# Douglas A. Shoemaker, Ph.D.

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## Education

Ph. D. in Forestry and Environmental Resources, 2016

North Carolina State University, Department of Forestry and Environmental Resource

*Dissertation: "Scenario Analyses of Urban Expansion and Associated Impacts to the Generation Ecosystem Services by Forest and Farmland"*

NSF IGERT Fellow

Portland State University, Nohad A. Toulan School of Urban Studies and Planning, 2012-2013.

*Program: "Ecosystem Services for Urbanizing Regions"*

M. S. Forestry, 2005

University of Florida, School of Forest Resource and Conservation.

*Thesis: "Multitemporal Extraction of the Leaf Area Index of Southern Pine Forests from Satellite Imagery"*

B. S. *Summa cum Laude*, Biology, 2003

University of Massachusetts Boston

*Honors Project "Predicting the Presence of the Scarlet Tanager in Massachusetts: a Spatial Model of Suitable Habitat"*

## Primary Appointments

*Director of Research and Outreach*, Center for Applied Geographic Information Science, UNC Charlotte ▪ 2016 to Current

*Director of Research and Outreach*, Center for Applied Geographic Information Science, UNC Charlotte ▪ 2010 to 2012

*Associate Director of Research and Outreach*, Center for Applied Geographic Information Science, UNC Charlotte ▪ 2008 to 2010

## Research Appointments

*Research Technician III*, Center for Applied Geographic Information Science, UNC Charlotte ▪ 2005 to 2008

*Research Assistant,* School of Forest Resource and Conservation, University of Florida, 2003 to 2005

## Awarded External Research Funding

2012-14 U.S. Fish & Wildlife Service. $294,154. SMART-SLEUTH: Augmenting the SLEUTH Urban Growth Model with New Smart-Growth Scenario-Building Capabilities. (PIs: R. Meentemeyer, W. Tang, J. Vogler, and D. A. Shoemaker)

2011-14 USDA Forest Service. $51,055. Southern Research Station's Santee Experimental Forest. (PIs: W. Tang, D. A. Shoemaker, R. Meentemeyer)

2009-11 National Science Foundation. $300,000. Collaborative Research on Hierarchical Analysis of Socio-Ecological Interactions in the Charlotte Metropolitan Region: Can Urbanization, Forest and Working Lands Coexist? (PI: R.K Meentemeyer; Co-PI: C. Wang, J-C. Thill, W. Ribarsky, T. BenDor, D. A. Shoemaker).

2008-09 North Carolina Wildlife Resource Commission. $15,000. Forecasting Development in the Greater Uwharries: Outcomes of Status Quo and Conservation-Based Planning Scenarios. (Co-PIs: R.K Meentemeyer, D.A. Shoemaker).

2007-08 Catawba Lands Conservancy. $63,480. Modeling the impacts of urban growth on natural and rural lands in the greater Charlotte area (1973 – 2030). (PIs: R.K Meentemeyer, D.A. Shoemaker, and J. Michael

## Project Experience

*Project Coordinator,* Charlotte Regional NSF ULTRA-EX Project ▪ 2010 to 2012

*Project Manager*, Developing the FUTURES multi-level land change model ▪ 2007-2012

*Project Manager*, Forecasting development in the Greater Uwharries: status quo and conservation based planning scenarios ▪ 2008- 2009

*Project Manager*, Forecasting and Visualization of Urbanization in the Greater Charlotte (NC) Region (1976 – 2030) ▪ 2006-2007

*Co-Project Manager*, Impacts of sudden oak death on tree mortality in the Big Sur ecoregion of California, 2005-200

## Peer-Reviewed Publication

Dorning, M. A., Smith, J. W., **Shoemaker, D. A**. and Meentemeyer, R. K. 2015. ”Changing decisions, changing landscapes: How would forest owners in urbanizing regions respond to emerging biofuel markets?” *Land Use Policy.* 9, 1-10.

