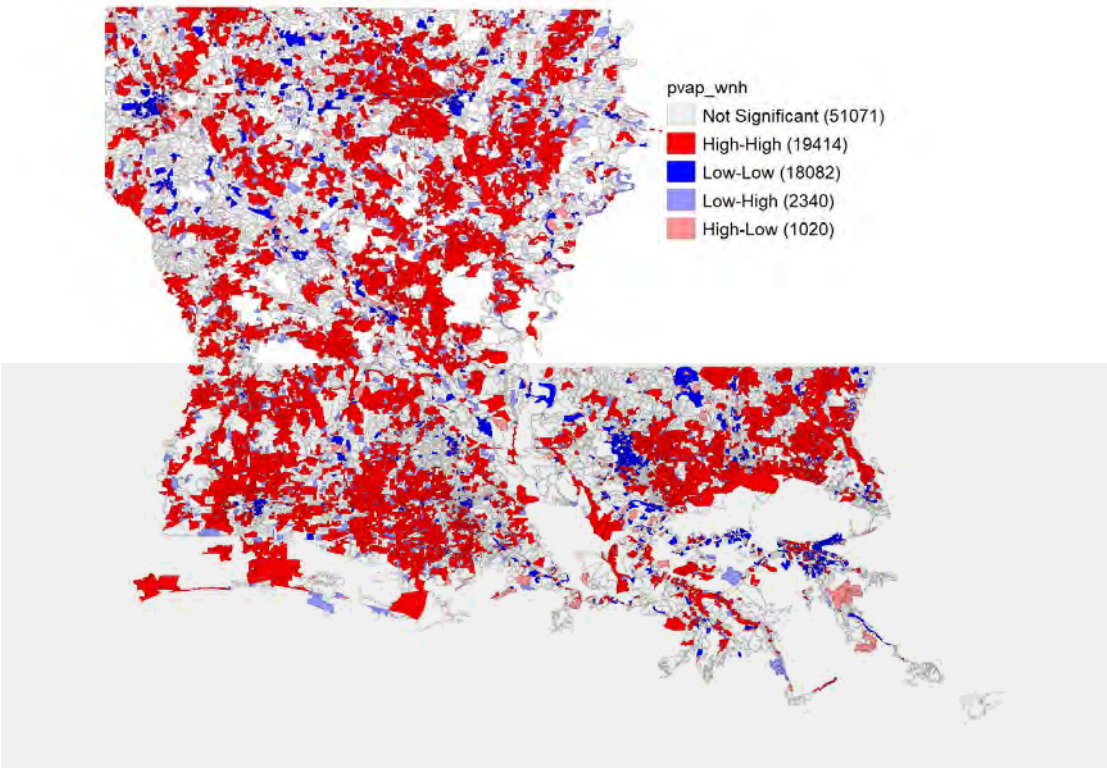
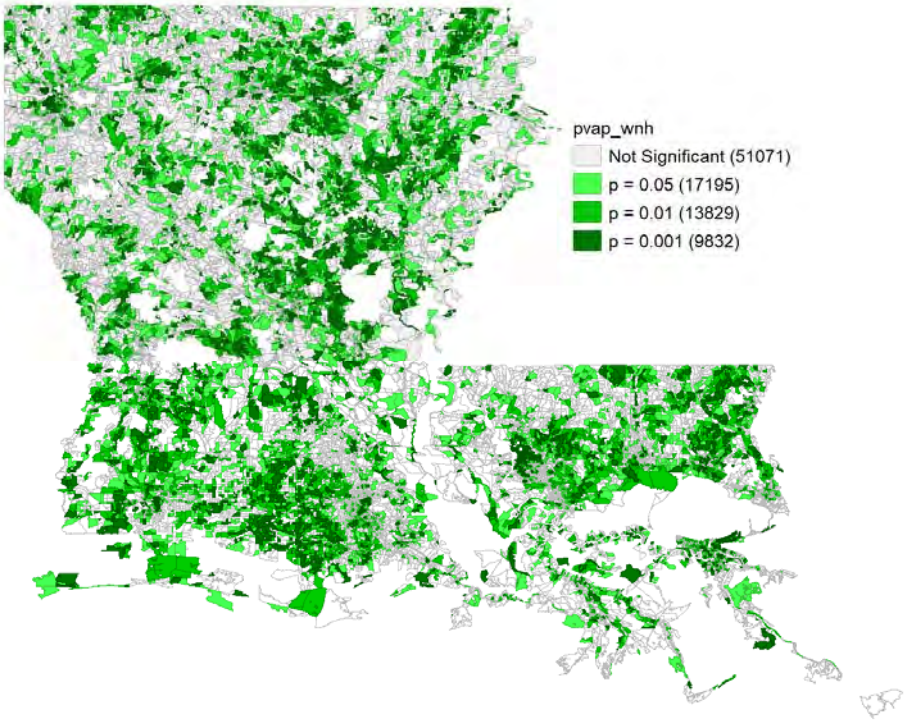


Figure III.A.11 Percent White, non-Hispanic Population Spatial Autocorrelation Significance



Focusing now on the Voting Age Population Black, non-Hispanic, again in percentage terms the attribute of each block now ranges from [0, +1], where 0 indicates no Voting Age Population Black, non-Hispanic and 1 represents 100% Voting Age Population Black, non-Hispanic. The global Moran's I for Percent Voting Age Population Black, non-Hispanic is 0.675, with the block population mean= 0.29 and standard deviation=0.35. This is a high, and significant, level of positive spatial autocorrelation. Further investigation using the Local Moran's I scatter plot is shown in Figure III.A.12, indicating the 37,563 blocks with significant positive spatial autocorrelation. This offers a geographic explanation of the positive spatial autocorrelation suggest by the global value of 0.675. Figure III.A.13 shows the significance level for each indicated instance. All are significant, but with 10,439 blocks are significant at the p=0.001 level.

Figure III.A.12 Percent Black, non-Hispanic Population Spatial Autocorrelation

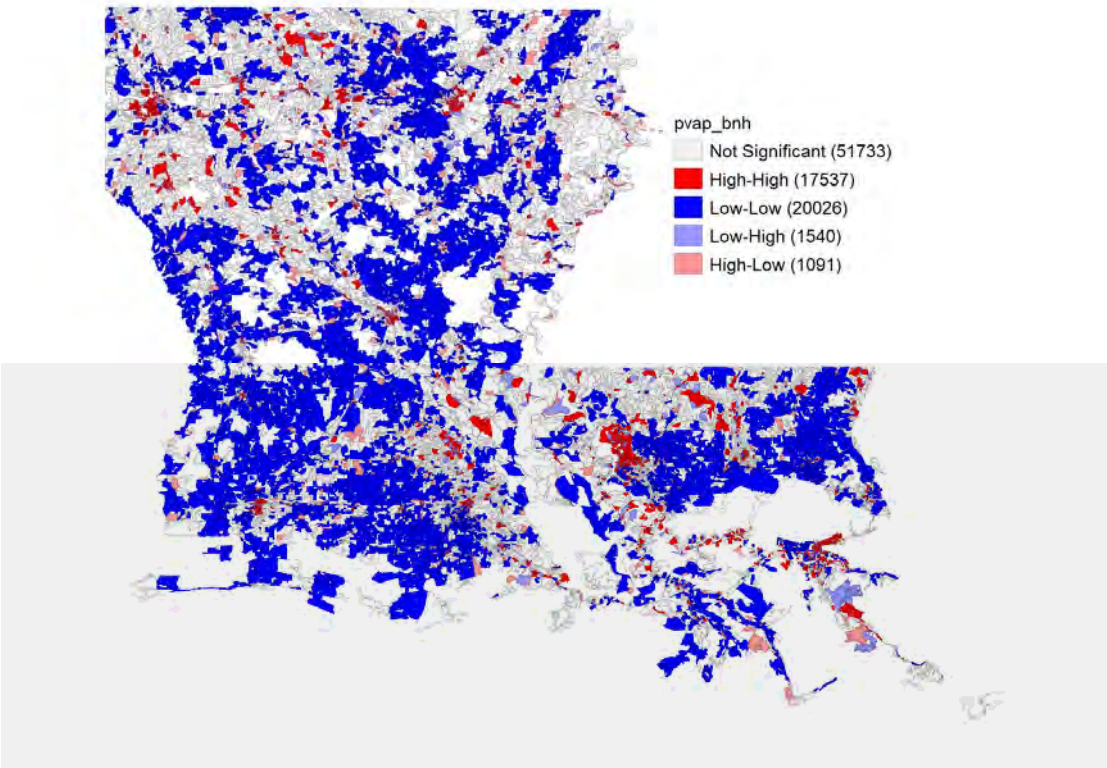
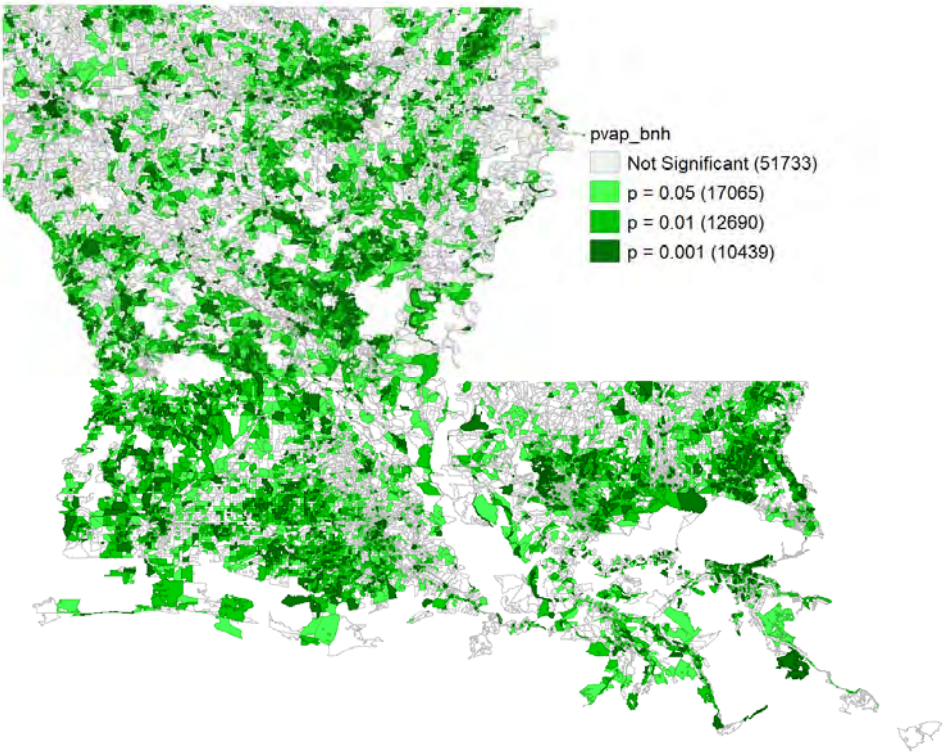


Figure III.A.13 Percent Black, non-Hispanic Population Spatial Autocorrelation Significance



While the above analysis of population counts and percentages of white and Black voting age populations is insightful, they are carried out independently in some sense, and not directly compared. In order to provide a more direct comparison, an analysis of Percent white Voting Age Population minus Percent Black Voting Age Population (e.g., %WVAP - %BVAP) is provided. This attribute ranges from [-1, +1], where -1 indicates a block is 100% Black VAP and +1 indicates a block is 100% white VAP. The analysis finds that there is statistically significant heterogeneity in the spatial distribution of white and Black VAP. That is, as suggested previously, a clusters of high percent white blocks (and low percent blocks) as well as a clusters of high percent Black blocks (and low percent blocks). In practical terms, the geographic distributions of white VAP is not the same as Black VAP, and they do not co-vary across space. A regional level, the observed Global Moran's I of 0.677 is exceptionally high (and significant). The local Moran's analysis in in Figure III.A.14 identifies specific instances of clustering. This suggests a high level of positive spatial autocorrelation, with blocks of high percentages of white VAP surrounded by high percentages of white VAP as well as blocks of low percentages of white VAP surrounded by low percentages of white VAP. Additionally, there are blocks of high percentages of Black VAP surrounded by high percentages of Black VAP as well as blocks of low percentages of Black VAP surrounded by low percentages of Black VAP. Essentially the entire state has noteworthy local areas of statistically significant clusters. Local Moran's I identifies 21,623 blocks with High-High and 18,493 blocks with Low-Low, both reflective of positive spatial autocorrelation.

Figure III.A.14 Difference in Percent White and Black (non-Hispanic) Population Spatial Autocorrelation

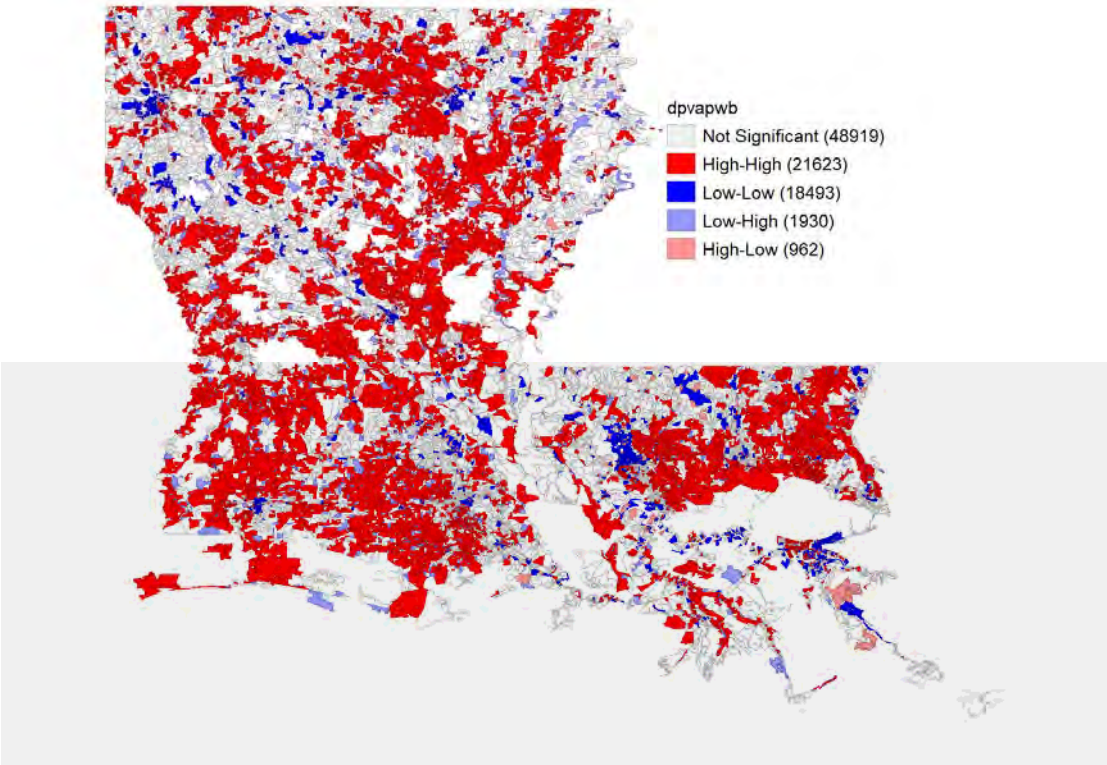
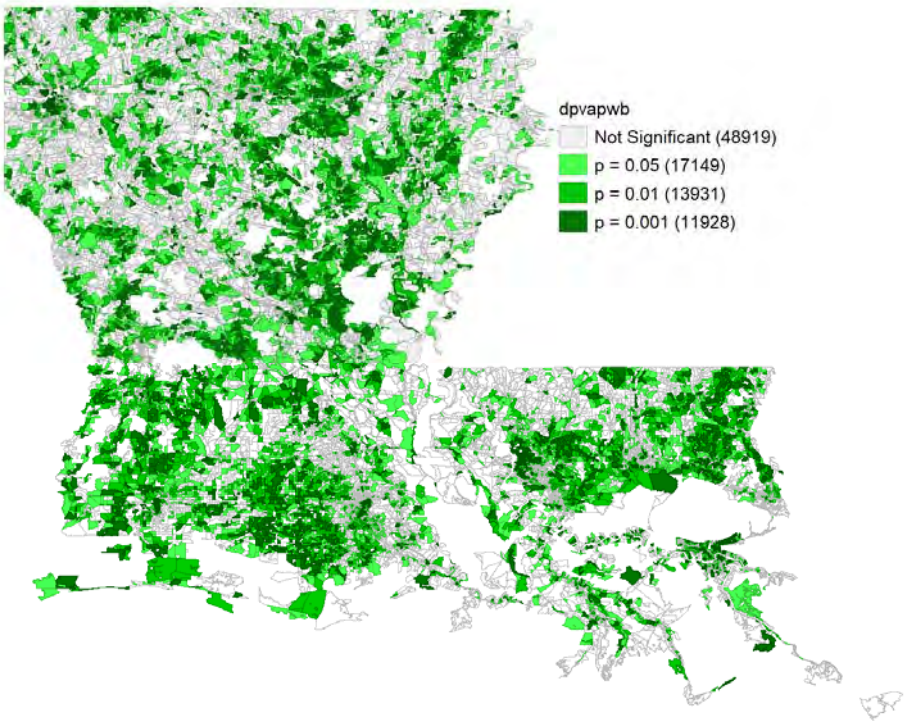


Figure III.A.15 Difference in Percent White and Black (non-Hispanic) Population Spatial Autocorrelation Significance



C. Sub-State Analysis

The analysis at the state level makes it difficult to see local variability with in major cities. Figure III.A.16 shows the local Moran's I findings for New Orleans and Figure III.A.17 shows the local Moran's I findings for Baton Rouge. The neighborhood clusters are clear and prominent.

Figure III.A.16 Difference in Percent White and Black (non-Hispanic) Population Spatial Autocorrelation – New Orleans

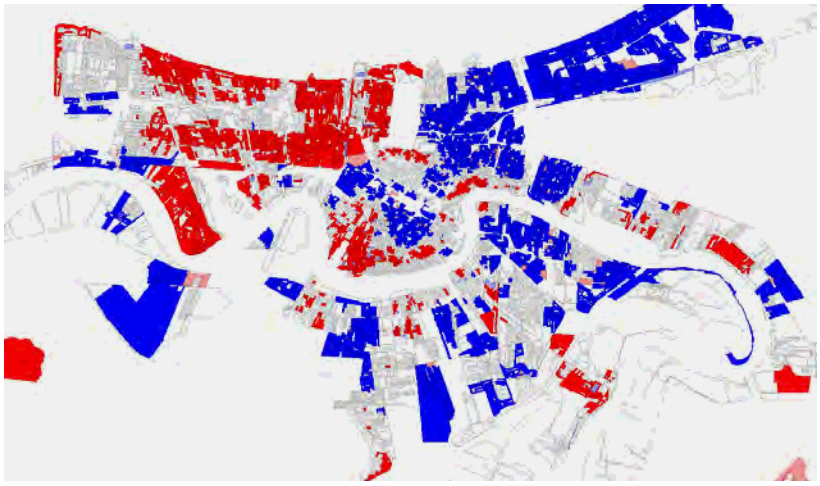
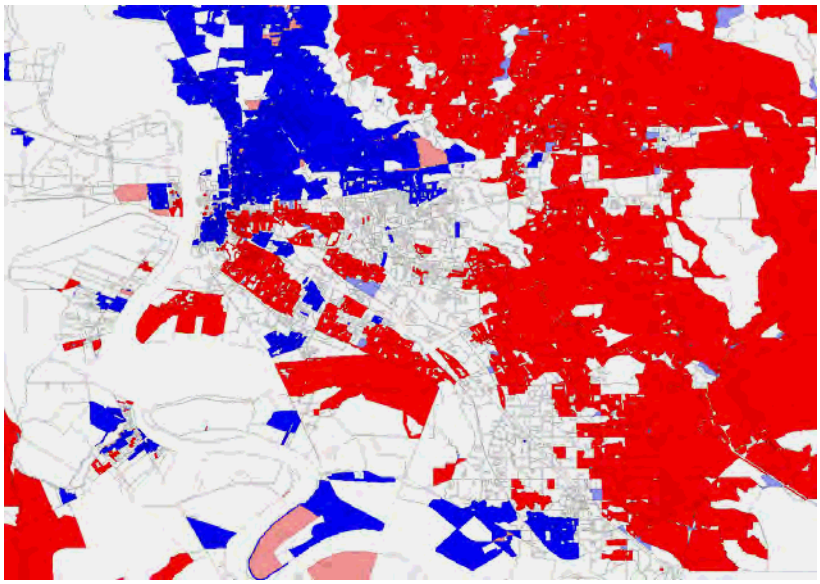


Figure III.A.17 Difference in Percent White and Black (non-Hispanic) Population Spatial Autocorrelation – Baton Rouge



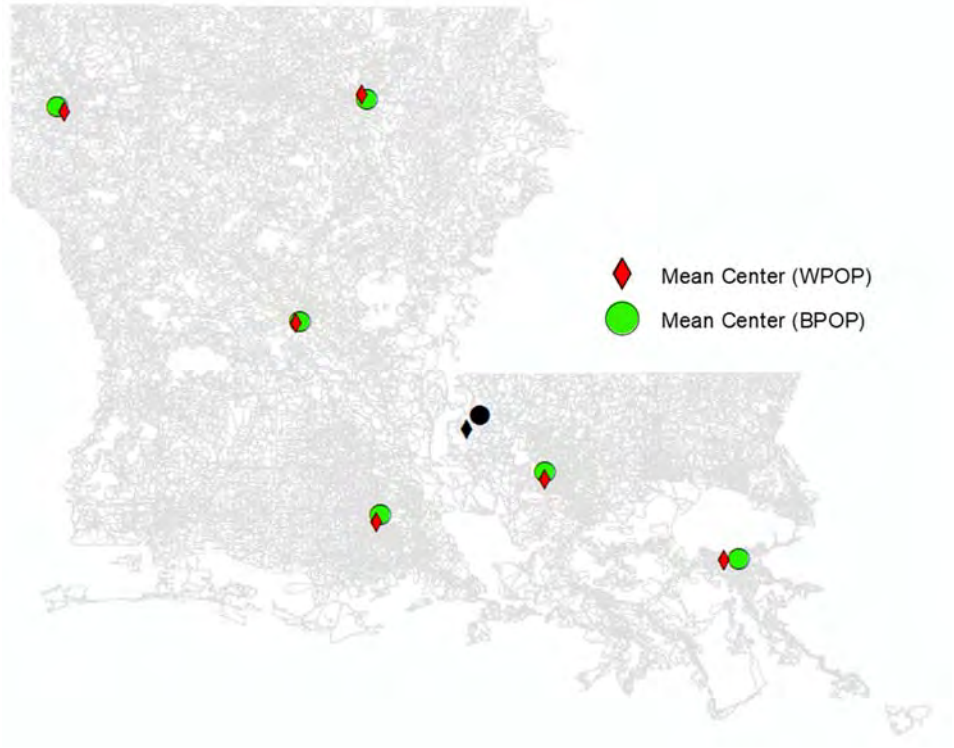
Another way in which the distributions of white and Black voting age population may be are clearly different is through the examination of spatial centrality**.** Figure III.A.18 indicates the white and Black weighted mean center for the state, and the cities of Alexandria, Baton Rouge,

New Orleans, Lafayette, Monroe and Shreveport. There are significant distances between center locations:

	Distance Between BPOP & WPOP Mean Centers (miles)
Alexandria	1.48
Baton Rouge	3.10
New Orleans	4.78
Lafayette	2.80
Monroe	2.64
Shreveport	2.72
Region	6.51

These differences are significant, ranges in 1.48 miles to 4.78 miles. Across the region, the difference is even larger, 6.51 miles. This further supports that the geographic distributions of white and Black population within cities and across the state differs in important and nuanced ways as demonstrated across the analysis provided.

