Marilyn O. Ruiz
University of Illinois, College of Veterinary Medicine
Department of Pathobiology
2001 South Lincoln Avenue
Urbana, Illinois 61802
217-265-5115
moruiz@illinois.edu

I. PERSONAL HISTORY AND PROFESSIONAL EXPERIENCE

A. Educational Background

1982	Bachelor of Arts in Geography, College of Liberal Arts and Sciences, University of Illinois
1985	Master of Arts in Geography, College of Liberal Arts and Sciences, University of Illinois
1995	Doctor of Philosophy in Geography, College of Liberal Arts and Sciences University of Florida

B. Academic Positions since Final Degree

1994 -1997	Assistant Professor. Department of Geography. Florida State University, Tallahassee, FL
2001 – 2004	Clinical Assistant Professor. Veterinary Diagnostic Laboratory (50%) and Center for Zoonoses Research (50%), 12 month appointment, 2001-02, 9-month 2003-2004. College of Veterinary Medicine, University of Illinois, Urbana, IL.
2004 – present	Clinical Assistant Professor. Department of Pathobiology (50%) and Center for Zoonoses Research (50%), 9 month appointment. College of Veterinary Medicine, University of Illinois, Urbana, IL.

C. Other Professional Employment

1985 – 1987	Owner. O'Hara Cartographic Services, Champaign, IL,
1987 – 1990	Geographic Information Systems Specialist. U.S. Army Corps of Engineers Construction Engineering Research Laboratory, Champaign, IL
1997 – 2001	Principal Investigator. U.S. Army Corps of Engineers Construction Engineering Research Laboratory, Champaign, IL

D. Honors, Recognitions, and Outstanding Achievements

1983-84	University Fellow, University of Illinois
1990	Recognized for outstanding contributions for development of training curriculum and data development for the Geographic Resources Analysis Support System
1991-93	Grinter Fellow, University of Florida
1993	Graduate School Social Science and Humanities Fellowship, University of Florida
1997 & 1999	Certificate of recognition from the Legal Environmental Assistance Foundation in Tallahassee, FL for mapping and analysis support
2006-2007	National Center for Supercomputer Applications Faculty Fellow

E. <u>Invited Lectures and Invited Conference Presentations</u>

1. "GIS in Higher Education". North Florida URISA Conference. Tallahassee, Florida, October, 1996
2. "GIS as a Bridge over the Data Gap Between People and Their Environments." The University of Central Florida, College of Engineering, Geographical Information Systems: Current and Future Trends, Orlando, Florida, June, 1996

3. "The Future of Urban Geography" Panel Presentation. Annual Meeting of the Association of American Geographers, New York, NY 27 Feb, 2001.
4. "Geospatial Infrastructure and Utility in Response to Bioterrorism" prepared for the workshop: The Geographical Dimensions of Terrorism: A Research Agenda for the Discipline, Association of American Geographers and National Science Foundation, January 2002.
5. "Geographic Information Systems and the Monitoring of Vector-Borne Disease", McDonough County Health Department Conference on Vector-Borne Disease, Nov, 2002, Macomb, IL.
6. "Spatial mapping and data collection for a WNV disease ecology study", Illinois Mosquito and Vector Control Association Meeting, November 2004, Champaign, Illinois.
7. "West Nile Virus: Eco-epidemiology of Disease Emergence in Urban Areas" University Consortium for Geographic Information Science Congressional Breakfast. Feb 2005, Washington, DC.
8. "West Nile virus and landscape characterization in Chicago and Detroit" for the Chicago Department of Public Health Epidemiologist General Meeting, Nov 2005, Chicago, IL
9. "GIS for Health Advocacy" ESRI Health GIS Conference. October 2005, Chicago, IL.
10. "West Nile virus: Eco-epidemiology of disease emergence in urban areas". Illinois Mosquito and Vector Control Association Meeting. Nov 2005, Springfield, IL.
11. "West Nile virus: A Geographical Investigation". Department of Pathobiology Seminar Series. Sep 2007, Urbana , IL
12. "Precipitation and West Nile virus infection". Illinois Mosquito and Vector Control Association Meeting. Nov 2007, Bloomington, IL.
13. "Space-time patterns of mosquitoes and human illness". Illinois Mosquito and Vector Control Association Meeting. Nov 2008, Peoria, IL.

F. Offices Held in Professional Societies

1. Open GIS Consortium, Committee Chair, Spatial Decision Support Group, 2000-2001.
2. Urban and Regional Information System Association, Conference planning committee leader for Health and Public Safety area, 2001-2002.
3. University Consortium of Geographic Information Science, University of Illinois Lead Delegate, 2005-2007.
4. Urban and Regional Information System Association Program Co-chair and Chair of the GIS in Public Health Conference, from 2006 to 2009

G. Editorships of Journals or Other Learned Publications

None

H. Grants Received

1. **M. Ruiz, PI**. Data Management Plan and User Documentation to Support the Land Management System. Army Corps of Engineers, Construction Engineering Research Laboratory. 2002. $7,000.
2. U. Kitron, PI. **M. Ruiz, Co-PI**. West Nile Virus in Illinois, Illinois Department of Public Health. 1/2001-12/2002. $25,000.
3. **M. Ruiz, PI**. Spatial Model and GIS Development to Support Archeological Predictive Models for Fort Irwin, CA. Army Corps of Engineers, Construction Engineering Research Laboratory. 11/2001 – 7/2003, $55,000
4. U. Kitron, PI, **M. Ruiz, Co-PI.** GIS and Spatial Analysis Workshop. Venture Technology funding through the State of Illinois. 11/2001-7/2002. $10,000.
5. V. Beasley, PI, **M. Ruiz, Co-PI**. State of Illinois Animal and Ecosystem Health Analysis System. Venture Technology funding through the State of Illinois. 11/2002 – 7/2003, $25,000

6. **M. Ruiz, PI.** Simulation Generic Use-case Prototype. Army Corps of Engineers, Construction Engineering Research Laboratory. $11,812
7. **M. Ruiz, PI.** Methods for regionalization and risk mapping: Orbivirus epidemiology as a model. 10/2003 – 10/2004, $28,000, Subcontract with the University of Minnesota on funds from USDA.
8. **M. Ruiz, PI.** Landscape Characterization and Spatial Model Development for Improved Cultural Resource Management at Fort Bragg, North Carolina. Army Corps of Engineers, Construction Engineering Research Laboratory. 9/2002 - 1/2005, $255,114
9. U. Kitron, PI. J. Brawn, T. Goldberg, **M. Ruiz** and E. Walker, Co-PI. West Nile Virus: Eco-Epidemiology of Disease Emergence in Urban Areas. NSF/NIH Ecology of Infectious Disease program, 11/1/2004 – 10/31/2007, $1,179,179
10. **Ruiz, M.O.** Evaluation of Critical Spatial Elements for Animal Disease Surveillance in Illinois. National Center for Supercomputer Applications Faculty Fellowship funding, 2006-07. $29,867.
11. **M. Ruiz, PI.** K. Kunkel, M. Sivapalan, E. Walker, Co-PI. Hydrology, Catch Basin Biology, Mosquitoes and West Nile Virus in Northeast Illinois. Adaptive Infrastructure Sensing and Information Systems Initiative, University of Illinois and National Center for Supercomputer Applications. 8/15/2007-8/15/2009. $65,416.
12. N. Mateus-Pinilla, PI. **M. Ruiz,** J. Diffendorfer, and J. E. Novakofski, Co-PI. Genetics and Geography of Chronic Wasting Disease in White-tailed Deer in Illinois and Wisconsin. U.S. Geological Survey. 10/1/2007-10/1/2008. $40,000
13. **M. Ruiz, PI,** Eco-epidemiology of Disease Emergence in Urban Areas II, Subaward from University of Wisconsin, Funding from the NSF/NIH Ecology of Infectious Disease program, 9/1/2008-8/31/2012. $594,888.
14. J. Braden, P.I. and **M. Ruiz, Co-PI.** Estimating the Effects of Brownfields Redevelopment on Property Values and Public Health Outcomes. U.S. Environmental Protection Agency, Research and Technical Assistance Project. 4/2009 – 5/2013. $343,104.
15. N. Mateus-Pinilla, P.I., **M. Ruiz** and J. Novakofski, Co-PI. Temporal changes in site-specific population structure and CWD prevalence in IL CWD endemic areas. U.S. Geological Survey. 10/1/2008-10/1/2009. $25,000.