Dorning, M. A., Koch, J., **Shoemaker, D. A**. and Meentemeyer, R. K. 2015 "Simulating urbanization scenarios reveals tradeoffs between conservation planning strategies." *Landscape and Urban Planning*. 136, 28–39.

BenDor, T., **Shoemaker. D.A.,** Dorning, M., Thill, J-C., and Meentemeyer, R.K. 2014 "A mixed- methods analysis of socio-ecological feedbacks between urbanization and forest persistence." *Ecology and Society*. (ISI = 2.831)

Meentemeyer[1], R.K., Tang, W., Dorning, M., Vogler, J.B., Cunniffe, N.J., and **Shoemaker, D.A.** 2013. FUTURES: Multilevel simulations of emerging urban-rural landscape structure using a stochastic patch-growing algorithm*. Annals of the Association of American Geographers.* (ISI = 2.115)

Singh, K. K., Vogler, J.B., **Shoemaker. D.A.** and Meentemeyer, R.K. 2012. LiDAR-Landsat data fusion for large-area assessment of urban land use: balancing spatial resolution, data volume and mapping accuracy. *Journal of Photogrammetry and Remote Sensing.* (ISI = 2.158)

**Shoemaker, D. A.** and Cropper Jr, W. P. (2010). Application of remote sensing, an artificial neural network leaf area model, and a process-based simulation model to estimate carbon storage in Florida slash pine plantations. *Journal of Forestry Research* 21(2):00 (ISI = 1.472)

Butkiewicz, T., Chang, R., Wartell, Z., Meentemeyer, R., **Shoemaker, D. A.,** Ribarsky, W. (2010). Alleviating the Modifiable Areal Unit Problem within Probe-Based Geospatial Analyses. *Computer Graphics Forum* 29(3):00 (ISI = 1.86)

Meentemeyer, R.K., Rank, N.E., **Shoemaker, D.A.**, Oneal, C., Rizzo, D.M. (2008) Impacts of sudden oak death on tree mortality in the Big Sur ecoregion of California. *Biological Invasions*. 10: 1243-1255. (ISI = 2.5)

**Shoemaker, D. A.** and Cropper Jr, W. P. " Prediction of Leaf Area Index for Southern Pine Plantations from Satellite Imagery using Regression and Artificial Neural Networks". *Proceedings of the 6th Southern Forestry and Natural Resources GIS Conference* (2008), P. Bettinger, K. Merry, S. Fei, J. Drake, N. Nibbelink, and J. Hepinstall, eds. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.

**Shoemaker, D. A.,** Oneal, C., Rizzo, D. M. and Meentemeyer, R. K. "Quantification of sudden oak death tree mortality in the Big Sur ecoregion of California". *Proceedings of the sudden oak death third science symposium* (2008). Eds. Frankel, Susan J., Kliejunas, John T., Palmieri, Katharine M. Gen. Tech. Rep.PSW-GTR-214. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

[1] First author Ross K. Meentemeyer acknowledges the equal role **Douglas A. Shoemaker** played in the conceptualization of FUTURES and writing of this article.

## Publications in review

Smith, J. W., Dorning, M. A., **Shoemaker, D. A.** and Meentemeyer, R. K. In Review. "Payments for Carbon Storage to Alleviate Development Pressure in a Rapidly Urbanizing Region?" *Forest Economics.*

Tonini, F., **Shoemaker, D. A.,** Petrasova, A., Harmon, B., Petras, V., Cobb, R. C., Mitasova, H. and Meentemeyer, R. K. "Collaboratively Shaping Disease Management Solutions Using Participatory (Geospatial) Simulation." In preparation, *Ecological Modeling.*

## Publications in preparation

**Shoemaker, D. A.,** BenDor, T. K. and Meentemeer, R. K. "Cost perspectives on competing land system architectures and their effect on ecosystem services, biodiversity and revenues." In preparation, *Journal of the American Planning Association.*

**Shoemaker, D. A.,** McHale, M. and Meentemeyer, R.K. "Is spatial structure critical? The role of urban configuration in ecosystem regulation of water quality." In preparation, *Landscape and Urban Planning.*