Figure III.A.18 Geographic centrality for White and Black Populations, across the state and for select cities (Alexandria, Baton Rouge, New Orleans, Lafayette, Monroe and Shreveport)



Finally, distances between the selected cities is noted, and highlights how these concentrations of black populations are not clustered close together.

	Alexandria	Baton Rouge	New Orleans	Lafayette	Monroe	Shreveport
Alexandria	0	98	169	77	86	112
Baton Rouge	98	0	72	56	152	209
New Orleans	169	72	0	119	211	279
Lafayette	77	56	119	0	157	186
Monroe	86	152	211	157	0	99
Shreveport	112	209	279	186	99	0

IV. CONCLUSION

The analysis finds that white and Black Voting Age Populations are not at all similarly geospatially distributed, with significant clusters of concentrated groupings. Essentially the entire state has noteworthy local areas of statistically significant clusters. This is evident in the supporting maps summaries, where positive spatial autocorrelation is identified. Namely there are clusters of high percent white populations as well as clusters of high percent Black populations. Not only are rural areas in the state dominated by high percentages of white population, but urban areas have clusters of high percent white population as well. Prominent Black population cluster can be observed as well, particularly in urban areas, although these urban areas are separated from each other. The weighted mean center analysis was offered as a summary to further highlight the differences in the spatial distribution of white and Black populations in the state and select cities. This further supports that the geographic distributions of white and Black population within cities and across the state differs in important and nuanced ways as demonstrated across the analysis provided.

Submitted: April 29, 2022

Dr. Alan Murray

Appendix 1 Dr. Alan Murray CV

Curriculum Vitae

Alan T. Murray

Contact Details

Department of Geography
University of California at Santa Barbara
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Education

Ph.D. 1995, University of California at Santa Barbara (Geography), USA

M.A. 1992, University of California at Santa Barbara (Statistics and Applied Probability), USA

B.S. 1990, University of California at Santa Barbara (Mathematics), USA

Administrative Appointments

2021-2022	UCSB-SDSU Joint Doctoral Program Graduate Advisor, Department of Geography, University of California at Santa Barbara
2017-2021	Graduate Advisor, Department of Geography, University of California at Santa Barbara
2017-2021	Vice Chair, Department of Geography, University of California at Santa Barbara
2014-2015	Director, Center for Spatial Analytics and Geocomputation, Drexel University
2005-2008	Director, Center for Urban and Regional Analysis, The Ohio State University

Academic Appointments

2015-present	Professor, Department of Geography, University of California at Santa Barbara
2014-2015	Professor, College of Computing and Informatics / School of Public Health, Drexel University
2008-2014	Professor, School of Geographical Sciences and Urban Planning, Arizona State University
2005-2008	Professor, Department of Geography, The Ohio State University
2002-2005	Associate Professor, Department of Geography, The Ohio State University
1999-2002	Assistant Professor, Department of Geography, The Ohio State University

1997-1999	Research Fellow and Lecturer, Australian Housing and Urban Research Institute, Department of Geographical Sciences and Planning, University of Queensland
1996-1997	Postdoctoral Research Fellow, Australian Housing and Urban Research Institute, Faculty of Built Environment and Engineering, Queensland University of Technology
1991-1995	Research Associate and Teaching Assistant, Department of Geography, University of California at Santa Barbara

Affiliations

2017-present	Affiliate, Earth Research Institute, University of California at Santa Barbara
2016-present	Research Associate, Broom Center for Demography, University of California at Santa Barbara
2015-present	Adjunct Professor, Department of Geography, San Diego State University
2015-2016	Adjunct Professor, School of Geographical Sciences and Urban Planning, Arizona State University
2010-2014	Industrial Engineering Graduate Faculty, School of Computing, Informatics, and Decision Systems Engineering, Arizona State University
2010-2014	Senior Sustainability Scientist, School of Sustainability, Arizona State University
2012-2014	Affiliated Research Professor, Regional Economics and Spatial Modeling Laboratory, University of Arizona
2008-2010	Guest Professor, Laboratory for Earth and Space Information Technologies, Shenzhen Institute for Advanced Technology, The Chinese Academy of Sciences, China

Editorial Appointments

2022-present	Editorial Board, *Urban Informatics*
2018-present	Editorial Board, *International Journal of Geographical Information Science*
2017-2025	Editorial Board, *Transactions in GIS*
2016-present	Associate Editor, *Papers in Regional Science*
2015-present	Editorial Board, *Computers, Environment and Urban Systems*
2014-present	Editorial Board, *Geographical Analysis*
2014-2018	Editorial Board, *Annals of the Association of American Geographers*
2010-present	Associate Editor, *Socio-Economic Planning Sciences*
2009-present	Co-Editor, *International Regional Science Review*
2009-2010	Executive Editorial Board, *International Journal of Mathematical and Computational Forestry & Natural-Resource Science*

2002-2008 Editor, *Geographical Analysis*

2001-2004 Associate Editor, *Forest Science*

2001-2002 Associate Editor, *Geographical Analysis*

Themed Issues

2020 Guest Editor, *Geographical Analysis*, volume 51 – Tribute to Professor Waldo Tobler (with K. Clarke)

2016 Guest Editor, *International Regional Science Review*, volume 39 – 40 Years of Maximal Coverage (with R. Church)

2014 Guest Editor, *International Regional Science Review*, volume 37 – Location Analysis and Modeling: ISOLDE XI (with A. Suzuki)

2012 Guest Editor, *Socio-Economic Planning Sciences*, volume 46 – Modeling Public Sector Facility Location Problems (with M. Daskin)

2011 Guest Editor, *International Regional Science Review*, volume 34 – Location Analysis and Modeling: ISOLDE X (with R. Church)

2009 Guest Editor, *Socio-Economic Planning Sciences*, volume 43 – The Contributions of Charles S. ReVelle (with T. Matisziw and J. Osleeb)

2001 Guest Editor, *Journal of Geographical Systems*, volume 3 – Spatial Modeling and GIScience

2001 Guest Editor, *Studies in Regional and Urban Planning*, volume 9

2000 Guest Editor, *Forest Science*, volume 46 – Modeling in Natural Resource Management and Planning (with S. Snyder)

Honors and Awards

2022 Best Paper Award (Location Intelligence) - Murray, A.T, R.L. Church, B.A. Pludow and P. Stine. "Location analytics for transitioning to fire resilient landscapes." 2022 Proceedings of the 55th Hawaii International Conference on System Sciences (http://hdl.handle.net/10125/80037).

2019 Elected Fellow, American Association for the Advancement of Science.

2019 William Alonso Memorial Prize for Innovative Work in Regional Science (Awarded by North American Regional Science Council) - Church, R.L. and A. Murray (2018), *Location Covering Models: History, Applications, and Advancements* (Berlin: Springer).

2019 Education Excellence Award, International Association of Chinese Professionals in Geographic Information Sciences.

2018 Elected Fellow, Regional Science Association International.

2017 Distinguished Scholar Award, Regional Development and Planning Specialty Group, American Association of Geographers.

2015 Walter Isard Award for Scholarly Achievement, North American Regional Science Council.

2014 Outstanding Service Award, Spatial Analysis and Modeling Specialty Group, American Association of Geographers.

2007 Best Publication Award in Forestry (Awarded by Energy, Natural Resources, and the Environment section of Institute for Operations Research and the Management Science [INFORMS]) - Goycoolea, M., A.T. Murray, F. Barahona, R. Epstein and A. Weintraub (2005), "Harvest scheduling subject to maximum area restrictions: exploring exact approaches", *Operations Research* **53**, 490-500.

2004 Geoffrey J.D. Hewings Award for Outstanding Young Scholar, North American Regional Science Council.

Teaching and Research Interests

Geographic information science; health disparities; crime and violence; urban, regional, and natural resource planning and development; public policy; infrastructure and transportation systems; spatial optimization; location modeling; spatial representation; spatial statistics; and, techniques to support interactive planning and decision making.

Publications

D. Books and Edited Volumes (3 total)

2018 R.L. Church and A.T. Murray. *Location Covering Models: History, Applications, and Advancements* (Berlin: Springer).

2009 R.L. Church and A.T. Murray. *Business Site Selection, Location Analysis and GIS* (New York: Wiley).

2007 A.T. Murray and T.H. Grubesic (editors). *Critical Infrastructure: Reliability and Vulnerability* (Berlin: Springer).

E. Refereed Articles, Book Chapters and Proceedings (287 total)

2022 A.T. Murray. "Sources of uncertainty in location analysis." In *Uncertainty in Facility Location Models: Incorporating Location Science and Randomness,* edited by H.A. Eiselt and V. Marianov (Springer).

2022 B.A. Pludow, A.T. Murray and R.L. Church. "Service quality modeling to support optimizing facility location in a microscale environment." *Socio-Economic Planning Sciences* (DOI: 10.1016/j.seps.2022.101273).

2022 A.T. Murray, R.L. Church, B.A. Pludow and P. Stine. "Advancing contiguous environmental land allocation analysis, planning and modeling." *Journal of Land Use Science* (DOI: 10.1080/1747423X.2022.2041120).

2022 J. Xu, A.T. Murray, R.L. Church and R. Wei. "A heuristic algorithm for balancing workloads in coverage modeling." *Computers, Environment and Urban Systems* **92**, 101746 (DOI: 10.1016/j.compenvurbsys.2021.101746).

2022 E. Noi and A.T. Murray. "Interpolation biases in assessing spatial heterogeneity of outdoor air quality in Moscow, Russia." *Land Use Policy* **112**, 105783 (DOI: 10.1016/j.landusepol.2021.105783).

2022 A.T. Murray, A. Ortiz and S. Cho. "Enhancing strategic defensive positioning and performance in the outfield." *Journal of Geographical Systems* (DOI: 10.1007/s10109-021-00367-1).

2022 S. Burtner and A.T. Murray. "COVID-19 and minimizing micro-spatial interactions." *ACM Transactions on Spatial Algorithms and Systems* **8**, 1-17 (DOI: 10.1145/3486970).

2022 A.T. Murray, R.L. Church, B.A. Pludow and P. Stine. "Location analytics for transitioning to fire resilient landscapes." *2022 Proceedings of the 55th Hawaii International Conference on System Sciences* (http://hdl.handle.net/10125/80037).

2022 A.T. Murray. "Spatial optimization." In *Handbook of Spatial Analysis in the Social Sciences*, edited by S. Rey and R. Franklin (Edward Elgar Publishing).

2022 H. Yu, A.T. Murray, Z. Fang, J. Liu, G. Peng, M. Solgi and W. Zhang. "Ship path optimization that accounts for geographical traffic characteristics to increase maritime port safety." *IEEE Transactions on Intelligent Transportation Systems* (DOI: 10.1109/TITS.2021.3057907).

2021 X. Feng, A.T. Murray and R.L. Church. "Drone service response: spatiotemporal heterogeneity implications." *Journal of Transport Geography* **93**, 103074 (DOI: 10.1016/j.jtrangeo.2021.103074).

2021 C. Jin and A.T. Murray. "Exploring public open data: micro-scale spatiotemporal dynamics of restaurant entrepreneurship in Seoul, Korea." *International Journal of Geospatial and Environmental Research* **8**(3), 5.

2021 H. Chen and A.T. Murray. "Open-source geospatial software for location cover models." In *Proceedings of the 29th GISRUK conference, 14-16 April 2021* (http://gisruk.org/proceedings.html).

2021 A.T. Murray. "Resilience in complex networks." In *Handbook on Entropy, Complexity and Spatial Dynamics: A Rebirth of Theory?*, edited by A. Reggiani, L.A. Schintler, D. Czamanski and R. Patuelli, 418-431 (Edward Elgar Publishing) (DOI: https://doi.org/10.4337/9781839100598).

2021 H. Chen, A.T. Murray and R. Jiang. "Open-source approaches for location cover models: capabilities and efficiency." *Journal of Geographical Systems* **23**, 361-380 (DOI: 10.1007/s10109-021-00350-w).

2021 A.T. Murray. "Significance assessment in the application of spatial analytics." *Annals of the American Association of Geographers* **111**, 1740-1755 (DOI: 10.1080/24694452.2020.1856639).

2021 A.T. Murray. "Spatial analysis and modeling: advances and evolution." *Geographical Analysis* **53**, 647-664 (DOI: 10.1111/gean.12263).

2021 A.T. Murray. "Replicability challenges in location analytics." In *Proceedings of the 54th Hawaii International Conference on System Sciences* (http://hdl.handle.net/10125/71272).

2021 A.T. Murray. "Contemporary optimization application through geographic information systems." *Omega* **99**, 102176 (DOI: 10.1016/j.omega.2019.102176).

2021 A.T. Murray. "Anticipating the next half-century of Geographical Analysis." *Geographical Analysis* **53**, 13-18 (DOI: 10.1111/gean.12200).

2021 H. Chen and A.T. Murray. "Open-source approaches for location coverage modelling." In *Open Source Geospatial Science for Urban Studies*, edited by A. Mobasher, 117-129 (Springer) (DOI: 10.1007/978-3-030-58232-6_7).

2021 A.T. Murray, L. Carvalho, R.L. Church, C. Jones, D. Roberts, J. Xu, K. Zigner and D. Nash. "Coastal vulnerability under extreme weather." *Applied Spatial Analysis and Policy* **14**, 497-523 (DOI: 10.1007/s12061-020-09357-0).

2021 X. Feng, S. Wang, A.T. Murray, Y. Cao and S. Gao. "Multi-objective trajectory optimization in planning for sequential activities across space and through time." *Environment and Planning B: Urban Analytics and City Science* **48**, 945-963 (DOI: 10.1177/2399808320913300).

2021 A.T. Murray. "New geography location analytics." In *Handbook of Regional Science, 2nd edition*, edited by M.M. Fischer and P. Nijkamp, 1341-1360 (Springer) (DOI: 10.1007/978-3-642-36203-3_144-1).

2021 H. Yu, Z. Fang, A.T. Murray and G. Peng. "A direction-constrained space-time prism-based approach for quantifying possible multi-ship collision risk." *IEEE Transactions on Intelligent Transportation Systems* **22**, 131-141 (DOI: 10.1109/TITS.2019.2955048).

2021 A.T. Murray, R.L. Church, J. Xu, L. Carvalho, C. Jones and D. Roberts. "Fire and flood vulnerability, and implications for evacuation." In *Geospatial Technology and Smart Cities*, edited by Poonam Sharma, 299-314 (Springer) (DOI: 10.1007/978-3-030-71945-6).

2021 S. Burtner and A.T. Murray. "Urban mobility and segregation examined through networked travel activity." In *Handbook of Cities and Networks*, edited by Z. Neal and C. Rozenblat, 331-349 (Edward Elgar Publishers).

2020 H. Goto and A.T. Murray. "Exact and flexible solution approach to a critical chain project management problem." *Constraints* **25**, 280-297 (DOI: 10.1007/s10601-020-09314-1).

2020 A.T. Murray. "Planning for classroom physical distancing to minimize the threat of COVID-19 disease spread." *PLoS ONE* **15**, e0243345 (DOI: 10.1371/journal.pone.0243345).

2020 K.C. Clarke and A.T. Murray. "Introduction to the special issue commemorating Professor Waldo Tobler." *Geographical Analysis* **52**, 477-479 (DOI: 10.1111/gean.12261).

2020 X. Feng and A.T. Murray. "Spatiotemporal heterogeneous allocation to support service area response." *Computers, Environment and Urban Systems* **82** (DOI: 10.1016/j.compenvurbsys.2020.101503).

2020 A.T. Murray, J. Xu, J. Baik, S. Burtner, S. Cho, E. Noi, B.A. Pludow and E. Zhou. "Overview of contributions in *Geographical Analysis*: Waldo Tobler." *Geographical Analysis* **52**, 480-493 (DOI:10.1111/gean.12257).

2020 A.T. Murray, R.L. Church and X. Feng. "Single facility siting involving allocation decisions." *European Journal of Operational Research* **284**, 834-846 (DOI: 10.1016/j.ejor.2020.01.047).

2020 H.S. Cha and A.T. Murray. "Enhancing equity in public transportation using geographic information systems and spatial optimization." *International Journal of Geospatial and Environmental Research* **7**(1), 2.

2020 H. Goto and A.T. Murray. "Acoustical properties in emergency warning siren coverage planning." *Computers, Environment and Urban Systems* **81** (DOI: 10.1016/j.compenvurbsys.2020.101477).

2020 J. Xu, A.T. Murray, Z. Wang and R.L. Church. "Challenges in applying capacitated covering models." *Transactions in GIS* **24**, 268-290 (DOI: 10.1111/tgis.12608).

2020 A.T. Murray. "Detection and analysis of spatial clustering." In *International Encyclopedia of Human Geography*, 2nd edition, edited by A. Kobayashi, vol. 8, 367-373 (Oxford: Elsevier) (DOI: 10.1016/B978-0-08-102295-5.10424-X).

2020 A.T. Murray. "Sustainability and resilience through micro-scale decisions for change." In *Development Studies in Regional Science: In Honor of Kingsley E Haynes*, edited by Z. Chen, W. Bowen and D. Whittington, 43-57 (Berlin: Springer) (DOI: 10.1007/978-981-15-1435-7_4).

2020 K. Grace, A.T. Murray and R. Wei. "Improving urban and peri-urban health outcomes through early detection and aid planning." In *Geospatial Technologies for Urban Health*, edited by Y. Lu and E. Delmelle, 231-250 (Cham: Springer) (DOI: 10.1007/978-3-030-19573-1_12).

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2020 J. Yao and A.T. Murray. "A spatial optimization approach for solving a multi-facility location problem with continuously distributed demand." In *Innovations in Urban and Regional Systems: Contributions from GIS&T, Spatial Analysis and Location Modeling*, edited by J.-C. Thill, 113-135 (Cham: Springer) (DOI: 10.1007/978-3-030-43694-0_6).

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2019 A.T. Murray. "Geocomputation and spatial analytics." In *GeoComputation 2019* (Queenstown, New Zealand).

2019 A.T. Murray. "Micro-scale decisions for sustainability and resilience." In *Proceeding Book, 16th Pacific Regional Science Conference Organization*, edited by S. Anantsuksomsri and N. Tontsirin, 21-24 (Pacific Regional Science Conference Organization Summer Institute: Bangkok, Thailand).

2019 H. Goto and A.T. Murray. "Small-m method for detecting all longest paths." *OPSEARCH* **56**, 824-839 (DOI: 10.1007/s12597-019-00385-0).

2019 N. Xiao and A.T. Murray. "Spatial optimization for land acquisition problems: a review of models, solution methods and GIS support." *Transactions in GIS* **23**, 645-671 (DOI: 10.1111/tgis.12545).

2019 A.T. Murray, R. Wei, R.L. Church and M.R. Niblett. "Addressing risks and uncertainty in forest land use modeling." *Journal of Geographical Systems* **21**, 319-338 (DOI: 10.1007/s10109-019-00302-5).

2019 J. Yao, A.T. Murray, J. Wang and X. Zhang. "Evaluation and development of sustainable urban land use plans through spatial optimization." *Transactions in GIS* **23**, 705-725 (DOI: 10.1111/tgis.12531).

2019 A.T. Murray, J. Xu, Z. Wang and R.L. Church. "Commercial GIS location analytics: capabilities and performance." *International Journal of Geographical Information Science* **33**, 1106-1130 (DOI: 10.1080/13658816.2019.1572898).

2019 J. Xu and A.T. Murray. "Spatial variability in retail gasoline markets." *Asia-Pacific Journal of Regional Science* **3**, 581-603 (DOI: 10.1007/s41685-019-00104-z).

2019 H. Yu, Z. Fang, F. Lu, A.T. Murray, H. Zhang, P. Peng, Q. Mei and J. Chen. "Impact of oil price fluctuations on tanker maritime network structure and traffic flow changes." *Applied Energy* **237**, 390-403 (DOI: 10.1016/j.apenergy.2019.01.011).

2019 A.T. Murray and T.H. Grubesic. "Evolving regional analytics in a rural world." *International Regional Science Review* **42**, 374-399 (DOI: 10.1177/0160017619827071).

2019 J. Yao, X. Zhang and A.T. Murray. "Location optimization of urban fire stations: access and service coverage." *Computers, Environment and Urban Systems*, **73**, 184-190 (DOI: 10.1016/j.compenvurbsys.2018.10.006).

2018 A.T. Murray. "Complexities in spatial center derivation." *Transactions in GIS* **22**, 1335-1350 (DOI: 10.1111/tgis.12476).

2018 X. Feng and A.T. Murray. "Allocation using a heterogeneous space Voronoi diagram." *Journal of Geographical Systems* **20**, 207-226 (DOI: 10.1007/s10109-018-0274-5).

2018 L. Conrow, A.T. Murray and H.A. Fischer. "An optimization approach for equitable bicycle share station siting." *Journal of Transport Geography* **69**, 163-170 (DOI: 10.1016/j.jtrangeo.2018.04.023).

2018 H. Goto and A.T. Murray. "Optimization of project schedules in the critical-chain project-management max-plus-linear framework." *International Review on Modelling and Simulations* **11** (DOI: 10.15866/iremos.v11i4.13485).

2018 A.T. Murray, X. Feng and A. Shokoufandeh. "Heterogeneous skeleton for summarizing continuously distributed demand in a region." In *10th International Conference on Geographic Information Science (GIScience 2018)*, edited by S. Winter, A. Griffin and M. Sester, 12:1-12:11 (Germany: Dagstuhl Publishing) (DOI: 10.4230/LIPIcs.GISCIENCE.2018.12).

2018 I. Hong, M. Kuby and A.T. Murray. "A range-restricted recharging station coverage model for drone delivery service planning." *Transportation Research C: Emerging Technologies* **90**, 198-212 (DOI: 10.1016/j.trc.2018.02.017).

2018 S. Wang, S. Gao, X. Feng, A.T. Murray and M. Zeng. "A context-based geoprocessing framework for optimizing meetup location of multiple moving objects along road networks." *International Journal of Geographical Information Science* **32**, 1368-1390 (DOI: 10.1080/13658816.2018.1431838).

2018 X. Feng and A.T. Murray. "Spatial analytics for enhancing street light coverage of public spaces." *LEUKOS* **14**, 13-23 (DOI: 10.1080/15502724.2017.1321486).

2018 A.T. Murray. "Evolving location analytics for service coverage modeling." *Geographical Analysis* **50**, 207-222 (DOI: 10.1111/gean.12146).

2018 J. Yao, X. Zhang and A.T. Murray. "Spatial optimization for land use allocation: accounting for sustainability concerns." *International Regional Science Review* **41**, 579-600 (DOI: 10.1177/0160017617728551).

2018 R. Wei and A.T. Murray. "Spatial uncertainty challenges in location modeling with dispersion requirements." In *Spatial Analysis and Location Modeling in Urban and Regional Systems*, edited by J.-C. Thill, 283-300 (New York: Springer) (DOI: 10.1007/978-3-642-37896-6_12).

2017 I. Hong, M. Kuby and A.T. Murray "A deviation flow refueling location model for continuous space: a commercial drone delivery system for urban areas." In *Advances in Geocomputation* , edited by D. Griffith, Y. Chun and D. Dean, 125-132 (Springer) (DOI: 10.1007/978-3-319-22786-3_12).

2017 A.T. Murray. "Regional analytics." *Annals of Regional Science* **59**, 1-13 (DOI: 10.1007/s00168-017-0825-6).

2017 Y. Zhang, A.T. Murray and B.L. Turner. "Optimizing green space locations to reduce daytime and nighttime urban heat island effects in Phoenix, Arizona." *Landscape and Urban Planning* **165**, 162-171 (DOI: 10.1016/j.landurbplan.2017.04.009).

2017 Q. Zhao, E.A. Wentz and A.T. Murray. "Tree shade coverage optimization in an urban residential environment." *Building and Environment* **115**, 269-280 (DOI: 10.1016/j.buildenv.2017.01.036).