Contracts for Service through the GIS and Spatial Analysis Laboratory

1. Spatial Analysis and Implementation of Geographic Information Technology in Champaign County, Illinois. Funded by Champaign-Urbana Public Health District and the Champaign County Department of Public Health, David Remmert, Epidemiologist. 11/2004 – 6/2005, $12,000
2. Maps of DeWitt and Piatt County. Funded by DeWitt-Piatt Bi-County Health Department, David Remmert, Administrator. 11/2005. $230
3. GIS Workshops in Kenya and Brazil. Funded by Center for Global Health & Diseases, Charles King, PI. 6/2005-10/2005, $7000
4. Geospatial Infrastructure and Disease Surveillance at Local Health Departments in Illinois. Funded by the Illinois Department of Public Health, Phil Pittman, IDPH GIS Coordinator. 7/1/2006-5/30/2007. $27,000
5. GIS and Spatial Analysis for Chronic Wasting Disease. Funded by Illinois Natural History Survey, Nohra Mateus-Pinillas, Epidemiologist 10/2006 – 7/2007. $28,240
6. GIS and Spatial Analysis for Chronic Wasting Disease. Funded by Illinois Natural History Survey, Nohra Mateus-Pinillas, Epidemiologist. 8/2007 – 2/2008. $12,240
7. Computer and spatial services for analysis of Chagas Disease. Funding from NSF, U. Kitron, PI. $9100

8. Spatial Services for the Champaign-Urbana Public Health District. Funded by the CUPHD, Awais Vaid, Epidemiologist, 1/2008 – 7/2008. $7500
9. GIS and Spatial Analysis for Chronic Wasting Disease. Funded by the Illinois Department of Natural Resources and subcontracted through Illinois Natural History Survey, Nohra Mateus-Pinillas, Epidemiologist. 3/2008-6/2009. $34,000
10. Spatial Services and Web-mapping for the Champaign-Urbana Public Health District. Funded by the CUPHD, Awais Vaid, Epidemiology, 8/2008-7/2009. $15,540.
11. Geographic analysis of the prevalence of human and canine blastomycosis in Illinois, 2001-2007. Funds from U of Illinois, John A. Herrmann, PI. 1/2009 – 5/2009. $3000.
12. Support for ArcPad GPS-based system for field data collection. Funds provided by Compass Systems, John T. Britt, PI. 12/2008-12/2009. $5000.

I. Review Panels (e.g., for Governmental Agencies, Educational Institutions)

1. NIH Scientific Review group for the MBRS program in 2006
2. Sector Applications Research Program, NOAA, Office of Global Programs, 2006 Program Review.
3. 2004 Moldovan-U.S. Bilateral Grants Program of the U.S. Civilian Research and Development Foundation
4. 2009 Jacques May Dissertation award review for the Association of American Geographers.

II. PUBLICATIONS AND CREATIVE WORKS

# Denotes a publication derived from the candidate's thesis.
* Denotes publication that has undergone stringent editorial review by peers.
+ Denotes publication that was invited and carries special prestige and recognition.

A. Doctoral thesis title

A Model of Error Propagation from Digital Elevation Models to Viewsheds

B. Books Authored or Co-Authored

C. Books Edited or Co-Edited

D. Chapters in Books (in print or accepted)

1. * + **Ruiz, M.O.** Spatial Surveillance of and Response to Biological Threats. Ch 6.3 in *The Geographical Dimensions of Terrorism (*Cutter, S. L., D.B. Richardson and T.J. Wilbanks, eds): 199-203. Routledge: New York and London, 2003.
2. * McDonald, T., Bullard, J. Britt, and **M. Ruiz**. Identification of geologic variables in development of an archeological predictive model for management of military lands in desert terrains. Ch 20 In : *Studies in Military Geography and Geology* (Caldwell, D.R., J. Ehlen and R.S. Harmon, eds): 259-270. Kluwer Academic Publishers: Dordrecht, 2004
3. Albihn, A., **M.O. Ruiz,** ad H. Gustafsson. 2009. Impact of climate changes on the health of wildlife, domestic animals and ecosystems. Module 4 in Ecosystem Health and Sustainable Agriculture Higher Educational Programme for Northwestern Russia, Belarus and Ukraine (20pp).

E. Monographs

1. **Ruiz, M.O.** 2005. Implementation of Geographic Information Technology and Spatial Analysis: A report to the Champaign-Urbana Public Health District. Monograph.
2. Wuebbles, D & K. Hayhoe. 2007. Climate Change and Chicago: Projections and Potential Impacts. Ch 4: Projected Changes in Health and Air Quality; Part C: Changes in Vector-borne Diseases.
3. **Ruiz, M.O.** and W.M. Brown. 2008. Analysis and recommendations for data flow in the HAMMER data collection system. For Compass Systems, Inc.

F. Articles in Journals

1. Thrall, G. and **M. Ruiz**, C. Sidman and S. Elshaw-Thrall, Using GIS Tools to Analyze and Visualize Spatial Phenomena *Geo-Info Systems* May, 1993
2. Thrall, G. and **M. Ruiz**, A History of Implementing an Urban GIS: Part I *Geo-Info Systems* 4(7):50-58, July 1994.
3. Thrall, G. and **M. Ruiz**, A History of Implementing an Urban GIS: Part 11. *Geo-Info Systems* 4(9), October 1994.
4. *# **Ruiz, M.** A Causal Analysis of Error from USGS Digital Elevation Models. *Transactions in GIS* 2(1):85-94, 1997.
5 **Ruiz, M.O.** 2005. Geocoded Photography. *Geospatial Solutions* 15 (5): 37-40.
6. * **Ruiz, M.O.** and D. Remmert. 2004. A Local Department of Public Health and the Geospatial Data Infrastructure. *Journal of Medical Systems.*28 (4): 385-395.
7. * **Ruiz, M.O.**, C. Tedesco, T. McTighe, and U. Kitron. 2004. Environmental and Social Determinants of Human Risk for West Nile Virus in the Chicago Region, 2002. 3:8 (April 20,

2004) *International Journal of Health Geographics*. 2004. On-line at http://www.ij-healthgeographics.com/content/3/1/8

8. * Reeder A.L., **M.O. Ruiz**, A. Pessier, L.E. Brown, J.M. Levengood, C.A. Phillips, M.B. Wheeler, R.E. Warner, and V.R. Beasley. 2005. Intersexuality and the Cricket Frog Decline: Historic and Geographic Trends *Environ Health Perspect*, 113(3): 261-65.
9. * **Ruiz, M.O. ,** E.D. Walker, E.S. Foster, L.D. Haramis, U.D. Kitron. 2007. Association of West Nile virus illness and urban landscapes in Chicago and Detroit. *International Journal of Health Geographics.* 6:10.
10. * Hamer, G.L., E.D. Walker, J.D.Brawn, S.R.Loss, **M. O. Ruiz**, T.L.Goldberg, A.M. Schothoefer, W.M. Brown, E. Wheeler, U.D. Kitron. 2007. Rapid amplification of West Nile virus: the role of hatch year birds. Vector-Borne and Zoonotic Diseases. . 8(1): 57-68 Doi: 10.1089/vbz.2007.0123
11. * Hamer, G.L., U.D. Kitron, J..D. Brawn, S.R. Loss, **M. O. Ruiz**, T.L. Goldberg, E.D. Walker. 2008. Culex pipiens (Diptera: Culicidae): a bridge vector of West Nile virus to humans. Journal of Medical Entomology 45 (1): 125-128.
12. * Bertolotti, L., U.D. Kitron, E.D. Walker, **M.O. Ruiz**, J.D. Brawn, S.R. Loss, G.L. Hamer, T.L. Goldberg. 2008. Fine-scale genetic variation and evolution of West Nile virus in a transmission "hot spot" in suburban Chicago, USA. Virology.May 10;374(2):381-9
13. * Kelly, A., N. Mateus-Pinilla, J. Diffendorfer, E. Jewell, **M. Ruiz**, J. Killefer, P. Shelton, T. Beissel, J. Novakofski. 2008. Prion sequence polymorphisms and Chronic Wasting Disease resistance in Illinois White-tailed deer (Odocoileus virginianus). Prion 2 (1) Print ISSN 1933-6896; Online ISSN 1933-690X
14. * Loss, S.R., G.L. Hamer, E.D. Walker, **M.O.Ruiz**, T.L. Goldberg, U.D. Kitron, J.D. Brawn. 2009. Avian host community structure and prevalence of West Nile virus in Chicago, Illinois. Oecologia. 159 (2); 415-424.
15. * Loss, S. R., G.L. Hamer, T.L. Goldberg, **M.O. Ruiz**, U.D. Kitron, E. D. Walker, J.D. Brawn. 2009. Nestling passerines are not major hosts for West Nile virus in Chicago, Illinois. Vector-Borne and Zoonotic Diseases. 9 (1):13-18.
16. * Wrobel, L, J.K. Whittington, C. Pujol, S-H. Oh, **M.O. Ruiz**, M.A. Pfaller, D.J. Diekema, D.R. Soll, L.L. Hoyer. 2008. Molecular phylogenetic analysis of a geographically and temporally matched collection of *Candida albicans* isolates from humans and non-migratory wildlife in Central Illinois. Eukaryotic Cell. 7 (9): 1475-1486.
17. * Messina, J., W.M Brown, U.D. Kitron and **M.O. Ruiz**. 2009. West Nile virus in the greater Chicago area, 2002-2006: changing patterns of human illness and social and environmental determinants of risk (Under revision. URISA Journal)
18. * Hamer, G.L., U.D. Kitron, T.L. Goldberg, J.D. Brawn, S.R. Loss, **M.O. Ruiz**, D.B. Hayes, E.D. Walker. 2009. Host selection by *Culex pipiens* and West Nile virus amplification. American Journal of Tropical Medicine and Hygiene. 80 (2): 268-78.
19. * Loss, S.R., **M.O. Ruiz**, J.D. Brawn. 2009. Relationships between avian diversity, neighborhood age, income, and environmental characteristics of an urban landscape. Biological Conservation. 142 (11): 2578-2585.

