

**Curriculum Vitae**  
**Rachel Todd Noble**

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The University of North Carolina at Chapel Hill  
Institute of Marine Sciences  
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**Education**

University of Southern California. Ph. D. Marine Biology, 1998.  
Dissertation: *Fates of Viruses in the Marine Environment*

Carnegie Mellon University. B.Sc. Molecular Biology, 1991.

**Professional Experience**

***Mary and Watts Hill Jr. Distinguished Professor*** **July 2015-present**

University of North Carolina at Chapel Hill, Institute of Marine Sciences: Joint appointment between the Institute of Marine Sciences and the Institute for the Environment, with additional Joint appointment to Department of Environmental Sciences and Engineering in the Gillings School of Global Public Health, including recognized affiliation with the “Water Institute”, and the Department of Marine Sciences

***Director*** **August 2003-present**

Institute for the Environment Morehead City Field Site

***Associate Professor/Full Professor*** **July 2007-June 2015**

University of North Carolina at Chapel Hill, Institute of Marine Sciences: Joint appointment between the Institute of Marine Sciences and the Institute for the Environment, with additional Joint appointment to Department of Environmental Sciences and Engineering in the Gillings School of Global Public Health and the Department of Marine Sciences

***Assistant Professor*** **July 2001 to June 2007**

University of North Carolina at Chapel Hill, Institute of Marine Sciences: Joint appointment between the Institute of Marine Sciences and the Carolina Environmental Program

***Research Faculty/Post-doctoral Researcher*** **1998-2001**

Joint appointment between the Southern California Coastal Water Research Project (SCCWRP) and the USC Wrigley Institute for Environmental Studies

***Graduate Research Assistant*** **1991-1998**

Department of Biological Sciences, University of Southern California

***Visiting Researcher*** **1996-1997**

Danish Research Academy, University of Copenhagen, Denmark

### **Honors and Awards**

Distinguished Professor Endowment and Recognition, July 2015

Recipient of US Patent **US Patent:** Methods and compositions for the detection and quantification of *E. coli* and *Enterococcus*. US2008/0233572. April 2012.

Recipient of UNC Chapel Hill Junior Faculty Development Award, December 2006

Recipient of an ISEA Travel Grant Award for Young Investigators, August 2002

DIALOG III, October 1999, Selected to represent recent doctorates in Aquatic Sciences, Bermuda Biological Research Station, Bermuda

Danish Research Academy, Visiting Research Fellowship, 1996-1997

ARCS Society Scholarship Awards, 1995-1998

Trojan League Award, May 1996

Recipient of the Award for Southern California American Society for Microbiology  
Doctoral Candidate Poster Presentation, 1993, 1994

### **Bibliography**

**Peer-reviewed Journal Articles (\* indicates mentored undergraduate and graduate students and postdoctoral associates, 90):**

Jesser, K. J. and R. T. Noble. 2018. Characterizing the ecology of *Vibrio* in the Neuse River Estuary, North Carolina using next-generation amplicon sequencing. *Applied and Environmental Microbiology*. DOI 10.1128/AEM.00333-18.

Steele J.A., Blackwood, A. D., Griffith, J. F. , Noble, R. T. and K. C. Schiff. 2018. Quantification of pathogens and markers of fecal contamination during storm events along popular surfing beaches in San Diego, California. *Water Research*. 136:137-149.

Williams, T. Froelich, B. Phippen\*, B. Fowler, P., **Noble, R. T.** and J. D. Oliver. 2017. Different abundance and correlation patterns exist between total and presumed pathogenic *V. vulnificus* and *V. parahaemolyticus* in shellfish and waters along the North Carolina coast. *FEMS Microbiol Ecol*. 2017 Jun 1;93(6). doi: 10.1093/femsec/fix071.

Froelich, B.A., B. Phippen\*, P. Fowler, **R.T. Noble**, and J.D. Oliver. 2016. Differences in total *Vibrio* spp. *V. vulnificus*, and *V. parahaemolyticus* abundance between clams and oysters in North Carolina. *Applied and Environmental Microbiology*. doi: 10.1128/AEM.02265-16

Rastelli, E., Dell'Anno, A., Corinaldesi, C., Middelboe, M., **Noble, R. T.**, and R. Danovaro. 2016. Quantification of viral and prokaryotic production rates in benthic ecosystems: a methods comparison. *Frontiers in Microbiology*. *Front Microbiol*. 2016 Sep 22;7:1501. eCollection 2016.

Raszl, S. M.\*, B. A. Froelich, C. R. W. Vieira, A. D. Blackwood and **R. T. Noble**. 2016. *Vibrio vulnificus* and *Vibrio parahaemolyticus* in South America: Water,

- Seafood, and Human Infections. *Journal of Applied Microbiology* ISSN 1364-5072. doi:10.1111/jam.13246
- Danovaro, R., Dell'Anno, A., Corinaldesi, C., Rastelli, E., Cavicchioli, R., Krupovic, M., **Noble, R.**, Nunoura, T., and D. Prangishvili. 2016. Virus-mediated archaeal hecatomb in the deep seafloor. *Journal of Science Advances*. Vol. 2, #10, e1600492. DOI: 10.1126/sciadv.1600492
- Froelich B.A.\*, and **R. T. Noble**. 2016. *Vibrio* bacteria in raw oysters: managing risks to human health. *Phil. Trans. R. Soc. B*. 371. 20150209. <http://dx.doi.org/10.1098/rstb.2015.0209>
- Groner, M., Maynard, J., Breyta, R., Carnegie, R., Dobson, A., Friedman, C., Froelich, B.\*, Garren, M., Gulland, F., Heron, S., **Noble, R.**, Revie, C., Shields, J., Vanderstichel, R., Weil, E., Wyllie-Echeverria, S. and D. Harvell. 2016. Managing Marine Disease emergencies in an Era of Rapid Change; *Philosophical Transactions B*; 371:1689
- Williams, H. N. Lymeropolopoulou, D. S., Athar, R., Chauhan, A., Dickerson, T., Chen, H., Laws, E., Berhane, T., Flowers, A., Bradley, N., Young, S., Blackwood, A. D., Murray, J., Mustapha, O., Blackwell, C., Tung, Y., and **R. T. Noble**. 2015. *Halobacteriovorax*, an underestimated predator on bacteria: potential impact relative to viruses on bacterial mortality. *International Society for Microbial Ecology*. <http://dx.doi.org/10.1038/ismej.2015.129>.
- \*Verhougstrate, M., Blackwood, A. D., Litaker, W. A., and **R. T. Noble**. 2015. Lessons learned from implementing a wet laboratory molecular training workshop for beach water quality monitoring. *PLoS One*. 30 Mar 2015. 10.1371/journal.pone.0121214.
- \*Froelich, B. A., M. Ayrapetyan, M., P. Fowler, J. D. Oliver, and **R. T. Noble**. 2015. Development of a matrix tool for the prediction of *Vibrio* Species in oysters harvested from North Carolina. doi: 10.1128/AEM.03206-14. *Appl. Environ. Microbiol.* 81(3):1111-1119.
- \*Ghazaleh, M. N. \*Froelich, B. A. and **R. T. Noble**. 2014. The effect of storage time on *Vibrio* spp. and fecal indicator bacteria in an Isco autosampler. *J. Microbiol. Methods*. 104:109-16. doi: 10.1016/j.mimet.2014.06.021. Epub 2014 Jul 6.
- Heaney, C. D., Exum N. G., Dufour, A. P., Brenner, K. P., Haugland, R. A., Chern, E., Schwab, K. J., Love, D., Serre, M. L., **Noble, R.T.**, and T.J. Wade. 2014. Water quality, weather and environmental factors associated with fecal organism density in sand at two recreational marine beaches. *Science of the Total Environment*. 1: 497-498:440-7. doi: 10.1016/j.scitotenv. 2014.07.113. Epub 2014 Aug 20.