2017 K. Grace, R. Wei and A.T. Murray. "A spatial analytic framework for assessing and improving food aid distribution in developing countries." *Food Security* **9**, 867-880 (https://doi.org/10.1007/s12571-017-0703-1).

2017 A.T. Murray. "GIS in regional research." In *Regional Research Frontiers – Vol. 2: Methodological Advance, Regional Systems Modeling and Open Science*, edited by R. Jackson and P. Shaeffer, 169-180 (Springer) (DOI: 10.1007/978-3-319-50590-9_10).

2017 D. Tong and A.T. Murray. "Location analysis: developments on the horizon." *Regional Research Frontiers – Vol. 2: Methodological Advance, Regional Systems Modeling and Open Science*, edited by R. Jackson and P. Shaeffer, 193-208 (Springer) (DOI: 10.1007/978-3-319-50590-9_12).

2017 L.J. Wolf and A.T. Murray. "Spatial analysis." In *International Encyclopedia of Geography: People, the Earth, Environment, and Technology*, edited by D. Richardson, N. Castree, M.F. Goodchild, A. Kobayashi, W. Liu and R.A. Marston (New York: John Wiley & Sons) (DOI: 10.1002/9781118786352.wbieg0505).

2017 S. McLafferty and A.T. Murray. "Regional perspectives on public health." In *Regional Research Frontiers- Vol. 1: Innovations, Regional Growth and Migration*, edited by R. Jackson and P. Shaeffer, 161-174 (Springer) (DOI: 10.1007/978-3-319-50547-3_10).

2016 T.H. Grubesic, R. Wei, A.T. Murray and W.A. Pridemore. "Comparative approaches for assessing access to alcohol outlets: exploring the utility of a gravity potential approach." *Population Health Metrics* **14,** 25 (DOI: 10.1186/s12963-016-0097-x).

2016 R.L. Oxley, L.W. Mayes and A.T. Murray. "Optimization model for the sustainable water resource management of river basins." *Water Resources Management* **30**, 3247-3264.

2016 S. Kleinschmidt, A.T. Murray, S. Rey, L. Anselin and T.H. Grubesic. "Spatial uncertainty in cluster detection." *Spatial Information Research* **24**, 181-189.

2016 A.T. Murray. "Assessing the impacts of traditional school year calendar start dates." *Socio-Economic Planning Sciences* **54**, 28-36.

2016 P.V. Amaral and A.T. Murray. "Equity in regional access to renal dialysis in Brazil." *Regional Science Policy & Practice* **8**, 27-44.

2016 I. Hong, A.T. Murray and S.J. Rey. "Obstacle-avoiding shortest path derivation in a multicore computing environment." *Computers, Environment and Urban Systems* **55**, 1-10.

2016 A.T. Murray and X. Feng. "Public street lighting service standard assessment and achievement." *Socio-Economic Planning Sciences* **53**,14-22.

2016 I. Hong, A.T. Murray and L.J. Wolf. "Spatial filtering for identifying a shortest path around obstacles." *Geographical Analysis* **48**, 176-190.

2016 A.T. Murray. "Maximal coverage location problem: impacts, significance and evolution." *International Regional Science Review* **39**, 5-27.

2016 T.H. Grubesic, R. Wei, A.T. Murray and F. Wei. "Essential Air Service in the United States: exploring strategies to enhance spatial and operational efficiencies." *International Regional Science Review* **39**, 108-130.

2016 I. Hong and A.T. Murray. "Assessing raster GIS approximation for Euclidean shortest path routing." *Transactions in GIS* **20**, 570-584.

2016 R. Wei and A.T. Murray. "A parallel algorithm for coverage optimization on multi-core architectures." *International Journal of Geographical Information Science* **30**, 432-450.

2015 A.T. Murray and T.H Grubesic. "Locational planning of health care facilities." In *Spatial Analysis in Health Geography*, edited by P. Kanaroglou, E. Delmelle and A. Paez, 243-259 (Farnham: Ashgate).

2015 A.T. Murray. "GIS and Transportation." In *Routledge Handbook of Transportation*, edited by D. Teodorovic, 437-447 (New York: Routledge).

2015 M. Ronnqvist, S. D'Amours, A. Weintraub, A. Jofre, E. Gunn, R.G. Haight, D. Martell, A.T. Murray and C. Romero. "Operational research challenges in forestry: 33 open problems." *Annals of Operations Research* **232**, 11-40.

2015 Y. Liu and A.T. Murray. "An integrated framework to support local and global assessment of residential movements." *Cityscape: A Journal of Policy Development and Research* **17**, 127-140.

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2000 R.L. Church, A.T. Murray and K.H. Barber. "Forest planning at the tactical level." *Annals of Operations Research* **95**, 3-18.

2000 A.T. Murray. "Spatial characteristics and comparisons of interaction and median clustering models." *Geographical Analysis* **32**, 1-18.

2000 R.L. Church, A.T. Murray, M.A. Figueroa and K. Barber. "Support system development for forest ecosystem management." *European Journal of Operational Research* **121**, 247-258.

2000 V. Estivill-Castro and A.T. Murray. "Clustering and capacitated facility location via hybrid optimization." *Intelligent Systems and Applications*, on CD-ROM (Canada: ICSC Academic Press).

2000 V. Estivill-Castro and A.T. Murray. "Hybrid optimization for clustering in data mining." *CLAIO 2000*, on CD-ROM (Mexico: IMSIO).

2000 A.T. Murray. "Spatially lagged choropleth display." *Proceedings of 9th International Symposium on Spatial Data Handling*, edited by P. Forer, A. Yeh and J. He, 1a40-49 (Beijing: International Geographical Union).

2000 A.T. Murray and R.L. Church. "Optimizing the location of harvesting equipment and access roads." *Seventh Symposium on Systems Analysis in Forest Resources*, edited by J. Fried, L. Leefers, and M. Vasievich, North Central Research Station General Technical Report NC-205, 361-363 (Washington D.C.: USDA Forest Service).

1999 A.T. Murray. "Spatial analysis using clustering methods: evaluating the use of central point and median approaches." *Journal of Geographical Systems* **1**, 367-383.

1999 A.T. Murray. "Spatial restrictions in harvest scheduling." *Forest Science* **45**, 45-52.

1999 A.T. Murray and R.L. Church. "Using proximity restrictions for locating undesirable facilities." *Studies in Locational Analysis* **12**, 81-99.

1998 A.T. Murray. "Ecosystem management or infeasible guidelines? Implications of adjacency restrictions for wildlife habitat and timber production." *Canadian Journal of Forest Research* **28**, 1093-1094.

1998 A.T. Murray, R. Davis, R.J. Stimson and L. Ferreira. "Public transportation access." *Transportation Research D* **3**, 319-328.

1998 A.T. Murray. "Route planning for harvest site access." *Canadian Journal of Forest Research* **28**, 1084-1087.

1998 R.L. Church, A.T. Murray and A. Weintraub. "Locational issues in forest management." *Location Science* **6**, 137-153.

1998 A.T. Murray, R.L. Church and A. Weintraub. "Operational forest planning and Steiner tree extensions." *Geographical Systems* **5**, 221-237.

1998 A.T. Murray and V. Estivill-Castro. "Cluster discovery techniques for exploratory spatial data analysis." *International Journal of Geographical Information Science* **12**, 431-443.

1998 A.T. Murray, R.L. Church, R.A. Gerrard and W.S. Tsui. "Impact models for siting undesirable facilities." *Papers in Regional Science* **77**, 19-36.

1998 A.T. Murray. "Minimizing aggregation error in input-output models." *Environment and Planning A* **30**, 1125-1128.

1998 V. Estivill-Castro and A.T. Murray. "Mining spatial data via clustering." *Proceedings of 8th International Symposium on Spatial Data Handling*, edited by T. Poiker and N. Chrisman, 522-532 (Vancouver: International Geographical Union).

1998 V. Estivill-Castro and A.T. Murray. "Discovering associations in spatial data – an efficient medoid based approach." *Research and Development in Knowledge Discovery and Data Mining: Second Pacific-Asia Conference*, edited by X. Wu, R. Kotagiri and K. Korb, 110-121 (New York: Springer).

1998 V. Estivill-Castro and A.T. Murray. "Spatial clustering for data mining with genetic algorithms." *International ICSC Symposium on Engineering of Intelligent Systems*, edited by E. Alpaydin and C. Fyfe, on CD-ROM (Canada: ICSC Academic Press).

1998 A.T. Murray, J.S. Western, P. Mullins and I. McGuffog. "Analyzing patterns of regional criminal activity." *GIS/LIS' 98*, on CD-ROM, 611-617 (Maryland: American Society for Photogrammetry and Remote Sensing).

1998 A.T. Murray. "Transport access and environmental sustainability." *International Conference on Modeling Geographical and Environmental Systems with Geographical Information Systems*, edited by P. Lai, Y. Leung and W. Shi, 336-339 (Hong Kong: The Chinese University of Hong Kong).

1997 A.T. Murray and R.A. Gerrard. "Capacitated service and regional constraints in location-allocation modeling." *Location Science* **5**, 103-118.

1997 A.T. Murray and J.M. Gottsegen. "The influence of data aggregation on the stability of *p*-median location model solutions." *Geographical Analysis* **29**, 200-213.

1997 A.T. Murray and R.L. Church. "Facets for node packing." *European Journal of Operational Research* **101**, 598-608.

1997 A.T. Murray and R.L. Church. "Solving the anti-covering location problem using Lagrangian relaxation." *Computers & Operations Research* **24**, 127-140.

1996 A.T. Murray and R.L. Church. "Constructing and selecting adjacency constraints." *INFOR* **34**, 232-248.

1996 A.T. Murray and R.L. Church. "Applying simulated annealing to location planning models." *Journal of Heuristics* **2**, 31-53.

1996 A.T. Murray and R.L. Church. "Analyzing cliques for imposing adjacency restrictions in forest models." *Forest Science* **42**, 166-175.

1996 J.M. Gottsegen and A.T. Murray. "Analyzing the relationships of spatial structure in aggregated data." *GIS/LIS' 96*, 457-466 (Maryland: American Society for Photogrammetry and Remote Sensing).

1995 A.T. Murray and R.L. Church. "Measuring the efficacy of adjacency constraint structure in forest planning." *Canadian Journal of Forest Research* **25**, 1416-1424.

1995 A.T. Murray and R.L. Church. "Solid-waste-disposal site location." *Journal of Urban Planning and Development ASCE* **121**, 109-114.

1995 A.T. Murray and R.L. Church. "Heuristic solution approaches to operational forest planning problems." *OR Spektrum* **17**, 193-203.

1995 R.L. Church, A.T. Murray, K.H. Barber and R. Dyrland. "A spatial decision support system for doing hierarchical habitat planning." *Analysis in Support of Ecosystem Management*, 283-292 (Washington D.C.: USDA Forest Service).

1994 R.L. Church, A.T. Murray and K. Barber. "Designing a hierarchical planning model for USDA Forest Service planning." *Proceedings of the 1994 Symposium on Systems Analysis and Forest Resources*, edited by J. Sessions and J.D. Brodie, 401-409 (Maryland: Society of American Foresters).

1994 A.T. Murray, R.L. Church and M.A. Figueroa. "Designing a spatial decision support system for forest ecosystem management." *Proceedings of GIS'94 Eight Annual Symposium on Geographic Information Systems*, 651-658 (Canada:).

1993 A.T. Murray and R.L. Church. "Adjacency constraint aggregation." *International Symposium on Systems Analysis and Management Decisions in Forestry*, edited by G. Paredes, 131-138 (Chile: Universidad Austral de Chile).

1993 R.L. Church and A.T. Murray. "Modeling school utilization and consolidation." *Journal of Urban Planning and Development ASCE* **119**, 23-38.

F. **Bulletins and Technical Reports (3 total)**

2021 R.L. Church, A.T. Murray and B.A. Pludow, *The Development of Spatial Optimization Tools to Support Efforts to Transition to Fire Resilient Forest Landscapes*, USDA Final Project Report (UCSB).

2002 A.T. Murray, *Airborne Techniques for Estimating Traffic Flow in the Private Sector*, National Consortia on Remote Sensing in Transportation – Flows (NCRST-F) (Center for Mapping, The Ohio State University, Columbus, Ohio).

1997 R.J. Stimson, M. Manicaros, A. Kabamba and A.T. Murray. *Ageing and Housing: ageing and retirement housing in Australia*. AHURI Research Monograph 4 (Brisbane: Australian Housing and Urban Research Institute).

G. **Book Reviews (2 total)**

2002 Geographical Analysis, vol. 34, 91-92 – *GIS and Multicriteria Decision Analysis* by J. Malczewski, 1999 (New York: John Wiley and Sons)

2000 Papers in Regional Science, vol. 79, 103-104 – *The Economics of Industrial Location* by P. McCann, 1998 (Berlin: Springer-Verlag).

***Publications in Progress* (6 total)**

J. Baik and A.T. Murray. "Locating a facility to simultaneously address access and coverage goals". Revised for *Papers in Regional Science* (revised 2/26/22; submitted 8/19/21).

A.T. Murray and J. Baik. "Spatial optimization in strategic siting of urban infrastructure and services." Submitted to *Journal of Urban Informatics* (submitted 9/24/21).

J. Xu, A.T. Murray, R.L. Church and R. Wei. "Service allocation equity in maximal covering." Revised for *European Journal of Operational Research* (revised 3/5/22; submitted 9/26/21).

S. Cho, A.T. Murray, S. Dodge and J. Baik. "Location-allocation to address access and coverage: a heuristic for identifying non-dominated solutions." Revised for *International Journal of Geographical Information Science* (revised ??; submitted 2/10/22).

A.T. Murray, R.L. Church and B.A. Pludow. "Multiple patch land allocation." Revised for *Computers, Environment and Urban Systems* (revised ??; submitted 2/12/22).

A.T. Murray, K. Shammout, R. Farwell, K. Burrows and T. Cox. "Strategic planning to support on-demand mobility needs." Submitted to *Journal of Transport Geography* (submitted 4/15/22).

Courses Taught

- GEOG 172 (UCSB) – Intermediate Geographical Data Analysis (2016, 2017, 2018, 2019)
- GEOG 185D (UCSB) – Urban and Environmental Systems Analysis (2023)
- GEOG 190/290 (UCSB) – Location Theory and Modeling (2017, 2019, 2021)
- GEOG 191/291 (UCSB) – Introduction to Optimization Methods for Geographic Problems (2021, 2021)
- GEOG 200A (UCSB) – Introduction to Geographic Research (2017, 2018, 2019, 2020)
- GEOG 210B (UCSB) – Analytical Methods in Geography II (2017)
- GEOG 294 (UCSB) – Advanced Topics in Location and Transportation Systems (2016, 2018, 2020, 2022)
- INFO 220 (Drexel) – Geographic Information Science (2014, 2015)
- GPH 473/591 (ASU) – Geographic Information Science II (2009, 2010, 2011, 2012, 2014)
- GPH/PUP 481/581 (ASU) – Optimization Fundamentals for Spatial Analysis (2009, 2010, 2011, 2012, 2013) (GCU 494/598 prior to 2012)
- GPH/PUP 482/582 (ASU) – Location Analysis and Modeling (2009, 2010, 2012, 2014) (GCU 494/598 prior to 2012)

- GPH/PUP 598 (ASU) – Advanced Topics in Location Modeling: Shortest paths, obstacles and uncertainty (2013)
- GCU/GPH 591 (ASU) – Geography Forum (Professional Development) (2010, 2011)
- GCU/GPH 591 (ASU) – Geography Colloquium (2009, 2010, 2011, 2012, 2013)
- PUP 701 (ASU) – Urban Planning Colloquium (2012, 2013)
- GCU 598/PUP 591 (ASU) – Special Topics: Location Analysis and Modeling (2010)
- Geog 200 (OSU) – World Regional Geography (2000 Winter and Autumn, 2001)
- Geog 607 (OSU) – Fundamentals of Geographic Information System (Team taught: 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007)
- Geog 647 (OSU) – Locational Analysis (2005, 2006, 2007, 2008)
- Geog 683 (OSU) – Introduction to Geographic Analysis (2002, 2003, 2004, 2005)
- Geog 685 (OSU) – Intermediate Geographical Information Systems (2000, 2001, 2002, 2003, 2004)
- Geog 740 (OSU) – Locational Analysis (2006, 2008)
- Geog 840.01 (OSU) – Seminar in Location Theory: Spatial representation issues (2006)
- Geog 840.01 (OSU) – Seminar in Location Theory: GIS and modeling (2007)
- Geog 840.02 (OSU) – Seminar in Locational Analysis (1999)
- Geog 840.02 (OSU) – Seminar in Locational Analysis: Natural resource management (2002)
- Geog 845.01 (OSU) – Seminar in Transportation Geography: Public transit (2001)
- Geog 889 (OSU) – Seminar in Geography: Professional development in geography (Co-taught: 2003, 2004, 2005)
- Geog 983 (OSU) – Special Topics in Quantitative Geography: Lagrangian relaxation (2000)
- Geog 983 (OSU) – Special Topics in Quantitative Geography: Voronoi diagrams and spatial optimization (2003)
- Geog 983 (OSU) – Special Topics in Quantitative Geography: Network analysis (2004)
- GN 342 (UQ) – Spatial Analysis and Geographical Information Systems (1998)
- GN 882 (UQ) – Natural Resources Information Systems (Co-taught 1998)
- ITN 357 (QUT) – Special Topic in Information Studies: GIS and Spatial Analysis (1997)

Students Advised

Postdoctoral (advisor) (2 total)

- Timothy Matisziw – Ohio State University (2005-2008) (Associate Professor, University of Missouri)

- Tony Grubesic – Ohio State University (2001-2002) (Professor and Associate Dean, University of Texas / Professor, Arizona State University / Professor, Drexel University / Associate Professor, Oregon State University / Associate Professor, Indiana University / Assistant Professor, University of Cincinnati)

Doctoral (advisor) (24 total)

- Vanessa Figueroa – University of California at Santa Barbara
- Jiwon Baik – University of California at Santa Barbara
- Seonga Cho (co-advisor) – University of California at Santa Barbara
- Evgeny Noi (co-advisor) – University of California at Santa Barbara
- Enbo Zhou (co-advisor) – University of California at Santa Barbara
- B. Amelia Pludow – University of California at Santa Barbara, ABD 2020 ("Demography of wildfire risk in the wildland-urban interface"). **Awards:** 2021-22 UCSB Graduate Research Mentorship Fellowship.
- Susan Burtner – University of California at Santa Barbara, ABD 2020 ("Artificial intelligence and network approaches for migration analysis")
- Jing Xu – University of California at Santa Barbara, 2021 "Addressing facility workload balancing in coverage problems" (Data Scientist, Meta)
- Xin Feng – University of California at Santa Barbara, 2019, "Heterogeneity impacts and implications in allocation and location processes." **Awards:** 2018-19 Excellence in Research Award (Geography, UCSB) (Assistant Professor, University of Oklahoma / Postdoctoral scholar, UC Riverside)
- Insu Hong – Arizona State University, 2015, "Deriving an obstacle-avoiding shortest path in continuous space: a spatial analytic approach." (Assistant Professor, West Virginia University; Currently: Senior Consultant, CJ Logistics)
- Ran Wei – Arizona State University, 2013, "Addressing geographic uncertainty in spatial optimization." **Awards**: 2011 UCGIS Summer Assembly Transactions in GIS Best Paper Award, 2011-12 ASU Graduate Research Support Program Award, 2012 ASU Graduate College Completion Fellowship, 2012-13 Regional Science Association International Benjamin H. Stevens Graduate Fellowship, 2021 INFORMS Section on Location Analysis Chuck ReVelle Rising Star Award (Associate Professor, University of California at Riverside / Assistant Professor, University of Utah)
- Jing Yao – Arizona State University, 2012, "Spatial optimization approaches for solving the continuous Weber and multi-Weber problems." **Awards**: 2012 Chinese Government Award for Outstanding Self-financed Students Abroad; 2013-15 Young Scientists Fund grant (National Natural Science Foundation of China) (Senior Lecturer, University of Glasgow)
- Yin Liu – Arizona State University, 2012, "An exploratory toolkit for exploring residential movement patterns at a micro scale" (Research Scientist, Sichuan Normal University)

- Khaled Shammout – Ohio State University, ABD Spring 2008 ("Three-step approach to designing a comprehensive bus transit network") (VP of Strategic Planning and Development, Southwest Ohio Regional Transit Authority)
- Jessica Mefford – Ohio State University, ABD Summer 2006 ("Determining activity space: An integrative spatial and behavioral approach to identifying travel decision outcomes under conditions of uncertainty") (Executive Director, Metro Transit, St. Louis, Missouri)
- Ho-Seop Cha – Ohio State University, 2008, "Enhancing equity in public transportation using geographic information systems and spatial optimization" (Assistant Professor, Park University / Assistant Professor, University of Central Missouri)
- Hu Wei – Ohio State University, 2007, "Solving continuous space location problems" (Chief Data Officer, Yingying Group)
- Daoqin Tong – Ohio State University, 2007, "Continuous space facility location for covering spatial demand objects." **Awards**: 2006 UCGIS Summer Assembly Best Paper Award, 2016 North American Regional Science Council Hewings Award (Associate Professor, Arizona State University / Assistant Professor, University of Arizona)
- Kamyoung Kim – Ohio State University, 2007, "Spatial analytical approaches for supporting security monitoring" (Associate Professor, Kyungpook National University)
- Xiaolan Wu – Ohio State University, 2005, "Quantification and optimization of spatial contiguity in land use planning" (Assistant Professor, Central Michigan University; Currently: Credit Risk Statistical Modeler, KeyBank)
- Changshan Wu – Ohio State University, 2003, "Remote sensing, geographic information systems and spatial modeling for analyzing public transit services." **Awards**: 2003 E. Willard and Ruby S. Miller Fellow (OSU), 2006 Intergraph UCGIS Young Scholar Award (Professor and Chair, University of Wisconsin at Milwaukee)
- Bilal Farhan – Ohio State University, 2003, "Evaluation, modeling and policy assessment for park and ride services as a component of public transportation" (Chief Engineer, Roads & Transport Authority, United Arab Emirates)
- Ickjai Lee (co-advisor) – University of Newcastle, 2002, "Multi-purpose boundary-based clustering on proximity graphs for geographical data mining" (Professor, James Cook University)
- Doug Ward (co-advisor) – University of Queensland, 2001, "Spatial form and dynamics of urban growth" (Senior Research Fellow, Griffith University)

Doctoral (committee member) (29 total)

- Chanwoo Jin – San Diego State University, ABD 2020
- Rafael Ramos – University of California at Santa Barbara, 2019 (Postdoctoral Research Associate, INPE, Brazil)
- Yujia Zhang – Arizona State University, 2018 (Postdoctoral scholar, Phoenix LTER, Arizona State University)
- Jorge Chen – University of California at Santa Barbara, 2017 (Research Scientist, Oak Ridge Institute for Science and Education)

