

## Elizabeth Christenson

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### Education

**M.S. Environmental Sciences and Engineering**, August 2015

**B.S., Environmental Science**, May 2010

Minors, Biology and English

**University of North Carolina at Chapel Hill**

### Research Experience

**Doctoral research: Understanding how land use characteristics affect the prevalence of antibiotic resistant, virulent *E. coli* and host-specific markers in watersheds with and without swine CAFOs**

University of North Carolina at Chapel Hill, Environmental Sciences and Engineering, Dr. Jill Stewart

- Obtained WRR/NC Sea Grant to implement proposed 12 month water quality study
- Objectives are to determine relationship of land use variables including swine CAFOs and wetlands on presence of antibiotic resistant and/or pathogenic *E. coli* in surface water

***Staphylococcus aureus* in conventional and antibiotic free hog heads**, June 2015 – July 2016

University of North Carolina at Chapel Hill, Environmental Sciences and Engineering, Dr. Jill Stewart

- Co-developed and co-wrote project and expected publication
- Learned aseptic laboratory techniques
- Implemented protocols for antimicrobial resistance testing, PCR, and gel electrophoresis

**Master's Research**, August 2013- August 2015

University of North Carolina at Chapel Hill, Environmental Sciences and Engineering, Dr. Marc Serre

- Developed a new method using remote sensing to identify crop nutrient needs on swine sprayfields
- Created the first spatial database of 485 industrial hog farm's sprayfields in Duplin county, NC
- Obtained and led a team of eight student volunteers to convert 2100 farm permits housed at the state department in Raleigh, NC on paper documents to electronic format by manual scanning followed by data entry, quality control, and sprayfield delineation in ArcGIS
- Communicated results and progress of data availability to government officials, professors across disciplines at different universities, and students

**GIS Research Technician**, 2012-2013

University of North Carolina at Chapel Hill, **The Water Institute**, Dr. Jamie Bartram

- Responsible for model development and analysis for a global assessment of exposure to climate-related disasters using ArcGIS
- Created new global urban datasets and compared these datasets to current estimations of global urban extent
- Adapted global model for assessment of each state's exposure to climate-related disasters in USA using National Oceanic and Atmospheric Administration (NOAA) hazard data
- Converted tabular database to spatial display of hazard frequency using Microsoft Access
- Collaborated with co-authors on manuscript content and revisions
- Created maps as figures in reports and presentations

**Water and Ecosystems Management Intern** – December 2010 – December 2011

### **RTI International, part-time**

- Compiled and displayed spatial data in ArcGIS for a water quantity vulnerability assessment of irrigated land modeling both groundwater and surface water interactions of the Snake River as well as institutional/policy-related effects on water permits
- Data processing, querying, and database management in Microsoft Access for a risk analysis of human health related to leakage in coal ash surface impoundments
- Map creation for presentations and reports
- Chosen to receive SPOT award for understanding and compiling complex datasets into one database

### **GIS Research Technician, May 2010 – March 2011**

University of North Carolina at Chapel Hill – **Institute for the Environment**, Dr. Lawrence Band

- Assembled data for several concurrent projects about hydropower feasibility, swine manure nutrient transfer, and wastewater treatment plant nitrogen trading credits
- Developed a nitrogen transport decay model based on SPARROW (created by USGS) using spatial hydrology
- Processed spatial and temporal mean trends for water discharge and incorporated watershed area and land use characteristics such as impervious surface

## **Teaching Experience**

**Teaching Assistant** - Fall 2014, Dr. Marc Serre

University of North Carolina at Chapel Hill - **Advanced Functions of Temporal GIS**

**GIS Graduate Research Consultant** - Fall 2013

University of North Carolina at Chapel Hill – **Medical Geography**, Dr. Ashley Ward

- Chosen to provide individual consultation for research-intensive undergraduate course to discuss research goals and methods as well as data processing and acquisition
- Advised students how to incorporate ArcMap display and analysis capabilities, and revise their research question as needed

**Teaching Assistant** – Spring 2010, Spring 2013

University of North Carolina at Chapel Hill - **Environmental Modeling**, Professor William Gray

