



Kelly M. Sims

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RESEARCH PROFILE:

Since October of 2008, my work has supported the Department of Energy's GIS spatial research initiatives, with particular emphasis in spatiotemporal population and social dynamics modeling, simulation, and visualization. My research is focused on characterizing the episodic and demographic patterns of populations at multiple geographic scales to inform a variety of applications such as urban resiliency, human health and security, and emergency management and response. Additional scientific pursuits include exploring Volunteered Geographic Information (VGI), imagery analysis, data curation, algorithmic development, and geoportal management to enhance research methods surrounding human dynamics. **I currently hold a security clearance of Q/SCI.**

RESEARCH INTERESTS:

High-Resolution Population Mapping	Geospatial Intelligence
Spatial Demography and Analysis	Open-Source Data Exploitation
Critical Infrastructure Modeling	Big Data Assessment and Management
Coding at Scale	Humanitarian Support

HONORS AND AWARDS:

2020: *UT-Battelle Distinguished Innovation Award*; Oak Ridge National Laboratory

2019: *Issued Copyright Award, LandScan USA 2016*; Oak Ridge National Laboratory

2013: *Outstanding Student Publication Paper Award*; the Department of Geography at The University of Tennessee, Knoxville

PROFESSIONAL EXPERIENCE:

Sep. 2018 – Present

Geospatial Research Scientist: Oak Ridge National Laboratory – Oak Ridge, TN

Supervisor: Marie Urban and Dr. Amy Rose

- Technical Project Lead for ORNL's LandScan Global Population Distribution Database.
 - » Responsible for the research, development, and deployment of human dynamics models and data funded by the National Geospatial-Intelligence Agency (NGA).
 - » Research regional and country specific census and administrative boundary data.
 - » Develop coefficient raster distribution models based on ancillary data.
- Principal for Insight, a Points of Interest (POI) database within ORNL's geospatial-intelligence platform, PlanetSense (PI: Dr. Gautam Thakur).
 - » Produce technical reports of in-depth analysis and assessments of POIs describing the reliability and availability of data for the end-user community.
 - » Maintain direct communication with Sponsors to fulfill project requests and coverage
- Mentor early career staff, ORISE research associates, and subcontractors across multiple projects.
- Publish project methodologies/analysis/research at national conferences and in journal articles.

Dec. 2014 – Sep. 2018

Post-Master's Research Associate: ORISE – Oak Ridge, TN

Mentors: Dr. Gautam Thakur and Eric Weber

- Key contributor in the expansion of the geospatial-intelligence platform, PlanetSense, in its GIS efforts of collecting world-wide VGI points of interest (POI) for use in a WFS service for improved land use mapping.
 - » Produced a dynamically-spaced global geo-grid for PlanetSense dataset curation.
- Principal for developing sub-population distributions in the educational sector (K-12, collegiate, private, daycare) for ORNL's LandScan USA 2016.
- Project Support for ORNL's LandScan Global Population Distribution Database by researching regional and country specific census and administrative boundary data.
- Provide programming and algorithmic development for the deployment of geospatial tools across multiple research efforts.
- Member of a team that rapidly developed several population distribution scenarios that were used operationally for the United States Presidential Inauguration festivities (2012 and 2016).
- Conducted research to improve settlement type classifications for residential population characterization models funded by the Bill & Melinda Gates Foundation.

Aug. 2012 – Dec. 2014

Graduate Research Assistant: The University of Tennessee, Knoxville – Knoxville, TN

Mentors: Dr. Budhendra Bhaduri, David Resseguie, and Dr. Gautam Thakur

- Collected and curated social media data to build small area estimation models depicting spatial distributions during special/episodic events.
- Established a nationwide dataset for national security management of special events scheduled in major metropolitan cities for the National Geospatial-Intelligence Agency (NGA).