- Sarah Blakeley – University of California at Santa Barbara (examination committee Fall 2016) (Postdoctoral scholar, Climate Hazards Center, University of California at Santa Barbara)
- Fangwu Wei – Drexel University, 2016 (examination committee Spring 2015) (Assistant Research Scientist, Arizona State University)
- Robert Oxley – Arizona State University (Sustainable Engineering and the Built Environment), 2015
- Ning Wang – Arizona State University (Industrial Engineering), 2013 (Lead data scientist, KMPG)
- Nicholas Malizia – Arizona State University, 2013 (Director of Data Science, GeoInnovation at Indigo)
- Lawrence Joseph– Arizona State University, 2013 (examination committee Summer 2010) (Franchise Development, KFC)
- David Folch - Arizona State University, 2012 (Assistant Professor, Northern Arizona University / Assistant Professor, Florida State University)
- Jong-Geun Kim – Arizona State University, 2010 (Lecturer, Seoul National University)
- Gunhak Lee – Ohio State University, 2008 (Professor, Seoul National University, South Korea)
- Myung Jin Kim – Ohio State University, 2011 (examination committee Spring 2007)
- Michael Niedzielski – Ohio State University, 2009 (examination committee Spring 2007) (Institute of Geography and Spatial Organization, Polish Academy of Sciences / Associate Professor, University of North Dakota)
- Jung Hwi (David) Lee – Ohio State University (City and Regional Planning), 2010 (examination committee Spring 2006) (Assistant Director, Long Range Planning Division, Tennessee Department of Transportation)
- Hyun Kim – Ohio State University, 2008 (Associate Professor, University of Tennessee / Assistant Professor, University of South Florida)
- Sunhee Sang – Ohio State University, 2008 (examination committee Spring 2005)
- Sumei Zhang – Ohio State University (City and Regional Planning), 2008 (examination committee Spring 2004) (Associate Professor, University of Louisville)
- Wook Lee – Ohio State University, 2005 (Associate Professor, Edinboro University)
- Timothy Matisziw – Ohio State University, 2005 (Associate Professor, University of Missouri)
- Hui Xie – Ohio State University (City and Regional Planning), ABD Summer 2002 (Senior Transportation Engineer, OKI Regional COG)
- Sherrylyn Henry – Ohio State University, ABD Autumn 2001
- Hyun-Mi Kim – Ohio State University, 2005 (examination committee Winter 2002) (Lecturer, Seoul National University, South Korea)

- Changjoo Kim – Ohio State University, 2004 (Associate Professor, University of Cincinnati)
- Sudhir Thakur – Ohio State University, 2004 (Associate Professor, California State University, Sacramento)
- Mark Horner – Ohio State University, 2002 (Professor, Florida State University)
- Tony Grubesic – Ohio State University, 2001 (Professor, University of Texas / Professor, Arizona State University / Professor, Drexel University / Associate Professor, Oregon State University / Associate Professor, Indiana University / Assistant Professor, University of Cincinnati)
- Jiyeong Lee – Ohio State University, 2001 (examination committee Winter 2000) (Professor, University of Seoul, South Korea)

Doctoral (external reviewer) (5 total)

- Shivesh Karan – Indian Institute of Technology, Dhanbad, Environmental Science and Engineering, 2019
- Monika Mangla – Thapar Institute of Engineering and Technology, Computer Science and Engineering, 2018
- Mohammad Aakil Caunhye – Nanyang Technological University, School of Mechanical and Aerospace Engineering, 2013
- Mustafa Canbolat – McMaster University, School of Business, 2010
- Mohan Akella – State University of New York at Buffalo, Department of Industrial Engineering, 2005

Master's (advisor) (17 total)

- Jiwon Baik – University of California at Santa Barbara, 2021, "A bi-objective facility location problem: coverage and access"
- B. Amelia Pludow – University of California at Santa Barbara, 2019, "Evaluating service system coverage of wireless Internet access"
- Jing Xu – University of California at Santa Barbara, 2018, "Spatial variability in retail gasoline pricing behavior"
- Sharisse Fisher – Arizona State University, 2013, "A spatial decision support system for optimizing the environmental rehabilitation of borderlands" (Geographic Information Specialist, Bureau of Land Management)
- Stephanie Kleinschmidt – Arizona State University, 2013, "Positional uncertainty in spatial data and its effect on cluster detection" (GIS Specialist, Gradient)
- George Oliver – Arizona State University, 2012, "Modeling the influence of vehicle characteristics on carsharing utilization" (Software Engineer, CARMERA)
- Paul Padegimas – Arizona State University, 2011 (Project Manager, UNICO Engineering)
- Jeffrey Olson – Ohio State University, 2007, "Map projection and coverage modeling at a continental scale" (Associate Professor, University of Wisconsin-Whitewater)

- Diane Snediker – Ohio State University, 2007, "Decision support for network disruption mitigation" (Geographer, U.S. Census Bureau)
- Brian Chastain – Ohio State University, 2005, "A comparative analysis of methods for imposing spatial structure in forest harvest scheduling" (Consultant, Geospatial Data Science, General Dynamics)
- Darlene Magold – Ohio State University, 2004, "Evaluating development in urban floodplains using geographical information systems and spatial analysis techniques" (Chief Executive Officer, Etch / MTECH)
- Amanda Trepac (now Zaza) – Ohio State University, 2004, "Comparative evaluation of environmental justice concerns in transportation project assessment" (Manager, Global Strategic Development and GIS, The Wendy's Company)
- David Twehues – Ohio State University, 2004, "Evaluating the emergency warning siren system in Columbus, Ohio" (Head of Marketing, Europe, Wayfair)
- Robert Henry – Ohio State University, 2003, "Linking spatial, temporal, and spatio-temporal aspects of auto thefts with criminological theory and time-specific analysis" (Sr. GIS Application Consultant, CentralSquare Technologies)
- Erick Lobao – Ohio State University, 2002, "Exploratory spatial analysis of homelessness and shelter system perceptions in Columbus, Ohio" (Enterprise Data Coordinator, City of Columbus)
- Xiaolan Wu – Ohio State University, 2002, "Estimating balance velocities using GIS-based spatial analytical techniques" (Credit Risk Statistical Modeler, KeyBank)
- Ho-Seop Cha – Ohio State University, 2001, "Assessing public transit service equity in Columbus, Ohio" (Assistant Professor, Park University)

Master's (committee member) (13 total)

- Carlos Baez – University of California at Santa Barbara, 2017
- Jillian Elder – Arizona State University, 2009
- Miti Gupta – Ohio State University (Allied Medical Professions), 2008
- Mark Sundermeier – Ohio State University, 2008
- Dingmou Li – Ohio State University, 2007
- Michael Niedzielski – Ohio State University, 2005
- Daoqin Tong – Ohio State University (Civil Engineering), 2004
- Joni Downs – Ohio State University (Natural Resources), 2004
- Youngho Kim – Ohio State University, 2003
- Tzu-Lung Sun – Ohio State University (Civil Engineering), 2002
- Sunhee Sang – Ohio State University, 2002
- Richard Healy – Ohio State University, 2001
- Enzhou Wang – Ohio State University, 2001

Master's (external reviewer) (1 total)

- Dime Kekana – University of Cape Town, Engineering and the Built Environment, 2019

Undergraduate (advisor) (11 total)

- Luis Validivia – University of California at Santa Barbara (College of Creative Studies, Mathematics), 2021
- Haoyu Shi – University of California at Santa Barbara, 2020
- Menghan Jiao – University of California at Santa Barbara, 2019-20
- Jiamin Tan – University of California at Santa Barbara, 2019-20
- Victoria Murillo – University of California at Santa Barbara (Statistical and Applied Probability), 2019
- Thomas Crimmel – University of California at Santa Barbara, 2018
- Danny Kolosta – University of California at Santa Barbara, 2018
- Wendy Gao – University of California at Santa Barbara (Statistics and Applied Probability), 2018
- Landon Settle (Senior thesis) – University of California at Santa Barbara (College of Creative Studies, Mathematics), 2017, "Nonlinear optimization of contiguity-constrained multiple linear regression including an indicator variable"
- Tess Irving-Ruffing – University of California at Santa Barbara, 2016-17
- Alecia Radatz (Honors thesis) – Arizona State University, 2010, "Public transit and faith communities: a transportation geography analysis with regards to the religious divisions of Belfast"

Research Funding

i. Submitted

ii. *Awarded* (34 total; $7,557,601 as PI or Co-PI)

2022-2023 Murray, A., L. Carvalho, C. Jones, D. Roberts and M. Moritz. *Wildfire Resilience Initiative*. Office of Research, $1,000,000.

2020-2021 Church, R. and A. Murray. *The Development of Spatial Optimization Tools to Support Efforts to Transition to Fire Resilient Forest Landscapes*. USDA Forest Service / Pacific Southwest Forest And Range Experiment Station, $94,901.

2020-2022 Cassels, S., A. Murray P. Gorbach and A. Vaughan. *Activity Spaces for HIV Risk and Prevention Among Diverse Men Who Have Sex with Men in Los Angeles*. National Institutes of Health, $401,769.

2017-2023 Carvalho, L., A. Murray, C. Jones, D. Roberts and R. Church. *PREEVENTS Track 2: Understanding Extreme Fire Weather Hazards and Improving Resilience in Coastal Santa Barbara, California*. National Science Foundation, $1,508,987.

2017-2018 King, J., K. Caylor, D. Harlow and A. Murray. *Creating an Augmented-Reality Sandbox for Teaching and Learning about Earth Surfaces (CASTLES)*. University of California (Faculty Outreach Grants, Office of Education Partnerships – UCSB), $15,253.

2014 Murray, A. *Mitigating Costs, Light pollution and Safety through Spatial Analysis and Strategic Planning in Public Lighting*. Arizona State University (College of Liberal Arts and Sciences NS-SS-GRG / SGSUP), $48,520.

2012-2014 Grubesic, T., L. Tabb and A. Murray. *Collaborative Research: Spatial Cluster Detection Based on Contiguity*. National Science Foundation, $350,000.

2010-2011 Agadjanian, V., S. Hayford and A. Murray. *Childbearing Dynamics in Setting of High HIV Prevalence and Massive ART Rollout*. National Institutes of Health, $243,000.

2010-2015 Gober, P., C. Redman, C. Kirkwood, M. Nelson and D. White. *Decision Center For A Desert City II: Urban Climate Adaptation*. National Science Foundation, $7,503,929 (Murray as Senior Project Personnel).

2009-2012 Murray, A. *Improving Survival From Sudden Cardiac Arrest: A Regional Geospatial Analysis*. American Heart Association (subcontract from Ohio State University), $127,500.

2009-2011 Murray, A., M. Griffin, S. Rey and T. Grubesic. *Collaborative Research: Spatial Analytical Framework for Examining Sex Offender Residency Issues over Space and Time*. National Science Foundation, $250,000.

2009-2024 Murray, A. *International Regional Science Review*. Sage, 384,000.

2007-2009 Matisziw, T., A. Murray and T. Grubesic. *Collaborative Research: Mitigating Disaster and Terrorism Impacts to Critical Infrastructure*. National Science Foundation, $234,197.

2006-2007 Murray, A. and J. Borstad. *Exploration of spatio-temporal variation in sedentary lifestyles*. The Ohio State University (Initiative in Population Research), $39,573.

2006-2008 Murray, A. *Housing Deed Transfers in Ohio*. Western Ohio Research Consortium and Ohio Urban University Program, $85,000 ($60K in 2006 and $25K in 2007).

2005-2007 Murray, A. *Geographic Representation in Location Coverage Modeling*. National Science Foundation (BCS-0518967), $180,000.

2004-2007 Parent, R., R. Machiraju, J. Davis, D. Woods and A. Murray. *Multi-level, active attention surveillance*. National Science Foundation (IIS-0428249), $1,300,000.

2004-2009 Culver, D., J. Reutter, A. Randall, K. Bedford and E. Irwin. *Large lake ecosystems: modeling interactions among human, biological, and physical processes*. National Science Foundation - Biocomplexity, $1,399,923 (A. Murray as Senior Personnel – Associate Investigator).

2004-2005 Murray, A. *Emergency warning siren coverage in Franklin County: Analysis and Modeling*. The Ohio State University (Center for Urban and Regional Analysis), $30,258.

2004-2008 Stimson, R., M. Bell, J. Mangan, K. Burrage, T. Wilson, D. Pullar, A. Murray, A. Skinner, P. Crossman, R. Barker, A. Taylor. *An Integrated Large Scale Urban*

Model and Spatial Decision Support System Simulating Growth and Evaluating Sustainability Outcomes for Southeast Queensland. Australian Research Council, AUD$420,000 (Principal Investigator).

2002-2003 Kraybill, D., H. Morrow-Jones, A. Murray and L. Lobao. *Economic growth and local environmental policies*. The Ohio State University (Environmental Policy Initiative), $27,975.

2001-2004 Murray, A. *Spatial representation and modeling in natural resource management.* National Science Foundation (BCS-0114362), $130,009.

2001 Murray, A. *Airborne techniques for estimating traffic flow in the private sector*. US Department of Transportation through National Consortia on Remote Sensing in Transportation - Flows (NCRST-F), $30,000

2001 Murray, A. *Spatial analysis of homeless shelters in Columbus, Ohio*. Community Shelter Board, $5,520.

2000-2001 Murray, A. and W. Ackerman. *Geo-coding Lima crime data for 2000/2001 and preliminary analysis*. Lima Police Department, $7,500 ($3,000 in 2000 and $4,500 in 2001).

2000 Murray, A. *Use and integration of geographic information systems and spatial analysis techniques for identifying patterns of urban crime*. The Ohio State University (Committee on Urban Affairs), $20,000.

2000 Murray, A. *Geographic information systems based approaches for assessing regional public transportation coverage*. The Ohio State University (Office of Research Seed Grant), $17,499.

1999-2001 Estivill-Castro, V. and A. Murray. *Clustering for knowledge discovery, pattern spotting and exploratory analysis in spatial databases.* Australian Research Council, AUD$150,000 (Associate Investigator after 9/99).

1999 Stimson, R., D. Wadley, A. Murray and D. Rudd. *Potential roles for the retirement village industry in providing appropriate affordable housing alternatives in an ageing Australian society.* Australian Research Council, AUD$50,000.

1999 Phinn, S. and A. Murray. *Monitoring urban growth using multi-temporal satellite images and spatial models*. Australian Research Council, AUD$19,500.

1998-2000 Stimson, R. and A. Murray. *Spatial data systems for evaluating regional performance in Queensland to inform strategies for managing growth and decline*. Australian Research Council, AUD$180,700 (Associate Investigator after 9/99).

1997-1999 Murray, A. *Decision support systems for planning urban growth and development*. Australian Research Council, AUD$122,000.

1997 Estivill-Castro, V. and A. Murray. *Knowledge discovery, pattern spotting and data analysis in geographical information systems*. Australian Research Council, AUD$14,000.

1997 Murray, A. and B. Roberts. *Analysing and modelling spatial corporate structure*. Australian Housing and Urban Research Institute, AUD$15,200.

1997 Murray, A. *Modelling aggregation in input-output systems.* Queensland University of Technology, AUD$6,000.

Meetings and Conference Presentations

2022 S. Burtner and A.T. Murray. "Extracting movement from text." *2022 American Association of Geographers Annual Meeting*, February 25-March 1, 2022.

2022 J. Xu, A.T. Murray, R.L. Church and R. Wei. "Service allocation equity modeling." *2022 American Association of Geographers Annual Meeting*, February 25-March 1, 2022.

2022 S. Cho, A.T. Murray and S. Dodge. "Exploring spatial unit effect on spatial optimization." *2022 American Association of Geographers Annual Meeting*, February 25-March 1, 2022.

2022 A.T. Murray, R.L. Church, B.A. Pludow and P. Stine. "Wildfire mitigation land use modeling." *Western Regional Science Association 61st Annual Meeting*, Scottsdale, Arizona, USA, February 17-20, 2022.

2022 A.T. Murray, R.L. Church, B.A. Pludow and P. Stine. "Location analytics for transitioning to fire resilient landscapes." *55th Hawaii International Conference on System Sciences*, January 4-7, 2022.

2021 A.T. Murray, R.L. Church and J. Baik. "Addressing multiple resource possibilities in the Weber model." *68th North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 10-13, 2021.

2021 B.A. Pludow and A.T. Murray. "Evaluating Wildfire risk reduction scenarios in the wildland-urban interface." *68th North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 10-13, 2021.

2021 S. Cho, A.T. Murray and S. Dodge. "Solving a location-allocation problem that addresses access and coverage." *68th North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 10-13, 2021.

2021 A.T. Murray and J. Baik. "A spatial algorithm to identify all non-dominated solutions in coverage and access optimization." *INFORMS*, Anaheim, California, USA, October 24-27, 2021.

2021 A.T. Murray, A. Ortiz and S. Cho. "Location analytics for strategic defense in baseball." *International Symposium on Locational Decisions XV*, July 5-9, 2021.

2021 H. Chen and A.T. Murray. "Open-source geospatial software for location cover models." *GISRUK 2021*, April 14-16, 2021.

2021 A. Pludow and A.T. Murray. "Spatial variability of demographic characteristics in zones of high wildfire risk." *2021 Annual Meeting of the American Association of Geographers*, April 7-11, 2021.

2021 J. Baik and A.T. Murray. "Strategic location that accounts for access and coverage." *2021 Annual Meeting of the American Association of Geographers*, April 7-11, 2021.

2021 J. Xu, A.T. Murray, R.L. Church and R. Wei. "Service allocation equity modeling." *2021 Annual Meeting of the American Association of Geographers*, April 7-11, 2021.

2021 S. Cho, A. Murray and S. Dodge. "Bi-objective optimization applying multi-weber problem and planar maximal covering location problem." *2021 Annual Meeting of the American Association of Geographers*, April 7-11, 2021.

2021 S. Burtner and A.T. Murray. "Spatial movement in natural language expressions." *2021 Annual Meeting of the American Association of Geographers*, April 7-11, 2021.

2021 A.T. Murray. "Facilitated access to spatial analytics." *Western Regional Science Association 60th Annual Meeting*, February 22-25, 2021.

2021 A.T. Murray. "Replicability challenges in location analytics." 54th *Hawaii International Conference on System Sciences*, January 4-8, 2021.

2020 B.A. Pludow and A.T. Murray. "Strategic reduction of wildfire risk in the wildland-urban interface." *67th North American Meetings of the Regional Science Association International*, November 9-13, 2020.

2020 E. Noi and A.T. Murray. "Spatial sampling configuration for air quality network monitoring." *67th North American Meetings of the Regional Science Association International*, November 9-13, 2020.

2020 S. Burtner and A.T. Murray. "COVID-19 and minimizing spatial interactions in micro-spatial environments." *67th North American Meetings of the Regional Science Association International*, November 9-13, 2020.

2020 H. Chen and A.T. Murray. "Open source approaches for location coverage modelling." *2020 Annual Meeting of the American Association of Geographers*, April 6-10, 2020.

2019 H. Goto and A.T. Murray. "Acoustical impacts in coverage modeling." *66th North American Meetings of the Regional Science Association International*, Pittsburgh, Pennsylvania, USA, November 13-16, 2019.

2019 B.A. Pludow and A.T. Murray. "Socio-demographic characteristics at the wildland-urban interface and wildfire risk mitigation." *66th North American Meetings of the Regional Science Association International*, Pittsburgh, Pennsylvania, USA, November 13-16, 2019.

2019 S. Burtner and A.T. Murray. "Making the 'neighborhood': Using spatial clustering of travel activity to inform neighborhood delineations." *66th North American Meetings of the Regional Science Association International*, Pittsburgh, Pennsylvania, USA, November 13-16, 2019.

2019 A.T. Murray. "Geocomputation and spatial analytics." *GeoComputation 2019*, Queenstown, New Zealand, September 18-21, 2019.

2019 A.T. Murray, R.L. Church, J. Xu, L. Carvalho, C. Jones and D. Roberts. "Coastal vulnerability under extreme fire weather." *2019 Applied Geography Commission*, Gran Sasso Science Institute, L'Aquila, Italy, June 17-19, 2019.

2019 J. Xu, A.T. Murray, Z. Wang and R.L. Church. "Facility workloads in covering modeling." *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA, April 3-7, 2019.

2019 A. Pludow and A.T. Murray. "Land use conflicts associated with growth and development." *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA, April 3-7, 2019.

2019 X. Feng and A.T. Murray. "Location and allocation under spatiotemporal heterogeneity: A case of optimizing drone-equipped stations." *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA, April 3-7, 2019.

2019 S. Burtner and A.T. Murray. "Social mobility and segregation examined through networked behavior." *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA, April 3-7, 2019.

2019 E. Noi and A.T. Murray. "Urban sensing optimization and sampling." *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA, April 3-7, 2019.

2018 A.T Murray, J. Xu, Z. Wang and R.L. Church. "Issues and challenges in capacitated coverage modeling." *65th North American Meetings of the Regional Science Association International*, San Antonio, Texas, USA, November 7-10, 2018.

2018 A.T Murray, X. Feng and R.L. Church. "Allocation complexities in single facility siting." *65th North American Meetings of the Regional Science Association International*, San Antonio, Texas, USA, November 7-10, 2018.

2018 X. Feng, A.T Murray and R.L. Church. "Medical drone delivery: optimizing location and allocation under spatiotemporal heterogeneity." *65th North American Meetings of the Regional Science Association International*, San Antonio, Texas, USA, November 7-10, 2018.

2018 B.A. Pludow and A.T Murray. "Wireless access coverage in an urban area." *65th North American Meetings of the Regional Science Association International*, San Antonio, Texas, USA, November 7-10, 2018.

2018 I. Hong and A.T. Murray. "Deriving obstacle-avoiding service coverage on Euclidean plane." *65th North American Meetings of the Regional Science Association International*, San Antonio, Texas, USA, November 7-10, 2018.

2018 A.T. Murray. "GIS and the subtle proliferation of optimization." *INFORMS*, Phoenix, Arizona, USA, November 4-7, 2018.

2018 A.T. Murray, X. Feng and A. Shokoufandeh. "Heterogeneous skeleton for summarizing continuously distributed demand in a region." *GIScience 2018*, Melbourne, Victoria, Australia, August 28-31, 2018.

2018 H. Goto and A.T. Murray. "Coverage planning to account for acoustical properties associated with emergency warning sirens." *29th European Conference on Operational Research*, Valencia, Spain, July 8-11, 2018.

2018 X. Feng, S. Wang, S. Gao, Y. Cao and A.T. Murray. "Optimizing activity locations in GIS using a multi-objective trajectory approach." *UCGIS 2018 Symposium and CaGIS AutoCarto*, Madison, Wisconsin, USA, May 22-24, 2018.

2018 J. Xu and A.T. Murray. "Assessment of commercial location analytics." *2018 Annual Meeting of the American Association of Geographers*, New Orleans, Louisiana, USA, April 10-14, 2018.

2018 J. Xu and A.T. Murray. "Spatial analytics for exploring retail gasoline price variability." *Western Regional Science Association 57th Annual Meeting*, Pasadena, California, USA, February 11-14, 2018.

2018 X. Feng and A.T. Murray. "Addressing spatial allocation: planning for drone-based emergency medical service." *Western Regional Science Association 57th Annual Meeting*, Pasadena, California, USA, February 11-14, 2018.

2018 D. Tong and A.T. Murray. "Location analysis: developments on the horizon." *Western Regional Science Association 57th Annual Meeting*, Pasadena, California, USA, February 11-14, 2018.

2017 A.T Murray. "Hidden yet there: regional analytics in GIS." *64th North American Meetings of the Regional Science Association International*, Vancouver, British Columbia, Canada, November 8-11, 2017.

2017 A.T. Murray and J. Xu. "GIS based location analytics: empirical performance characteristics." *64th North American Meetings of the Regional Science Association International*, Vancouver, British Columbia, Canada, November 8-11, 2017.

2017 H. Goto and A.T. Murray. "Exact optimal solution of a critical chain project management problem." *Industrial Engineering and Operations Management Conference*, Bogota, Columbia, October 25-26, 2017.

2017 A.T. Murray, R. Wei and R.L. Church. "Understanding and mitigating risks and uncertainty in harvest scheduling." *2017 Symposium on Systems Analysis in Forest Resources*, Suquamish, Washington, USA, August 27-30, 2017.

2017 J. Yao and A.T. Murray. "Location modeling to support sustainable land use planning." *International Symposium On Locational Decisions (ISOLDE) XIV*, Toronto, Ontario, Canada, July 9-14, 2017.

2017 I. Hong, M. Kuby and A.T. Murray. "A range-restricted recharging station coverage model for drone delivery service planning." *International Symposium On Locational Decisions (ISOLDE) XIV*, Toronto, Ontario, Canada, July 9-14, 2017.