G. Creative Works

1. * + Clennon, J., U. Kitron, A. Lippold, T. McTighe, D. Norris, and **M. Ruiz.** 2004. West Nile Virus in Illinois – 2001 and 2002. Set of Maps In *GIS – The Language of Geography ESRI Map Book Volume Nineteen* (N. Sappington, ed): 59. United States: ESRI Press.

H. Bulletins, Reports, or Conference Proceedings

1. J. Messersmith and **M. Ruiz**, Cartographic Issues in the Development of a Digital GRASS Database, USACERL Special Report N-90/16. September, 1990.
2. **Ruiz, M**. 1991. GIS in Higher Education Symposium: notes and observations from selected sessions, In *GlS Curricula, Course Outlines and Lab Exercises.* Edited by R.T. Aangeenbrug, M. Hafen and C. Knick. Tampa, Florida: World Computer Graphics and U. of South Florida.
3. **Ruiz, M.** 1996. GIS: A Tool for Needs Assessment and Program Evaluation. Educational materials prepared for the Southeast Evaluation Association. Tallahassee, FL.
4. Schreiner F, and **M. Ruiz**. 2000 Building a Distributed Data Repository Using ArcSDE. *Proceedings of the 2000 ESRI International User Conference*. San Diego, CA. 28 June 2000.
5. **Ruiz, M.** Geospatial Data Repository: Sharing Data Across the Organization and Beyond. ERDC/CERL Technical Note 01-1 February, 2001.
6. **Ruiz, M.**, D. Morrison, D. Bouwman, K. McNinch, F. Schriener and S. Forbes. Geospatial Data Enterprise Repository: A Report on the Prototype for Fort Hood, Texas. ERDC Technical Report, May 2001.
7. **Ruiz, M.**, G. Smith, R. Sheeri, and D. Morrison. "Military Digging Permit Process Goes Geospatial". *Proceedings of the 2001 ESRI International User Conference.* San Diego, CA. July, 2001. http://www.esri.com/library/userconf/proc01/professional/abstracts/a200.html
8. **Ruiz, M. O.** The Development of Testing of an Archeological Predictive Model for Fort Irwin, CA. U.S. Army Corps of Engineers ERDC/CERL. Accepted Sep 2003.
9. Meyer, W and **M. Ruiz**. Data Management of Watershed Information and Data Enterprise Repository Implementation at Fort Hood, Texas. Report Number ERDC/CERL TR-03-6, 2003
10. McDonald, E., T. Bullard, T. Britt, M.O. Ruiz. Identification of Geologic Variables in Development of an Archeological Predictive Model for Management of Military Lands in Desert Terrain. *Proceedings of the International Conference on Military Geoglogy and Geography. June 2003.*
11. * **Ruiz, M.O**., A.J. Wolf, C. Tedesco & U. Kitron. West Nile virus risk in Illinois. In *Proceedings of GISVET'04: Second International Conference on the Applications of GIS and Spatial Analysis to Veterinary Science* (Durr, P.A. and S.W. Martin, eds): 59 – 61. Veterinary Laboratories Agency: Weybridge, England, 2004.
12. **Ruiz, M. O.** and D. Leigh**.** Landscape Characterization and Spatial Model Development for Improved Cultural Resources Management at Fort Bragg, NC. U.S. Army Corps of Engineers ERDC/CERL. July 2005.
13. **Ruiz, M.O.** W.M. Brown & J. Clennon. Weather conditions and West Nile virus in Illinois. *Proceedings of 2006 ESRI International User Conference.* San Diego, CA. August 2006. http://gis2.esri.com/library/userconf/proc06/papers/abstracts/a1458.html
14. Escamilla, V. and **M.O. Ruiz.** 2006. Proposed Location for a New Champaign-Urbana District Public Health Facility. A report to the Champaign-Urbana Public Health District.
15. Messina, J., W.M Brown and **M.O. Ruiz**. West Nile virus in the greater Chicago area, 2002-2006: changing patterns of human illness and social and environmental determinants of risk. *Proceedings of the URISA GIS in Public Health Conference.* New Orleans, LA. May 2007.

I. Abstracts

1. **Ruiz, M.O.** A Method of measuring spatial differences in fertility. Annual Florida-Georgia Conference, Gainesville, FL. Feb 1993.

2. **Ruiz, M.O.** Error propagation from DEMs to Viewsheds. Association of American Geographers Annual Meeting. San Francisco, CA. Apr 1994.
3. **Ruiz, M.O.** & A. Walker. GIS in Health Care. Sharing Solutions Conference, Florida's Health Start. Orlando, FL. Nov 1994.
4. **Ruiz, M.O.** Geographic aspects of fertility. Association of American Geographers Annual Meeting. Chicago, IL. Mar 1995.
5. **Ruiz, M.O.** GIS and Health Geographics. GIS/LIS 1997, Cincinnati OH, Oct 1997.
6. **Ruiz, M.O.** A Surface model approach to the exploration of spatial patterns of fertility. Association of American Geographers Annual Meeting. Fort Worth, TX. Apr 1997.
7. **Ruiz, M.O.** Report Card on Equity. The Effect of scale on an analysis of vocational rehabilitation benefits to Whites and Blacks. Southeast Division of the Assoication of American Geographers Annual Meeting, Memphis, TN, Nov 1998.
8. **Ruiz, M.O.** Real Time Geocoding Improves Trip Diary Survey Data. URISA Annual Meeting, Chicago, IL, May 2000.
9. **Ruiz, M.O.,** F. Grobler, R. Kress. Geospatial Data Repository Design. CADD-GIS Symposium. St. Louis, MO. Nov. 2000
10. Schriener, F. & **M. O. Ruiz**. Building an Internet based Data Enterprise Repository with SDE and ArcIMS. ESRI International User Conference. San Diego, CA. July 2000.
11. **Ruiz, M.O.** Y2K and the End of GIS as We Know It? Association of American Geographers Annual Meeting. New York, NY. Mar 2001.
12. **Ruiz, M.O.,** G. Smith, D. & Morrison, Military Dig Permit Process Goes Geospatial. . ESRI International User Conference. San Diego, CA. July 2001.
13. **Ruiz, M.O.,** T. Britt, D. Gundrum, E. McDonald, T. McTighe. Geostatistics for an Archeological Site Potential Model. ESRI International User Conference. San Diego, CA. July 2002.
14. Britt, T., **M.O. Ruiz,** & E. McDonald. Archeological Favorability Characteristics in the North-Central Mohave Desert: Trends in Site Patterning and Geomorphic Factors Affecting Lifeways. Great Basin Anthropological Conference. Elko, NV. Oct.2002.
15. **Ruiz, M.** & U. Kitron. Vector-borne Diseases in the North Central US: from Malaria to Lyme to West Nile virus. AGU Chapman Conference on Ecosystem Interactions with Land Use Change. June 2003.
16. Britt, T. Synchronizing Cultural Resource Management Proceses at Ft. Irwin National Training Center, California. Western Pennsylvania GIS Conference. Sep 2003.
17. **Ruiz, M.** & T. Britt. Cultural Resource Management on a Military Installation: from Database to Modeling. URISA Annual Conference. Atlanta, GA. Oct 2003.
18. **Ruiz, M.O.,** Clennon, J., U.Kitron, T.McTighe, C. Tedesco, A. Wolf. Spatial and Space-time Clusters of West Nile Virus in Illinois, 2002. URISA Annual Meeting, Atlanta, GA. Oct 2003.
19. Kirby, R.S. & **M.O. Ruiz**. Interpreting the National Pattern of Certified Nurse Midwife-Attended Deliveries in the Year 2000", 9th Annual Maternal and Child Health Epidemiology Conference, Tempe, AZ, Dec 2003
20. **Ruiz, M.O.** C. Tedesco, T. McTighe, C. Austin, & U. Kitron. Spatial Clustering of West Nile Virus Cases in the Chicago 2002 Outbreak. Association of American Geographers Annual Meeting. Philadelphia, PA. Apr 2004.
21. **Ruiz, M.O.,** A.J. Wolf, C. Tedesco, U. Kitron. West Nile Virus Risk in Illinois. GISVET. Guelph, ON. Jun 2004.
22. **Ruiz, M.O.,** T. McTighe, S. Yang, T.Britt, D. Norris, E. McDonald & T. Bullard. An Archeological Predictive Model for Fort Irwin, California: an approach to model development and technology transfer. Poster at Desert Surficial Processes and Landscape Dynamics on Military Lands. Zzyzx, CA. Sep 2004,