Aug. 2009 – Aug. 2012

Post-Bachelor's Research Associate: ORISE – Oak Ridge, TN

Mentors: Eddie Bright and Dr. Amy Rose

- Contributed to the creation of a national geospatial database consisting of schools, daycare facilities, and rail lines for the National Geospatial-Intelligence Agency's (NGA) Homeland Security Infrastructure Program (HSIP).
- Participated in the verification and validation of global populations and sub-national level administrative data for ORNL's LandScan Global Population Distribution Database; handled distribution to U.S. government, and educational licensing of the data.
- Researched and collected GPS coordinates of facilities housing chemicals of interest for the Chemical Security Assessment Tool (CSAT) – CVI Authorized User Certification in 2009.

Jan. 2009 – May 2009

Student Research Assistant: H.E.R.E. at ORNL – Oak Ridge, TN

Mentor: Marie Urban

- Participated in the research and development of ORNL's Population Density Tables (PDT) by collecting open source global demographic and population data, and developed models to produce occupancy estimates for the socio-cultural activities and associated facility spaces that define normal patterns of life.
- Georeferenced and digitized country shapefiles for use with other geographic data.

Oct. 2008 – Dec. 2008

Undergraduate Student Internship: H.E.R.E. at ORNL – Oak Ridge, TN

Mentors: Dr. Bruce Ralston and Eddie Bright

- Explored various population distribution patterns between business and leisure travelers to Las Vegas, Nevada.

EDUCATION:

Aug. 2012 – Dec. 2014

M.S. Geography & GIS: The University of Tennessee, Knoxville

- *Thesis (2014): Integrating Social Media in the Development of a Special Event Population Dynamics Model*

Aug. 2005 – May 2009

B.A. Geography: The University of Tennessee, Knoxville

- Minor: Tourism and Hospitality Management

SKILLS & ABILITIES:

Geographic Data Science Expertise:

- Trained in the acquisition, interpretation, and production of geographic information
- Efficient in data fusion methods/techniques with respect to census and administrative boundary data, geospatial data conflation, and exploitation of volunteered geographic information
- Capable of producing hierarchical spatial data structures to increase spatial precision mapping
- Experienced in remote sensing applications, imagery analytics, GPS, and grid referencing

Computer Skills

- 10+ years working with commercial and open-source GIS software packages; ArcGIS, QGIS
- Daily interaction with Python for algorithmic development
- A working understanding of database management with SQL software and programming languages; PostgreSQL/PostGIS, as well as R, WMS/WFS services, RESTful API

Teamwork and Communication

- Actively engaged across team and group projects:
 - » Geographic Data Sciences Team within GIST: provided GIS support of time-lapsed power outage reporting from social media during Hurricane Matthew.
 - » Infrastructure Data Team within GIST: co-lead the development efforts to build a national geospatial database for Public and Private College campuses.
 - » Computational Data Analytics (CDA) Group: curation and analysis of Facebook Check-in and Twitter data
 - » *Outside of Lab*: researched and modeled populations at risk in downtown San Francisco, California for Pacific Gas and Electric (PG&E) Company.
- Provided guidance to Post-Master/Bachelor and summer interns across various research efforts
- Extensive experience in public speaking and excellent interpersonal skills

INVENTION DISCLOSURES:

R. N. Stewart, G. S. Thakur, M. L. Urban, **K. M. Sims**, K. A. Sparks (2018) *Using POI Hours of Operation to Estimate Population Modeling and Land Use*, Oak Ridge National Laboratory, 201804229, DOE S-138,900.

K. M. Sims, K. A. Sparks, R. N. Stewart, G. S. Thakur, and M. L. Urban (2017) *Creation and Deployment of a Points of Interest Mapping Data Layer to Address Data Set Curation*, Oak Ridge National Laboratory, 201703980, DOE S-138,644.

M. M. Asfaw, R. N. Stewart, **K. M. Sims**, K. A. Sparks, G. S. Thakur, and M. L. Urban (2017) *Entity Categorization Through Text Classification and Natural Language Processing*, Oak Ridge National Laboratory, 201703978, DOE S-138,642.