- \*Froelich, B. A. and **R. T. Noble**. 2014. Factors affecting the uptake and retention of *Vibrio vulnificus* bacteria in oysters. *Applied and Environmental Microbiology*. 80(24):7454-9. doi: 10.1128/AEM.02042-14. Epub 2014 Sep 26.
- Gulbransen, D., \*Gonzalez, R., \*Froelich, B., Oliver, J., **Noble, R.**, and K. McGlathery. 2014. Association of *Gracilaria vermiculophylla*, a non-native, mat forming macroalga, with increased concentrations of *Vibrio* bacteria in sediment, water, and oysters on intertidal mudflats. *Marine Ecology Progress Series*. 505: 29–36, 2014. doi: 10.3354/meps10771.
- \*Froelich, B. A., \*Weiss, M. J., and R. T. Noble. 2014. The evaluation of four recent culture-based methods for the isolation and enumeration of *Vibrio vulnificus* bacteria from oyster meat. *J. Microbiol. Methods*. 97:1-5.
- \*Gonzalez, R. A. and **R. T. Noble**. 2014. Comparisons of statistical models to predict fecal indicator bacteria concentrations enumerated by qPCR- and culture-based methods. *Water Research*. 48:296-305
- \*Froelich, B. A., Bowen, J. D., Gonzalez, R. A., Snedeker, A., and **R. T. Noble**. 2013. Mechanistic and Statistical Models of Total *Vibrio* Abundance in the Neuse River Estuary. *Water Research*. DOI:10.1016/j.watres.2013.06.050. 47 (15):5783-5793.
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- enumeration of *Enterococcus* sp. and *Escherichia coli* in recreational waters. Appl. Environ. Microbiol. 2010 0: AEM.00651-10
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Jiang, S. J., and **R. T. Noble**. 2001. Human adenoviruses and coliphages in urban runoff-impacted waters of Southern California. *Applied and Environmental Microbiology*. 67:179-184.

**Noble, R. T.**, and J. A. Fuhrman. 2000. Rapid virus production and removal as measured with fluorescently labeled viruses as tracers. *Applied and Environmental Microbiology*. 66 (9) 3790-3797.

**Noble, R.T.**, Dorsey, J., Leecaster, M., Reid, D., Schiff, K., Weisberg, S. W. 2000. A regional survey of the microbiological water quality along Southern California Bight Shoreline. *Environmental Monitoring and Assessment*. 64: 435-447.

Fuhrman, J. A., and **R. T. Noble**. 2000. Causative agents of bacterial mortality and the consequences to marine food webs. *Microbial Biosystems: New Frontiers. Proceedings of the 8<sup>th</sup> International Symposium on Microbial Ecology*. Bell, C. R., Brylinsky, M., and Johnson-Green, P. (eds.). Atlantic Canada Society for Microbial Ecology, Halifax, Canada.

**Noble, R.T.**, and J.A. Fuhrman. 1999. Breakdown and microbial uptake of marine viruses. *Aquatic Microbial Ecology*. 20 (1): 1-11.

**Noble, R. T.**, Middelboe, M., and J. A. Fuhrman. 1999. The effects of viral enrichment on the mortality and growth of heterotrophic bacterioplankton. *Aquatic Microbial Ecology*. 18 (2): 1-13.

**Noble, R. T.**, and J. A. Fuhrman. 1998. Use of SYBR Green I for rapid epifluorescence counts of marine viruses and bacteria. *Aquatic Microbial Ecology*. 14 (2): 113-118.

**Noble, R.T.**, and Fuhrman, J.A. 1997. Virus decay and its causes in coastal waters. *Appl. Environ. Microbiol.* 63 (1):77-83.

Fuhrman, J.A., and **R.T. Noble**. 1995. Viruses and protists cause similar bacterial mortality in coastal seawater. *Limnology and Oceanography*. 40(5):875-885.

#### **Peer Reviewed Journal Articles In Progress**

Froelich, BA, RA Gonzalez; AD Blackwood, KA Lauer, and RT Noble; Long-term changes in *Vibrio* spp in the Neuse River Estuary of Eastern North Carolina; In prep.

Hart, J. A. and R. T. Noble. Characterizing fecal contamination dynamics in a complex estuarine system. *Journal of Water Research*. In prep.

#### **Books, Book Chapters and Technical Reports (22)**

Stumpf, C. A., Gonzalez, R. A. and **R. T. Noble**. 2012. Investigating the Coastal Water Quality of the Galapagos Islands, Ecuador. Chapter 10. In: *Science and Conservation in the Galapagos Islands: Frameworks & Perspectives*, eds. Walsh, S.