- Graded problem sets relating to fluid kinematics and mathematical modeling

## **Skills**

**Spatial analysis** – proficiency ArcGIS 10.X, some experience with hydrologic models ArcSWAT, TauDEM, ArcHYDRO, and SPARROW, cursory knowledge of GeoDa and GRASS

**Programming** – familiar with MATLAB, R, STATA

**Statistical Analysis** – Microsoft Access, STATA

**Language** – beginning Arabic

## **Honors and Awards**

**WRI/NC Sea Grant**, 2016 – This joint fellowship for \$10,000 is given as research funds to a graduate student studying water quality in North Carolina

**North Carolina Impact Award, 2016** - This award is given annually by the UNC Graduate School to graduate students who demonstrate that their work positively impacts North Carolina. I received this award for the development of a comprehensive spatial database (i.e. map) of industrial hog farm sprayfields in Duplin county.

**BIOS Training Grant** –UNC department- awarded annual two-year stipend and tuition for 2015-2017 academic years

**Selected Professions Fellowship** - American Association of University Women – awarded annual stipend as Graduate Research Assistant in national competition for proposed research for 2014-2015 academic year

**University Cancer Research Fund**, University of North Carolina at Chapel Hill - tuition waiver and stipend as Graduate Research Assistant for 2013-2013 academic year

**First place graduate student**, 2013 Innovative Use of GIS Competition, University of North Carolina at Chapel Hill - Presentation of "A spatial representation of national frequency of and exposure to climate-related hazards"

**Spot Award**, RTI International - May 2011 for compilation of complex datasets in Microsoft Access

## Community Activities

Volunteer for Refugee Health Initiative – 2016

- Health liaison between newly arrived refugees and local health services

Member and Volunteer, Grace Community Church- 2008 to 2016

Volunteer Frisbee League Commissioner, Carrboro Recreation and Parks- 2011, 2013-2015

- Managed communication and schedules for 8 teams, 16 captains, and 130 registrants

Volunteer – World Relief, May 2012

- Developed curriculum for English as a second language (ESL) refugees

Volunteer weekly ESL tutor - 2009 -2015

- Assists with homework, household bills, transportation, and other miscellaneous household chores

## Publications

**Christenson, E.** Using remote sensing to calculate plant available nitrogen from industrial hog CAFOs in North Carolina at the sprayfield and sub-watershed scales (master's thesis). Publically available Aug. 12, 2016.

**Christenson, E., Serre, M.** Using remote sensing to calculate plant available nitrogen needed by crops on swine factory farm sprayfields in North Carolina. Proc. SPIE 9637, Remote Sensing for Agriculture, Ecosystems, and Hydrology XVII, 963704. October 14, 2015. doi:10.1117/12.2195434

Luh, J., **Christenson, E.**, Toregozhina, A., Holcomb, D., Witsil, T., Hamrick, L., Ojomo, E., Bartram, J. Assessing the Impact of Climate Change Related Hazards on the Vulnerability of U.S. Drinking Water Systems. Climatic Change. 2015. Doi: 10.1007/s10584-015-1483-0

Fisher, M.B., Shields, K., Leker, H., **Christenson, E.**, Cronk, R.D., Samani, D., Apoya, P., Bartram, J. Understanding handpump sustainability: Determinants of rural water source functionality in the Greater Afram Plains region of Ghana. Water Resources Research. 2015. Doi: 10.1002/2014WR016770

Bain, R., Wright, J., **Christenson, E.**, Bartram, J. Rural:urban inequalities in post 2015 targets and indicators for drinking-water. Science of the Total Environment. 2014, 490, 509-513.

**Christenson, E.**, Bain, R., Wright, J., Aondoakaa, S., Hossain, R., Bartram, J. Examining the influence of urban definition when assessing relative safety of drinking-water in Nigeria. *Science of the Total Environment*. 2014, 490, 301–312.

**Christenson, E.,** Elliott, M., Banerjee, O., Hamrick, L. Bartram, J. Exposure to climate-related hazards: a global assessment of populations exposed to cyclone, drought, and flood. *International Journal of Environmental Research and Public Health*. 2014.