2017 A.T. Murray and X. Feng. "Allocation problem solved through Voronoi diagram in heterogeneous space." *International Symposium On Locational Decisions (ISOLDE) XIV*, Toronto, Ontario, Canada, July 9-14, 2017.

2017 X. Feng and A.T. Murray. "Heterogeneous Voronoi diagram." *2017 Annual Meeting of the American Association of Geographers*, Boston, Massachusetts, USA, April 5-9, 2017.

2017 J. Xu and A.T. Murray. "Detection of nighttime street lighting." *2017 Annual Meeting of the American Association of Geographers*, Boston, Massachusetts, USA, April 5-9, 2017.

2016 A.T Murray. "The evolving location analytics toolbox." *63rd North American Meetings of the Regional Science Association International*, Minneapolis, Minnesota, USA, November 9-12, 2016.

2016 X. Feng and A.T Murray. "Heterogeneous space facility siting in order to maximize coverage." *63rd North American Meetings of the Regional Science Association International*, Minneapolis, Minnesota, USA, November 9-12, 2016.

2016 Y. Zhang, A.T Murray and B.L Turner. "Optimizing green space locations to reduce daytime and nighttime urban heat island effects in Phoenix, Arizona." *63rd North American Meetings of the Regional Science Association International*, Minneapolis, Minnesota, USA, November 9-12, 2016.

2016 K. Grace, R. Wei and A.T. Murray. "Merging population and environmental data to construct a spatial analytic framework for assessing and improving food aid distribution." *2016 Annual Meeting of the Population Association of America*, Washington, D.C., USA, March 31-April 2, 2016.

2016 A.T. Murray. "Optimizing school summer break scheduling." *2016 Annual Meeting of the American Association of Geographers*, San Francisco, California, USA, March 29-April 2, 2016.

2016 X. Feng and A.T. Murray. "Street light coverage optimization." *2016 Annual Meeting of the American Association of Geographers*, San Francisco, California, USA, March 29-April 2, 2016.

2016 A.T. Murray and I. Hong. "Path optimization through complex environments based on spatial knowledge." *LAND-TRANSLOG III*, Santa Cruz, Chile, March 13-17, 2016

2016 A.T. Murray. "Strategic scheduling of summer break in K-12 traditional school year planning." *Western Regional Science Association 55th Annual Meeting*, Hawaii, USA, February 14-17, 2016.

2015 I. Hong, M. Kuby and A. Murray. "Deviation flow refueling location model for continuous space: commercial drone delivery system for urban area." *13th International Conference of GeoComputation*, Dallas, Texas, USA, May 20-23, 2015.

2015 H.A. Fischer, A.T. Murray and L. Conrow. "Siting bicycle service stations in an urban area." *2015 Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, April 21-25, 2015.

2015 I. Hong, M. Kuby and A.T. Murray. "Locating recharging stations for commercial drone delivery in urban areas." *2015 Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, April 21-25, 2015.

2015 R. Wei and A.T. Murray. "A parallel algorithm for the efficient solution of continuous space set coverage problem." *2015 Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, April 21-25, 2015.

2015 A.T. Murray. "Evolving spatial analytics and rural area classifications." *Rationalizing Rural Area Classifications*, National Academies of Science, Committee on National Statistics (sponsored by Economic Research Service, U.S. Department of Agriculture), Washington, D.C., USA., April 16-17, 2015.

2015 T. Grubesic, A.T. Murray and R. Wei. "Alcohol outlet access in the state of Washington." *Western Regional Science Association 54th Annual Meeting*, Tucson, Arizona, USA, February 15-18, 2015.

2014 A.T. Murray and X. Feng. "Street light coverage optimization." *61st North American Meetings of the Regional Science Association International*, Washington, D.C., USA, November 12-15, 2014.

2014 R. Wei and A.T. Murray. "A high performance computing approach for solving the continuous space set coverage problem." *61st North American Meetings of the Regional Science Association International*, Washington, D.C., USA, November 12-15, 2014.

2014 L.J. Wolf, W. Li, C. Fan and A.T. Murray. "Detecting racial gerrymandering using normalized mass moment of inertia methods." *61st North American Meetings of the Regional Science Association International*, Washington, D.C., USA, November 12-15, 2014.

2014 I. Hong, A.T. Murray and L.J. Wolf. "Shortest path travel around obstacles: enhanced spatial processing." *61st North American Meetings of the Regional Science Association International*, Washington, D.C., USA, November 12-15, 2014.

2014 A.T. Murray. "Geospatial technologies for natural resource management." *The 2nd Saudi International Environmental Technologies Conference 2014*, Riyadh, Saudi Arabia, November 10-12, 2014.

2014 R. Wei and A. Murray. "High performance computing to optimize spatial coverage." *INFORMS*, San Francisco, California, USA, November 9-12, 2014.

2014 Y. Zhang, A. Murray and K. Wang. "Mitigating urban heat island effects through strategic park siting." *INFORMS*, San Francisco, California, USA, November 9-12, 2014.

2014 A.T. Murray Q. Zhao and E. Wentz. "Shade optimization in a desert environment." *GIScience 2014*, Vienna, Austria, September 24-26, 2014.

2014 A.T. Murray. "Maximal coverage: application, solution, evolution and continued significance." ISOLDE XIII, Naples and Capri, Italy, June 16-20, 2014.

2014 Q. Zhao, E.A. Wentz and A.T. Murray. "Shade optimization in a desert environment." *2014 Annual Meeting of the Association of American Geographers*, Tampa, Florida, USA, April 8-14, 2014.

2014 I. Hong, A.T. Murray and S.J. Rey. "High performance computing to derive obstacle-avoiding shortest paths." *2014 Annual Meeting of the Association of American Geographers*, Tampa, Florida, USA, April 8-14, 2014.

2014 L.J. Wolf, I. Hong and A.T. Murray. "Complexity bounds for deriving a shortest Euclidean path." *2014 Annual Meeting of the Association of American Geographers*, Tampa, Florida, USA, April 8-14, 2014.

2014 T.H. Grubesic, A.T. Murray, R. Wei and F. Wei. "Essential air service in the United States: Exploring strategies to enhance spatial and operational efficiencies." *Western Regional Science Association 53rd Annual Meeting*, San Diego, California, USA, February 16-19, 2014.

2013 A.T. Murray, T. Grubesic and R. Wei. "Spatial cluster detection and interpretation." *6th International Conference of the ERCIM WG on Computational and Methodological Statistics (ERCIM 2013)*, London, UK, December 14-16, 2013.

2013 A.T. Murray. "Forty years of maximal coverage location modeling." *60th North American Meetings of the Regional Science Association International*, Atlanta, Georgia, USA, November 13-16, 2013.

2013 R. Wei and A.T. Murray. "Continuous space siting for maximal coverage." *60th North American Meetings of the Regional Science Association International*, Atlanta, Georgia, USA, November 13-16, 2013.

2013 A.T. Murray, T.H. Grubesic and R. Wei. "Maximal coverage and data envelopment analysis in evaluating rural air transport in the US." *60th North American Meetings of the Regional Science Association International*, Atlanta, Georgia, USA, November 13-16, 2013.

2013 T.H. Grubesic, A.T. Murray and R. Wei. "Evaluating the spatial precision of cluster detection approaches." *60th North American Meetings of the Regional Science Association International*, Atlanta, Georgia, USA, November 13-16, 2013.

2013 I. Hong and A.T. Murray. "Efficient wayfinding in complex environment: derivation of a continuous space shortest path." *6th ACM SIGSPATIAL International Workshop on Computational Transportation Science*, Orlando, Florida, USA, November 5, 2013

2013 A.T. Murray and I. Hong. "Navigating complex environments." *INFORMS*, Minneapolis, Minnesota, USA, October 6-9, 2013.

2013 R. Wei, A.T. Murray and R. Batta. "A bounding based solution approach for the continuous arc covering problem." *INFORMS*, Minneapolis, Minnesota, USA, October 6-9, 2013.

2013 R. Wei and A. T. Murray. "Assessing continuous demand representation in coverage modeling." *12th International Conference on GeoComputation*, Wuhan, China, May 23-25, 2013.

2013 A.T. Murray and I. Hong. "Finding my way." *2013 Annual Meeting of the Association of American Geographers*, Los Angeles, New California, USA, April 9-13, 2013.

2013 J. Yao, A.T. Murray and V. Agadjanian. "Geographical access to sexual and reproductive health care for women in rural Mozambique." *2013 Annual Meeting of the Association of American Geographers*, Los Angeles, New California, USA, April 9-13, 2013.

2013 R. Wei and A.T. Murray. "Continuous demand representation to support coverage modeling." *2013 Annual Meeting of the Association of American Geographers*, Los Angeles, New California, USA, April 9-13, 2013.

2013 P.V. Amaral and A.T. Murray. "Spatial allocation of dialysis machines in Brazil." *2013 Annual Meeting of the Association of American Geographers*, Los Angeles, New California, USA, April 9-13, 2013.

2013 T. Grubesic, A.T. Murray and L. Tabb. "Evaluating spatial precision of approaches for irregularly shaped spatial cluster detection." *2013 Annual Meeting of the Association of American Geographers*, Los Angeles, New California, USA, April 9-13, 2013.

2013 A.T. Murray. "Expanding fire station service provision." *Western Regional Science Association 52nd Annual Meeting*, Santa Barbara, California, USA, February 24-27, 2013.

2013 R. Wei and A.T. Murray. "Spatial uncertainty challenges in location modeling with dispersion requirements." *Western Regional Science Association 52nd Annual Meeting*, Santa Barbara, California, USA, February 24-27, 2013.

2013 T.H. Grubesic, A.T. Murray and T.C. Matisziw. "Putting a price on politics as usual: Rural air transport in the United States." *Western Regional Science Association 52nd Annual Meeting*, Santa Barbara, California, USA, February 24-27, 2013.

2013 J. Yao and A.T. Murray. "Evaluation of health care facility locations: A case study in rural Mozambique." *Western Regional Science Association 52nd Annual Meeting*, Santa Barbara, California, USA, February 24-27, 2013.

2012 W.A. Pridemore, T. Grubesic, A.T. Murray, L.P. Tabb, Y. Liu and R. Wei. "Using spatial optimization modeling to examine alcohol beverage control and to estimate future dispersion of alcohol outlets." *68th Annual Meeting of The American Society of Criminology*, Chicago, Illinois, USA, November 14-17, 2012.

2012 A.T. Murray, R. Wei and T.H. Grubesic. "Spatial contiguity in cluster detection." *59th North American Meetings of the Regional Science Association International*, Ottawa, Ontario, Canada, November 7-10, 2012.

2012 T.H. Grubesic, A.T. Murray and T. Matisziw."Putting a price on politics as usual rural air transport in the United States." *59th North American Meetings of the Regional Science Association International*, Ottawa, Ontario, Canada, November 7-10, 2012.

2012 R. Wei and A.T. Murray. "Evaluating polygon overlay to support coverage modeling." *59th North American Meetings of the Regional Science Association International*, Ottawa, Ontario, Canada, November 7-10, 2012.

2012 T.H. Grubesic, A.T. Murray, R. Wei, J. Yao and W. Lazarus. "Model support for school boundary planning." *59th North American Meetings of the Regional Science Association International*, Ottawa, Ontario, Canada, November 7-10, 2012.

2012 A.T. Murray. "Positional uncertainty in coverage modeling. *INFORMS*, Phoenix, Arizona, USA, October 14-17, 2012.

2012 A.T. Murray, T.H. Grubesic, S. Rey and L. Anselin. "Spatial data uncertainty and cluster detection." *GIScience 2012*, Columbus, Ohio, USA, September 18-21, 2012.

2012 R. Wei and A.T. Murray. "Achieving dispersive goals and objectives in locational planning." *GIScience 2012*, Columbus, Ohio, USA, September 18-21, 2012.

2012 A.T. Murray and I. Hong. "Deriving shortest distance in the presence of obstacles." *ISOLDE XII*, Nagoya and Kyoto, Japan, July 19-24, 2012.

2012 R. Wei and A.T. Murray. "A facility dispersion heuristic in the case of spatial uncertainty." *ISOLDE XII*, Nagoya and Kyoto, Japan, July 19-24, 2012.

2012 J. Yao and A.T. Murray. "Assessment of sexual and reproductive health service location in rural Mozambique." *ISOLDE XII*, Nagoya and Kyoto, Japan, July 19-24, 2012.

2012 A.T. Murray. "基調講演." *15th Symposium CSIS*. Center for Spatial Information Science, University of Tokyo, Tokyo, Japan, July 19, 2012.

2012 M. Cudnik, J. Yao, A.T. Murray, S Pennington and J. Christenson. "Does GIS-derived transport time prediction reflect actual transport times in out of hospital cardiac arrest patients?" *Society for Academic Emergency Medicine 2012 Annual Meeting*, Chicago, Illinois, USA, May 9-12, 2012.

2012 R. Wei and A.T. Murray. "Spatial uncertainty in forest management planning." *2012 Annual Meeting of the Association of American Geographers*, New York, New York, USA, February 24-28, 2012.

2012 S. Kleinschmidt, A.T. Murray, S.J. Rey and T.H Grubesic. "Spatial patterns and geographic data uncertainty." *2012 Annual Meeting of the Association of American Geographers*, New York, New York, USA, February 24-28, 2012.

2012 J. Yao and A.T. Murray. "Continuous surface representation and approximation: spatial analytical implications." *2012 Annual Meeting of the Association of American Geographers, New York*, New York, USA, February 24-28, 2012.

2012 Y. Liu, A.T. Murray and S.J. Rey. "Local patterns of movement behavior." *2012 Annual Meeting of the Association of American Geographers*, New York, New York, USA, February 24-28, 2012.

2012 A.T. Murray and D. Tong. "Regional science and spatial optimization. *Western Regional Science Association 51st Annual Meeting*, Poipu, Kauai, Hawaii, USA, February 8-11, 2012.

2011 A.T. Murray and R. Wei. "Spatial coverage modeling: bounds for eliminating representational error." *LAND-TRANSLOG II*, Puerto Varas, Chile, December 12-15, 2011.

2011 A.T. Murray, R. Wei, E.A. Mack and T.H. Grubesic. "Spatio-temporal geocoding to support rehabilitative services provision." *First International Geospatial Geocoding Conference*, Esri Conference Center, Redlands, California, USA, December 6-7, 2011.

2011 A.T. Murray and R. Wei. "Addressing spatial uncertainty in dispersion modeling." *INFORMS*, Charlotte, North Carolina, USA, November 13-16, 2011.

2011 A.T. Murray and R. Wei. "Computational bounds for location set covering." *58th Annual North American Meetings of the Regional Science Association International*, Miami, Florida, USA, November 9-12, 2011.

2011 R. Wei and A.T. Murray. "Multi-objective models that address spatial uncertainty." *58th Annual North American Meetings of the Regional Science Association International*, Miami, Florida, USA, November 9-12, 2011.

2011 T.H. Grubesic, A.T. Murray, W.A. Pridemore and L. Philip-Tabb. "Managing the spatial distribution of alcohol outlets with the intent of reducing violence." *58th Annual North American Meetings of the Regional Science Association International*, Miami, Florida, USA, November 9-12, 2011.

2011 L. Philip Tabb, T.H. Grubesic, W.A. Pridemore and A. Murray. "The spatial distribution of alcohol outlets and assaultive violence in the City of Philadelphia: developing a new spatial scan statistic." *2011 Joint Statistical Meetings*, Miami, Florida, USA, July 30 - August 4, 2011.

2011 R. Wei and A.T. Murray. "An integrated approach for addressing spatial uncertainty in a spatial optimization model." *UCGIS Summer Assembly*, Boulder, Colorado, USA, June 22-23, 2011.

2011 A.T. Murray, I. Hong and R. Wei. "Comparison techniques for solving an implicit coverage model." *2011 Annual Meeting of the Association of American Geographers*, Seattle, Washington, USA, April 12-16, 2011.

2011 X. Kang, S.J. Rey and A.T. Murray. "Regionalization approaches for ESDA: implementation and evaluation in PySAL." *2011 Annual Meeting of the Association of American Geographers*, Seattle, Washington, USA, April 12-16, 2011.

2011 F. Li, S.J. Rey and A.T. Murray. "Cluster detection methods in PySAL." *2011 Annual Meeting of the Association of American Geographers*, Seattle, Washington, USA, April 12-16, 2011.

2011 J. Yao, A.T. Murray, V. Agadjanian and S. Hayford. "Exploratory spatial analysis of sexual and reproductive health services utilization in rural Mozambique." *2011 Annual Meeting of the Association of American Geographers*, Seattle, Washington, USA, April 12-16, 2011.

2011 S.J. Rey, A.T. Murray and L. Anselin. "Visualizing regional income distribution dynamics." *Western Regional Science Association 50th Annual Meeting*, Monterey, California, USA, February 27-March 2, 2011.

2010 A.T. Murray. "Vulnerability reduction through strategic protection." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 T.H. Grubesic, T.C. Matisziw and A.T. Murray. "Optimizing essential air service (EAS) airport locations." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 J. Yao and A.T. Murray. "Siting a single facility to best serve an area." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 R. Wei and A.T. Murray. "Intelligent identification of dispersion constraints in spatial optimization problems." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 P.D. Padegimas and A.T. Murray. "Cooperative water management using spatial optimization." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 Y. Liu and A.T. Murray. "Local measures for assessing movement patterns." *57th Annual North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 11-13, 2010.

2010 A.T. Murray. "Network infrastructure vulnerability mitigation." *INFORMS*, Austin, Texas, USA, November 7-10, 2010.

2010 A.T. Murray, D. Tong and T.H. Grubesic. "Spatial optimization: expanding emergency services to address regional growth and development." *International Geographical Union Applied Geography Commission (CO8.01)*, Ericeira, Portugal, July 18-22, 2010.

2010 A.T. Murray. "Enhancing location optimization modeling capabilities through the use of GIS." *24th European Conference on Operational Research*, Lisbon, Portugal, July 11-14, 2010.

2010 A.T. Murray, Y. Liu, J. Koschinsky and L.A. Brown. "Spatial contagion effects in socio-economic collapse: foreclosure in Columbus Ohio 2003-2007." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 T.H. Grubesic, T. Matisziw and A.T. Murray. "The impact of urban morphology on sex offender residence restrictions." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 R. Wei, A.T. Murray, S.J. Rey, T.H. Grubesic and E. Mack. "ESDA for identifying patterns in sex offender residential change." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 P. Padegimas, A.T. Murray, S. Rey, L. Anselin and P. Gober. "Modeling to support multi-district water management." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 J. Yao, A.T. Murray, S. Hayford, V. Agadjanian and B. Cau. "Regional variability of women's HIV/AIDS risks: a case study of Gaza, Mozambique." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 Y. Liu, A.T. Murray, S. Rey and L. Anselin. "Exploring movement patterns." *2010 Annual Meeting of the Association of American Geographers,* Washington, D.C., USA, April 14-18, 2010.

2010 A.T. Murray, Y. Liu, S.J. Rey and L. Anselin. "Exploring movement object patterns." *Western Regional Science Association 49th Annual Meeting*, Sedona, Arizona, USA, February 21-24, 2010.

2009 A.T. Murray. "Evolving spatial detail and complexity in vulnerability assessment modeling." *56th Annual North American Meetings of the Regional Science Association International*, San Francisco, California, USA, November 18-21, 2009.

2009 A.T. Murray, P.D. Padegimas, L. Anselin, S. Rey and P. Gober. "A spatial optimization model for water supply allocation." *56th Annual North American Meetings of the Regional Science Association International*, San Francisco, California, USA, November 18-21, 2009.

2009 T.H. Grubesic, T. Matisziw and A.T. Murray. "Sex offender residence restrictions and urban morphology: a modeling framework and comparative analysis." *56th Annual North American Meetings of the Regional Science Association International*, San Francisco, California, USA, November 18-21, 2009.

2009 L. Brown, A. Murray, J. Koschinsky and Y. Liu. "Spatial contagion effects in socio-economic collapse: foreclosure in Columbus Ohio 2003-2007." *56th Annual North American Meetings of the Regional Science Association International*, San Francisco, California, USA, November 18-21, 2009.

2009 T.H. Grubesic and A.T. Murray. "Spatial uncertainty and location modeling: implications for sex offender mitigation strategies." *INFORMS*, San Diego, California, USA, October 11-14, 2009.

2009 A.T. Murray. "Quantitative geography." Symposium of the 50th Anniversary of the Journal of Regional Science, New York, New York, USA, April 23-24, 2009.

2009 A.T. Murray. "GIS contributions in advancing location science." Location and Network Design (LAND) Workshop, Pucon, Chile, March 22-25, 2009.

2009 A.T. Murray and Y. Liu. "Exploratory spatial data analysis of origin-destination patterns." *2009 Annual Meeting of the Association of American Geographers,* Las Vegas, Nevada, USA, March 22-27, 2009.

2009 P.D. Padegimas and A.T. Murray. "Location modeling software." *2009 Annual Meeting of the Association of American Geographers,* Las Vegas, Nevada, USA, March 22-27, 2009.

2009 J. Corcoran, A.T. Murray and R.J. Stimson. "Spatially disaggregating employment growth estimates." Western Regional Science Association 48th Annual Meeting, Napa Valley, California, USA, February 22-25, 2009.

2008 A.T. Murray. "Location analysis and GIS." *55th Annual North American Meetings of the Regional Science Association International*, Brooklyn, New York, USA, November 19-22, 2008.

2008 D. Tong, H. Wei and A.T. Murray. "Efficient vertex p-center problem solution." *55th Annual North American Meetings of the Regional Science Association International*, Brooklyn, New York, USA, November 19-22, 2008.

2008 T.C. Matisziw, A.T. Murray and T.H. Grubesic. "Accounting for uncertainty in network restoration planning." *55th Annual North American Meetings of the Regional Science Association International*, Brooklyn, New York, USA, November 19-22, 2008.

2008 A.T. Murray and T.C. Matisziw. "Optimizing network infrastructure service recovery." *INFORMS*, Washington, D.C., USA, October 12-15, 2008.

2008 T.H. Grubesic and A.T. Murray. "Optimization models for policy evaluation of sex offender laws." *INFORMS*, Washington, D.C., USA, October 12-15, 2008.

2008 A. Weintraub, M. Goycoolea, A. Murray and J. Vielma. "Imposing maximum clear-cut size constraints in harvest scheduling models: a comparison of three approaches." *CLAIO 2008* (XIV Latin-Ibero American Congress on Operations Research), Cartagena de Indias, Colombia, September 9-12, 2008.

2008 A.T. Murray and R.L. Church. "Location analysis and GIS." *International Symposium on Locational Decisions (ISOLDE) XI*, Santa Barbara, California, USA, June 26 - July 1, 2008.

2008 T.H. Grubesic, T.C. Matisziw and A.T. Murray. "Market coverage and service quality in digital subscriber lines infrastructure planning." *International Symposium on Locational Decisions (ISOLDE) XI*, Santa Barbara, California, USA, June 26 - July 1, 2008.

2008 T.C. Matisziw, A.T. Murray and T.H. Grubesic. "Prioritizing network service restoration." *International Symposium on Locational Decisions (ISOLDE) XI*, Santa Barbara, California, USA, June 26 - July 1, 2008.

2008 D. Tong, A.T. Murray, T.H. Grubesic and S. Dall'erba. "Coverage optimization for deploying an wireless mesh network." *International Symposium on Locational Decisions (ISOLDE) XI*, Santa Barbara, California, USA, June 26 - July 1, 2008.

2008 A.T. Murray, J. Corcoran and R.J. Stimson. "Estimating employment growth under commute minimization scenarios." *2008 Annual Meeting of the Association of American Geographers*, Boston, Massachusetts, USA, April 15-19, 2008.

2008 J. Olson, A.T. Murray and K. Kim. "Radar location: exploring coverage modeling issues." *2008 Annual Meeting of the Association of American Geographers*, Boston, Massachusetts, USA, April 15-19, 2008.