21. Britt, T. & **M.O. Ruiz.** A Site Concentration Approach to Suitability Mapping and Modeling. CADD-GIS Symposium. Nov 2004.
22. **Ruiz, M.O.** Patterns of Persistence and Change: West Nile virus and St. Louis encephalitis virus in Cook and DuPage count, Illinois, in 1975 and 2002. Association of American Geographers Annual Meetings, Denver, CO. Apr 2005.
23. **Ruiz, M.O.,** E. Walker & U. Kitron. Urban Landscapes and West Nile Virus in the Upper Midwest. International Medical Geography Symposium. Fort Worth, TX. Jul 2005.
24. **Ruiz, M.O.,** E. Walker, & U. Kitron. West Nile Virus and Landscape Characterization in Chicago and Detroit. 2005 ESRI Health GIS Conference. Chicago, IL, Sep 2005
25. **Ruiz, M.O.** Weather Conditions and West Nile Virus in Illinois. ESRI International User Conference. San Diego, CA. Aug 2006
26. **Ruiz, M.O.,** W. D. Brown, J. Clennon. Precipitation and West Nile Virus Infection: Implications for Disease Surveillance and Modeling. Poster at NCSA Cyberinfrastructure for Health Workshop. Sep 2006.
27. **Ruiz, M.O.,** W. Brown, J. Clennon, K. Kunkel. Temperature, Rainfall and West Nile Virus in Northeast Illinois. URISA Annual Meeting. Vancouver, BC. Sep 2006.
28. Kitron, U. J. Brawn, T. Goldberg, **M.O. Ruiz,** & T. Goldberg. West Nile Virus: Eco-epidemiology of disease emergence in urban areas. Poster at Ecohealth One. Madison, WI. Oct 2006.
29. Hamer, G.L, E.D. Walker, J.D. Brawn, S.R. Loss, M.O. Ruiz, T.L. Goldberg, & U.D. Kitron. Host Selectivity by vectors of West Nile virus. Michigan Mosquito Control Association Annual Meeting Acme MI, Feb 2007.
30. Amore, G., L. Tomassone, W. Brown, U. Kitron & **M. O. Ruiz**. Spatial and Temporal analysis of St. Louis and West Nile Virus encephalitis in Cook and DuPage County, Illinois, in 1975 and 2002. Poster at New and Re-Emerging Infectious Diseases Conference, Urbana, IL. Apr 2007.
31. Messina, J. **M. O. Ruiz**. West Nile Virus in Greater Chicago 2002-2006. URISA's GIS in Public Health Conference, New Orleans, LA, May 2007.
32. **Ruiz, M.O.** Spatial Dimensions of Animal Disease Surveillance. URISA's GIS in Public health Conference, New Orleans, LA, May 2007.
33. Scapa, J. **M. Ruiz**, N. Jung, C. Maddox. An Epidemiological Study of Leptospirosis in Champaign County, Illinois, Canines. North Central Conference of Veterinary Laboratory Diagnosticians. Jun 2007.
34. Britt, T., **M. Ruiz**, & D.Leigh. A Landscape Approach to Understanding Archeological Site Potential within Fort Bragg, NC and the Sandhills Physiographic Province. DOD Sustainability Conference 2007, Orlando FL. July 2007.
35. **Ruiz, .M.O.,** Public Health GIS: A Case Study. Urban and Regional Information System Association Annual Meeting, Washington, DC, Aug 2007.
36. **Ruiz, M.O.,** W. Brown, A. Kelly, J. Novakofski, J. Diffendorfer, P. Shelton, & N. Mateus-Pinilla Spatial Aspects of Chronic Wasting Disease in Illinois. Association of American Geographers West Lakes Region Annual Meeting, Urbana, IL. Nov 2007
37. Messina, J. and **M.O. Ruiz.** West Nile Virus in the Greater Chicago Area from 2002-2006: Changing patterns of human illness and social and environmental determinants of risk, Association of American Geographers West Lakes Region Annual Meeting, Urbana, IL. Nov 2007
38. Messina, J. & **M.O. Ruiz.** West Nile Virus, Neighborhoods, and Risk Behaviors in the Greater Chicago Region. Illinois Mosquito and Vector Control Association Annual Meeting, Bloomington, IL, Nov 2007.
39. Amore, G, L. Tomossone, U. Kitron, W. Brown & **M.O. Ruiz.** Patterns of Persistence and Change. : Environmental factors and disease distribution of West Nile virus and St. Louis

encephalitis in greater Chicago, Illinois. Conference of Research Workers in Animal Diseases, Chicago, IL, Dec 2007.

40. Kelly, A, N. Mateus-Pinilla, J. Diffendorder, T. Beissel, P. Shelton, J. Killefer, **M. Ruiz**, W. Brown, J. Novakofski. High-Throughput Analysis of Microsatellite Markers to Assess Genetic Structure in White-Tailed Deer: A tool for investigating an outbreak of CWD in Illinois. Midwest Fish and Wildlife Conference, Madison, WI, Dec 2007.
41. Wrobel, L, J.K. Wittington, C. Pujol, S. Oh, **M.O. Ruiz**, M. A. Pfaller, D.J. Diekema, D.R. Sol, L.L. Hoyer. Molecular phylogenetic analysis of Candida albicans isolates from humans and non-migratory wildlife in Central Illinois. 9th ASM Conference on Candida and Candidiasis. Jersey City, NJ, Mar 2008.
42. Messina, J., W.M. Brown, and **M.O. Ruiz.** 2008. West Nile Virus in the Greater Chicago Region, 2002 – 2006. Annual Meeting of the American Association of Geographers. April 15-19, 2008. Boston, MA.
43. Messina, J. and **M.O. Ruiz**. 2008. West Nile virus, neighborhoods, and risk behavior in the greater Chicago region. Poster at the 11th Annual New and Reemerging Infectious Diseases Conference. April 17, 2008. Urbana, IL.
44. Delcore, K., W. Brown, S. Lee & **M. Ruiz.** Epidemiology of fresh produce availability in Champaign County, IL. Poster at the Center for Zoonoses Research Symposium. August 20, 2008. Urbana, IL.
45. **Ruiz, M.O.**, J. Messina, M. Sivapalan, G. Hamer, E. Walker. Storm water runoff, catch basin biology and mosquitoes in an urban area. URISA Annual Meeting, New Orleans, LA. Oct 2008.
46. Bullard, T., E. McDonald, T. Britt, and **M. Ruiz.** Identification of geologic variables in development of an archeological predictive model for management of military lands in desert terrain. 2008 Joint Annual Meeting of the Geological Society of America, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America. Oct 5-9. Houston, TX.
47. **Ruiz, M.O.,** J. Messina, & W. Brown. Spatial and temporal pattersn of mosquito infection ad human illness from West Nile virus in northeastern Illinois. Geospatial Health-GnosisGIS Annual Meeting. Dec 5-6, 2008. New Orleans, LA.
48. **Ruiz, M.O.,** K. Debaene, J. Messina, M. Sivapalan, H. Li, G. Hamer, W. Brown & E. Walker. 2008. Mosquitoes, catch basins, hydrology, and risk of West Nile virus in Illinois. Poster at the Annual Meeting of the American Society for Tropical Medicine and Hygiene. Dec 7-11, 2008. New Orleans, LA.