### **Manuscripts in review:**

**Christenson, E.,** Serre, M. Integrating remote sensing data with Nutrient Management Plans to calculate plant available nitrogen from industrial swine CAFOS in North Carolina at the sprayfield and sub-watershed scales. Expected submission to *Water Resources Research* 2016.

### **Manuscripts in draft-for-publication:**

Rhodes, S. & **Christenson, E.** Nguyen, A., Larsen, J., Price, L., Stewart, J. Prevalence of livestock-associated, multi-drug-resistant, methicillin-susceptible *S. aureus* (MSSA) is much lower in the snouts and mouths of recently slaughtered North Carolina hogs raised without antibiotics compared to conventionally raised hogs. Expected submission to *Journal of Applied Microbiology* 2016.

## **Oral Presentations**

Rhodes, S., **Christenson, E.** Tracking antibiotic resistant bacteria in communities of color in industrial hog production regions of NC. Institute for African American Research. Chapel Hill, NC. Oct. 21, 2015.

**Christenson, E.,** Serre, M. A remote sensing approach to calculate plant available nitrogen at the sprayfield and subwatershed scales from swine concentrated animal feeding operations in North Carolina. SPIE Remote Sensing. Toulouse, France. Sept. 21-24, 2015.

**Christenson, Elizabeth.** GIS Methods for Water, Sanitation, and Hygiene (WASH) applications. The Water Institute lunch seminar. Chapel Hill, NC. Jan. 23, 2015.

**Christenson, E.,** Serre, M. Creating a swine waste spatial database for evaluating water quality. 16<sup>th</sup> North Carolina Environmental Justice Summit, Franklinton, NC. Oct. 18, 2014.

**Christenson, E.,** Bain, R., Wright, J., Aondoakaa, S., Hossain, R., Jaime Bartram. Examining the influence of urban definition when assessing relative safety of drinking-water in Nigeria. Water and Health Conference, UNC Chapel Hill, NC. Oct. 15, 2014.

**Christenson, E.,** Elliott, M., Banerjee, O., Hamrick, L., Bartram, J. Modeling global, urban, and rural exposure to climate-related hazards. ESRI International User Conference, San Diego, CA. July 15, 2014.

## **Poster Presentations**

Rhodes, S & **Christenson, E.,** Nguyen, A., Larsen, J., Price, L., Stewart, J. Resistant, Methicillin-Susceptible *S. aureus* is Lower in Recently-Slaughtered North Carolina Hogs Raised Without Antibiotics Compared to Conventionally Raised Hogs. *Ecology and Evolution of Infection and Disease*. Ithaca, NY. May 2016.

**Christenson, E.** Improving accessibility and quality of sprayfield data. Graduate Education Day, NC State Legislature. May 23, 2016

**Christenson, E.** Improving accessibility and quality of sprayfield data. North Carolina Impact Award Graduate Student Recognition Celebration. April 14, 2016

**Christenson, E.**, Serre, M. Improved estimation of permitted nutrient application on hog CAFOs: creating the first spatial database of hog sprayfields. Water Resources Research Institute Conference. NC State University, Raleigh, NC. March 2015.

**Christenson, E.**, Bain, R., Wright, J., Aondoakaa, S., Hossain, R., Jaime Bartram. Examining the influence of urban definition when assessing relative safety of drinking-water in Nigeria. Water Microbiology Conference, UNC Chapel Hill, NC. May 2014.

Elliott, M., Banerjee, O., **Christenson, E.**, Holcomb, D., Hamrick, L., Bartram, J. Global Assessment of Drinking Water Access Vulnerability to Climate-Related Hazards. Climate Change Symposium. UNC Chapel Hill, NC. April 2014

Elliott, M., Banerjee, O., **Christenson, E.**, Holcomb, D., Hamrick, L., Bartram, J. Global Assessment of Drinking Water Access Vulnerability to Climate-Related Hazards. Nexus 2014: Water, Food, Climate and Energy Conference, UNC Chapel Hill, NC. March 2014.