2008 T.C. Matisziw, A.T. Murray and T.H. Grubesic. "Strategic infrastructure restoration." *2008 Annual Meeting of the Association of American Geographers*, Boston, Massachusetts, USA, April 15-19, 2008.

2008 H.-S. Cha and A.T. Murray. "Public transit service equity and spatial representation." *2008 Annual Meeting of the Association of American Geographers*, Boston, Massachusetts, USA, April 15-19, 2008.

2008 D. Tong, A.T. Murray and N. Xiao. "Heuristics in facility location: a genetic algorithm for coverage maximization." *Western Regional Science Association 47th Annual Meeting*, Hawaii, USA, February 17-20, 2008.

2008 T.H. Grubesic and A.T. Murray. "Spatial equity in exposure to risk: sex offender residency." *Western Regional Science Association 47th Annual Meeting*, Hawaii, USA, February 17-20, 2008.

2007 A.T. Murray. "Extending the boundaries with location analysis and GIScience." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 T.H. Grubesic and A.T. Murray. "Spatial dispersion of convicted sex offenders." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 T.C. Matisziw, A.T. Murray and T.H. Grubesic. "Network vulnerability analysis: implications for planning and policy." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 J. Olson and A.T. Murray. "Continental scale radar siting." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 D. Tong, A.T. Murray and N. Xiao. "Incorporating spatial information for solving a coverage maximization siting problem." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 X. Wu, A.T. Murray and N. Xiao. "Optimizing relative contiguity in reserve design." *54th North American Regional Science Association International*, Savannah, Georgia, USA, November 7-10, 2007.

2007 A.A. Iqbal and A.T. Murray. "Locating emergency warning sirens: a new approach." *Association of Collegiate Schools of Planning 48th Annual Conference*. Milwaukee, Wisconsin, USA, October 18-21, 2007.

2007 A.T. Murray, T.C. Matisziw, D. Tong, H. Wei. "GeoComputational approaches to coverage maximization in service facility siting." *GeoComputation 2007*, Kildare, Ireland, September 3-5, 2007.

2007 K. Kim and A.T. Murray. "Spatial representation issues in surveillance sensor location modeling." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 D.E. Snediker, A.T. Murray and T.C. Matisziw. "Decision support for network management." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 J.N. Mefford and A.T. Murray. "Discrete choice and spatial analysis of travelers' responsiveness to urban land use and transportation system change." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 H. Wei, R.C. Tiwari and A.T. Murray. "A spatial semiparametric Bayesian model for predicting cancer mortality rates." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 G. Lee and A. Murray. "Municipal wireless broadband network design: facility location-network design approach." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 D. Tong and A.T. Murray. "Addressing region-wide coverage issues." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 T.C. Matisziw and A.T. Murray. "Assessing nature reserve vulnerability." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 J. Olson and A.T. Murray. "Large scale set covering." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 E. Delmelle and A. Murray. "Spatial sampling and location modeling." *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21 2007.

2007 T.H. Grubesic, A.T. Murray and E.A. Mack. "Geographic exclusion: spatial analysis for evaluating the implications of Megan's Law." *Ninth Annual International Crime Mapping Research Conference,* Pittsburgh, Pennsylvania, USA, March 28-31, 2007.

2007 F. Janoos, R. Machiraju, R. Parent, J.W. Davis, A. Murray. "Sensor orientation for coverage optimization for surveillance applications." IS&T/SPIE 19th Annual Symposium on Electronic Imaging, Science and Technology, San Jose, California, USA, January 28 – February 1, 2007.

2007 Matisziw, T.C., A.T. Murray, and T.H. Grubesic. "Evaluating vulnerability and risk in interstate highway operation. *Transportation Research Board 86th Annual Meeting,* Washington, D.C., USA, January 21-25, 2007.

2006 H. Wei and A.T. Murray. "A hierarchical spatial model to explore the effect of West Nile Virus on wild bird population." *53rd North American Meeting of the Regional Science Association International*, Toronto, Ontario, Canada, November 16-18, 2006

2006 D. Tong and A.T. Murray. "Maximizing regional coverage using spatial objects." *53rd North American Meeting of the Regional Science Association International*, Toronto, Ontario, Canada, November 16-18, 2006

2006 T.H. Grubesic, T.C. Matisziw and A.T. Murray. "Comparative approaches for assessing network performance and vulnerability." *53rd North American Meeting of the Regional Science Association International*, Toronto, Ontario, Canada, November 16-18, 2006

2006 T.C. Matisziw and A.T. Murray. "Reducing model complexity in the search for vital network facilities." *53rd North American Meeting of the Regional Science Association International*, Toronto, Ontario, Canada, November 16-18, 2006

2006 K. Kim, A.T. Murray and N. Xiao "A multi-objective evolutionary algorithm for surveillance sensor placement." *53rd North American Meeting of the Regional Science Association International*, Toronto, Ontario, Canada, November 16-18, 2006

2006 M. Goycoolea, J. Vielma, A.T. Murray and A. Weintraub. "Green up and adjacency issues in forest spatial harvesting." *INFORMS Annual Meeting*, Pittsburgh, Pennsylvania, USA, November 5-8, 2006.

2006 M. Goycoolea, J. Vielma, A.T. Murray and A. Weintraub. "Comparing two formulations for the ARM problem." *12th Symposium for Systems Analysis in Forest Resources*, Burlington, Vermont, USA, September 5-8, 2006.

2006 D. Tong and A.T. Murray. "Geographical information science to enhance location coverage modeling." *UCGIS Summer Assembly 2006*, Vancouver, Washington, USA, June 28 - July 1, 2006.

2006 D. Tong and A.T. Murray. "Partial coverage in continuous space facility siting." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 T.C. Matisziw and A.T. Murray. "The contributions of Professor Charles S. ReVelle." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 K. Kim and A.T. Murray. "Modeling to support 24/7 security monitoring." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 J. Mefford, A.T. Murray and T.H. Grubesic. "Multi-objective optimization for identifying vulnerability in critical network infrastructure." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 X. Wu and A.T. Murray. "Identifying critical network infrastructure: n most vital arc problem." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 H. Wei A.T. Murray and T.C. Matisziw. "An EM algorithm for inferring OD traffic matrix." *102nd Annual Meeting of the Association of American Geographers*, Chicago, Illinois, USA, March 7-11, 2006.

2006 A.T. Murray and D. Tong. "Analyzing structure fires in Massachusetts: regional science and the media." *45th Annual Meeting of the Western Regional Science Association*, Santa Fe, New Mexico, USA, February 22-26, 2006.

2005 J.P. Vielma, M. Goycoolea, A. Murray and A. Weintraub. "Comparison of methodologies for limiting opening sizes in forest harvest scheduling." *INFORMS Annual Meeting*, San Francisco, California, USA, November 13-16, 2005.

2005 A.T. Murray and K. Kim. "Modeling to support greater integration of surveillance system sensors." *52nd North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 A.T. Murray and D. Tong. "Coverage in continuous space facility siting." 52nd *North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 A.T. Murray, T.C. Matisziw and T.H. Grubesic. "Simulating impacts of network interdiction on O-D flow activity." 52nd *North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 X. Wu, A.T. Murray and N. Xiao. "A hybrid evolutionary algorithm for optimizing spatial contiguity in multiobjective land acquisition." 52nd *North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 H. Wei and A.T. Murray. "Bayesian inference for origin-destination matrix estimation." 52nd *North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 T. Grubesic, A.T. Murray and J. Mefford. "Continuity in critical network infrastructures: measuring nodal disruptions." 52nd *North American Meeting of the Regional Science Association International*, Las Vegas, Nevada, USA, November 10-12, 2005.

2005 A.T. Murray and D. Tong . "Threshold coverage optimization." *ISOLDE X*, Spain (Sevilla and Islantilla), June 2-9, 2005.

2005 C. ReVelle, A.T. Murray and D. Serra. "Location models for ceding market share and shrinking services." *ISOLDE X*, Spain (Sevilla and Islantilla), June 2-9, 2005.

2005 A.T. Murray, K. Kim, J. Davis, R. Machiraju and R. Parent. "Coverage optimization to support security monitoring."*101st Annual Meeting of the Association of American Geographers*, Denver, Colorado, USA, April 5-9, 2005.

2005 H. Wei, A.T. Murray and N. Xiao. "Solving the continuous space p-center problem: planning application issues."*101st Annual Meeting of the Association of American Geographers*, Denver, Colorado, USA, April 5-9, 2005.

2005 B. Chastain and A.T. Murray. "Spatial structure in harvest scheduling optimization."*101st Annual Meeting of the Association of American Geographers*, Denver, Colorado, USA, April 5-9, 2005.

2005 X. Wu, A.T. Murray and N. Xiao. "Solution approaches for land use planning models addressing spatial contiguity."*101st Annual Meeting of the Association of American Geographers*, Denver, Colorado, USA, April 5-9, 2005.

2005 T.H. Grubesic and A.T. Murray. "Asset concentration and the geographic dimensions of cascading failure." *44th Annual Meeting of the Western Regional Science Association*, San Diego, California, USA, February 23-26, 2005.

2004 T.C. Matisziw and A.T. Murray. "Modeling continuous location and demand in the coverage of non-convex regions." 51*th North American Meeting of the Regional Science Association International*, Seattle, Washington, USA, November 11-13, 2004.

2004 X. Wu and A.T. Murray. "Optimizing spatial contiguity in land use modeling." 51*th North American Meeting of the Regional Science Association International*, Seattle, Washington, USA, November 11-13, 2004.

2004 T.H. Grubesic and A.T. Murray. "Vital nodes, interconnected infrastructures and the geographies of cascading failure." 51*th North American Meeting of the Regional Science Association International*, Seattle, Washington, USA, November 11-13, 2004.

2004 X. Wu and A.T. Murray. "Spatial contiguity in land use planning." *GIScience 2004*, College Park, Maryland, USA, October 20-23, 2004.

2004 C. Wu and A.T. Murray. "Validating population estimates using remote sensing." *American Society for Photogrammetry & Remote Sensing - ASPRS 2004 Annual Conference*, Denver, Colorado, USA, May 23-28, 2004.

2004 A. Weintraub, D. Ryan, J. Vielma and A.T. Murray. "Exact formulation for spatial harvesting problems." *CORS/INFORMS Joint International Meeting*, Banff, Alberta, Canada, May 16-19, 2004.

2004 A.T. Murray. "Coverage modeling of geographic areas." *Centennial Meeting of the Association of American Geographers*, Philadelphia, Pennsylvania, USA, March 14-19, 2004.

2004 W.V. Ackerman and A.T. Murray. "A vector analysis of violent crime in Lima, Ohio." *Centennial Meeting of the Association of American Geographers*, Philadelphia, Pennsylvania, USA, March 14-19, 2004.

2004 T.C. Matisziw and A.T. Murray. "Enhancing species survivability in nature reserve design." *Centennial Meeting of the Association of American Geographers*, Philadelphia, Pennsylvania, USA, March 14-19, 2004.

2004 X. Wu and A.T. Murray. "Quantification of spatial contiguity." *Centennial Meeting of the Association of American Geographers*, Philadelphia, Pennsylvania, USA, March 14-19, 2004.

2003 A.T. Murray and B. Farhan. "Modeling coverage and distance decay." 50th *North American Meeting of the Regional Science Association International*, Philadelphia, Pennsylvania, USA, November 20-22, 2003.

2003 T.H. Grubesic and Alan T. Murray. "Geocoding accuracy and its impact on location modeling and planning: a review of the critical issues." 50th *North American Meeting of the Regional Science Association International*, Philadelphia, Pennsylvania, USA, November 20-22, 2003.

2003 C. Wu and A.T. Murray. "Addressing quality and coverage in transit system management." 50th *North American Meeting of the Regional Science Association International*, Philadelphia, Pennsylvania, USA, November 20-22, 2003.

2003 A. Weintraub, D. Ryan, A. Murray and J.P. Vielma. "Solving a difficult exact formulation of a spatial forestry problem." *Mathematical Programming in Rio, A Conference in Honour of Nelson Maculan*, Buzios, Brasil November 9-12, 2003.

2003 A.T. Murray and C. Wu . "Using GIS to improve transit planning." *Ohio Transportation Engineering Conference*, Columbus, Ohio, USA, November 5-6, 2003.

2003 A.T. Murray and X. Wu. "Assessing landscape contiguity in reserve design." *Symposium for Systems Analysis in Forest Resources*, Stevenson, Washington, USA, October 7-9, 2003.

2003 A.T. Murray, J.P. Vielma, D. Ryan and A. Weintraub. "Improved solution techniques for multi-period area-based harvest scheduling problems." *Symposium for Systems Analysis in Forest Resources*, Stevenson, Washington, USA, October 7-9, 2003.

2003 E. Lobao and A.T. Murray. "Examining spatial inequality within the homeless shelter system in Columbus, Ohio." *66th Annual Meeting of the Rural Sociological Society*, Montreal, Quebec, Canada, July 27-30, 2003.

2003 A.T. Murray and R.W. Jackson. "Approaches for IO matrix updating." *99th Annual Meeting of the Association of American Geographers*, New Orleans, Louisiana, USA, March 4-8, 2003.

2003 C. Wu and A.T. Murray. "A cokriging method for estimating population density in urban areas." *99th Annual Meeting of the Association of American Geographers*, New Orleans, Louisiana, USA, March 4-8, 2003.

2003 B. Farhan and A.T. Murray. "A new approach for locating park and ride facilities." *99th Annual Meeting of the Association of American Geographers*, New Orleans, Louisiana, USA, March 4-8, 2003.

2003 W.V. Ackerman and A.T. Murray. "Assessing spatial patterns of crime in Lima, Ohio." *99th Annual Meeting of the Association of American Geographers*, New Orleans, Louisiana, USA, March 4-8, 2003.

2003 T.C. Matisziw, C. Kim and A.T. Murray. "Strategic bus route extension." *99th Annual Meeting of the Association of American Geographers*, New Orleans, Louisiana, USA, March 4-8, 2003.

2003 B. Farhan and A.T. Murray. "A GIS-based approach for delineating market areas for park-and-ride facilities." *Transportation Research Board 82nd Annual Meeting*, Washington, D.C., USA, January 12-15, 2003.

2002 A.T. Murray and T.H. Grubesic. "Assessing the reliability of crime analysis using imperfect spatial information." *The Sixth International Crime Mapping Research Conference* (National Institute of Justice, Mapping and Analysis for Public Safety program), Denver, Colorado, USA, December 8-11, 2002.

2002 T.H. Grubesic and A.T. Murray. "Imperfect spatial information: implications for crime mapping and analysis." *The Sixth International Crime Mapping Research Conference* (National Institute of Justice, Mapping and Analysis for Public Safety program), Denver, Colorado, USA, December 8-11, 2002.

2002 A.T. Murray, M. Goycoolea and A. Weintraub. "Modeling average and maximum area restrictions in harvest scheduling." *INFORMS*, San Jose, California, USA, November 17-20, 2002.

2002 A.T. Murray and X. Wu. "Supporting public transit service provision planning: access and accessibility concerns." *49th North American Meeting of the Regional Science Association International*, San Juan, Puerto Rico, November 13-16, 2002.

2002 T.H. Grubesic and A.T. Murray. "Broadband internet access and competition in the last-mile." *49th North American Meeting of the Regional Science Association International*, San Juan, Puerto Rico, November 13-16, 2002.

2002 T.C. Matisziw, C. Kim and A.T. Murray. "Strategic service extension in bus-based public transportation systems." *49th North American Meeting of the Regional Science Association International*, San Juan, Puerto Rico, November 13-16, 2002.

2002 M.W. Horner and A.T. Murray. "Rethinking estimates of spatial access to transit service." *49th North American Meeting of the Regional Science Association International*, San Juan, Puerto Rico, November 13-16, 2002.

2002 R.W. Jackson and A.T. Murray. "Alternative matrix updating formulations." *49th North American Meeting of the Regional Science Association International*, San Juan, Puerto Rico, November 13-16, 2002.

2002 B. Farhan and A.T. Murray. "A new approach for locating park-and-ride facilities." *2002 Annual Meeting of the East Lakes Division of the Association of American Geographers*, Central Michigan University, Mt. Pleasant, MI, USA, October 18-19, 2002.

2002 W.V. Ackerman and A.T. Murray. "Assessing spatial patterns of crime in Lima, Ohio." *Ohio Criminal Justice Research Conference*, Columbus, Ohio, USA, October 15, 2002.

2002 R.W. Jackson and A.T. Murray. "Alternate formulations for minimizing inter-matrix distances." *Fourteenth International Conference on Input-Output Techniques*, Montréal, Canada, October 10-15, 2002.

2002 A.T. Murray, M.E. O'Kelly and R.L. Church. "Exploring geometric representation in coverage modeling." *ISOLDE* IX, Fredericton, New Brunswick, Canada, June 12-18, 2002.

2002 A.T. Murray. "Overview of private sector approaches for estimating traffic flow using aerial photography and videography." *North American Travel Monitoring Exhibition and Conference*, Orlando, Florida, USA, May 12-16, 2002.

2002 A.T. Murray and T.H. Grubesic. "Spatial models for crime hot spot detection." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 C. Wu and A.T. Murray. "Estimating population distribution for transit planning using integrated GIS and RS technologies." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 R.W. Jackson and A.T. Murray. "Competition and complementarities in multi-regional economic development." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 X. Wu, K. Jezek and A.T. Murray. "Antarctic ice sheet balance velocities." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 E.G. Lobao and A.T. Murray. "Exploratory spatial data analysis of homeless services in Columbus, Ohio." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 B. Farhan and A.T. Murray. "An approach for delineating park and ride market areas." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 S.K. Thakur, A.T. Murray and R.W. Jackson. "Evaluating the spatial distribution of Research and Development facilities in India." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 H.-S. Cha and A.T. Murray. "Assessing public transit service equity in Columbus, Ohio." *98th Annual Meeting of the Association of American Geographers,* Los Angeles, California, USA, March 19-23, 2002.

2002 M. Goycoolea, A.T. Murray, J. Vielma, F. Barahona, R. Epstein and A. Weintraub. "An exact algorithm for the area restriction model." *Systems Analysis Forestry Symposium Chile 2002*, Punta de Tralca, Chile, March 4-7, 2002.

2001 T.H. Grubesic and A.T. Murray. "Detecting hot-spots using cluster analysis and GIS." *5th Annual International Crime Mapping Research Conference*, Dallas, Texas, USA, November 30 - December 4, 2001.

2001 A.T. Murray. "Addressing access and accessibility in public transit service." *48th North American Meeting of the Regional Science Association International*, Charleston, South Carolina, USA, November 15-17, 2001.

2001 M.W. Horner and A.T. Murray. "Reducing congestion through strategic planning." *48th North American Meeting of the Regional Science Association International*, Charleston, South Carolina, USA, November 15-17, 2001.

2001 M.E. O'Kelly and A.T. Murray. "Geometric models for planar covering with application to warning sirens." *48th North American Meeting of the Regional Science Association International*, Charleston, South Carolina, USA, November 15-17, 2001.

2001 T.H. Grubesic, M.E. O'Kelly and A.T. Murray. "Network reliability and the commercial Internet." *48th North American Meeting of the Regional Science Association International*, Charleston, South Carolina, USA, November 15-17, 2001.

2001 A.T. Murray. "A hybrid coverage model for accessing public transportation service provision." *INFORMS*, Miami, Florida, USA, November 4-7, 2001.

2001 A. Weintraub, M. Goycoolea, A.T. Murray, R. Epstein and F. Barahona. "Solving the adjacency problem constructing the harvesting units." *INFORMS*, Miami, Florida, USA, November 4-7, 2001.

2001 T. Shyy, R.J. Stimson and A.T. Murray. "Internet GIS to benchmark local government socio-economic performance." *7th Pacific Conference of the Regional Science Association International*. Portland, Oregon, USA, June 30 - July 4, 2001.

2001 A. Weintraub, M. Goycoolea, R. Epstein, F. Barahona and A. Murray. "A branch and price approach for a difficult combinatorial problem in spatial forestry." *CORS-OPTD 2001*, Quebec, Canada, May 7-9, 2001.

2001 V. Estivill-Castro, I. Lee and A.T. Murray. "Criteria on proximity graphs for boundary extraction and spatial clustering." *The fifth Asian Pacific Conference on Knowledge Discovery and Data Mining - PAKDD-01*, Hong Kong, China, April 16-18, 2001.

2001 A.T. Murray. "Extending access in public transportation service provision." *97th Annual Meeting of the Association of American Geographers,* New York, New York, USA, February 27 - March 3, 2001.

2001 A.T. Murray. "Spatial pattern detection and scale." *Spatial Statistics and Spatial Econometrics Conference* (sponsored by the Applied Econometrics Association and the Western Regional Science Association), Palm Springs, California, USA, February 24-28, 2001.

2000 V. Estivill-Castro and A.T. Murray. "Clustering and weighted facility location via hybrid optimization." *International ICSC Congress on Intelligent Systems and Applications*, Wollongong, NSW, Australia, December 11-15, 2000.

2000 A.T. Murray and W.V. Ackerman. "Assessing spatial patterns of crime in smaller communities." *4th Annual International Crime Mapping Research Conference,* San Diego, California, USA, December 9-12, 2000.

2000 A.T. Murray. "Suggested locations in space." *47th North American Meeting of the Regional Science Association International*, Chicago, Illinois, USA, November 9-12, 2000.

2000 T.H. Grubesic, A.T. Murray and M.E. O'Kelly. "Constructing the divide: spatial disparities in broadband access." *47th North American Meeting of the Regional Science Association International*, Chicago, Illinois, USA, November 9-12, 2000.

2000 S.K. Thakur, A.T. Murray and R.W. Jackson. "Evaluating the spatial distribution of Research and Development facilities in India." *47th North American Meeting of the Regional Science Association International*, Chicago, Illinois, USA, November 9-12, 2000.

2000 A.T. Murray and M.E. O'Kelly. "Spatial modeling and represented geographic space." *GIScience 2000 - First International Conference on Geographic Information* Science, Savannah, Georgia, USA, October 28-31, 2000.

2000 R. Epstein, M. Goycoolea, A.T. Murray and A. Weintraub. "An adjacency-modeling problem based on constructing harvesting areas." *2000 Symposium on Systems Analysis in Forest Resources*, Aspen, Colorado, USA, September 27-30, 2000.

2000 A.T. Murray and V. Estivill-Castro. "Hybrid optimization for clustering in data mining." *CLAIO 2000*, Mexico City, Mexico, September 4-8, 2000.

2000 A.T. Murray. "Spatially lagged choropleth display." *9th International Symposium on Spatial Data Handling (SDH)*, Beijing, P.R. China, August 10-12, 2000.

2000 D. Ward and R.J. Stimson and A.T. Murray. "A spatial decision support system model for planning real time optimal allocation of regional growth: a case study of the Gold Coast sub-region in South East Queensland." *6th World Congress of the Regional Science Association International*, Lugano, Switzerland, May 16–20, 2000.

2000 A.T. Murray. "Suitable access coverage in the provision of public transportation." *INFORMS*, Salt Lake City, Utah, USA, May 7-10, 2000.

2000 A.T. Murray and A. Weintraub. "Approaches for solving the area restriction model in harvest scheduling." *INFORMS*, Salt Lake City, Utah, USA, May 7-10, 2000.

2000 A.T. Murray. "Exploring crime patterns using quantitative methods." *96th Annual Meeting of the Association of American Geographers*, Pittsburgh, Pennsylvania, USA, April 4-8, 2000.

2000 T. Shyy, R. Davis, R.J. Stimson and A.T. Murray. "An internet geographical information system for revolutionizing access to regional development research." *Western Regional Science Association 39th Annual Meeting*, Kauai, Hawaii, USA, February 26 – March 1, 2000.

1999 A.T. Murray and T. Shyy. "Spatial patterns and choropleth mapping." *46th North American Meeting of the Regional Science Association International,* Montreal, Quebec, Canada, November 11-14, 1999.