J. Book Reviews (in print or accepted)

None

K. Software Reviews

1. **Ruiz, M**. "1st Impressions of BioMedware." *Geo-Info Systems*, June, 1996.
2. **Ruiz, M**. and D. Morrison. "Feature Manipulation Engine (FME) 2000". *Geospatial Solutions* 10(10):46-47, October, 2000.
3. Morrison, D. and **M. Ruiz**. "Instant Replay: Red Hen's Multimedia GIS." *Geospatial Solutions* 11(10), October 2001.
4. **Ruiz, M.O.** and T.J. McTighe. iPIX Mapping System: GIS with a 360 View. *Geospatial Solutions* 13(33) 2003.

5. **Ruiz, M.O.** U.D. Kitron, and T.J. McTighe. 2005. Space-Time Intelligence. *Geospatial Solutions*, 15(2): 38-41.

III. RESIDENT INSTRUCTION

A. Summary of Instruction

Primary courses at University of Illinois

PATH 560 (formerly VP460) **– Spatial Epidemiology**
PATH 439 (formerly PATH 594) **– Health Applications of GIS**

1. Descriptive Data – from University of Illinois reporting system

Term	Offering Dept	Course---		Section-		Indiv Instr /Class	IUs	Students	Class Contact Hours	# of Instructors
SP09	1-872	GEOG	595	IND	MR	I	6	1	0	1
SP09	1-282	PATH	439	LBD	A	C	54	18	3.2	1
SP08	1-872	GEOG	595	IND	#MR	I	2	1	1	1
SP08	1-872	GEOG	599	IND	MR	I	4	1	4	1
SP08	1-282	PATH	439	LBD	A	C	30	10	3	1
FA07	1-282	PATH	527	DIS	A	C	0.9	0.9	0	3
SP07	1-872	GEOG	595	IND	MR	I	0	1	1	1
SP07	1-282	PATH	560	LCD	A	C	18	4.5	2	2
FA06	1-282	PATH	594	LEC	MR	C	18	6	3	1
SP06	1-872	GEOG	595	IND	MR	I	0	1	4	1
FA05	1-282	VP	692	IND	MOR	I	3	1	3	1
SP05	1-282	VP	560	LCD	A	C	18	4.5	2	2
FA04	1-282	VP	592	IND	MOR	I	3.4	1	4	1
FA04	1-282	VP	692	IND	MOR	I	3	1	3	1
FA03	144300	VP	392	CONF	MR	I	3	1	4.5	1
SP03	144300	VP	460	LAB	B	C	0	0	0	2
SP03	144300	VP	460	LECT	A	C	0	0	0	2
S202	132430	GEOG	290	CONF	XXX	I	3	1	1	1
FA88	132430	GEOG	373	LAB	2	C	8.1	3	4.4	1
FA88	132430	GEOG	373	LAB	1	C	35.1	13	4.4	1
FA88	132430	GEOG	373	LECD		C	20.8	16	2	1

2. Supervision of Graduate Student Research

Advisor

1. Christopher Duclos, "An Examination of Childhood Lead Poisoning Surveillance in the State of Florida" (M.S. in Geography, Florida State University. Defended November 1997). Currently at the Florida Department of Health.
2. Carmen Tedesco (research advisor) "Understanding an Outbreak: a Multidimensional Spatial Analysis of the Chicago " (M.A. in Geography. Defended 2004). Currently at the Center for Applied and Behavioral Research.
3. Messina, Jane, West Nile Virus 2002-2007: "West Nile Virus in the Greater Chicago Area: A Geographic Examination of Human Illness and Risk from 2002 - 2006" (M.A. in Geography. Defended 2008)

Served on supervisory committee at University of Illinois

1. Evelin Grijalva, "A Model of Habitat Suitability for *Ixodes Scapularis* in the Eastern and Central United States". (M. S. in Veterinary Medicine completed 2004)
2. Richard Djukpen, "HIV/AIDS in Nigeria: Geographic, social and economic perspectives" (PhD in Geography. Proposal defense complete, May 2007)

3. Imelda Moise, "Application of Geospatial Analysis to Surveillance Data: a Spatial Look at HIV/AIDS Prevalence in Zambia" (M.A. in Geography, Completed Sep 2007). Currently in PhD program in Department of Geography, University of Illinois..
4. Imelda Moise, title to be arranged. (PhD in Geography)
5. Michelle Rowland, Integrating Spatial and Temporal Analyses into Surveillance of Shga Toxin Producing Escherichia Coli (STEC) O157 in the State of Illinois. (MD/PhD in Community Health. Defended March 2008.
6. Amy Kelly, PhD in Animal Science.
7. Jong-Hyung (John) Lee, M.A. in Geography
8. Jason D. Fischer, PhD in Program in Ecology, Evolution, and Conservation Biology

3. <u>Other Contributions to Instructional Programs</u>

Mentor to Students

1. Mentor - Center for Zoonoses Research and Merck-Merial Veterinary Scholar summer fellowships program 2004-2008.
   a) Summer 2004 Amy Wolf: Spatial Analysis of Equine West Nile Virus Case Rates by County in Illinois in 2002 and Comparison with Land Cover,
   b) Summer 2005 Kate Brix-Rutherford: Spatial Clustering of 2002 Equine West Nile Virus Cases in East-Central Illinois;
   c) Summer 2008 Kelly DeBaene: Catch Basins and Mosquitoes in suburban neighborhoods; Summer 2008 Keely Delcore: Epidemiology of Fresh Produce in Champaign County, IL.
   d) Summer 2009 Kate Varela; Internal biological characteristics of catch basins and vector mosquito productivity. Dana Johnson: Vegetation communities, storm water sewer systems and West Nile virus in Chicago.
2. Mentoring in GIS/Spatial analysis to students working with other faculty in Wildlife Health Clinic and Departments of Pathobiology and Veterinary Biosciences. Have also worked with international scholars from Argentina, Uganda and Italy on the spatial aspects of their research.
3. Mentor - The Earth and Society Initiative Disease Emergence and Ecosystem health Summer Fellowship Program in Summer 2007. Jane Messina: West Nile virus, neighborhoods, and risk behavior in the greater Chicago region.
4. Course under development for Global Campus BS-Environmental Sustainability Degree Completion Program**:** ESUS 309: Application of GIS for Sustainability

Reading Group Organization

1. Molecular Spatial Epidemiology. 7 participants. Spring 2007.
2. Spatial Statistics. 10 participants. Spring 2008.

Instructional Presentations

1. Envirovet Program 2001 – 2003, Lecture on spatial data analysis for conservation medicine at White Oaks Plantation in Florida.
2. Center for Zoonoses Research summer fellowship program. Lecture on GIS in veterinary and public health and assistance to fellows - 2006 and 2007.
3. **Guest lecturer**
   GEOG 438, Geography of Health Care (Fall 2006)
   CHLH 274, Introduction to Epidemiology (Spr 2008 & Fall 2008)
   PATH 641, Food Safety and Public Health
4. Current and Potential Uses of GIS for Emergency Preparedness". Illinois Department of Public Health and Illinois Public Health Association - Illinois Immunization and Communicable Disease Conference and Downstate Emergency Preparedness and Response/Bioterrorism Summit. July 2007, Springfield, IL.