**Shoemaker, D. A.**, Mitasova, H., and Meentemeyer, R.K. "Functional connectivity in urban environments: chasing virtual electrons along eco-hydrological gradients." In preparation, *Landscape Ecology.*

## Reports

Vogler, J. B., **Shoemaker D. A.,** Dorning M., and Meentemeyer R. K. (2009). Mapping historical development patterns and forecasting urban growth in Western North Carolina: 1976 – 2030. *Report*. Center for Applied Geographic Information Science at UNC Charlotte, Charlotte, North Carolina, United States. http://renci.uncc.edu/wp-content/uploads/2009/12/RENCI-4County-ExpansionSummaryReportl.pdf

Dorning, M., **Shoemaker D. A.**, Meentemeyer, R. K. (2009). "Forecasting development in North Carolina's South Central Piedmont: historical trends versus conservation based planning". *Report to the NC Wildlife Resources Commission and the Greater Uwharries Conservation Partnership.* Center for Applied GIS, University of North Carolina Charlotte. <http://greateruwharrie.wikispaces.com/file/view/Final+Report.zip>

## Field Experience

*Sudden Oak Death Management (Culling U. californica),* Big Sur, CA ▪ May 2015

*Plot Sighting*, *Sudden Oak Death (SOD) Monitoring Network,* Northern CA ▪ June, 2014

*Private Forest Holdings Ecological Assessment and Timber Cruise,* Charlotte Regional

NSF ULTRA-EX Project ▪ 2010 to 2012

*Post-fire SOD Plot Assessments*, Big Sur CA ▪ July 2010

*Establishing Monitoring Network, SOD Plot Assessments*, Big Sur CA ▪ June, 2006

*Tern Colony Monitor*, Buzzards Bay MA ▪ Summer 2003

## Certifications

University of Florida, 2005.
Graduate Interdisciplinary Concentration in Geographic Information Systems

University of Massachusetts, Boston 2003.
Geographic Information Technologies

## Research Mentors

PH. D.—Ross K. Meentemeyer (Chair), Melissa McHale, Helena Mitasova (NCSU)

Todd K. Bendor (UNC)

IGERT— Vivek Shandas, J. Alan Yeakley (PSU)

MS.—Wendell P. Cropper, Jr., Michael Binford and Tim Martin (UF)

Undergraduate.—Jeremy J. Hatch (UMASS Boston)

## Honoraria

US Regional Association of the International Association for Landscape Ecology (USIALE) Student Travel Award, Anchorage AK (2014)

NASA-MSU Professional Enhancement Award, Michigan State University (2013)

Natural Capital Project Scholarship, Stanford University (2013)

NSF Integrative Graduate Education & Research Traineeship (IGERT), "Ecosystem Services in Urbanizing Regions" (2012), Portland State Univers

Taylor & Francis CRC Press Best Poster at the University Consortium of Geographic Information Science (UCGIS) 2012 annual symposium

Outstanding Student Scholarship (2005), School of Forest Resource and Conservation, University of Florida

Honorable Mention, National Science Foundation Graduate Research Fellowship for the Proposed Plan of Research, "*Easy LAI Inputs for Carbon Sequestration Models"*

Graduate Research Assistantship, School of Forest Resources and Conservation, University of Florida. Advisor: Dr. Wendell Cropper

Inductee, Pi Chapter of the Xi Sigma Pi National Honor Fraternity in Forestry

Honorary Inductee, Iota Rho Chapter of the Gamma Theta Upsilon National Professional Honor Society in Geography

## Professional Presentations

"Scenario comparisons of land system architectures and their effect on ecosystem services, biodiversity and revenues". International Association of Landscape Ecology World Congress, Portland OR, July, 2015.

"The integration of land change modeling framework FUTURES in GRASS GIS 7" with Petrasova, A., Petras V., Shoemaker, D. A., Dorning, M. A., Meentemeyer, R. K. FOSS4G Europe 2015, Jul 2015, Como, Italy

"Assessing the role of urban landscape configuration in the modulating an ecosystem service." Presented at the Ecosystem Services Partnership Annual Meeting, San Jose, Costa Rica, Sept. 2014.