- J. and C. F. Mena. Springer Science & Business Media. ISBN1461457947, 9781461457947. 246 pp.
- McQuaig, S. M., and R. T. Noble. 2011. Viruses as Tracers of Fecal Contamination. Chapter 5. In: Microbial Source Tracking: Methods, Applications, and Case Studies. Eds. C. Hagedorn, A. R. Blanch, and V. J. Harwood. Springer Science & Business Media, 2011. ISBN: 144199386X, 9781441993861. 642 pp.
- Kinzelman, J., Bushon, R., Dorevitch, S., and **R.T. Noble**. 2011. Comparative evaluation of molecular and culture methods for fecal indicator bacteria for use in inland recreational waters. WERF PATH7R09. (*Peer-reviewed*)
- Noble, R.T.**, Blackwood, A.D., Griffith, J.F., McGee, C.D., and S. B. Weisberg. 2009. Comparison of rapid QPCR-based and culture-based methods for enumeration of Enterococcus sp. and Escherichia coli in recreational waters. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report, Southern California Coastal Water Research Project. Costa Mesa, CA. (*Peer-reviewed*)
- Converse, R. R., Blackwood, A.D., Kirs, M., **Noble, R.T.**, and J. F. Griffith. 2009. Rapid QPCR-based assay for fecal Bacteroides spp. as a tool for assessing fecal contamination in recreational waters. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report, Southern California Coastal Water Research Project. Costa Mesa, CA. (*Peer-reviewed*)
- Band, L., and Salvesen, D. (eds.). Contributors: Andrews, P., Band, L.E., Berke, P., Bromberg, P., Brubaker, J., Burby, R., Characklis, G., Doyle, M., Godschalk, D. R., Gray-Little, B., Hornstein, D. T., Konrad, C., Koren, H. S., Luettich, R. A., MacDonald, J., McKee, B., McNelis, D., Mitchell, C., **Noble, R. T.**, Paerl, H., Peden, D., Peet, R., Piehler, M., Pinschmidt, Jr., R. K., Rial, J. Ries, J., Robinson, P., Rodriguez, D., Rodriguez, A., Salvesen, D., Smith, R., Song, C., Surge, D., Weber, D., West, J., Whisnant, R., and P. S. White. 2009. North Carolina Climate Change Committee Report. Edited by Larry Band and David Salvesen. Institute for the Environment Website. UNC Chapel Hill Press. (*Not Peer-reviewed*)
- Noble, R. T.** and J. F. Fries. 2007. Estuarine Sediment Beds as a Reservoir for Human Pathogens: Monitoring Transport of Populations of Enterococci and Vibrio Sp. in the Neuse River Estuary. Publisher: Water Resources Research Institute of the University of North Carolina Series/Report no.:368. 25 pp. (*Not Peer-reviewed*)
- Noble, R. T.**, Griffith, J. F., Blackwood, A. D., Fuhrman, J. A., Gregory, J. B., Hernandez, X., Liang, X., Bera, A. A. and K. Schiff. 2006. Multi-tiered approach using quantitative polymerase chain reaction for tracking sources of fecal pollution to Santa Monica Bay, California, pp. 181-193 in: S.B. Weisberg and K. Miller (eds.), Southern California Coastal Water Research Project 2005-06 Biennial Report. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

- Noble, R. T.** Commission Internationale pour L'Exploration Scientifique de la Mer Mediterranee CIESM. 2003. Ecology of Marine Viruses. CIESM Workshop Monographs. Number 21. 94 p. Monaco.  
[www.ciesm.org/publications/Banyuls03.pdf](http://www.ciesm.org/publications/Banyuls03.pdf) (*Not Peer-reviewed*)
- Noble, R. T.,** Leecaster, M.K., McGee, C.D., Weisberg, S.B., and K. Ritter. 2002. Comparison of bacterial indicator analysis methods in stormwater affected coastal waters. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2001-2002. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)
- Noble, R. T.,** Lee, I.M., and K. Schiff. 2002. Inactivation of indicator bacteria from various sources of fecal contamination in seawater and freshwater. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2001-2002. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)
- Noble, R. T.,** Moore, D.F., Leecaster, M. K., McGee, C. D., and S. B. Weisberg. 2002. Comparison of total coliform, fecal coliform and *Enterococcus* bacterial indicator response for ocean recreational water quality testing. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2001-2002. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)
- Noble, R. T.,** Weisberg, S. B., Leecaster, M. K., McGee, C. D., Dorsey, J. H., Vainik, P. and Orozco-Borbón, V. 2002. Storm effects on regional beach water quality in southern California. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2001-2002. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)
- Noble, R.T.,** Dorsey, J.H., Leecaster, M.K., McGee, C.D., Moore, D. Orozco-Borbon, V., Vainik, P.M., and S.B. Weisberg. 2000. Southern California Bight 1998 Regional Monitoring Program: Volume III. Storm Event Shoreline Microbiology. Southern California Coastal Water Research Project. Westminster, CA. (*Not Peer-reviewed*)
- Weisberg, S. B., Dufour, A., Galt, F., Gold, M., Noble, M., **Noble, R.T.,** Reichard, E., Roberts, P., Rose, J., and D. Rosenblatt. 2000. Huntington Beach Closure Investigation. Technical Review USCSG-TR-01-2000. Sea Grant, University of Southern California, San Diego, CA. (*Not Peer-reviewed*)
- Noble, R. T.,** Dorsey, J. H., Leecaster, M. K., Orozco-Borbon, V., Reid, D., Schiff, K. C. and S. B. Weisberg. 2000. A regional survey of the microbiological water quality along the shoreline of the Southern California Bight. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 1999-2000. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

**Noble, R. T.,** and J. A. Fuhrman. 2000. Enterovirus detection by reverse transcriptase polymerase chain reaction from the coastal waters of southern California. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 1999-2000. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

**Noble, R. T.** 2000. Enterovirus detection in storm drain-impacted waters along the shoreline of the Southern California Bight. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 1999-2000. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

**Noble, R. T.,** Leecaster, M. K., Moore, D. F., Schiff, K. C. and S. B. Weisberg. 2000. Relationships among bacterial indicators during a regional survey of microbiological water quality along the shoreline of the Southern California Bight. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 1999-2000. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

**Noble, R.T.,** Dorsey, J.H., Leecaster, M.K., Mazur, M., McGee, C.D., Moore, D. Orozco-Borbon, V., Reid, D., Vainik, P.M., and S.B. Weisberg. 1999a. Southern California Bight 1998 Regional Monitoring Program: Volume I. Summer Shoreline Microbiology. Southern California Coastal Water Research Project. Westminster, CA. (*Not Peer-reviewed*)

