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| ***1. Project Title*** | Tracking the fate of plastic pollution in the Neuse River Basin |

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| ***2a. Primary Contact or Project Manager1*** | | | | | |
| Name | Barbara Doll | | | | |
| Title | Extension Associate Professor | | | | |
| Organization Name | NC State University and NC Sea Grant | | | | |
| Organization Tax ID Number | 56-6000756 | | | | |
| E-mail address | bdoll@ncsu.edu | | | | |
| Mailing Address | Campus Box 8605  850 Main Campus Drive, Suite 105 | | | | |
| City | Raleigh | State | NC | Zip | 27695 |
| Telephone | 919 515 5287 | Fax Number | |  | |

**1****A paragraph or Statement of Qualifications must be provided in Section 4 of the application form to confirm that**

**anyone designing, installing, or monitoring the proposed project is qualified to do so.**

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| 2b. Execution Address (where contract will be mailed for signature) | | | | | |
| Name | Sherrie Settle | | | | |
| Title | Director of Sponsored Programs | | | | |
| Organization Name | North Carolina State University | | | | |
| E-mail Address | sps@ncsu.edu | | | | |
| Mailing Address | Admin Services III, Suite 240  2601 Wolf Village Way | | | | |
| City | Raleigh | State | NC | Zip | 27607 |
| Telephone | 919 515 2444 | Fax Number | |  | |
| Federal Tax ID Number | 56-6000756 | | | | |

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| 2c. Payment Address (where invoice payments will be mailed) | | | | | |
| Name | Justo Torres | | | | |
| Title | Director of Contracts and Grants | | | | |
| Organization Name | North Carolina State University | | | | |
| E-mail Address | cngacctsrec@ncsu.edu | | | | |
| Mailing Address | Admin Services III, Suite 240  2601 Wolf Village Way | | | | |
| City | Raleigh | State | NC | Zip | 27695 |
| Telephone | 919 515 2153 | Fax Number | |  | |

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| ***3. Project Description (provide a short summary of the project).*** |
| Plastics currently comprise the bulk of marine debris (Zettler et al., 2013). Over the last decade, researchers have documented the proliferation of plastics (both macro and micro) in aquatic environments around the globe. An overwhelming majority of the plastic pollution in the marine environment is transported to the coast from river systems (Jambeck et al., 2015). Over the past year NC State and NC Sea Grant have been collecting microplastic samples throughout the Neuse River basin and captured and quantified plastic pollution in Raleigh area streams. Our preliminary results indicate that (1) both macro- and microplastic pollution are problems throughout the basin and (2) it is very difficult to determine the ultimate fate of plastic pollution (i.e., what percentage reaches the coast vs. captured in floodplains or other riverine areas). Therefore we propose to conduct a study to determine the path, travel time, and ending location of plastic bottle discarded into streams in the Raleigh area. To address these objectives, plastic bottles (40) equipped with GPS tracking devices will be released into Crabtree and Walnut Creeks in Raleigh. Six bottles will be released at 5 different locations along the streams. The GPS devices report a location every hour. The bottles will be tracked for two to four weeks, depending on their locations. The bottles will then be collected. After collection, the GPS batteries will be recharged and the bottles will be released into the stream again in Raleigh. This process of releasing and collecting the bottles will be repeated four times during the study. The bottles will be marked with brightly colored high visibility paint and labeled with identifying information and a link (QR code) will be provided to a Google form where people can learn more about the project or report seeing the bottles. These trials will yield a dataset of 160 paths and travel times for the plastic bottles. The project will be publicized through NC Sea Grant and partner organizations. The end product will be a website hosted by NC Sea Grant that shows the path and travel information of each bottle released. The results will help communicate the problem of plastic pollution to the general public and likely illustrate that marine plastic pollution is not just a coastal problem, but is actually something everyone needs to consider and take action to address. |

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| ***4. Statement of qualifications (provide a brief explanation of your organization’s qualifications to complete the project)*** |
| Over the past year we have been working on a NOAA-funded project investigating the sources and prevalence of plastic pollution in the Neuse River Basin. We have been testing and refining methods to collect and monitor plastic pollution. We have sampled microplastics using a trawl net and via bailing and sieving at 15 locations throughout the Neuse River Basin. We have also applied several methods to collect and gauge loadings of macroplastics. During this time we have collaborated with nonprofits (Plastic Ocean Project, Sound Rivers), other universities (UNC Wilmington), and contributed to an international microplastics research effort (The 100 Plastic Rivers project – University of Birmingham (UK)). |
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| ***5. Project Start Date*** | 1/1/2022 | ***Project End Date*** | 12/31/2022 |