PEER-REVIEWED PUBLICATIONS:

- G. S. Thakur, **K. M. Sims**, C. M. Rittmaier, J. D. Bentley, D. De, J. Fan, R. L. Palumbo, J. R. McGaha, P. J. Nugent, T. Liu, D. T. Sheldon, B. Eaton, J. A. Burdette, J. D. Wray, K. A. Sparks (2021) "Accelerated Assessment of Critical Infrastructure in Aiding Recovery Efforts During Natural and Human-made Disaster." Accepted, awaiting publication for the 29th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, (Beijing, China).
- K. A. Sparks, **K. M. Sims**, G. S. Thakur, M. L. Urban (2019) "Modeling Building Use and Population Distribution Opportunity Using Open Geosocial Data in Urban Areas." *GeoComputation 2019*, figshare. Conference contribution. <https://doi.org/10.17608/k6.auckland.9870140.v2>.
- K. M. Sims**, G. S. Thakur, K. A. Sparks, M. L. Urban, A. N. Rose, and R. N. Stewart. "Dynamically-Spaced Geo-Grid Segmentation for Weighted Point Sampling on a Polygon Map Layer." *GIScience 2018: Proceedings of the 10th International Conference on Geographic Information Science, Melbourne, Australia*.
- G. S. Thakur, **K. M. Sims**, H. Mao, J. O. Piburn, K. A. Sparks, E. M. Weber, B. L. Bhaduri, "Utilizing Geo-Location Sensors and Social Media Insight for Research in Population Dynamics and Land Classification", in *Human Dynamics Research in Smart and Connected Communities*, pages 13–40. Springer International Publishing, Cham, 2018. doi:10.1007/978-3-319-73247-3.
- K. M. Sims**, E. M. Weber, B. L. Bhaduri, G. S. Thakur, and D. R. Resseguie, "Application of Social Media Data to High-Resolution Mapping of a Special Event Population", in *Advances in Geocomputation*, pp. 67-74. Cham: Springer International Publishing, 2017. doi: 10.1007/978-3-319-22786-3_7.
- G. S. Thakur, B. L. Bhaduri, J. O. Piburn, **K. M. Sims**, R. N. Stewart, and M. L. Urban, "PlanetSense: A real-time streaming and spatio-temporal analytics platform for gathering geo-spatial intelligence from open source data," in *Proceedings of the 23rd SIGSPATIAL International Conference on Advances in Geographic Information Systems, GIS '15*, (New York, NY, USA), pp. 11:1-11:4, ACM, 2015.
- W. C. Jochem, **K. M. Sims**, E. A. Bright, M. L. Urban, A. N. Rose, P. R. Coleman, and B. L. Bhaduri, "Estimating traveler populations at airport and cruise terminals for population distribution and dynamics," *Natural Hazards*, vol. 68, no. 3, pp. 1325-1342, 2013.

PEER-REVIEWED PROFESSIONAL CONFERENCES:

- K. A. Sparks, **K. M. Sims** (presenter), G. S. Thakur, M. L. Urban (2019) "Modeling Building Use and Population Distribution Opportunity Using Open Geosocial Data in Urban Areas", *GeoComputation 2019*, Queenstown, New Zealand.
- K. M. Sims**, G. S. Thakur, K. A. Sparks, M. L. Urban, A. N. Rose, and R. Stewart (2018) "Dynamically-Spaced Geo-Grid Segmentation for Weighted Point Sampling on a Polygon Map Layer", *GIScience 2018*, Melbourne, Australia.
- K. M. Sims**, G. S. Thakur, K. A. Sparks (2017) "Using Social Media as a Supplemental Points of Interest Layer to Improve Ambiguous Parcel Data," *American Geophysical Union (AGU) Fall Meeting*, New Orleans, LA.
- K. M. Sims**, E. M. Weber (presenter), B. L. Bhaduri, G. S. Thakur, D. R. Resseguie (2015) "Application of social media data to high resolution mapping of a special event population," *Geocomputation*, Dallas, TX.
- K. M. Sims**, B. L. Bhaduri, E. M. Weber (2015) "Integrating Social Media in the Development of a Special Event Population Dynamics Model," *International Conference on Location-Based Social Media (ICLSM) Data*, Athens, GA.

