

Training Environmental Statisticians – Tomorrow’s Problem Solvers

**William F. Hunt, Jr., Dr. Kimberly Weems, Dr. William Swallow
and Michael Crotty**

Department of Statistics
North Carolina State University
Raleigh, NC 27695-8203

Dr. Nagambal Shah and Dr. Monica Stephens

Spelman College
Atlanta, GA 30314-4399

How could a win-win strategy be used to train young people in environmental statistics and at the same time analyze environmental data for Federal, State and local agencies, that have not been analyzed until now? This presentation will discuss two courses that I have developed to train undergraduate students in environmental statistics and the impact the courses have had. The courses are entitled: Environmental Statistics Practicum and Special Topics in Environmental Statistics. This training comes in support of a National Science Foundation Grant, **Collaborative Research: Training Environmental Statisticians Using Complicated Data Sets to Make More Informed Environmental Decisions**. A collaborative effort is being undertaken with Spelman College, a historically black college for women in Atlanta, Georgia. This collaborative effort has shown that this approach is portable to other universities and colleges with an undergraduate statistics program and at those without, as long as there are some courses in statistics and a statistician with an interest in environmental statistics. The collaborators has demonstrated that the environmental statistics program can be modified, adapted and enhanced at Spelman College, which represents those colleges without a formal undergraduate statistics program. The objectives of the environmental statistics courses are: (1) to provide a consulting opportunity for the students with Federal, State or local agencies; (2) focus on the application of the student’s technical skills to a real problem; (3) have the students gain consulting experience; and (4) develop their oral and written communication skills. The students learn how to prepare a final report, brief clients at the client’s office, present poster papers at technical conferences and write papers for publication. Students have done work for ten clients: (1) the Southern Oxidant Study at North Carolina State University (NCSU); (2) the U. S. Environmental Protection Agency’s (USEPA) National Exposure Research Laboratory; (3) the USEPA’s Office of Air Quality Planning and Standards; (4) the USEPA’s Office of Environmental Information in Washington, DC; (5) the North Carolina Department of Environment and Natural Resources (NCDENR); (6) the Forsyth County Environmental Affairs Department; (7) the U. S. Department of State; (8) Environment Canada; (9) the University of Texas; (10) the Texas Council on Environmental Quality; (11) the State Climate Office of North Carolina, NCSU; (12) the NCDENR Water Division; (13) the USEPA Region 4; (14) the Georgia Department of Natural Resources and (15) the Mid –Atlantic Regional Air Management Association. In addition to briefing their clients and providing the client’s with final reports, they have presented papers at 34 professional meetings and university sponsored undergraduate research symposia. The meetings they participated in are:

- (1) the Southern Oxidant Study Data Analysis Workshop, Research Triangle Park, NC, March 9, 2000;
- (2) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 27, 2000;
- (3) USEPA Technical Workshop on PM_{2.5} Monitoring, Quality Assurance, and Data Analysis, Cary, NC, May 22-25, 2000;
- (4) Future Directions in Air Quality Research, Ecological, Atmospheric, Regulatory/Policy and Educational Issues, Research Triangle Park, NC February 12, 2001; and
- (5) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 19, 2001.
- (6) NC Department of Environment and Natural Resources Data Analysis Colloquium, Raleigh, NC, May 23, 2001.
- (7) Second Annual NC State University Minority Graduate Education (MGE) Summer Research Program Poster Session, July 23, 2001.
- (8) Mathfest 2001, sponsored by the Mathematical Association of America and Pi Mu Epsilon, Madison, Wisconsin, August 2-3, 2001.

- (9) 2001 Sigma Xi Student Research Symposium, Raleigh, North Carolina on November 10, 2001.
- (10) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 18, 2002.
- (11) North Carolina Department of Environment and Natural Resources Data Analysis Colloquium, Raleigh, NC, May 23, 2002.
- (12) First Annual NC State Undergraduate Summer Research Program Symposium, August 9, 2002.
- (13) Joint Statistical Meetings, New York City, New York, August 11 - 15, 2002.
- (14) Air & Waste Management Association's Annual South Atlantic States Section Meeting, Research Triangle Park, NC, December 4, 2002.
- (15) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 10, 2003.
- (16) NC Department of Environment & Natural Resources Data Analysis Colloquium, Raleigh, NC, May 23, 2003.
- (17) 96th Annual Air & Waste Management Association Meeting, San Diego from June 22-26, 2003.
- (18) Second Annual NC State Undergraduate Summer Research Symposium, Raleigh, NC. August 9, 2003.
- (19) Triangle University Undergraduate Research Symposium, Duke University, Durham, NC, Nov. 1, 2003.
- (20) Water Resources Research Institute 2004 Annual Conference, Raleigh, NC. March 31, 2004.
- (21) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 22, 2004
- (22) 97th Annual Air & Waste Management Association Meeting, Indianapolis, IN from June 22-25, 2004.
- (23) Third Annual NC State Undergraduate Summer Research Symposium, Raleigh, NC. August 5, 2004.
- (24) Joint Statistical Meetings, Toronto, Ontario, Canada, August 8-12, 2004.
- (25) OPT-ED Alliance Day Meeting, Raleigh, NC. September 24, 2004.
- (26) Annual Meeting of the South Atlantic States Section of the Air and Waste Management Association, Virginia Beach, VA, November 4-5, 2004.
- (27) Triangle Undergraduate Research Symposium, North Carolina State University, Raleigh, NC. November 6, 2004.
- (28) Statistics/Biomathematics/ Bioengineering Undergraduate Poster Session, North Carolina State University, Raleigh, NC, February 4, 2005.
- (29) Meredith College: Mathematical Association of America, Southeastern Section, 84th Annual Meeting, Raleigh, NC, March 11-12, 2005.
- (30) 24th Annual National Conference on Managing Environmental Quality Systems, San Diego, California, April 11 - 14, 2005.
- (31) Capital Research Day, North Carolina State Legislature, Raleigh, NC, April 12, 2005.
- (32) USEPA Earth Day Celebration, Research Triangle Park, NC, April 21, 2005.
- (33) NCSU Undergraduate Research Symposium, McKimmon Center, Raleigh, NC, April 28, 2005.
- (34) The First United States Conference on Teaching Statistics (USCOTS), Ohio State University in Columbus, Ohio, May 19-21, 2005.

After six years at NCSU, 56 percent have gone on to graduate school. An even greater percentage (69%) of students taking both statistical classes goes onto graduate school. Nine students graduated with a master's degree in statistics and four are continuing on for a Ph.D. Seventeen students have gone onto graduate school programs in statistics. Seven students are employed at the Research Triangle Institute as an environmental statistician and ten students have worked part time at the USEPA as statisticians. One student has been hired by the U. S. Environmental Protection Agency. The students have given 112 professional presentations and have written 36 reports for their clients and scientific and technical papers. The students have won \$24,975 in awards for their work. In summary, these classes have created a win-win situation for the students, the clients and the university and provide an alternative way to complete environmental data analysis. Examples of their work will be presented in the paper.