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| **6. Project Location: Important to submit as completely as possible, especially the Lat/Long coordinates. Only projects which take place within or primarily impact areas in APNEP’s management boundary will be considered for funding.** | |
| Project Location | The Neuse River from Raleigh to the coast |
| River Basin(s) | Neuse River |
| Position coordinates of project location | Latitude   35.8206\*          Longitude   -78.633\*               \*This is the upper most location of this study. This project will be conducted across the Neuse River Basin from Raleigh to the coast. |

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| **7. List which CCMP Actions will be addressed and how the proposed activity will address them:** |
| Link to [**APNEP Comprehensive Conservation and Management Plan**](https://apnep.nc.gov/resources/publications-and-reports/ccmp) **(CCMP)**  **D1.1: Communicate the importance of stewardship and offer opportunities for volunteerism to further APNEP's mission.**  **NC Sea Grant will work to publicize the project through media alerts, social media and partner organizations and encourage citizen volunteers (anglers, boaters, other users of the river) to watch for the bottles and enter the location and submit a photo through a Google form. The results of the project (interactive GIS map of the bottle paths, photos and end locations) will be available on a website hosted by NC Sea Grant. The interactive website can be used as an educational tool to raise awareness of the impact of inland plastic pollution on our estuaries. Sea Grant will prepare a media alert for each bottle release with key information to encourage citizens to be on the lookout for the bottles and information about how to report sightings.** |

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| **8. Brief explanation of linkage to APNEP priority areas (1)water quality, (2)submerged aquatic vegetation, (3)coastal habitats, (4)increasing resiliency:** |
| (1) Water Quality and (3) Coastal Habitats – plastic pollution is an area of emerging water quality concern as more research indicates that while plastics appear to degrade into simple compounds in the aquatic environment; this is not the case. Instead, plastics only breakdown into smaller and smaller components, their total mass not substantially reduced (Yonkos et al., 2014). There are many unknowns regarding the severity or long term environmental and human health impacts of microplastics, but research has clearly demonstrated microplastics pose an increasing threat to marine life (Thompson, 2015). The consumption of larger plastics can cause obstructions in wildlife’s digestive tracts and there are also potential toxicity concerns. Because of the surface chemical properties of plastics, toxic substances such as persistent organic pollutants (Rochman et al., 2013) and heavy metals (Munier and Bendell, 2018) readily bind to microplastics. Leaching of plastic additives is also a concern (Koelmans et al., 2014).  Wildlife can be exposed to these pollutants when they consume microplastics and there is also the risk of negative impacts higher up in the food web due to bioaccumulation of toxins (Teuten et al., 2009). |

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| ***9. List activities that will be used to monitor or indicate the success of the proposed activity/project by listing one or more output and/or outcome metrics that will be measured, documented, and reported after project completion, as well as the expected target for each metric. Please also include a short explanation for how each listed metric assists in measurement of a CCMP Action being implemented by the project. Please see the proposal guidelines RFP*** [***output/outcome example document***](https://apnep.nc.gov/documents/engagement-outputsoutcomes-guidance) ***for details.*** |
| **Outcome metric**: **number of volunteers that document bottle locations and number of visitors to the project website**. These metrics will we tracked using Google Analytics software and presented in the final report. Expected targets: 200 volunteers fill out google form documenting citing of plastic bottles in the Neuse River. 10,000 unique visitors to project website. |

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| 10. Description of funds (Combined APNEP and leveraged funds. | | | | |
| Description of Service | APNEP | Contract Applicant  (Cash, In-Kind, Other)  (e.g. In-kind - staff assistance 5hrs/wk\*$13/hr\*10wks=$650) | Other Contributions  (Organization, Cash, In-Kind, Other)  (e.g. NC DMF - In-kind – staff assistance 5hrs/wk\*$13/hr\*10wks=$650) | Total |
| Personnel/Salary | $ 7,791 (11% Research Associate) | $7,933 (9% Associate Prof.) |  | $15,724 |
| Fringe Benefits | $3,110 | $3,024 |  | $6,134 |
| Project Supplies | $6,308 (40 GPS trackers, tracking subscription, bottles and labels) |  |  | $6,308 |
| Equipment |  |  | $4,000 (kayak rental) | $4,000 |
| Transportation/Travel | $936 (Use of NC State vehicle) |  |  | $936 |
| Sub-contract Services |  |  |  |  |
| Other Direct Costs |  |  | $4,566 (volunteer effort) | $4,566 |
| Total Direct Cost | $18,145 | $10,957 | $8,566 | $37,668 |
| \*Indirect Cost (F&A) (not to exceed 10%)  (e.g. 10% of the total direct costs $10,000 = $1,000) | $1,815 | $1,096 | $857 | $3,768 |
| Total Cost | $19,960 | $12,053 | 9,423 | $41,436 |