**Noble, R.T.,** Dorsey, J.H., Leecaster, M.K., McGee, C.D., Moore, D. Orozco-Borbon, V., Vainik, P.M., and S.B. Weisberg. 1999b. Southern California Bight 1998 Regional Monitoring Program: Volume II. Winter Shoreline Microbiology. Southern California Coastal Water Research Project. Westminster, CA. (*Not Peer-reviewed*)

**Recent Published Abstracts/Contributions (since 2012, \*denote students and postdoctoral associates):**

K.J. Jesser, B.A. Froelich, R.T. Noble. Ecological characterization of *Vibrio* in the Neuse River Estuary, NC using next-generation amplicon sequencing. American Society of Microbiology Conference on the Biology of *Vibrio* 2017, Chicago, IL. (poster)

K.J. Jesser, R.T. Noble. Insights into Storm-Related Dynamics of Potentially Pathogenic Bacteria in the Neuse River Estuary, NC Using hsp60 Amplicon Sequencing. Water Microbiology 2018, Chapel Hill, NC.

K.J. Jesser, R. Nowell, B.A. Froelich, R.T. Noble. Genes significantly associated with human virulence revealed through comparative genomics of *V. vulnificus* strains. ASM Microbe 2018, Atlanta, GA. (poster, selected for rapid talk as well.)

K.J. Jesser, B.A. Froelich, W. Valdivia-Granda, R.T. Noble. Comparative clustering of

- V. parahaemolyticus and V. vulnificus isolates using phylogenetics and protein motif fingerprints. ASM Microbe 2018, Atlanta, GA. (poster)
- Oliver, J. D. BA Froelich, RT Noble, B Phippen; A long term study on the interaction of *Vibrio vulnificus* and *V. parahaemolyticus* with oysters and clams; Presented at the 11th International Conference on Molluscan Shellfish Safety; Galway, Ireland, 2017
- Jesser, K. J., J. Hart, E. Andersson, R. Canty, D. Blackwood, B. Froelich, R.T. Noble. Analysis of *Vibrio* dynamics in the Neuse River Estuary, NC using next-generation amplicon sequencing. Water Microbiology, May 2017.
- \*Jesser, K. J., J. Hart, E. Andersson, R. Canty, D. Blackwood, B. Froelich, R.T. Noble. Ecological characterization of *Vibrio* in the Neuse River Estuary, NC using next-generation amplicon sequencing. WRRRI Conference, March 16, 2017.
- \*Hart, J. D., Blackwood, A. D., and R. T. Noble. "Characterizing fecal contamination in stormwater in Beaufort, North Carolina." Poster Presented at: North Carolina Water Resources Research Institute Annual Conference, Raleigh, North Carolina, March 15-16, 2017.
- \*Hart, J. D., Blackwood, A. D., and R. T. Noble. "Microbial Source Tracking of Fecal Contamination in Coastal Stormwater in Beaufort, North Carolina." Water Microbiology Conference, May 15-18, 2017, Chapel Hill, North Carolina.
- Froelich, B. A., and R. T. Noble. *Vibrio vulnificus* and *Vibrio parahaemolyticus* in North Carolina oysters and clams, Invited Presentation to the 1st Oyster Symposium, presented by Oyster South, Auburn, AL, January 2017
- Froelich, B. A., and R. T. Noble. Human *Vibrio* pathogens;resented at the Marine Diseases Research Coordination Network, Santa Barbara, CA, December 2016
- Froelich, B. A. and R. T. Noble, Safe Seafood; Presented to the NC General Assembly and the UNC General Administration at the UNC Research Opportunities Initiative, Raleigh, NC, 2016 -- The entire talk can be viewed at: <https://goo.gl/AGUjg6>
- Steele, J., Schiff, K. C., Blackwood, A. D., Noble, R. T., and J. F. Griffith. Quantification of Pathogenic Viruses, and Bacteria in Storm Water Discharging to Beaches with Year-round Surfer Populations in San Diego, California. UNC Water Microbiology Conference, May 2016.
- Steele, J., Schiff, K. C., Blackwood, A. D., Noble, R. T., and J. F. Griffith. Pathogenic Viruses and Bacteria in Storm Water Discharging to Beaches with Year-round Surfer Populations in San Diego, California. EPA 2016 Recreational Waters Conference. New Orleans, LA.

- Froelich, B. A. , and R. T. Noble Differences in *Vibrio vulnificus* and *Vibrio parahaemolyticus* ecology between clams and oysters collected from the same location, Presented at the 2016 International Conference on *Vibrio*; Roscoff, France
- Williams, T. C., BA Froelich, B Phippen, P Fowler, RT Noble, and JD Oliver; Long-term assessment of *V. vulnificus* clinical and environmental genotype distributions in environmental samples from the North Carolina coast; Presented at the 2016 Water Microbiology Conference, Chapel Hill, NC.
- K. Jesser, B. Froelich, R.T. Noble. Metagenomic characterization of *Vibrio* in the Neuse River Estuary, NC. Water Microbiology Conference, May 2016. (talk)
- Steele, J. A., M.R. Raith, B. Layton, A. D. Blackwood, **R.T. Noble**, and J.F. Griffith. 2015. Comparison of Three Filtration Methods to Capture Pathogenic Viruses and Bacteria from Brackish Stormwater. 115<sup>th</sup> General Meeting of the American Society for Microbiology. New Orleans, LA. June 2015.
- \*Froelich, B. A., \*R. A. Gonzalez, A. D. Blackwood, \*K.C. Lauer, and **R. T. Noble**. 2015. Total *Vibrio* Abundance is increasing in the Neuse River Estuary in Eastern North Carolina while *V. vulnificus* is undergoing rarefaction. 115<sup>th</sup> General Meeting of the American Society for Microbiology. New Orleans, LA. June 2015.
- \*Froelich, B. A., \*R.A. Gonzalez, A.D. Blackwood, R.P. Boyles, \*A.H. Snedecker, \*M.P. Verhoughstraete, **and R.T. Noble**; 2014 Multi-year changes in *Vibrio* populations in the Neuse River Estuary of North Carolina, USA; *Vibrio* 2014, Edinburgh, Scotland.
- \*Froelich, B. A., M. Ayrapetyan, P. Fowler, **R.T. Noble**, and J.D. Oliver; 2014; The development of a decision matrix tool for predicting pathogenic *Vibrio* spp. in oysters harvested from North Carolina, USA; *Vibrio* 2014, Edinburgh, Scotland.
- \*Ghazaleh, M., \*B.A. Froelich, and **R.T. Noble**; 2014; The effect of storage time on *Vibrio* spp. and fecal indicator bacteria in estuarine water samples in an ISCO autosampler; presented at the 2014 Water Microbiology Conference: Microbial contaminants from watersheds to human exposure; Chapel Hill, NC.
- \*Froelich, B. A., Blackwood, A. D., \*Verhoughstrate, M., \*Gonzalez, R. A., Luettich, R. A., Paerl, H. W., Oliver, J. D., and **R. T. Noble**, 2013, The ecology of *Vibrio* bacteria in an estuarine system impacted by extreme climatic events. Invited Presentation at the Centre for Environment, Fisheries, and Aquaculture Science, Weymouth, Dorset, United Kingdom.
- \*Froelich, B.A., D. Blackwood, \*M. Verhoughstrate, \*R. A. Gonzalez, R. Luettich, H. Paerl, J. Oliver, and R. Noble; 2013; The importance of long-term, cross