PRESENTATIONS & MEETINGS:

- C. M. Rittmaier, **K. M. Sims**, G. S. Thakur, J. D. Bentley, D. J. Wray, K. A. Sparks, D. T. Sheldon, S. Walters (2021) "Port of Beirut Explosion: A Case Study in Applying Comprehensive Quality Assessments to Determine Point of Interest (POI) Reliability in Disaster Areas," *American Association of Geographers (AAG) Annual Meeting*, Seattle, WA (virtual).
- J. D. Bentley, C. M. Rittmaier, D. T. Sheldon, **K. M. Sims**, G. S. Thakur, D. J. Wray (2021) "A Spatio-semantic Approach to Quality Control of Global Point of Interest Data," *American Association of Geographers (AAG) Annual Meeting*, Seattle, WA (virtual).
- K. M. Sims**, K. A. Sparks, G. S. Thakur (2018) "How User-Generated Content (UGC) Helps Identify Commercial and Residential Land Use for Developing Daytime and Nighttime Population Distributions," *American Association of Geographers (AAG) Annual Meeting*, New Orleans, LA.
- K. A. Sparks, **K. M. Sims** (presenter), G. S. Thakur, M. L. Urban, and R. Stewart (2018) "Estimating Building Use and Population Distribution Opportunity in Urban Areas," *Urban Dynamics Institute – Scientific Advisory Board (SAB) Poster Session*, Oak Ridge, TN.
- K. M. Sims**, E. M. Weber, A. N. Rose (2017) "Fusing national facility data with parcel data to map daytime subpopulations in the USA," *American Association of Geographers (AAG) Annual Meeting*, Boston, MA.
- K. M. Sims**, E. M. Weber, A. N. Rose (2017) "Fusing national facility data with parcel data to map daytime subpopulations in the USA," *Urban Dynamics Institute – Scientific Advisory Board (SAB) Poster Session*, Oak Ridge, TN.
- K. M. Sims**, E. M. Weber, A. N. Rose (2017) "Fusing national facility data with parcel data to map daytime subpopulations in the USA," *5th Annual Oak Ridge Postgraduate Association (ORAU) Research Symposium Poster Session*, Oak Ridge, TN.
- K. M. Sims**, E. M. Weber, J. J. Moehl, J. Yuan (2016) "Combining Automated and Manual Segmentation Techniques for Settlement Characterization," *American Association of Geographers (AAG) Annual Meeting*, San Francisco, CA.
- K. M. Sims**, B. L. Bhaduri, E. M. Weber, G. S. Thakur, D. R. Resseguie (2016) "Episodic Population Dynamics Supported by VGI and UGC," *Urban Dynamics Institute – Scientific Advisory Board (SAB) Poster Session*, Oak Ridge, TN.
- K. M. Sims**, B. L. Bhaduri, E. M. Weber (2015) "Integrating Social Media in the Development of a Special Event Population Dynamics Model," *American Association of Geographers (AAG) Annual Meeting*, Chicago, IL.
- K. M. Sims**, B. L. Bhaduri (2014) "Integrating Social Media in High-Resolution Population Dynamics Model: A Sporting Event Case Study," *American Association of Geographers (AAG) Annual Meeting*, Tampa, FL.
- K. M. Sims** (2013) "ORNL's Special Event GIS Database: Automating High Resolution Population Estimation," *American Association of Geographers (AAG) Annual Meeting*, Los Angeles, CA.
- K. M. Sims**, E. A. Bright, A. N. Rose (2012) "Raster Analysis using the LandScan Population Distribution Database: Issues & Solutions," *American Association of Geographers (AAG) Annual Meeting*, New York City, NY.
- K. M. Sims**, E. A. Bright, B. L. Bhaduri (2011) "United States Ports and their Tourists: A look at unaccounted population influxes," *American Association of Geographers (AAG) Annual Meeting*, Seattle, WA.
- K. M. Sims**, E. A. Bright, B. L. Bhaduri (2010) "Seasonal Population Variations in Popular U.S. Cities," *American Association of Geographers (AAG) Annual Meeting*, Washington, D.C.

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS:

American Association of Geographers (2010-present)

American Geophysical Union (2017-present)

Women's Alliance Council (WAC) member, ORNL (2017-present)