Workshops developed and presented

1. GRASS GIS workshop presentation at the 2005 Illinois GIS Association meeting in Springfield, IL.
2. Workshop on GIS in local departments of public health on behalf of the Illinois Department of Public Health. Developed materials, provided instruction and led discussions of 25 public health personnel from the East Central Illinois region. Summer 2007.
3. An Overview of GIS in Public Health". Workshop presented at the URISA 2007 GIS for Public Health meeting. One-day workshop May 2007.
4. Workshop in Geographic Information Systems for Public and Veterinary Health
   5-day workshop. Developed materials and presented to students at these locations
   --UIUC College of Veterinary Medicine, May 12-16, 2003, 12 students
   --University of Buenos Aires, Dec 1-5, 2003, 12 students
   --UIUC College of Veterinary Medicine, May 17-21, 2004, 11 students
   --University of MN College of Veterinary Medicine, July 12-16, 2004, 21 students
   --ICIPE and Ministries of Health, Nairobi, Kenya, Jun 6-10, 2005, 20 students
   --FIOCRUZ, Belo Horizonte, Brazil, Sep 19-23, 2005, 20 students
5. Workshop on GIS for Veterinary and Public health, May 19-20, 2008. College of Veterinary Medicine, Urbana. 12 students.
6. Undergraduate GIS and Health Workshop. Mar 7-8, 2009. Sponsored by the Center for Spatially Integrated Social Sciences. College of Veterinary Medicine, Urbana, IL. 17 students.

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B. <u>Evaluation of Instruction</u>

The experimental course that I taught in Fall 2006 was not formally reviewed by ICES. I did receive positive feedback from the students and 4 of the students enrolled subsequently enrolled in the Spatial Epidemiology class offered in the Spring 2007.

1. <u>Student ICES Course Evaluation Results</u>

Spring 2005 – VP560
Overall effectiveness - instructor 4.4 average

# of students	Score
4	5
5	4

Overall course quality 4.6 average

5	5
4	4

Spring 2007 – PATH560
Overall effectives (ICES not available, due to lack of questionnaires)
Overall course quality 4.5 average

# of students	Score
6	5
2	3

Spring 2008 – PATH/GEOG/CHLH 439
Overall effectiveness – instructor 4.8 average

# of students	Score

5 5
1 4
Overall course quality 4.7 average
4 5
2 4

Other evaluations

University of MN, GIS workshop July 12-14, 2004 Evaluations from students
Marilyn Ruiz, Instructor

Questions	Average
The instructor communicates the information in an understandable manner	3.46
The organization of the material was logical	3.77
The instructor is enthusiastic	3.69
The instructor willingly and thoroughly answered questions	3.77
The course materials are understandable	3.31
The materials are useful and meet my expectations	3.23
The materials cover the subject matter	3.54
I will use the course materials after I leave this workshop	3.46

4= absolutely
3=yes
2=no
1=detracted from the workshop

2. Teaching Activities Report and Self Review

I work well both as a mentor to individual students on specific projects and as a classroom teacher of traditional college-level courses and shorter intense workshops. I have developed and taught two new courses at the University of Illinois. The course in Spatial Epidemiology has been offered several times now and is unique in its combination of ecological and geographic principles and data. A second course on health applications of Geographic Information Systems (GIS) came about largely in response to seeing students in the Spatial Epidemiology class who required considerable assistance in finding and processing spatial data to address the complex health problems that make up their research. This second course both teaches GIS software as well as gives the students a range of skills related to understanding spatial data from a variety of sources as well as those collected by the student, himself. Students are challenged to apply spatial thinking to issues related to health. An important objective of this course is to attract undergraduates and students from different departments who are interested in spatial aspects of health and who may want to pursue graduate studies or gear their research toward this area.

My approach in teaching is largely based on an Inquiry Learning format. I present some structured material and guided exercises, then provide students the opportunity to learn by developing questions and presenting solutions of their own. I place an emphasis on problem solving skills, the need to ask questions, find information and come to independent and justifiable solutions. In this way, I provide guidance in how to work through complex techniques while also showing students general strategies they will need to apply to a given problem that is in front of them.

When I am interested in learning something more deeply, I find it helpful to organize discussion sessions with students and other faculty. In 2007, I organized a reading group to review and discuss literature in the area of spatial aspects of phylogeny and the integration of spatial and molecular

techniques. This important area is one that students interested in medical geography and spatial epidemiology should be aware, as it holds great promise in improving understanding of transmission and spread of disease. The organization of the reading group has both exposed students to this literature as well provides me with an opportunity to learn about the field as I work with molecular biologists in interdisciplinary teams. In 2008, I also helped to organize a reading group on the topic of spatial statistics.

My goals in teaching in the future are to make more use of instructional technologies in the development of materials to help students understand spatial analysis and spatial data and to extend my efforts more effectively in continuing education, especially for personnel engaged in public health work. I will accomplish this through the development of an on-line course in GIS for the University of Illinois Global Campus and through continued revision of workshop materials and outreach for people working in public health.

IV. SERVICE (PUBLIC, PROFESSIONAL/DISCIPLINARY, AND UNIVERSITY)

A. Summary of Service

Much of my service work is carried out through the Geographic Information System and Spatial Analysis Laboratory, where I am the director. I hire and supervise computer scientists, GIS analysts, and graduate students to assist me in performing these services. I am responsible for securing funds, setting budgets, acquiring equipment, writing and submitting reports, communicating with and developing plans to meet needs of specific activities. I am involved daily in providing technical, scientific and statistical oversight of all products and services.

I also participate in the customary service activities of other university faculty, though some participation is limited due to my status of Clinical faculty, which precludes serving in some committees. I am also active in professional organizations, especially the Urban and Regional Information System Association and in state and University-wide GIS activities.

1. Public Service

GIS & Spatial Analysis service activities for State and Local Agencies in Illinois

1. ***West Nile Virus surveillance and mapping, 2002.*** The Illinois Department of Public Health needed help in responding to the large outbreak of WNV in 2002. We created a web-based spatial application to allow the viewing of these data. *The GIS and Spatial Analysis lab was, at one point, the only place where data on human and equine illness and mosquito test results could be viewed on-line and seamlessly across jurisdictional boundaries*.
2. ***Wetlands and West Nile Virus in Illinois analysis, 2004.*** White paper prepared for the Illinois Department of Public Health (IDPH) to address the question of whether WNV illness was more likely to present near wetlands. This allowed IDPH to respond to citizen concerns about this topic.
3. ***Assistance and consultation to the Champaign-Urbana Public Health District (CUPHD) with GIS implementation during the years from 2004-2007***. Interviewed division supervisors and evaluated data in terms of how it might be used spatially. Worked with student to perform site location analysis relative to a new clinic location. My work provided justification for budgetary decisions to add a GIS analyst to the CUPHD workforce.
4. ***Advise Chicago Department of Public Health on GIS analysis methods and West Nile virus risk areas, 2005***. Through collaboration with public health personnel in the Chicago

area, I have made presentations on the practical application of the research work that I am doing on WNV.

5. ***Spatial analysis interpretation and informational materials for the Illinois Department of Public Health in the areas of confidentially, HIPAA, disease clusters and WNV, 2006-2007.*** Result is a summary of literature and hyperlinked documents. This provided guidance to IDPH in areas of high concern.
6. ***Maintain and design new methods for updating and organizing Chronic Wasting Disease (CWD) surveillance sampling database, 2006-2008.*** This complex dataset includes test results, sample records and geographic location information on thousands of deer in Illinois tested for CWD since 2001. My lab is responsible for integrating disparate versions of data and creating a documented, validated, complete data available for creating tables and for generating special subsets of the data for spatial, epidemiological and genetic analysis of the deer populations and test results.
7. ***Create plan for GIS implementation and contact list for local health departments in Central Illinois, 2007.*** This activity was performed for the Illinois Department of Public Health (IDPH). We identified key personnel at local health departments in central Illinois, created a survey about the use and potential for use of GIS in their departments and summarized the results of the survey. This supported the IDPH efforts to better assist local health departments in GIS implementation.
8. ***Develop methods to measure prevalence of CWD in deer for the Illinois Department of Natural Resources (IDNR), 2008.*** Developed methods to define areas of intensive management in the CWD high risk zone and then developed and implemented a method to compare the prevalence of CWD in these areas with less highly managed areas. This method was presented to the IDNR along with the protocol ongoing consultations with agency personnel for follow up assistance and interpretation. This work will be included in the evaluation of management efforts of CWD by the State of Illinois and help to focus efforts in the future.
9. ***Model of deer mobility for CWD risk area, 2007-2008.*** Use GIS techniques and land cover data to create a model to measure the potential for deer movement in the CWD high risk area. This model is being used with genetic data on deer populations to better determine the degree to which movement of deer results in spread of CWD.
10. ***Create maps and spatial database of food preparation sites for the Champaign Urbana Public Health District, 2008.*** Geocode addresses of sites in Champaign County where the CUPHD conducts inspections for food preparation safety. The maps supply immediate information for use by the CUPHD and the spatial database can be used to link inspection results with locations.
11. ***Create maps and spatial database of radon test results for the CUPHD, 2008.*** The CUPHD has made radon tests available to citizens over the past several years. The samples are taken at homes by the residents and then sent in for testing. We created a spatial database and mapped the results of these tests by point of residence and then created maps that synthesize environmental and social factors with the radon test results.
12. ***Create maps and spatial database of Women's Infants and Children (WIC) program risk factor data for the CUPHD, 2008.*** For this, my lab geocoded residential addresses of participants in the WIC program and then created a method to retrieve a set of risk factor data on each participant as it was stored in a centralized database. These data were then incorporated into a spatial database for Champaign County to enable analysis of these risk factors relative to socio-economic conditions in neighborhoods as well as to determine how accessible fresh produce are from the participants' homes.
13. ***Develop methods and data to create a spatial database on deer hunter harvest and deer permits provided by the IDNR, 2007-2009.*** We processed data on number of deer taken during various hunting activities in Illinois over a 6 year period and combined it with data