. "A mixed- methods analysis of socio-ecological feedbacks between urbanization and forest persistence." Presented at the US-IALE Annual Symposium, Anchorage AK, May, 2014.

"The Roots That Bind: A Spatial Analysis of Forest Persistence and Woodland Owner Values at the Urban Frontier" presented at the US-IALE Annual Symposium, Austin TX April, 2013

"FUTURES: Multi-level simulation of landscape fragmentation using a combination of field and object-based representations" was awarded the Taylor & Francis CRC Press Best Poster at the University Consortium of Geographic Information Science (UCGIS) 2012 Annual symposium in Washington, DC.

"Socio-ecological feedbacks between land change decisions and ecosystem trajectories in urbanizing landscapes" presented at the NASA-MSU Symposium: Disentangling Diverse Drivers and Complex Dynamics of Coupled Human and Natural Systems (CHANS), US-IALE Annual Symposium, Newport, RI April, 2012

"Hierarchical analysis of socio-ecological interactions in the Charlotte metropolitan region: Can urbanization, forests, and working lands coexist?" presented at the Ecological Society of America Annual Meeting, Austin, TX August, 2011

"UNC Charlotte Land Use Study" presented to the Charlotte-Mecklenburg Planning Commission, Charlotte, NC February, 2011

"A GIS Modeling Tool for Assessing Land Change Scenarios and Resolving Urbanization-Conservation Conflicts at the Edge of Metropolis" presented at the NC AUG Fall Conference, Carolina Beach NC September, 2010

"Trends in Urban Forestry Analysis" presented to the NC Chapter of the Society of American Foresters, Charlotte NC June, 2010

"Quantifying the Dynamics of Human Footprint: Do Landscapes Exhibit a Legacy of Sprawl?" presented at the Emerging Issues Annual Conference, Atlanta GA. September, 2010.

"The Concrete Footprint: Measuring the Imprint of Rapid Growth in a Sprawling Metropolis" presented at the US-IALE Symposium, Snowbird UT April, 2009

"Forecasting development in the Greater Uwharries: outcomes of status quo and conservation based planning scenarios". Presented to the Greater Uwharries Conservation Partnership, Asheboro NC, October 14, 2008

"Forecasting and Visualization of Urbanization in the Greater Charlotte Region (1976 – 2030)" presented to UNC Chancellors Thorpe and Dubois, Charlotte, NC October 1, 2008

"Forecasting and Visualization of Urbanization in the Greater Charlotte Region (1976 – 2030)" presented at the Davidson Land Conservancy's Annual Meeting, Davidson, NC November 17, 2008

"Statewide Urbanization Modeling: Expanding the Greater Charlotte Region Model to the Mountain Region" presented to stakeholders including the City of Asheville, Land of Sky, The Community Foundation, USDA Forest Service, UNC Asheville, NC November 21, 2008

"Forecasting and Visualization of Urbanization in the Greater Charlotte Region (1976 – 2030)" Press Conference, Charlotte, NC March, 2008. Note: reporting of the study was front page news in the Observer and Independent Tribune, and received radio and TV coverage.

"Findings: Forecasting and Visualization of Urbanization in the Greater Charlotte Region (1976 – 2030)" presented to the Open Space Protection Collaborative, Charlotte, NC January, 2008

"Forecasting Patterns of Urbanization and the Loss of Natural and Rural Landscapes in the Carolinas Piedmont" presented to the Open Space Protection Collaborative, Charlotte-Mecklenburg Planning Commission, and the Knight Foundation, Charlotte NC 2007

"Quantification of sudden oak death tree mortality in the Big Sur ecoregion of California". Presented at the Sudden Oak Death Third Science Symposium, Santa Rosa CA March, 2007