disciplinary study of pathogen dynamics in relation to extreme climatic events in complex estuarine systems: an examination across scales; 2013 Ecology and Evolution of Infectious Diseases Conference, Athens, GA.

\*Froelich, B.A., \*R. Gonzalez, D. Blackwood, M. Greene, R. Guajardo, S. Brothers, \*M. Verhoughstraete, R. Luettich, H. Paerl, J. Oliver, and **R. Noble**; 2012; Pathogenic *Vibrio* species in the Neuse River Estuary, 2012. Ecology of Infectious Marine Disease Research Coordination Network Conference, Seattle, WA

\*Froelich, B.A., \*R. Gonzalez, E. Crill, D. Blackwood, M. Greene, R. Guajardo, S. Brothers, R. Luettich, H. Paerl, J. Oliver, and **R. Noble**; 2012. *Vibrio vulnificus* population dynamics in the Neuse River estuary of eastern North Carolina; Gordon Research Conference on Oceans and Human Health; Biddeford, ME.

\*Froelich, B.A.,\* Gonzalez, R. A., Oliver, J. D., and **R. T. Noble**. Understanding the dynamics of total *Vibrio* and pathogenic *Vibrio* species in a complex estuarine system impacted by extreme events. Ecology and Evolution of Infectious Disease 2012. Berkeley, CA.

Layton, B., Cao, Y., Balleste, E., Farnleitner, A., Gourmelon, M., Lee, J., Meijer, W., Noble., R. T., Peed, L., Reischer, G., Van De Werfhorst, L., Boehm, A., Holden, P., Jay, J., Shanks, O., and J. F. Griffith. Performance of Human Fecal-Associated PCR-based Methods in the California Source Identification Protocol Project. ASM General Meeting, San Francisco, CA. June 2012.

#### **Published Doctoral Dissertations (Primary Advisor)**

*Vibrio vulnificus* em ostras (*Crassostrea gigas*) em Santa Catarina; caracterizacao genotipica e comparacao de eficacia de metodos microbiologicos de deteccao. Simone Raszl. August 2016.

Gonzalez, R. A. July 2013. Tools for predicting microbial water quality in estuaries used for recreation and shellfish harvesting. Doctoral dissertation for Department of Environmental Sciences and Engineering in the Gillings School of Global Public Health. UNC Chapel Hill. UNC Press, Chapel Hill, NC, USA.

Stumpf, C. H. April 2011. New approaches and technologies for quantifying fecal contamination in tidal creek and coastal receiving waters. Doctoral Dissertation for Department of of Marine Sciences at UNC Chapel Hill. UNC Press. Chapel Hill, NC, USA.

Converse, R. R. November 2009. Bridging the Gap between Molecular and Traditional Assessments of Recreational Water Quality. Doctoral Dissertation for Department of Marine Sciences at UNC Chapel Hill. UNC Press. Chapel Hill, NC, USA.

Coulliette, A. D. July 2008. Characterization of Fecal Contamination in the Newport River Estuary (North Carolina, USA). Doctoral Dissertation for Department of Environmental Sciences and Engineering at UNC Chapel Hill. UNC Press. Chapel Hill, NC, USA.

**Teaching Activities (Recent Five Years)**

Human Impacts on Estuarine Processes (ENEC 471)

Fall 2018 [13]  
Fall 2017 [16]  
Fall 2016 [14]  
Fall 2015 [11]  
Fall 2014 [15]  
Fall 2013 [14]

Capstone: Analysis and Solution of Environmental Problems (ENEC 698)

Fall 2018 [13]  
Fall 2015 [11]  
Fall 2014 [15]  
Fall 2013 [14]

Independent Research or Honors Thesis (ENEC 395, ENEC693H)

Fall 2018 [13]  
Fall 2017 [14]  
Fall 2016 [15]  
Fall 2015 [11]  
Fall 2014 [15]  
Fall 2013 [14]

Environmental Seminar (ENEC 204)

Fall 2015 [11]  
Fall 2014 [15]  
Fall 2013 [14]  
Fall 2012 [13]

Honors Project in Environmental Sciences and Studies\* (ENEC 694H)

Fall 2018 [1]  
Spring 2018 [2]  
Spring 2016 [2]  
Spring 2015 [1]  
Fall 2014 [5]  
Spring 2014 [1]  
Spring 2013 [1]

Honors Project in Geology\*

Spring 2010 [1]

**Student Mentoring Activities:**

Primary Graduate Advisor

Sandra Mesquita (Ph. D., Fall 2012, University of Portugal)  
Raul Gonzalez (Ph. D., Summer 2013, ESE)  
Kellen Lauer (M. Sc., July 2015, MASC)  
Simone Moraes Raszl (Ph. D. August 2016, University of Santa Caterina, Brazil)  
Justin Hart (M. Sc. August 2017, ESE)  
Kelsey Jesser (Ph. D. Candidate, MASC)  
Rachel Canty (M. Sc. Student, MASC)  
Matthew Price (Ph. D. Student, ESE)  
Alyssa Grube (Ph. D. Student, ESE)