1999 A.T. Murray, D.P. Ward, S.R. Phinn and R.J. Stimson. "Urban growth scenario evaluation using an integrated spatial optimization model." *46th North American Meeting of the Regional Science Association International,* Montreal, Quebec, Canada, November 11-14, 1999.

1999 R. Davis, T. Shyy, R.J. Stimson, A.T. Murray and C. Pettit. "Developing an interactive spatial database for decision makers in regional Queensland." *1999 Australia and New Zealand Regional Science Association International Annual Conference*, New Castle, New South Wales, Australia, September 19-22, 1999.

1999 D.P. Ward, A.T. Murray and S.R. Phinn. "Integrating cellular automata and spatial optimization for evaluating rapidly urbanizing regions." *4th International Conference on GeoComputation*, Fredericksburg, Virginia, USA, July 25-28, 1999.

1999 B. Hooper and A.T. Murray. "Social data for catchment management: integrating GIS, demographic and attitudinal surveys for improved catchment decision-making." *International Symposium on Society and Resource Management*, Brisbane, Australia, July 7-10, 1999.

1999 A.T. Murray and R. Davis. "Evaluating equity, fairness and justice concepts in public transport service provision." *95th Annual Meeting of the Association of American Geographers*, Honolulu, Hawaii, USA, March 23-27, 1999.

1999 A.T. Murray. "Public transport access efficiency and coverage." *Western Regional Science Association 38th Annual Meeting*, Ojai, California, USA, February 21-24, 1999.

1998 A.T. Murray. "Cluster analysis in the spatial domain." *45th North American Meeting of the Regional Science Association International,* Santa Fe, New Mexico, USA, November 11-14, 1998.

1998 A.T. Murray, J.S. Western, P. Mullins and I. McGuffog. "Analyzing patterns of regional criminal activity." *GIS/LIS'98,* Fort Worth, Texas, USA, November 10-12, 1998.

1998 R.J. Stimson, R. Davis and A.T. Murray. "Changing economic performance of urban centres in Queensland 1986-1996." *Australia and New Zealand Regional Science Association International 22nd Meeting*, Barossa Valley, South Australia, Australia, September 21-23, 1998.

1998 R. Davis and A.T. Murray. "Equity in public transport service provision." *Australia and New Zealand Regional Science Association International 22nd Meeting*, Barossa Valley, South Australia, Australia, September 21-23, 1998.

1998 A.T. Murray. "Assessing clustering methods for exploratory spatial data analysis." *38th European Regional Science Association Congress*, Vienna, Austria, August 28 – September 1, 1998.

1998 V. Estivill-Castro and A.T. Murray. "Mining spatial data via clustering." *Eighth International Symposium on Spatial Data Handling*, Vancouver, British Colombia, Canada, July 12-15, 1998.

1998 A.T. Murray. "Transport access and environmental sustainability." *International Conference on Modeling Geographical and Environmental Systems with GIS*, Hong Kong, China, June 23-25, 1998.

1998 A.T. Murray. "Forest modeling and spatial optimization." *CORS/INFORMS*, Montreal, Quebec, Canada, April 26-29, 1998.

1998 R. Davis and A.T. Murray. "Quantifying social justice: a transport example." *Social Justice/Social Judgment*, Sydney, New South Wales, Australia, April 25-26, 1998.

1998 V. Estivill-Castro and A.T. Murray. "Discovering associations in spatial data – an efficient medoid based approach." *2nd Pacific-Asia Conference on Knowledge Discovery and Data Mining*, Melbourne, Victoria, Australia, April 15-17, 1998.

1998 A.T. Murray, R. Davis and R.J. Stimson. "Regional development and public transport." *Western Regional Science Association 37th Annual Meeting*, Monterey, California, USA, February 18-22, 1998.

1998 V. Estivill-Castro and A.T. Murray. "Spatial clustering for data mining with genetic algorithms." *Engineering of Intelligent Systems – EIS'98*, Tenerife, Spain, February 11-13, 1998.

1997 A.T. Murray and R. Davis. "Environmental sustainability and urban growth management." *Pacific Regional Science Conference Organisation 15th Meeting/Australia and New Zealand Regional Science Association 21st Meeting*, Wellington, New Zealand, December 8-12, 1997.

1997 A.T. Murray and V. Estivill-Castro. "Spatial data analysis and clustering." *44th North American Meeting of the Regional Science Association International*, Buffalo, New York, USA, November 6-9, 1997.

1997 A.T. Murray. "Urban development: issues in integrated analysis and planning." *Fifth International Workshop on Technological Change and Urban Form – CIB W72/97*, Jakarta, Indonesia, June 18-20, 1997.

1997 A.T. Murray and R.L. Church. "Optimizing the location of harvesting equipment and access roads." *1997 Symposium on Systems Analysis in Forest Resources*, Traverse City, Michigan, USA, May 28-31, 1997.

1997 R.L. Church, K. Barber, M.A. Figueroa and A.T. Murray. "Generating alternatives in forestry modeling." *INFORMS*, San Diego, USA, May 4-7, 1997.

1997 A.T. Murray and R.L. Church. "Forest planning and Steiner tree extensions." *INFORMS*, San Diego, USA, May 4-7, 1997.

1997 A.T. Murray. "Aggregation error minimization in input-output modeling." *Western Regional Science Association 36th Annual Meeting*, Hawaii, USA, February 23-26, 1997.

1997 B. Roberts and A.T. Murray. "Mapping the spatial corporate." *Producer Services in the APEC Region*, Hawaii, USA, February 22-23, 1997.

1996 J.M. Gottsegen and A.T. Murray. "Analyzing the relationships of spatial structure in aggregated data." *GIS/LIS '96*, Denver, Colorado, USA, November 19-21, 1996.

1996 A.T. Murray and J.M. Gottsegen. "Location model solution stability and the use of aggregate data." *Forty-Third North American Meeting of the Regional Science Association International*, Washington D.C., USA, November 14-17, 1996.

1996 R.L. Church, K. Barber and A.T. Murray. "Modeling for desired future conditions in a National Forest." *Society of American Foresters 1996 Convention*, Albuquerque, New Mexico, USA, November 9-13, 1996.

1996 A.T. Murray and J.M. Gottsegen. "Aggregation effects on location modeling." *Australia and New Zealand Regional Science Association 20th Annual Conference*, Canberra, ACT, Australia, September 23-25, 1996.

1996 A.T. Murray, R.L. Church and A. Weintraub. "Locational issues in forest management." *ISOLDE VII*, Edmonton/Jasper, Alberta, Canada, June 25 - July 3, 1996.

1996 A.T. Murray and R.L. Church. "Optimizing harvesting operations: locating towers, skidders and roads." *ISOLDE VII*, Edmonton/Jasper, Alberta, Canada, June 25 - July 3, 1996.

1995 A.T. Murray and R.L. Church. "The *p*-impact problem for locating noxious and obnoxious facilities." *42nd North American Meeting of the Regional Science Association International*, Cincinnati, Ohio, USA, November 9-12, 1995.

1995 A.T. Murray and R.L. Church. "Modeling desired future conditions." *INFORMS National Meeting*, Los Angeles, California, USA, April 23-26, 1995.

1995 A.T. Murray, R.L. Church, M.A. Figueroa and K. Barber. "A hierarchical land use planning approach for the USDA Forest Service." *INFORMS National Meeting*, Los Angeles, California, USA, April 23-26, 1995.

1994 A.T. Murray and R.L. Church. "Expanding spatial detail and restrictions in public sector location models." *Regional Science Association International 41st North American Meetings*, Niagara Falls, Ontario, Canada, November 17-20, 1994.

1994 A.T. Murray, R.L. Church, M.A. Figueroa, A. Ager and R.J. McGaughey. "Artificial landscape visualization of ecosystem management plans." *Decision Support - 2001*, Toronto, Ontario, Canada, September 12-16, 1994.

1994 R.L. Church, A.T. Murray and K. Barber. "Designing a hierarchical planning model for USDA Forest Service planning." *Sixth Symposium on Systems Analysis and Management Decisions in Forestry*, Pacific Grove, California, USA, September 6-9, 1994.

1994 A.T. Murray, R.L. Church and M.A. Figueroa. "Developing a spatial decision support system for land use management." *TIMS/ORSA Joint National Meeting*, Boston, Massachusetts, USA, April 24-27, 1994.

1994 A.T. Murray, R.L. Church and M.A. Figueroa. "Designing a spatial decision support system for forest ecosystem management." *GIS'94 Eight Annual Symposium on Geographic Information Systems*, Vancouver, British Columbia, Canada, February 21-24, 1994.

1993 A.T. Murray and R.L. Church. "Simulated annealing as a solution methodology for location models." *Regional Science Association International Fortieth North American Meetings*, Houston, Texas, USA, November 11-14, 1993.

1993 A.T. Murray and R.L. Church. "Heuristic approaches for solving area-based forest planning problems." *ORSA/TIMS Joint National Meeting*, Phoenix, Arizona, USA, October 31 - November 3, 1993.

1993 A.T. Murray and R.L. Church. "Adjacency constraint aggregation." *International Symposium on Systems Analysis and Management Decisions in Forestry*, Valdivia, Chile, March 9-12, 1993.

1992 A.T. Murray and R.L. Church. "Vehicle availability and estimating service coverage." *Regional Science Association International Thirty-Ninth North American Meetings*, Chicago, Illinois, USA, November 13-15, 1992.

1992 A.T. Murray and R.L. Church. "The reliability of α-reliability." *ORSA/TIMS Joint National Meeting*, San Francisco, California, USA, November 1-4, 1992.

1992 R.L. Church, A.T. Murray and S.R. Loban. "Forest planning and management using large scale linear programming." *ORSA/TIMS Joint National Meeting*, San Francisco, California, USA, November 1-4, 1992.

1991 A.T. Murray and R.L. Church. "Modeling school utilization and consolidation." *Thirty-Eighth North American Meetings of the Regional Science Association International*, New Orleans, Louisiana, USA, November 7-10, 1991.

Invited Lectures

2022 School of Public Policy, University of California at Riverside. "Geospatial sciences to support urban, economic, social and environmental planning and policy." April 25, 2022.

2021 A.T. Murray. "International Regional Science Review Trends." *68th North American Meetings of the Regional Science Association International*, Denver, Colorado, USA, November 10-13, 2021.

2020 R.L. Church and A.T. Murray. "Alonso Book Award Session: Location covering models." *67th North American Meetings of the Regional Science Association International*, November 9-13, 2020.

2020 Department of Geography, University of Utah, USA. "Extreme weather vulnerability risk and response". February 7, 2020.

2019 *Global Economy and Finance Re-start Conference*, Nanjing, China. "Economic and financial impacts of wildfire and floods" (**野火和洪水**对经济和金融的影响). November 9-10, 2019.

2019 *Understanding Extreme Fire Weather Hazards and Improving Resilience in Coastal Santa Barbara Workshop*, University of California at Santa Barbara, Santa Barbara, California, USA. "Risk, warning and evacuation". October 24, 2019.

2019 *Machine Learning and Famine Early Warning Workshop*, Climate Hazards Center, University of California at Santa Barbara, Santa Barbara, California, USA. "Machine learning from a spatial perspective". October 16, 2019.

2019 Department of Industrial Engineering, University of Naples Federico II, Italy. "Spatial optimization for addressing vulnerability issues". June 26, 2019.

2019 College of Surveying and Geo-Informatics, Tongji University, China. "Spatial data analytics revolution" (**空**间数据分析革命). June 2, 2019.

2019 School of Geographic Sciences, East China Normal University, China. "Addressing vulnerability through spatial data science" (**通**过**空**间**数据科学解决脆弱性**问题). May 30, 2019.

2019 *The New Data Revolution in Regional Science,* The Regional Science Academy, Tel Aviv, Israel. "Regional science publication trends." April 10-11, 2019.

2019 Spatial Analysis and Modeling Plenary, Spatial Analysis and Modeling Specialty Group of the Association of American Geographers (plenary), *2019 Annual Meeting of the American Association of Geographers*, Washington D.C., USA. "Spatial analysis and modeling: analytics and spatial data science." April 3-7, 2019.

2019 California Center for Population Research, University of California at Los Angeles, USA. "Population vulnerability and spatial analytics." March 13, 2019.

2019 Department of Geography, Seoul National University, South Korea. "Spatial data science analytics" (공간 데이터 과학 분석). January 17, 2019.

2018 *65th North American Meetings of the Regional Science Association International (The Regional Science Academy, Special Academic Session)*, San Antonio, Texas, USA. "To cover or not to cover." November 7-10, 2018.

2018 *I/UCRC Spatiotemporal Innovation Center: 2018 Technical Training Course of National Geographic Conditions Monitoring and Analysis*, University of California at Santa Barbara, Santa Barbara, California, USA. "Spatial variability of retail gasoline price in Santa Barbara." October 23-24, 2018 (with J. Xu).

2018 *I/UCRC Spatiotemporal Innovation Center: 2018 Technical Training Course of National Geographic Conditions Monitoring and Analysis*, University of California at Santa

Barbara, Santa Barbara, California, USA. "Spatial analytics for the evaluation and enhancement of public street lighting service." October 23-24, 2018 (with X. Feng).

2018 *International Conference on Spatial Analysis and Modeling* (keynote), Tokyo, Japan. "Spatial analysis and modeling evolution" (空間解析とモデリングの進化). September 8-9, 2018.

2018 School of Earth and Environmental Sciences, University of Queensland, Australia. " The rise (or return) of spatial optimization." August 23, 2018.

2018 National Institute for Applied Statistics Research Australia, University of Wollongong, Australia. " Observed spatial clustering." August 22, 2018.

2018 School of Earth Sciences and Engineering, Hohai University, China. "GIS时代的中心位置问题". June 10, 2018.

2018 School of Geographic and Oceanographic Sciences, Nanjing University, China. "Questions of central location in an era of GIS". June 10, 2018.

2018 *7th International Workshop on Regional, Urban, and Spatial Economics in China* (keynote), Changsha, Hunan, China. "Regional analysis in a rural world" (农村地区的区域分析). June 8-9, 2018.

2018 Distinguished Lecture Series in Remote Sensing and GIScience, Peking University, China. "The significance of GIS and spatial optimization" (GIS的意义和空间优化). June 6, 2018.

2017 Center for Spatial Information Science / Housing and Urban Analysis Lab, Department of Urban Engineering, University of Tokyo and Department of Logistics and Information Engineering, Tokyo University of Marine Science and Technology, Japan. "Information engineering and optimization in system sustainability planning" (持続可能なシステムのための都市オペレーション研究). December 12, 2017.

2017 *Workshop on Urban Operations Research* (keynote), Nanzan University, Japan. "Urban operations research for sustainable systems" (システム・サステナビリティ計画における情報工学と最適化). December 9-10, 2017.

2017 Department of Information Systems and Mathematical Sciences, Nanzan University, Japan. "Spatial optimization in commercial GIS" (商業GISにおける空間最適化). December 8, 2017.

2017 *I/UCRC Spatiotemporal Innovation Center: 2017 Training Workshop*, University of California at Santa Barbara, Santa Barbara, California, USA. "Providing effective spatio-temporal fire service." November 6-8, 2017.

2017 *Western Regional Science Association 56th Annual Meeting* (presidential address), Santa Fe, New Mexico, USA. "Analytics and regional science." February 15-18, 2017.

2016 *International Symposium on National Geographic State Monitoring* (keynote), "Data, modeling and analytics for urban-regional sustainability" (城市区域可持续发展的数据，建模和分). Wuhan, China, December 17-18, 2016.

2016 Jiangxi University of Finance & Economics, China. "Spatial analytics in urban-regional development" (城市区域发展中的空间分析).

2016 GeoMundus (keynote), *8th International Symposium on Geography, Earth and Environmental Studies*. "Why you should care about advanced spatial analytics." Castellon de la Plana, Spain, November 4-5, 2016.

2016 SOCHER (keynote), *Meeting of the Sociedad Chilena de Estudios Regionales*, "The role of data, modeling and analysis in reshaping regions and cities." Santiago, Chile, September 8-10, 2016.

2016 Departamento de Ingenieria Industrial, Universidad de Chile, Chile. "Facility location optimization advances through spatial knowledge."

2016 Harbin Normal University, China. "Geospatial challenges in analytical definitions of a center."

2016 Peking University, China. "Location and spatial analytics in contemporary planning and decision making environments."

2016 Center for Spatial Studies, University of California at Santa Barbara, USA. "Identifying the center of a spatial object."

2015 Department of Geography, UC Libraries and IT@UC, University of Cincinnati, USA. "Applying GIS to contemporary issues."

2015 School of Social Sciences, Monash University, Australia. "Spatial analytics: past, present and future."

2015 Department of Industrial & Systems Engineering, Lehigh University, USA. "Spatial optimization: evolving analytics, knowledge and theory."

2015 Department of Geography, University of California at Santa Barbara, USA. "Advancing spatial analytics to address urban, economic, social and environmental issues."

2015 School of Geography, Earth and Environmental Sciences, University of Birmingham, UK. "Evolving spatial analytics to support geographical inquiry."

2014 Department of Geography (Getis Lecture in Spatial Analysis), San Diego State University, USA. "Evolution of spatial analytics and geocomputation."

2014 College of Business, University of Kent, UK. "Spatial analytics to support wayfinding and routing in complex urban environments."

2014 College of Computing and Informatics, Drexel University, USA. "GeoComputation and spatial analytics to support planning and decision making."

2014 Department of Geography, University of Utah, USA. "GeoComputation to support valid and meaningful GIScience analysis."

2013 Centre for GeoInformatics, University of St Andrews, Scotland, UK. "Spatial optimization to support navigation of complex environments."

2013 College of Computing and Informatics, Drexel University, USA. "Spatial analytics for navigating complex environments."

2013 Department of Geography, University of California at Santa Barbara, USA. "GIScience advances for navigating complex environments."

2012 Department of Planning and Regional Development, University of Thessaly, Greece. "Επέκταση της παροχής υπηρεσιών αστικών πυροσβεστικών σταθμών: χωρική ανάλυση και χρήση GIS και εφαρμογή."

2012 Department of City and Regional Planning, Cornell University, USA. "Land use planning and spatial data uncertainty."

2012 Department of Geography, University of Hawaii, Manoa, USA. "Addressing spatial data uncertainty in land use planning."

2011 Department of Geography & Earth Sciences, University of North Carolina at Charlotte, USA. "The use of GIS in addressing important contemporary planning problems."

2011 iSchool, Drexel University, USA. "GIS and spatial analysis application challenges in addressing contemporary problems and issues."

2010 Department of Geography, University of Texas, USA. "Sex offender residency change behavior."

2010 School of Computing, Informatics, and Decision Systems Engineering, Decision Systems Seminar Series, Arizona State University, USA. "Network infrastructure fortification."

2010 Center for Population Dynamics, Arizona State University, USA. "Exploratory spatial data analysis of housing movement patterns."

2009 Department of Industrial and Systems Engineering, Texas A&M University, USA. "Geographic information systems (GIS) relevance in optimization."

2008 Department of Geography and Regional Development, University of Arizona, USA. "Sex offender exclusion laws: spatial analytical methods to support policy evaluation and formulation."

2008 School of Geographical Sciences, Arizona State University, USA. "Location modeling and GIScience".

2007 Criminal Justice Research Center and the Institute for Excellence in Justice, The Ohio State University, USA. "Evaluating sex offender exclusion laws."

2007 Initiative in Population Research, The Ohio State University, USA. "Geographic Information Systems (GIS): Introduction and Use in Population Research" (with N. Xiao).

2005 Department of Geography, San Diego State University, USA. "Spatial representation and location coverage optimization."

2005 Department of Geology and Geography, West Virginia University, USA. "The importance of spatial representation in emergency service planning."

2004 Department of Geography, University of Connecticut, USA. "A new perspective for coverage modeling."

2004 Department of Geography, University of Cincinnati, USA. "Rethinking coverage modeling in siting emergency warning sirens."

2004 Department of City and Regional Planning, The Ohio State University, USA. "Emergency warning siren coverage: planning and analysis."

2004 Department of Geography, University of California at Los Angeles, USA. "GIST in modeling spatial coverage."

2003 Center for Urban and Regional Analysis, The Ohio State University, USA. "Examining forecasted population growth by integrating regional modeling and local simulation."

2003 Criminal Justice Research Center and Center for Urban and Regional Analysis, The Ohio State University, USA. "Imperfect spatial information and the analysis of crime."

2002 Regional Research Institute, West Virginia University, USA. "Geographical considerations in forest management planning."

2002 Departamento de Ingenieria Industrial, Universidad de Chile, Chile. "Exploring alternative interpretations of maximum area restrictions in harvest scheduling."

2001 Bio-Complexity Workshop, Center for Mapping, The Ohio State University, USA. "Spatial modeling for evaluating urban growth."

2001 Departamento de Ingenieria Industrial, Universidad de Chile, Chile. "The importance of modeling to support forest planning and decision making."

2000 Institute of Remote Sensing Applications, Chinese Academy of Sciences, China. "Potential remote sensing applications in public transportation planning."

1999 Department of Geography, State University of New York at Buffalo, USA. "GIS based approaches for identifying patterns of suburban crime."

1999 Department of Geography, Ohio State University, USA. "Using GIS and spatial analysis for evaluating and planning public transportation."

1999 Department of Geography and Center for the Study of Institutions, Population, and Environmental Change, Indiana University, USA. "Evaluating sustainability issues using GIS and spatial analysis."

1999 Departamento de Ingenieria Industrial, Universidad de Chile, Chile. "Mathematical considerations for imposing spatial restrictions in harvest scheduling problems."

1998 Department of Earth and Atmospheric Sciences, University of Alberta, Canada. "Regional public transportation service access."

1998 Department of Earth and Atmospheric Sciences, University of Alberta, Canada. "Spatially restricted forest harvest scheduling."

1998 Department of Geography, University of Utah, USA. "Regional public transportation service access."

1998 Department of Geography, University of Kentucky, USA. "Regional public transportation service access."

1998 Department of Geography, University of Kentucky, USA. "GIS, spatial analysis and forest management."

1998 Department of Anthropology and Sociology, University of Queensland, Australia. "What every sociologist should know about geographical information systems."

1998 SEQ 2001, Queensland Government, Australia. "Modelling access to services and facilities."

1998 Department of Geography, Southern Illinois University, USA. "The use of GIS in natural resource management."

1998 Department of Systems and Industrial Engineering, University of Arizona, USA. "Location models for improving public transport services."

1997 Department of Geography, University of Florida, USA. "Systems analysis in forest management planning."

1997 Australian Housing and Urban Research Institute, Queensland University of Technology, Australia. "Systems analysis in environmental management planning."

1997 School of Forest Resources, University of Georgia, USA. "Analysis and modeling in forest resource management."

1997 Department of Geographical Sciences and Planning, University of Queensland, Australia. "Natural resource management."

1997 Forest Research Institute, Rotorua, New Zealand. "Harvest scheduling and spatial restrictions."

1996 CSIRO - Division of Building, Construction and Engineering, Australia. "Modelling impact in undesirable facility location."

1996 Department of Geography, University of Iowa, USA. "Data issues in medical geography: boundaries and aggregation."

1996 Department of Geography, University of Iowa, USA. "Land management and policy assessment using integrated optimization."

1996 Department of Geography and GISCA, University of Adelaide, Australia. "SDSS and GIS development for integrated analysis and planning."

1996 AHURI/CSIRO Knowledge Exchange Seminar, Mallacoota, Victoria, Australia. "GIS and SDSS for sustainable urban and regional planning."

1995 Department of Forest Science, Texas A&M University, USA. "Applying heuristic solution techniques to operational forest planning problems."

1995 Departamento de Ingenieria Industrial, Universidad de Chile, Chile. "Development and application of heuristics for spatial optimization: location and land management" (with R.L. Church).