"Extraction of the Leaf Area Index of Southern Pine Forests from Satellite Imagery" Poster, presented at the Southeastern Society of American Foresters Annual Meeting, Jacksonville FL 2004

"Predicting the Presence of the Scarlet Tanager in Massachusetts: a Spatial Model of Suitable Habitat" Presented to the Undergraduate Research Symposium, Boston, MA 2003

"Nantucket Field Survey: Integrating GPS and GIS" Presented to the Partnership for Harrier Habitat Protection, Boston, MA 2002

## Professional Service

Journal Reviewer, *Computers, Environment and Urban Systems, iEMSs 2014*

Society Member: *Ecological Society of America, US Regional Association of the International Association for Landscape Ecology, American Planning Association, South Atlantic Region Land Conservation Cooperative, International Association for Society and Natural Resources*.

UNC Charlotte, Geography Faculty Search Committee 2007, 2008, 2010.

## Publicity

*Student's Model Predicts a Better Environmental Future.* By Cynthia Adams in the NCSU Graduate School News 2015, September 29, 2015

*Urban Sleuths: Researchers investigate 'green' mystery.* By James Hathaway in the UNC Charlotte Magazine Q4 2010, December 17, 2010

*Unlocking the future of cities: UNC Charlotte scientists work across disciplines to predict how urban areas will use open land.* By Tyler Dukes in the SciTech section of Charlotte Observer, November 01, 2010

*Is Charlotte's lure for newcomers starting to wither?* By Christopher D. Kirkpatrick and Amy Baldwin. Charlotte Observer June 11, 2008

*Tree Ordinances.* Guest on WFAE's "Charlotte Talks with Mike Collins" morning talk show June 11, 2008

*Commentary on flooding*. Front page Charlotte Observer May 7, 2009.

*Are we losing all our green?* Front page Charlotte Observer, March 26, 2007 and the Independent Tribune (Concord NC), March 30 2007

## Relevant Public Service

*Appointee, Mecklenburg Livable Communities Plan*, 2013- 2015

*Participant, South Atlantic Land Conservation Consortium (SALCC) Conservation Blueprint Workshop*, 2013

*Member, Mecklenburg County Stewardship Advisory Council*, 2006- 2012

*Board Member, Town of Davidson (NC) Natural Assets and Tree Board*, 2009- 2011

*Facilitator, Innovative Community Planning Tools Workshop*, March 2008

*Board member, Town of Davidson (NC) Greenprint Project*, 2007 to 2008

*Volunteer, Davidson Lands Conservancy*, 2005 to 2011

## Relevant Social Media

In my professional social media presence I have created[2] #urbaneden to raise awareness of the presence, aesthetics and natural histories of the many plants and animals that share the built environment with us:

Instagram.com/urban.eden

Dougshoemaker.tumblr.com Urban*Eden

Twitter @Dougshoemaker

[2] There is some other usage of this hashtag.

## Specialty Computer Software and Hardware Experience

- Natural Capital InVEST 3.x Ecosystem Services Models: Water Purification, Carbon
- Circuitscape
- ESRI ArcGIS 10.x, 9.x, 8.x Components, including Spatial Analyst and Geostatistical Analyst
- GRASS 6.4.2 open source GIS
- RSI ENVI 5.0, 4.2 Software for Remote Sensing
- ERDAS IMAGINE 10.x Software for Remote Sensing
- InVEST 3.X Water purification, Carbon Storage Modules
- ESRI ArcPad 6.x for use in collecting field data with handheld computers FRAGSTATS landscape metrics software
- Trimble GeoExplorer XT Differential GPS and Pathfinder

## Relevant Ancillary Experience

Ability to identify many fauna and flora of the Eastern states and Coastal California: skilled in using field guides, dichotomous keys

Navigation and Satellite Survey, using integrated GPS and GIS technology.

Photography and Video Skills, including telephoto and macro photography

Backcountry First Aid/First Responder (Inactive)

SSC Scuba Certification

Basic Seamanship skills, including Boat piloting, operating outboard motors

Mechanical Repair Skills