Thesis Committee Member

Elizabeth Christensen (Ph. D. student, ESE)  
Adam Gold (Ph. D. student, MASC)  
Mollie Yacano (M. Sc. Student, MASC)  
Britney Phippen (Ph. D.. May 2018, UNC Charlotte)  
Sarah Rhodes (Ph. D. student, ESE)  
Yvonne Yuen (Ph. D. student, ESE)  
Stephanie Wear (Ph. D. 2015, DUML)  
Charmaine Yung, (Ph. D. 2016, DUML)  
Brianna Young (M. Sc. 2016, ESE)  
Teri O'Meara (Ph. D., 2014)  
Timothy Otten (Ph.D., 2012)  
Jen Gentry-Shields (Ph. D., 2012)  
Dendy Lofton (Ph. D. 2012)

Honors Thesis Advisor: All below completed Honors Theses and graduated with highest honors. They also presented their research at national-level research conferences

Kinsey Fisher (Spring 2018)  
Chelsea Brown (Spring 2018)  
Allison Duprey (Fall 2018)  
Peggy Mullin (Fall 2018)  
Bonnie Ertel (Spring 2018)  
Abigail Henderson (Spring 2018)  
Allison Kline (Fall 2014, Spring 2016)  
Rachel Voorhis (Fall 2014, Spring 2016)  
Alexandra Lorentz (Spring 2015)  
Maite Ghazaleh (Spring 2014)  
Alexandra Snedeker (Spring 2013)

Undergraduate Research Advisor

Luke Myers (NSF REU)  
Sarah Hiser (NSF REU)  
Sarah Hatcher (NSF REU)  
Sarah Rhodes (NSF REU)

	Chelsea Berg (NSF REU)
	Maria Walker (NSF REU)
	Sunny Choi
	Zeph Pendleton
	Stephanie Walker (NSF REU)
	Marie English
	Sara Posey
	Alexandra Snedeker
	Mary Jo Weiss (NSF REU)
	Steven Morgan (NSF REU)
	Larissa Bennett
	Ryan Leighton
	Joshua Dickens
	Matthew Herman
	Lauren Smith
	Chandler Musson
	Jake Malone
Visiting International Scholars	Simone Moraes Raszl (University of Brazil, Florianopolis, Fall 2014 and 2015-2016)
	Dr. Luiz Pimental (University of Brazil, Florianopolis, 2015-2016)
Post-doctoral Research Scholars	J. Steve Fries
	Marek Kirs
	Kathy Conn
	Mussie Habteselassie
	Tamer Helmy
	Marc Verhougstraete
	Raul Gonzalez
	Brett Froelich

**Projects and Funding (listed in reverse chronological order):**

***Active Projects:***

- Lead PI: Monitoring the San Diego Bay for Microbial Contaminants, Port of San Diego, June 1, 2018-June 30, 2020. \$89,000.
- Co-PI: Characterizing and Manipulating Oyster Microbiology for Aquaculture Applications, North Carolina Sea Grant, Feb 1, 2018-Jan 31, 2020. \$100,000.
- Lead PI: Characterization of fecal contamination in an Oregon Paper Mill. \$52,000. October 2016-December 2018. Georgia Pacific.
- Lead PI: An Applied Coliphage and Human Viral Pathogen Investigation in Wastewater Discharge and Receiving Waters. \$67,000. Funding July 2016-December 2018. Hampton Roads Sanitation District.
- Lead PI: Rapid, quantitative molecular diagnostics for virulent *Vibrio* pathogens in water and shellfish. National Science Foundation. June 2016-December 2018. \$199,900.

- Co-PI: A multi-faceted collaborative approach toward managing stormwater impacts on NC reserves. NOAA NERRS Science Collaborative. Funding November 2017-November 2020. \$750,000.
- Lead PI: Understanding the public health risk associated with under dock oyster culture and aquaculture activities in the estuarine waters of North Carolina, NC Sea Grant, \$100,000. Funding February 1, 2016-February 1, 2018.
- Lead PI: Understanding the public health risk associated with under dock oyster culture and aquaculture activities in the estuarine waters of North Carolina, NC Sea Grant, \$24,889. Funding February 1, 2016-February 1, 2018.
- Lead PI: Revolutionizing and commercializing rapid molecular diagnostics for viral and bacterial pathogen quantification in marine waters and seafood. Funding Agency: University of North Carolina General Administration. Project Duration: February 2015 to June 2018. \$684,805.
- Sole PI: Virus quantification and recovery from complex matrices in San Diego, CA. Funding Agency: Southern California Coastal Water Research Project. Project Duration: February 2014 to December 2018. \$69,113.
- Sole PI: Microbiological Assessment of Industrial Wastewater Discharge from the RockTenn Paper Mill in West Point, VA. Funding Agency: Oakwood Laboratories and RockTenn Paper Mills. Project Duration: July 2014 to June 2018. \$36,000.

***Completed Projects (Last 5 years only)***

- Co-PI: Evaluation of the Role of Salinity in Determining Levels of *Vibrio vulnificus* and *Vibrio parahaemolyticus* in North Carolina Oysters and Clams. Prime Funding Agency: NOAA. Funded as Subcontract to UNC Charlotte. Project Duration: July 2014 to June 2017. \$75,048.
- -Lead PI: Quantification of human pathogens in water and shellfish near a WWTP outfall. March 2016-June 2018. Hampton Roads Sanitation District. \$380,063.
- Lead PI: Studying Stormwater Runoff to Better Protect Public Health at North Carolina Beaches. Prime Funding Agency: NC Sea Grant (\$100,000). Student Fellowship Stipend Plus Grant Award. Project Duration: February 2014 to February 2018. Student Stipend Portion (\$73,000).
- Co-PI: Meteorological and environmental conditions leading to increases in virulent *Vibrio vulnificus* abundances in shellfish. Funding Agency: USDA-NIFA. Postdoctoral Research Fellowship to Brett Froelich. Project Duration: January 2014 to January 2016. \$160,000.
- Sole PI: Molecular Analyses for Quantitative Microbial Risk Assessment Study in Tecolote Creek, CA. Prime Funding Agency: City of San Diego, CA. Part of a large multi-institutional QMRA Project. Project Duration: June 2014 to June 2016. \$187,000.
- Sole PI: Assessing the role of resuspension of fecal indicator bacteria and markers of fecal contamination. Funded by Hampton Roads Sanitation District and the City of Virginia Beach, VA. Project Duration: November 2011 to December 2015. \$349,600.