captured from printed forms showing how many permits were issued for different types of hunts over those years. These combined data are now available to better determine deer population numbers and to create a model of deer population potential using remotely sensed land cover data.

GIS and database support for other agencies and for the College of Veterinary Medicine

1. ***Development of maps and procedures for spatially stratified sampling at Fort Irwin, CA, 2001.*** We used spatial data on environmental conditions and random sampling procedures to create a set of specific representative sites for geomorphic investigation of cultural resource sites at Fort Irwin. This improves the ability of the Department of Defense to perform military training while protecting valuable cultural resources.
2. ***On-line cultural resource database for Fort Irwin, CA, 2002.*** Creation of on-line database and mapping system and web-based user interface for querying and for ranking of cultural resource sites according to priority for management at Fort Irwin.
3. ***Integrated archeological and environmental spatial database for Fort Irwin, CA, 2001-2003.*** Creation of spatial database integrating environmental and cultural resource factors in Fort Irwin. Included the incorporation of data digitized from historical maps and from a variety of datasets from different agencies. This dataset can be used by Fort Irwin staff to better manage their cultural resources.
4 ***Archeological site predictive model for Fort Irwin, CA, 2003.*** Creation of methods and model for prediction of the location and type of cultural resource sites at Fort Irwin, CA. Used multivariate statistics along with our own method of measuring site potential that could be used by the installation without additional statistical software. With this model, Fort Irwin cultural resource managers can make better decisions about the best use of scarce funds in protecting cultural sites.
5. ***Training materials and on-site consultation for archeological site predictive model for Fort Irwin, CA, 2003.*** Development of procedure to run and update the archeological predictive model at Fort Irwin, CA. These materials help to ensure the sustainability of the improved management of cultural resources.
6. ***Create digital maps and analysis of CVM veterinary clinic clients 2004.*** Geocode client zipcodes and analyze by specialty type to support assessment of potential new clinic in the Chicago area.
7 ***DMapper- an online mapping system for animal disease diagnostic data, 2001-2003.*** Worked with the Veterinary Diagnostic Lab to extract diagnostic test data from the central database in a form suitable for mapping and developed an on-line secure mapping system for these data. The system allowed a user to query data by time period, by county, by species and by diagnosis type and create custom maps of these queries. It is a tool for improved communication and risk assessment of animal diseases.
8. ***Department of Defense workshop on archeological site predictive modeling, 2004.*** Through the SRI Foundation I was invited to participate in workshop sponsored by the U.S. Army Corps of Engineers and the U.S. Air Force, November 15-18, 2004, Santa Fe, New Mexico. Participated in discussions on this topic and helped to develop white paper with goal of more standard methods for cultural resource modeling used across military installations.
9. ***Creation of MS Access-based cultural resource database linked to GIS software and mapping capabilities at Fort Bragg, NC, 2003.*** Helped cultural resource staff at Fort Bragg, NC, to reorganize and approximately 50,000 records so that it could be more effectively queried and linked to mapping applications.
10 ***Hydrological model of streams in Fort Bragg, NC, 2003.*** Using high resolution LIDAR elevation data, developed both Strahler and Shreve order stream channel networks,

calculated discharge and created sub-basin catchment areas. This innovative approach created a map that was a foundation for organizing resource management activitites.

11. ***Veterinary Wildlife Clinic maps and GIS implementation support 2004.*** Provided assistance in setting up GIS software, general software help, mapping point locations of wildlife submitted to the Veterinary Wildlife Clinic.
12 ***On-site briefing and database support to Fort Bragg, NC, Cultural Resource staff on the implementation of the cultural resources modeling. Nov 2005.*** Provide both on-site and remote consultations during the year 2005 to enable the staff at Fort Bragg to implement and make use of the cultural resource and environmental databases created by our lab.
13. ***Digital spatial database depicting landforms of Fort Bragg, NC, 2005***. This digital product is a map of landforms developed from a high resolution elevation model and digital tools for hydrological modeling. By combining technical spatial data analysis expertise with geomorphological understanding of North Carolina's landscapes, we developed a unique mapping of major landforms. It was used in combination with soil data to predict the possibility of buried archeological sites and will be used to better manage cultural resources at Fort Bragg.
14. ***Spatial predictive model of location and type of cultural resources at Fort Bragg, NC, 2005.*** Models for specific lithic resources using several statistical methods resulted in improved ability to manage land for military training while preserving cultural resources.
15. ***Datanode, 2003-present***. We created, host and maintain a secure, custom web-based application to enable more efficient sharing of large spatial databases among project team members. Members can access this site from anywhere in the world with internet access and it is currently host to approximately 15 different project nodes with dozens of users.
16. ***Processing of spatial environmental data to support Lyme Disease risk model 2005.*** Downloaded and processed large raster datasets to support the development of a Lyme Disease risk model for the eastern half of the United States.
17. ***Interpolation of points and maps for Salmonella risk assessment 2005.*** Used spatial interpolation techniques to create surface models and maps of air flow in poultry facilities as a part of a Salmonella risk analysis.
18. ***Geocoding and mapping of Illinois St. Louis Encephalitis (SLE) cases from 1975 records, 2005.*** Human case data from the outbreak of SLE in 1975 were recorded from paper forms and geocoded to enable spatial analysis. This was the first time that detailed maps of disease occurrence were made, allowing for better understanding of environmental factors related to illness.
19. ***WNV mosquito infection database for mapping and spatio-temporal analysis, 2006-2009.*** State-wide mosquito WNV test results for approximately 900 different mosquito trap locations and thousands of test results across 3 years were processed to enable spatial analysis of mosquito infection across time and space at a variety of temporal and spatial scales.
20. ***Precipitation and temperature space-time database for mosquito infection analysis, 2007-2009.*** Mosquito populations are closely tied to weather conditions. My lab compiled daily weather data from three different sources for the years 2001 to the present to determine the effect of rainfall on mosquito infection.
21. ***Improved data flow and recommendations for integration of GIS and GPS data collection system, 2008.*** The HAMMER field data collection system requires integration of field data with enterprise GIS. My lab has performed technology evaluation and testing and made recommendations to improve the methods used in this system.
22. Environmental database for an analysis of Blastomycosis in Illinois. This database will be used to better understand the environmental transmission of the disease.

Other Service Activities

1. "West Nile Virus: Eco-epidemiology of Disease Emergence in Urban Areas" presentation at the University Consortium of Geographic Information Science Congressional Breakfast in the U.S Hart Senate Office building for staff members from congressional offices in February 2005.
2. Illinois GIS Strategic Planning Committee, 2007-2008. I was nominated by other GIS professionals in the state to be a part of a state-wide committee tasked to write a strategic plan for better sharing and cooperation in the creation of spatial data in the state of Illinois. In this committee, I represent the needs of public health as well as a view from academia. I led the writing for the Training and Education portion of the Strategic Plan and was instrumental in creating a brochure to be distributed state-wide to highlight GIS activities in the state.