1995 Department of Geography, University of California, Santa Barbara, USA. "Applying heuristic solution approaches to operational forest planning problems."

Expert Testimony

John Doe vs. Jim Petro et al. (2005); United States District Court

Professional Service

1. Editorial Activities

(i) Journal Boards and Editorships (see above)
(ii) Edited Journal Special Issues (see above)
(iii) Panelist

"Editors Panel Discussion: How to Publish in International Journals", *Western Regional Science Association 60th Annual Meeting*, February 22-25, 2021.

"The future of regional and urban economics in China and the world", *The 8th RUSE (Regional, Urban, and Spatial Economics in China) International Workshop*, Shanghai, China, May 31-June 1, 2019.

"A Globe-Shaped Crystal Ball: The Next Fifty Years of Geographical Analysis", *2018 Annual Meeting of the Association of American Geographers,* New Orleans, Louisiana, USA, April 10-14, 2018.

"Special Session to Honor Manfred M. Fischer's Contributions to Geography: Spatial Analysis and Modeling 2", *104th Annual Meeting of the Association of American Geographers*, Boston, Massachusetts, USA, April 15-19, 2008.

"Honoring Atsuyuki Okabe: Applications, Developments, and Future Research on Spatial Analysis and GIScience 1", *103rd Annual Meeting of the Association of American Geographers*, San Francisco, California, USA, April 17-21, 2007.

"Meet the Journal Editors II", *Centennial Meeting of the Association of American Geographers*, Philadelphia, Pennsylvania, USA, March 14-19, 2004.

(iv) Book Proposal Reviewer

W.H. Freeman and Company (2000)
Springer (2007)

(v) Journal Reviewer (162 different journals)

4OR - A Quarterly Journal of Operations Research
ACM Transactions on Spatial Algorithms and Systems
Advances in Data Analysis and Classification
Annals, Association of American Geographers
Annals of Operations Research
Annals of Regional Science
Applied Geography
Applied Mathematical Modelling
Applied Soft Computing
Applied Spatial Analysis and Policy
Arabian Journal of Chemistry
Asia-Pacific Journal of Operational Research
Asia-Pacific Journal of Regional Science
Australasian Journal of Regional Studies
Automation in Construction
BMC Public Health
Biodiversity and Conservation
Biosafety and Health
Canadian Journal of Criminology and Criminal Justice
Canadian Journal of Earth Systems
Canadian Journal of Forest Research
Cartographica
Cartography and Geographic Information Science
Case Studies on Transport Policy
Chemical Engineering Science
Cities
Conflict Management and Peace Science
Computational and Applied Mathematics
Computational Optimization and Applications
Computational Statistics and Data Analysis
Computer-Aided Civil and Infrastructure Engineering
Computers & Geosciences
Computers & Operations Research
Computers, Environment and Urban Systems
Crime, Law and Social Change
Crime Mapping: A Journal of Research and Practice
Decision Support Systems
Defence & Peace Economics

Discrete Optimization
Earth Interactions
Ecological Applications
Ecological Informatics
Economic Systems Research
Electronics and Telecommunications Research Institute Journal
Energy Strategy Reviews
Environment and Planning A
Environment and Planning B: Urban Analytics and City Science
Environment and Planning C: Government and Policy
Environmental Engineering Science
Environmental Science & Technology
European Journal of Operational Research
Expert Systems with Applications
Forest Policy and Economics
Forest Science
Geografiska Annaler B: Human Geography
Geographical Analysis
Geographical Journal
Geographical and Environmental Modelling
Geography Compass
GeoJournal
Geoscience and Remote Sensing Letters
Geo-spatial Information Science
Global Food Security
Health and Place
IEEE Access
IEEE Transactions on Intelligent Transportation Systems
INFOR
INFORMS Journal on Computing
ISPRS Journal of Photogrammetry and Remote Sensing
International Forestry Review
International Journal of Critical Infrastructure Protection
International Journal of Digital Earth
International Journal of Environmental Research and Public Health
International Journal of Geographical Information Science
International Journal of Health Geographics
International Journal of Critical Infrastructure Protection
International Journal of Mathematical and Computational Forestry and Natural-Resource Sciences
International Journal of Production Economics
International Journal of Remote Sensing
International Journal of Sustainable Transportation
International Journal of Systems Science
International Transactions in Operational Research
Journal of Advanced Transportation
Journal of Asian Architecture and Building Engineering
Journal of Cleaner Production
Journal of Environmental Management
Journal of Forest Research
Journal of Geographical Systems
Journal of Hydrology
Journal of Infrastructure Systems
Journal of King Saud University - Science
Journal of Parallel and Distributed Computing
Journal of Regional Science
Journal of Spatial Science
Journal of Sustainable Transportation
Journal of the Operational Research Society
Journal of the Operations Research Society of Japan
Journal of Transport Geography
Journal of Water Resources Planning and Management
Journal of Urban Technology
Journal of Urbanism
Justice Quarterly
Land Use Policy
Landscape Ecology
Landscape and Urban Planning
Location Science
LEUKOS

Manufacturing and Service Operations Management
Natural Resource Modeling
Naval Research Logistics
Networks
Networks and Spatial Economics
Omega, The International Journal of Management Science
Operational Research
Operations Research
Optics and Laser Technology
OR Spectrum
Papers in Regional Science
Photogrammetric Engineering and Remote Sensing
Physica A
Physics and Chemistry of the Earth
PLOS ONE
Planning Practice and Research
Population Research and Policy Review
Preventing Chronic Disease
Professional Geographer
Proceedings of the National Academy of Sciences of the United State of America
Reliability Engineering and System Safety
Remote Sensing
Review of Regional Studies
Risk Analysis
Safety and Health at Work
SAGE Open
Social and Cultural Geography
Social Psychological and Personality Science
Social Science Journal
Socio-Economic Planning Sciences
Southern Journal of Applied Forestry
Spatial Cognition and Computation: An Interdisciplinary Journal
Spatial Economic Analysis
Spatial Statistics
Stat
Sustainable Cities and Society
Swarm and Evolutionary Computation
Technology | Architecture + Design
The Geographical Journal
The Southwestern Geographer
TOP
Transportation
Transportation Letters: the International Journal of Transportation Research
Transactions in GIS
Transactions of the Institute of British Geographers
Transactions on Spatial Algorithms and Systems
Transportation Research A: Policy and Practice
Transportation Research C: Transport and Environment
Transportation Research Record
Travel Behaviour and Society
Transportation Science
Urban Climate
Urban Geography
Visual Computing for Industry, Biomedicine, and Art
Water Resources Management

2. Grant Review Panel

National Institutes of Health (2009)
National Science Foundation (2004-2005, 2009, 2019)

3. Grant Proposal Assessor

AgreenSkills (EU)
Australian Research Council
Czech Science Foundation
Criminology Research Council

Critical Infrastructure Resilience Institute (University of Illinois / US Department of Homeland Security)
Eidgenossische Technische Hochschule Zurich (Swiss Federal Institute of Technology Zurich) - Competence Center Environment and Sustainability
European Research Council
Israel Science Foundation
Medical Research Council
National Center of Science and Technology Evaluation (Kazakhstan)
National Commission for Scientific and Technological Development (CONICYT) / Superior Council of the National Fund for Scientific & Technological Development (FONDECYT) (Chile)
National Institutes of Health
National Institute of Justice
National Science Center (Poland)
National Science Foundation
Natural Sciences and Engineering Research Council of Canada
Netherlands Organisation for Scientific Research
Qatar National Research Fund
Research Grants Council of Hong Kong
Regional Research Institute (West Virginia University)
Royal Society (UK)
Science Fund of the Republic of Serbia
U.S. Census Bureau
U.S. Department of Homeland Security / Science & Technology Critical Infrastructure Resilience Center of Excellence

4. External Promotion and Tenure Review

Arizona State University
Boston University
Brigham Young University
Dartmouth College
George Mason University
Griffith University
Indiana University - Purdue University
Louisiana State University
McMaster University
National Cheng Kung University
Northeastern University
Seoul National University
State University of New York, Buffalo
Temple University
Universiti Sains Malaysia
University of California, Riverside
University of Cincinnati
University of Colorado
University of Denver
University of Georgia
University of Hong Kong
University of Illinois, Urbana-Champaign
University of Kent
University of Louisville
University of Maryland
University of Miami
University of Minnesota
University of Nevada, Reno
University of North Carolina, Charlotte
University of Queensland
University of Tennessee
University of Texas, Dallas
University of Toronto

5. External Program Review

2018 Department of Earth & Environment, College of Arts & Sciences, Boston University

6. Advisory Panels

2008-2014 GeoDA Center for Geospatial Analysis and Computation, Arizona State University (oversight committee member)

2005-2008 Initiative in Population Research, The Ohio State University (executive committee member)

2005-2008 Regents Advisory Committee on the Urban University Program, Ohio Board of Regents

2005-2008 Community Research Partners System Policy Group

2004-2005 Center for Urban and Regional Analysis, The Ohio State University (oversight and advisory committee member)

7. Professional Society Service

(i) Boards

2005-2015 Western Regional Science Association, Board of Directors

(ii) Offices

2017-2018 President, Western Regional Science Association

2015-2016 Vice President, Western Regional Science Association

2014-2015 Vice President, Section on Location Analysis, INFORMS

2012-2013 Secretary, Section on Location Analysis, INFORMS

2011-2012 Treasurer, Section on Location Analysis, INFORMS

2009-2011 Councilor-at-Large, North American Regional Science Council

2000-2003 Chair, Spatial Analysis and Modeling Specialty Group of the Association of American Geographers

1999-2000 Newsletter Editor, Mathematical Models and Quantitative Methods Specialty Group of the Association of American Geographers

(iii) Committees

2022-2025 Honors Committee (Regional Science Association International)

2020-2022 Steering committee member, Research Activities Panel (Channel Islands National Marine Sanctuary, National Oceanic and Atmospheric Administration, US Department of Commerce)

2018-2022 Committee member, Tiebout Prize (Western Regional Science Association) (Chair, 2019-2020)

2017 Committee member, ReVelle Rising Star Award Committee (Section on Location Analysis, INFORMS)

2015 Committee member, North American Regional Science Council, Graduate Paper Award

2013 Committee member, North American Regional Science Council, Graduate Student Led Paper Competition

2011 Chair, SOLA-Air Products Dissertation Committee (Section on Location Analysis, INFORMS)

2010 Committee member, INFORMS, Energy and Natural Resources and the Environment Section Student Paper Competition

2005 Chair, UPS-SOLA Dissertation Committee (Section on Location Analysis, INFORMS)

2003 UPS-SOLA Dissertation Committee (Section on Location Analysis. INFORMS)

2003-2006 Census Advisory Committee, Association of American Geographers (Chair, 2006)

2002-2005 Standards for Geographic Data Committee, Association of American Geographers

(iv) International Conference Organization

2022 Western Regional Science Association 61st Annual Meeting (Program Committee). Scottsdale, Arizona, USA, February 17-20, 2022.

2021 GIScience 2021: 11th International Conference on Geographic Information Science (Program Committee), Poznan, Poland, September 27-30, 2021.

2021 ISOLDE (Program Committee), Hamburg and Timmendorfer Strand, Germany, June 13-18, 2021.

2021 Western Regional Science Association 60th Annual Meeting (Program Committee). February 22-25, 2021.

2019 The 8th RUSE (Regional, Urban, and Spatial Economics in China) International Workshop (Scientific Committee), Shanghai, China, May 31-June 1, 2019.

2019 Western Regional Science Association 58th Annual Meeting (Program Committee). Napa, California, USA, February 10–13, 2019.

2018 International Conference on Spatial Analysis and Modeling (Organizing Committee), Tokyo, Japan September 8-9, 2018.

2018 GIScience 2018: Tenth International Conference on Geographic Information Science (Program Committee), Melbourne Australia, August 28-31, 2018.

2018 The 7th International Workshop on Regional, Urban, and Spatial Economics in China (Scientific Committee), Changsha, Hunan, China, June 8-9, 2018.

2017 ISOLDE (Scientific Committee), Toronto and Huntsville, Ontario, Canada, July 10-14, 2017.

2016 GIScience 2016: Ninth International Conference on Geographic Information Science (Program Committee), Montreal, Canada, September 27-30, 2016.

2016 EURO Working Group on Locational Analysis XXIII (Scientific Committee), Malaga, Spain, September 14-16, 2016

2015 13th International Conference on GeoComputation (GeoComputation 2015) (Scientific Advisory Board), Richardson, Texas, USA, May 21-23, 2015.

2015 International Geospatial Health Research Symposium: Creating Synergies (Committee Member), Chicago, Illinois, USA, April 21-25, 2015.

2014 GIScience 2014: Eighth International Conference on Geographic Information Science (Program Committee), Vienna, Austria, September 23-26, 2014.

2014 ISOLDE (Scientific Committee), Naples and Capri, Italy, June 16-21, 2014.

2013 1st International Conference on Geo-Informatics in Green Ecology & Environment (Program Committee), Wuhan, China, November 8-10, 2013.

2013 12th International Conference on GeoComputation (GeoComputation 2013) (Program Committee), Wuhan University, China, May 23-25, 2013.

2012 GIScience 2012 (Program Committee), Columbus, Ohio, USA, September 18-21, 2012.

2011 LAND-TRANSLOG II (Program Committee), Puerto Varas, Chile, December, 12-15, 2011.

2008 ISOLDE (Program Committee), Santa Barbara, California, USA, June 23-28, 2008.

2002 Symposium on Models and Systems in Forestry (with A. Weintraub, R. Haight, M. Bevers, D. Martell and M. Ronnqvist), Punta de Tralca, Chile, March 4-7, 2002.

(v) International Conference Session Organization

2021 The New Data Revolution in Regional Science and the Dilemma of More, and Better Measurement: A Tribute to Stan Czamanski (with D. Broitman, K. Kourtit, D. Czamanski, P. Nijkamp and P. Batey) – 68th North American Meeting of the Regional Science Association International, Denver, Colorado, USA, November 10-13, 2021.

2021 Location and Spatial Analysis sessions (with R. Wei) – 68th North American Meeting of the Regional Science Association International, Denver, Colorado, USA, November 10-13, 2021.

2020 Location and Spatial Analysis sessions (with R. Wei) – 67th North American Meeting of the Regional Science Association International, November 9-13, 2020.

2019 Location and Spatial Analysis sessions (with R. Wei) – 66th North American Meeting of the Regional Science Association International, Pittsburgh, Pennsylvania, USA, November 13-16, 2019.

2018 Location and Spatial Analysis sessions (with R. Wei) – 65th North American Meeting of the Regional Science Association International, San Antonio, Texas, USA, November 7-10, 2018.

2017 Location and Spatial Analysis sessions (with R. Wei) – 64th North American Meeting of the Regional Science Association International, Vancouver, British Columbia, Canada, November 8-11, 2017.

2016 Location and Spatial Analysis sessions (with R. Wei) – 63rd North American Meeting of the Regional Science Association International, Minneapolis, Minnesota, USA, November 9-12, 2016.

2015 Location and Spatial Analysis sessions (with R. Wei) – 62nd North American Meeting of the Regional Science Association International, Portland, Oregon, USA, November 11-14, 2015.

2015 Section on Location Analysis cluster – INFORMS, Philadelphia, Pennsylvania, USA, November 1-4, 2015.

2014 Location and Spatial Analysis sessions (with T. Grubesic) – 61st North American Meeting of the Regional Science Association International, Washington, D.C., USA, November 13-15, 2014.

2014 Section on Location Analysis cluster – INFORMS, San Francisco, California, USA, November 9-12, 2014.

2013 Location and Spatial Analysis: 40 years of Maximal Coverage sessions (with R. Church) – 60th North American Meeting of the Regional Science Association International, Atlanta, Georgia, USA, November 13-16, 2013.

2013 Location and Spatial Analysis sessions (with R. Wei and T. Grubesic) – 60th North American Meeting of the Regional Science Association International, Atlanta, Georgia, USA, November 13-16, 2013.

2013 Optimization, Spatial Analysis and GIS cluster (with R. Church) – INFORMS, Minneapolis, Minneapolis, USA, October 6-9, 2013.

2005 Charles S. ReVelle Sessions in Location Modeling and Spatial Analysis (with T. Matisziw) – 52nd North American Meeting of the Regional Science Association International, Las Vegas, Nevada, USA, November 10-12, 2005.

2004 Location and Spatial Modeling sessions – 51st North American Meetings of the Regional Science Association International, Seattle, Washington, USA, November 11-13, 2004.

2003 Location and Spatial Modeling sessions – 50th North American Meetings of the Regional Science Association International, Philadelphia, Pennsylvania, USA, November 20-22, 2003.

2003 Spatial Analysis and Modeling sessions (sponsored by Spatial Analysis and Modeling specialty group) – 99th Annual Meeting of the Association of American Geographers, New Orleans, Louisiana, USA, March 5-8, 2003.

2002 Location and Spatial Modeling sessions – 49th North American Meetings of the Regional Science Association International, San Juan, Puerto Rico, USA, November 14-17, 2002.

2002 Spatial Analysis and Modeling sessions (sponsored by Spatial Analysis and Modeling specialty group) – 98th Annual Meeting of the Association of American Geographers, Los Angeles, California, USA, March 12-23, 2002.

2001 Location and Spatial Modeling sessions – 48th North American Meetings of the Regional Science Association International, Charleston, South Carolina, USA, November 15-17, 2001.

2001 Spatial Analysis and Modeling, Population Analysis and Modeling, and Plenary Lecture (sponsored by Spatial Analysis and Modeling specialty group) – 97th Annual Meeting of the Association of American Geographers, New York, New York, USA, February 27 – March 3, 2001.

2000 Location Modeling sessions – 47th North American Meetings of the Regional Science Association International, Chicago, Illinois, USA, November 9-12, 2000.

2000 GIS and Modeling in the Analysis of Crime session and Plenary Lecture (sponsored by Mathematical Models and Quantitative Methods specialty group) – 96th Annual Meeting of the Association of American Geographers, Pittsburgh, Pennsylvania, USA, April 4-8, 2000.

1999 Location Modeling sessions – 46th North American Meetings of the Regional Science Association International, Montreal, Quebec, Canada, November 11-14, 1999.

1999 Transportation and Location Modeling session (co-sponsored by Mathematical Models and Quantitative Methods, Transportation Geography and Geographic Information System specialty groups) – 95th Annual Meeting of the Association of American Geographers, Honolulu, Hawaii, USA, March 23-27, 1999.

1998 Location Modeling sessions – 45th North American Meetings of the Regional Science Association International, Santa Fe, New Mexico, USA, November 11-14, 1998.

8. University and Department Committees

University of California at Santa Barbara

Awards and Nominations Committee (chair) – Department of Geography (2021-present)

Space Committee – Department of Geography (2021-present)

Dangermond Student Travel Grants Committee – Department of Geography (2020-present)

Dangermond Chair in Conservation Science Search Committee – University (2019-20)

Committee on Courses and General Education – University (Academic Senate) (2019-20)

Graduate Committee (chair) – Department of Geography (2017-21)

GIS Dangermond Endowed Chair Search Committee – Department of Geography (2019-20)

Spatial Data Science Search Committee (chair) – Department of Geography (2017-18, 2018-19)

UCGIS delegate (2017-present)

Central Recruitment Fellowship Committee – University (Graduate Division) (2016-17)

Web subcommittee (chair) – Department of Geography (2016-18)

Web subcommittee – Department of Geography (2018-19)

Chair's Advisory Committee – Department of Geography (2016-17)

Graduate Core Curriculum – Department of Geography (2016-17)

Strategic and FTE Planning – Department of Geography (2016-17)

Strategic Planning – Department of Geography (2018-19)

Computing & Information Systems – Department of Geography (2016)

Visibility/Outreach/Diversity/Development – Department of Geography (2016)

Curriculum – Department of Geography (2016)

Colloquia – Department of Geography (1994-1995)

Drexel University

Data Science Faculty Search Committee (chair) – Department of Information Science (2015)

Undergraduate Curriculum Committee – Department of Information Science (2015)

Strategic Planning Committee – College of Computing and Informatics (2015)

Finance Committee – College of Computing and Informatics (2015)

Arizona State University

UCGIS representative (2014)

Scholarships/Awards Committee – School of Geographical Sciences and Urban Planning (2014)

Executive Committee – School of Geographical Sciences and Urban Planning (2010-2011)

GIS and Spatial Analysis Faculty Search Committee (chair) – School of Geographical Sciences and Urban Planning (2010, 2011)

Ad hoc Bylaws Committee – School of Geographical Sciences and Urban Planning (2009)

Graduate Studies Committee – School of Geographical Sciences and Urban Planning (2009-2014)

Colloquia Committee (chair) – School of Geographical Sciences and Urban Planning (2008-2014)

The Ohio State University

Senate Government Affairs Committee – University Senate (2007-2008)

Personnel Committee – Department of Geography (2006-2008)

Spatial Analysis and Modeling Faculty Search Committee (chair) – Department of Geography (2005)

GIS Faculty Search Committee – Department of Geography (2004)

College of Social and Behavioral Sciences ad hoc Clinical Faculty Committee (2004)

University Scholar Maximus Competition (2003, 2004)

Office of International Affairs Graduate Student Travel Grants (2002, 2003)

Infrastructure Committee (chair) – Department of Geography (2002-2008)

GIScience Faculty Search Committee – Department of Geography (2002)

Graduate Studies Committee – Department of Geography (2001-2004)

Denman Undergraduate Research Forum (2001, 2002)

Speakers Committee – Department of Geography (1999-2002)

9. Workshops

2015 National Academies of Science, Committee on National Statistics. Rationalizing Rural Area Classifications (sponsored by Economic Research Service, U.S. Department of Agriculture). Washington, D.C., USA. April 16-17, 2015.

2010 Santa Fe Institute. Emergent Properties and Resilience of Interacting Networks. Santa Fe, New Mexico, USA. June 21-23, 2010.

2010 National Research Council. Workshop on New Research Directions for the National Geospatial-Intelligence Agency. Washington, D.C., USA. May 17-19, 2010.

10. Outreach, Extension and Continuing Education

Association for Women in Math (UCSB chapter), February 24, 2021.

Laguna Blanca School (high school), Santa Barbara, California. September 2019-June 2020. Introduced GIS and spatial analysis as part of independent study at this local high school.

Brophy College Preparatory (high school), Phoenix Arizona. September 2011-May 2012. Lectures, workshop and tutorials with teachers and students introducing GIS in mathematics, statistics and science courses at this local high school.

Instructor, Geographical methods in public transit planning (sponsored by United Arab Emirates Department of Transport. Abu Dhabi, United Arab Emirates. April 30 – May 1, 2009. The workshop had approximately 40 attendees.

Instructor, Spatial optimization and GIS (sponsored by Università degli Studi di Milano, University of Milan, and Politecnico of Milan). Milan, Italy. January 29 – February 2, 2007. The seminar had approximately 25 researchers and students.

Instructor, Spatial Perspectives on Analysis for Curriculum Enhancement (SPACE) program through Center for Spatially Integrated Social Science (CSISS) - "GIS & Spatial Modeling for Use in Undergraduate Education." Columbus, Ohio, USA (June 28 - July 2, 2004: July 10-15, 2005; June 18-23, 2006; June 18-23, 2007). SPACE and CSISS are funded by NSF and the workshop had approximately 30 U.S. and international participants each year.

Instructor, Center for Spatially Integrated Social Science (CSISS) Workshop - "Accessibility in Space and Time: A GIS Approach." Columbus, Ohio, USA (July 16-20, 2001; July 22-26, 2002; July 7-11, 2003). CSISS is funded by NSF and the workshops had approximately 30 U.S. and international participants each year.

11. Professional Society Membership

American Association for the Advancement of Science
American Association of Geographers
American Planning Association
Association of Collegiate Schools of Planning
Institute for Operations Research and the Management Sciences
North American Regional Science Association
Regional Science Association International

Society of American Foresters
Western Regional Science Association