- Sole PI: Quantitative Assessment of Rapid Molecular Methods for Rehabilitation of Drinking Water Infrastructure. Funded by 3M. Project Duration: May 2013 to June 2015. \$55,000.
- Sole PI: Quantitative analysis of fecal bacteria in Wrightsville Beach stormwater outfalls. Funded by Town of Wrightsville Beach. Project Duration: February 2011 to June 2015. \$83,960.
- Lead PI: Further assessment of fecal contamination and related risks from ocean outfalls of stormwater in Dare County, North Carolina. Funded by Moffat and Nichol, with Prime Funding Agency, NCDENR. Project Duration: September 2010 to March 2015. \$347,514.
- Lead PI: Whalebone Junction Supplement to the existing UNC CH Project-Monitoring, prioritization and assessment of ocean outfalls of stormwater in Dare County, North Carolina". Project Duration: July 2008 to June 2015. \$85,017.
- Lead PI: North Carolina Department of Transportation. Monitoring, Prioritization, and Assessment of Ocean Outfalls of Stormwater in Dare County, North Carolina. Project Duration: May 2006 to June 2015. \$861,313.
- Sole PI: Specific Quantitative Microbial Source Tracking Investigation in Wilmington, NC. Funding Agency: Coastal Planning and Engineering. Project Duration: February 2014 to February 2015 \$4,800.
- Lead PI: Linkage of Bacterial Pathogens to Human infectious Disease in an Estuary Subjected to Extreme Climatic Events. National Science Foundation/National Institutes of Health Ecology of Infectious Disease Program. Collaborative Research within Ocean Sciences. Project Duration: September 2008 to August 2014. \$1,527,729.
- Sole PI: Preliminary Assessment of Potential Sources of Fecal Contamination in Nanney's Creek, Back Bay, VA. Funded by Hampton Roads Sanitation District and the City of Virginia Beach, VA. Project Duration: January 2013 to June 2014. \$61,000.
- Sole PI: Understanding the dynamics of microbial contaminant fate and transport in rural and agricultural lands. United States Department of Agriculture National Research Initiative Program. Project Duration: September 2008 to August 2013. \$397,136.
- Sole PI: Quantitative Analysis of Markers of Fecal Contamination at Falls Lake Beaches. Funded by Wake County Environmental Services. Project Duration: September 2011 to September 2013. \$12,151.
- Sole PI: Development of a molecular training facility in eastern North Carolina. Funded by the North Carolina Biotechnology Center. Project Duration: December 2012 to August 2013. \$40,000.
- PI: NSF HBCU-RISE Center for Microbial Ecology, Molecular Biology and Biotechnology. National Science Foundation, in collaboration with Florida A & M University. Project Duration: November 2009 to April 2013. \$67,000.
- Sole PI: Assessing source of fecal contamination in high priority creeks in the Hampton Roads Region. Project Duration: January 2010 to April 2012. \$252,000.

**Patents Approved:**

- **US Patent:** Enterococcus and Fecal Bacteroides for Rapid Water Quality Assessment. US2010/042889, Published. February 10, 2011. Abandoned January 2015.
- **US Patent:** Methods and compositions for the detection and quantification of *E. coli* and *Enterococcus*. US2008/0233572. Filled January 2006. Claims approved January 2012. Patent issued April 2012.
- **Current Report of Invention:** Probiotics for shellfish aquaculture. Patent filing anticipated September 2018.

**University Service (Recent Five Years)**

Post Tenure Review Committee, Institute of Marine Sciences (2018-2019)

Served as Chair for multiple Tenure and Promotion Committees

Undergraduate Semester Planning Committee, UNC Chapel Hill Institute of Marine Sciences (2014-present)

Performance Committee, UNC Chapel Hill Institute of Marine Sciences (2003-Present)

Institute for the Environment Faculty Advisory Committee (2010-present)

UNC Chapel Hill Center for Galapagos Studies Facilities Committee (2010-present)

**Professional Service:**

**Major Conference Organization:**

UNC Water Microbiology Conference and Health Related Water Microbiology Symposium, May 2018, Convener, Disaster Response Panel

Invited Speaker, Bio-Rad Panel Discussion on Molecular Pathogen Quantification in Water, May 2018

UNC Water Microbiology Conference and Health Related Water Microbiology Symposium, May 2017, Side Event Convener, Hurdles to Implementation of Molecular Methods

UNC Water Microbiology Conference and Health Related Water Microbiology Symposium, 2014-present, Organizing Committee

Molecular Training Facility-Workshops to Train Professionals in qPCR and digital droplet PCR techniques, (2012-present)

UNC Water Microbiology Conference, May 2014—present, Conference Organizing Committee, Abstract Review and Side Event Convener

Originating Founder, Water Institute and Institute of Marine Sciences Communities of Practice Initiative, January 2015

**Professional Service: Nominated Panels and Steering Committees**

Mariculture Research Plan, NC Mariculture Plan Committee, Water Quality Subcommittee, Research and Development Subcommittee, and Shellfish Mariculture Advisory Committee (December 2017-present) NC Coastal Federation

Town of Beaufort, Stormwater Advisory Committee, Nominated Member

Invited Expert, EPA Coliphage Experts Workshop, March 2016

ASTM, Section D19 Voting Representative in Regulatory Affairs for Water (June 2012 to present)

Chair (January 2006-present), Standard Methods Part 9230, Fecal

Enterococcus/Streptococcus Groups, resulting in complete revision of section

Chair (January 2006-present), Standard Methods Committee, Part 9211 Rapid Detection Methods

Advisor (January 2002-present) to recreational water quality sampling program for the Shellfish Sanitation Section, North Carolina Division of Water Quality

Nominated (January 2003-present) steering committee member, NC Division of Water Quality Storm Drain Rules Committee

Nominated Representative (January 2004-present) from American Society of Limnology and Oceanography to the National Water Quality Monitoring Council

***Session Chair Opportunities (Since 2010):***

Session Chair Convener, UNC Water Microbiology Conference and International Water Symposium, May 2014-present

Session Chair, Abstract Review and Convener, Water Quality, Diarrheal Disease, Preparedness Side Event, UNC Water and Health Conference. October 2011-present

Session Chair, Challenges in Ecology of Infectious Disease, American Society for Limnology and Oceanography, Aquatic Sciences Meeting, February 2011