2. Service to Disciplinary and Professional Societies or Associations

Manuscript review

American J of Epidemiology
American J of Preventive Medicine
American J of Trop Med and Hygiene
Applied Geography
Emerging Infectious Diseases
Geographical Analysis
Geospatial Health
International J of Cancer
International J of Health Geographics
J of the American Mosquito Control Association
J of Med Entomology
Neglected Tropical Diseases
Photogrammetric Engineering and Remote Sensing
Transactions in GIS
URISA Journal

Other Service

1. Open GIS Consortium, Committee Chair, Spatial Decision Support Group, 2000-2001. I provided a view of the applications that would be possible with the development of open GIS standards.
2. Urban and Regional Information System Association, Conference planning committee leader for Health and Public Safety area, 2001-2002.
3. Urban and Regional Information System Association Program Co-chair for GIS in Public Health Conference. Played leading role in planning of URISAs GIS in Public Health conference held in May 2007. I am chairperson of the second meeting in 2009, Providence, RI.
4. University of Illinois ESRI Development Center Board Member, 2009.
5. Illinois GIS Association, Education Committee member, 2009.

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3. University/Campus Service

College

Committees

UIUC Pathobiology Teaching Assessment Committee, 2005-2007

UIUC Pathobiology Graduate Admissions Committee, 2005-2007
UIUC CVM Information Management Committee, 2005-2007
UIUC Pathobiology Seminar Committee, 2006-2009 (chair in 2007-09)

Other
1. Translational Research Initiative – arranged speakers for the Epidemiology portion of the seminar series for 2005-2006

University
1. Reviewed proposal for UIUC Research Board, 2006
2. Coordinated multidisciplinary materials for geospatial aspects of the UIUC Illinois Informatics Initiative, 2006
3. University Consortium of Geographic Information Science – arranged UIUC chapter seminars, 2003 and 2004
4. University Consortium of Geographic Information Science – Led UIUC chapter 2006 and 2007. Represented UIUC at the University Consortium of Geographic Information Science Winter Assembly 2006. On campus, manage listserv and communicate with the UIUC faculty and students across campus.
5. Campus search committee to hire a GIS librarian at UIUC, 2007-08.

Statement of Service Activities

Over the past four years, I have worked with the Champaign-Urbana Public Health Department, other east central Illinois health departments and the Illinois Department of Public Health to provide assistance in the use of spatial tools for improving public health. My efforts helped the local health department to make a more informed decision in selecting the new site for their new health clinic. In addition, I have provided justification for funding for additional technical support in spatial data processing and analysis at local health departments. Through this work, I have gained a better understanding of the breadth of activities and spatial data collected by health departments. Combining this understanding with my work in geographical analysis, I am in a position of being an authority on policy issues related to the costs and benefits of spatial analysis in public health.

My general expertise in modeling and processing of complex spatial data has also been useful as I work on research teams, such as the Chronic Wasting Disease group at the Illinois Natural History Survey, or the Cultural Resource group at the CERL lab, in Champaign. In this capacity, I oversee the work of GIS technicians and computer scientists and play an active role in designing studies and developing methods to measure the key dimensions of biological processes. In addition, I perform statistical analyses both independently and with students. The blending of service with research has been very fruitful as more analytically useful databases have been developed for the good of all members of the team, and I am able to make use of those as well, as I work on my research goals.

V. Research

A. Statement of Research Goals and Accomplishments

My research interests are in the synthesis of critical factors of disease transmission to enable the elucidation of the key characteristics of a place that result in infection at particular locations and times. This goal spans academic disciplines, and I often work in a multidisciplinary team. My emphasis is on the development and application of geographical methodologies including spatial modeling, cartographic visualization and a variety of statistical analysis tools, including spatial statistics. These tools are especially useful to integrate human and natural environmental aspects of

places to better understand the complex processes that lead to disease persistence and transmission among humans and other species, and they enable the quantification of the key aspects of underlying processes. I am particularly interested in how the type of land use and changes in the environment over time affect the health of ecosystems and in disease transmission as it relates to the water cycle.

My recent work has focused on the development of spatial risk models in the context of West Nile Virus (WNV). The goal in assessing risk spatially is to characterize the landscape to reflect the probability that an event will occur there. This involves taking into account key risk factors that help to model the spatial and temporal patterns of the known occurrences of the event. I carry out this work by integrating spatial data processing, spatial autocorrelation measures and statistical methods, including logistic regression and multi-variate methods, such as factor and discriminant analysis and generalized linear models. I am currently working to incorporate the effects of spatial autocorrelation of the dependent variable and of the error terms into regression models using Poisson regression techniques and the inclusion of spatial lag variables in linear regression. I often work with grid-based modeling methods and incorporate image processing techniques into analyses as needed.

For WNV, one of my models considered the factors that explained inclusion of a place in the measurable spatial clusters of the age-adjusted rate of WNV in humans at the census tract level. The risk factors in question included distance to a dead bird specimen, age of housing, presence in the Lake Plain physiographic region, elevation range, housing density, vegetation, and age, income and race of the resident population. With the addition of Mosquito Abatement District boundaries, the logistic regression model explained about 52% of the risk for a placing have a measurable spatial cluster of WNV human illness. This model is significant in that it uses robust spatial data processing to measure both environmental and epidemiological factors in a meaningful way. Since this earlier work, I am also incorporating mosquito infection, precipitation and human behavior into the model and have developed a model that incorporates the effect of values of neighbors.

Another key element of my work is spatial sampling for representative sampling of an area based spatial, environmental and infection-related factors. With WNV in the Chicago area, I performed a statistical analysis to characterize a two-county area in terms of a combination of housing, demographic and environmental factors. This resulted in the division of the region into five types of urban areas, with statistically measurable differences in terms of WNV infection in humans. This characterization provides a structured framework for the selection of field sites for more detailed observations, adding credibility to the selection process and optimizing resources for field work.

I will continue work on WNV as well as on other systems. We believe that urban catch basins are a key part of the mosquito production and WNV amplification in the Chicago area. To better understand this, I am working with hydrologists to integrate the role of precipitation on changing biological characteristics of mosquito habitat. For this, we have compiled precipitation data for seven years from over seventy weather stations from which to compile weekly rainfall amounts for distinct spatial regimes. Further, we are using sensors inside urban catch basins to measure the biological characteristics of these underground areas in response to the precipitation and will measure mosquito production through samples of larvae. We will also incorporate mosquito infection rates for the same areas and time scales. The temporal aspects of this question are particularly challenging and will call for innovative space-time measures and analysis. The question of the geographic scale of transmission of the virus is another issue of concern.

In another project, graduate students and I compare the spatial patterns of WNV and the related Saint Louis Encephalitis virus that caused St. Louis encephalitis in the Chicago area in 1975. In addition,

I am comparing mosquito and human infections across time as WNV becomes more established in Illinois to provide estimates of how well mosquito infection predicts human infections.
My research related to hydrology and health is especially important in considering the spatial risk of other water-borne pathogens to the health of humans and animals.

In work on Chronic Wasting Disease (CWD) in white-tailed deer in Illinois, I create spatial measures of deer populations and movements, prevalence estimates and spatial epidemiology of CWD in Illinois. This work has allowed us to explore the dimensions of spatial distance relative to genetic distances among deer populations to better explain deer movement and also to offer insights into the relationship of spread of CWD and the movement and subsequent genetic mixing of deer. I have used statistical model to determine the degree to which persistence of CWD in a set of locations is related to deer behavior and density and that to which it can be accounted for by environmental contamination.

My work is generally based in the logical positivist tradition. I work with data in a robust way and prefer taking the time to create excellent databases and to use relatively straightforward analyses, rather than using little or poor data that are then highly processed statistically. My projects with spatial data at times are developed over years and thus take time to reach maturity. The complexity of a system should be reflected in the data to the extent possible, so the data are the right balance between reality and abstraction. Although I am not a biologist, I make a strong effort to be informed about the biology of the disease system under study so that I can participate more fully as a member of a multi-disciplinary team, rather than as a sophisticated technician. I think that my greatest strength is combining my creativity and my depth of experience with spatial data and data processing with statistical skills, my ability create effective graphical renditions of data, and my enduring interest in infectious disease transmission in different ecological settings. Through my own work and in combination with students and other scientists, I hope to make significant contributions to improving public health through better understanding of disease ecology and through the ability to provide empirically-based estimates of risk of disease in a temporally and geographically useful way.