

Spring 4-2022

Georgetown County Environmental Services Office 2022 Spring Litter Index United Nations Youth Corps Internship

Rainwater Nicole
Coastal Carolina University, nrrainwater@coastal.edu

Follow this and additional works at: <https://digitalcommons.coastal.edu/goal-6-clean-water>



Part of the [Sustainability Commons](#)

Recommended Citation

Nicole, Rainwater, "Georgetown County Environmental Services Office 2022 Spring Litter Index United Nations Youth Corps Internship" (2022). *Goal 6: Clean Water and Sanitation*. 2.
<https://digitalcommons.coastal.edu/goal-6-clean-water/2>

This Article is brought to you for free and open access by the Georgetown RISE UN Youth Corps at CCU Digital Commons. It has been accepted for inclusion in Goal 6: Clean Water and Sanitation by an authorized administrator of CCU Digital Commons. For more information, please contact commons@coastal.edu.

Georgetown County Environmental Services Office

2022 Spring Litter Index

United Nations Youth Corps Internship

Prepared by:

Nicole Rainwater

April 2022

1.1 Introduction

Georgetown County, with its rural southern charm, holds the title of the third largest water basin on the east coast. Being home to one of the largest watershed basins and the largest delta on the east coast, Winyah Bay helps to provide beauty and historical value to the community. Winyah Bay is connected to five freshwater rivers, which provides vast amounts of natural resources to the area, allowing for much economic growth and development to the Georgetown County area. However, as the county continues to grow and develop, threats are growing larger to the area's ecosystems and environments, as more damage is occurring.

This study, in partnership with the United Nations Regional Centre of Expertise Youth Corps and the Georgetown County Environmental Services Office, examines closely the current state of land pollution within the entirety of Georgetown County with specific emphasis on roadside litter. Recommendations for county change are also discussed in the study, based on other case studies and best practices in the literature.

The basis for this report will be the research conducted with the Georgetown County Environmental Services Office, this year's data, and the previous year, in partnership with local and state-level Keep America Beautiful Chapters in creating and executing a countywide litter index. Georgetown County has a notable, widespread litter issue to which the litter index will be utilized to assess the issues current state and provide the county with data to inform decisions on solution strategies¹.

1.2 Overview of Litter Index in Georgetown County

¹ Shayne Doone and Dean Wrobel, "Georgetown County Environmental Services Office 2021 Spring Litter Index United Nations Youth Corps Internship," April 2021.

Most people would expect litter and pollution to be directly related to population density. This is not always the case, as many different factors play a part in the distribution of litter. Overall, our data points to higher litter densities in more remote regions of the county, like Andrews, rather than the higher population areas, like Pawley's Island. This is likely because of the income differences seen between these two cities. Pawleys Island is a more has higher income levels than Andrews, allowing for them to have more opportunities to pay for private maintenance of the city. Pawleys Island is also visited more by tourists, which could also be a factor for why the area is cleaner, as people are more concerned with keeping tourist areas clean, rather than the remote areas inland. This does raise question about the available resources to those who live farther away from the Waccamaw Neck because it is a concerning factor for the overall health of the community and environment. With the five major rivers located in the county, and the largest watershed basin on the east coast, the land pollution and litter are major concerns affecting the health and well-being of the people in the county, as the litter can and will reach the waterways. The Environmental Protection Agency roughly estimates that worldwide 80% of trash and debris in the marine environment is a result of land litter and pollution². The Winyah Bay watershed drains a 24.8 square kilometer area³, making it a dangerous pathway for marine pollution.

1.3 Thesis

² "Movement of Aquatic Trash," United States Environmental Protection Agency, accessed March 18, 2021, <https://www.epa.gov/trash-free-waters/movement-aquatic-trash>.

³ "Environmental Monitoring – North Inlet-Winyah Bay." n.d. Accessed April 11, 2022. <http://northinlet.sc.edu/environmental-monitoring/#:~:text=The%20watershed%20drains%20a%2024.8%20km%20%20area>.