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| ***11. Describe leveraging of funds from project partners (Optional):*** |
| Sound Rivers will provide kayaks for use in collecting the bottles from the river.  \*Check with Heather Jennings for more information at 919-707-8632  Eight kayaks + trailer @ $500 per day x 8 days = $4,000  In addition, volunteers will be recruited to help collect the bottles from the Neuse River.  40 volunteers x 4 hours each x $28.54/hr = $4,566 |

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| 12. Project Partners (may add more if needed) | | | |
| Agency Name | Sound Rivers, Inc. | | |
| Agency Address | P.O. Box 1854 | | |
| Role/contribution to Project | Organize volunteers for bottle recovery, provide kayaks for recovery, and promote media announcements about bottle releases on their web page and through social media. | | |
| Contact Person | Heather Deck | Phone No. | (252) 946-7211 |
| E-mail address | heather@soundrivers.org | | |
| Agency Name |  | | |
| Agency Address |  | | |
| Role/contribution to Project |  | | |
| Contact Person |  | Phone No. |  |
| E-mail address |  | | |

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| ***13. Project Milestone Schedule*** |

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| **Time Period / Date** | **Activities (List specific outputs or activities that will be achieved during each quarter.)** |
| First Quarter | Purchase the equipment and schedule bottle release timing. Recruit volunteers and publicize project through NC Sea Grant and partners. |
| Second Quarter | Conduct first two bottle release and collection trials, build website and begin posting results. |
| Third Quarter | Conduct second two trials |
| Fourth Quarter | Analyze data and finalize website, and write final report |

**Note: All projects must submit a detailed Final Project Report that is due by the end of the contract for APNEP review and approval. Supplemental information should include (when relevant) a file containing data collected during the project, GIS Data, brochures, outreach tools, photographs or videos taken during the project, and a summary of survey results.**

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| ***14. References and Literature Cited (if applicable)*** |
| Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., … Law, K. L. (2015). Plastic waste inputs from land into the ocean. Science, 347(6223), 768–771. <https://doi.org/10.1126/science.1260352>  Koelmans, A. A., Besseling, E., Foekema, E. M. (2014). Leaching of plastic additives to marine organisms. *Environmental Pollution*, *187*, 49–54. https://doi.org/10.1016/j.envpol.2013.12.013  Munier, B., Bendell, L. I. (2018). Macro and micro plastics sorb and desorb metals and act as a point source of trace metals to coastal ecosystems. PLoS ONE, 13(2). <https://doi.org/10.1371/journal.pone.0191759>  Rochman, C. M., Hoh, E., Hentschel, B. T., Kaye, S. (2013). Long-Term Field Measurement of Sorption of Organic Contaminants to Five Types of Plastic Pellets: Implications for Plastic Marine Debris. Environmental Science & Technology, 130109073312009. <https://doi.org/10.1021/es303700s>  Teuten, E. L., Saquing, J. M., Knappe, D. R. U., Barlaz, M. A., Jonsson, S., Björn, A., … Takada, H. (2009). Transport and release of chemicals from plastics to the environment and to wildlife. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 2027–2045. https://doi.org/10.1098/rstb.2008.0284  Yonkos, L. T., Friedel, E. A., Perez-Reyes, A. C., Ghosal, S., Arthur, C. D. (2014). Microplastics in four estuarine rivers in the chesapeake bay, U.S.A. *Environmental Science and Technology*, *48*(24), 14195–14202. https://doi.org/10.1021/es5036317  Zettler, E. R., Mincer, T. J., Amaral-Zettler, L. A. (2013). Life in the “plastisphere”: Microbial communities on plastic marine debris. *Environmental Science and Technology*, *47*(13), 7137–7146. <https://doi.org/10.1021/es401288x> |