***Invited Presentations and Workshops (since 2012):***

Invited Speaker, Girls in Engineering, Science and Technology (GEST) Event, Keynote Speaker, Duke University Marine Laboratory, April 2018

Invited Speaker, Orange County Public Works Department, August 2017

Invited Speaker and Session Convener, UNC Water Microbiology Conference, May 2017

Invited Speaker, UNC Water and Health, October 2016

Invited Speaker, 2<sup>nd</sup> Annual qPCR & Digital PCR Congress: USA, Philadelphia, PA, July 2016

Invited Panelist, EPA Coliphage Experts Workshop, March 2016

Organizer and Co-Convener, Open Session on Coliphage Criteria for Wastewater, UNC Water Microbiology Conference, May 2015, Chapel Hill, NC

Invited Speaker and Panelist, UNC Water and Health 2015, Diarrheal Disease, October 2015

Invited Speaker and Panelist, April 2014, USGS qPCR Rapid Diagnostics Panel, NWQMC National Meeting, Cincinnati, OH

Invited Speaker, March 2014, Lower Cape Fear Technical Advisory Committee

Invited Speaker, November 2012, Back Bay Restoration Initiative Forum, VA Beach, VA

Invited Speaker, October 2012. Economic Development Forum, UNC Wilmington.

Invited Speaker, NOAA NCCOS Laboratory, Beaufort, NC, January 2012

Invited Speaker, Coastal Science Café, Contaminated Waters, January 2012

**Peer Review Service**

Genomic Applications Partnerships Program, Genome Canada, Spring 2018

California Sea Grant Proposal Review Panel, 2013-2018

Abstract Review, UNC Water and Health Conference, 2013-present

Abstract Review and Selection, UNC Water Microbiology Conference, 2014-present

Associate Editor, Advances in Limnology and Oceanography (October 2009- present)

Ecology and Evolution of Infectious Disease, NSF Program Panel, 2014-2016



AAAS Review, Rhode Island Sea Grant, Fall 2014  
Abstract Review, Symp. for Aquatic Microbial Ecology, Stresa, Italy, September 2013  
Abstract Review, Scientific Funding Agency, Portugal  
Outside Examiner, Flinders University, Australia, Natalie Bolton, 2012, 2014, 2016  
Chair, Peer Review Team, USEPA Fall 2011, Criteria Development in Surface Waters  
NIEHS Bioavailability in Sediment Peer Review Panel, Raleigh, NC, May 2011  
Abstract Review Committee, National Water Quality Monitoring Council, Fall 2011  
Abstract Review and Editing Committee, UNC Water and Health Conference 2011  
Peer Review and Synthesis of Tropical Indicators Report for USEPA, November 2010  
Mail reviewer (2001-Present) for Florida Sea Grant, Delaware Sea Grant, Texas Sea Grant, North Carolina Sea Grant, California Sea Grant, NOAA Oceans and Human Health, USDA, National Research Initiative, USEPA, National Institutes for Environmental Health Sciences, National Science Foundation, Water Resources Research Institute, Cooperative Institute for Coastal and Estuarine Environmental Technology, and National Water Resources Institute, NOAA Center for Coastal Ocean Research MERHAB Program, North Carolina Water Resources Research Institute, University of Rhode Island, University of New Hampshire, Great Lakes Beach Initiative, Michigan Sea Grant  
Peer reviewed journal manuscripts for the following journals (from 2001-2018):  
-Marine Pollution Bulletin-Outstanding Reviewer 2016-2017  
-Water Research-Outstanding Reviewer 2014-2017  
- PLoS Biology,  
-Nature and Nature Methods,  
-Aquatic Microbial Ecology,  
-Applied and Environmental Microbiology,  
- Journal of Applied Microbiology  
-Journal of Environmental Microbiology  
-Limnology and Oceanography  
-Limnology and Oceanography: Methods  
-Journal of Water and Health  
-Microbial Ecology  
-Hydrobiologia  
-The Biological Bulletin  
-FEMS Microbiology Ecology  
-FEMS Microbial Ecology Reviews  
-Journal of the Marine Biological Association  
-Marine Ecology Progress Series  
-Ecological Applications  
-Estuaries and Coasts  
-Journal of Environmental Engineering  
-Environmental Science and Technology  
-Environmental Health Perspectives  
-Environmental Microbiology and Environmental Microbiology Reports  
-Geophysical Research Letters  
-Journal of Biotechnology  
-Journal of Environmental Monitoring

- Journal of Environmental Monitoring and Assessment
- Journal of Microbiological Methods
- Science of the Total Environment
- PLoS One
- Proceedings of the National Academy of the Sciences

### **Local Teaching, Volunteer, and Educational Engagements**

- Assisting Friends of the Maritime Museum in Phase II Educational and Outreach Opportunities and Development
- Science Night, Beaufort Middle School, Featured Scientist 2017-present
- Judge and Competition Question Designer, Coastal Marine Science Competition, NC Marine Science and Education Partnership, 2015-2017
- Stormwater in the Rachel Carson Estuarine Reserve, Beaufort Middle School 7<sup>th</sup> Grade, October 2016-present-serving over 350 students in stormwater and environmental education
- Summer Camper Training Program on Oysters and Bacteria, North Carolina Coastal Federation, Summer 2015
- The Water Cycle and Stormwater to Your Beach, Learning Module for 2<sup>nd</sup> graders at St. Egbert Elementary School
- Senior Project on Public Health, Graduating Senior Cici Capps, February 2015 (later admitted to UNC Chapel Hill as an undergraduate)
- Marine Plastics Exhibit, Organizer, Institute of Marine Sciences, December 2014, an opportunity to teach students of all ages about the marine plastics
- Leader and Organizer, Water Quality Test Kit Fundraiser in collaboration with Clear Cambodia, Spring 2014
- Chair and Member St. Egbert Silent Auction Committee (2012 to present)
- Teaching Elementary Students Water Quality, Water Conservation and Water Testing Approaches, Spring 2014-present, St. Egbert Catholic School, all grades, all classes.
- Teaching Elementary Students Meiofauna Dynamics, March 2013, St. Egbert Elementary School
- College Success Foundation, Training to Inner City High School Students in Marine Science, August 2011
- Elementary Level education in Stormwater Runoff and Prevention, DNA: The Blueprint of Life, St. Egbert Catholic School, 2010-present