Through the execution of a yearly litter index by the Georgetown County Environmental Services Office, the county will be able to collect litter data annually to create strategies to fix the pollution issues while tracking long-term trends in response to the applied strategical programs. The litter index reports will help to provide the local officials with current statistics concerning the effects of litter on human and environmental health.

2.0 Methods

In regard to this study, litter is defined as any manifestation of trash, debris, or dumps that are disposed of improperly or illegally on roads, in parking lots, or waterways⁴. Also, litter can be defined as any piece of misplaced solid waste⁵. This leaves a very broad system for classification. Litter can range from something as small as a cigarette butt or a candy wrapper to something as large as vehicle tires and large electronics such as TVs. Whether intentional, like throwing trash out of the car window, or dumping alongside a remote road, or unintentional, like blowing off the back of a truck, it is still littering. The issue of debris falling off trucks when being hauled is a widespread issue that needs to be addressed sooner rather than later, as a study found that garbage trucks are part of the littering problem as their collected waste falls off the truck and is not picked back up⁶.

This study was conducted throughout the entirety of Georgetown County, South Carolina from February to March 2022. Survey points were obtained randomly by using GIS open-source

⁴ Wesley P. Schultz, "Littering Behavior in America: Results of a National Study," Keep America Beautiful, January 2019.

⁵ 8 Scott E. Geller, William Brasted, and Millard Mann "Waste Receptacle Designs and Interventions for Litter Control," Journal of Environmental Systems 9, no. 2 (1980): 145-160, <http://dx.doi.org/10.2190/5P46-8H2N-41JR-C2EJ>.

⁶ University of Florida, "UF Study Points To Garbage Recycling Trucks As Source Of Litter," University of Florida, February 23, 2000. <https://news.ufl.edu/archive/2000/02/uf-studypoints-to-garbage-recycling-trucks-as-source-of-litter.html>.

data and GPS information. Roadside points were limited to county and local municipality-maintained roads and did not include any state highways or privately owned roads. The index from this year started off with 150 points. Some points were removed due to private property, construction, or they were too close to a previously studied point. This ended our data collection with 146 points. The quantity of litter and debris was scored according to the guidelines set by Keep America Beautiful. These protocols rate each site on a scale of one to four, with a one being little to no litter, two being slightly littered but manageable, three being a site where an organized cleanup was needed, and four being extremely littered and needed vehicles or machines to help remove the litter (like large items of TVs or old furniture)⁷.

While in the field, the data was obtained by using various GPS programs to help reach the point site. When arrived, we would travel a 200-meter distance in the car, while maintaining a speed of 5 mph or less to clearly observe the area, a strategy recommended by the previous year's researchers. After observing the site, each intern would give their independent score and it would be recorded on the data sheet along with the data, the site number, the GPS coordinates, and any notable comments. If a point needed to be removed from the data due to lack of availability of the road it would be marked as "does not exist" or (D.N.E.) and then removed from the dataset.

3.0 Results

The litter index achieved a total of 146 roadside points. Out of all these points examined, 93 were classified as one, 33 were classified as two, 19 were classified as three, and only 1 site was marked as a scoring of four on the litter index scale. Percentage wise, the distribution of

⁷ Keep America Beautiful" Being a Good Neighbor: A Guide to Reducing Litter, Managing Trash, And Encouraging Recycling,".

scores for the points showed that 64% of the points were classified as one, 23% were scored as two, 13% received a score of three, and 0.006% earned the score of four. Figure 1 represents this data. Most of the litter present was found to be majority alcohol related, such as beer bottles, cans, and cardboard boxing, as well as empty liquor bottles. Other types of litter that were majority present consisted of take-out food containers, plastic shopping bags, aluminum cans, plastic bottles, and lots of old tires. Most of the roads that were examined were secondary if not tertiary roads, mainly consisting of residential housing. Across all survey points, the average litter index score was 1.51.

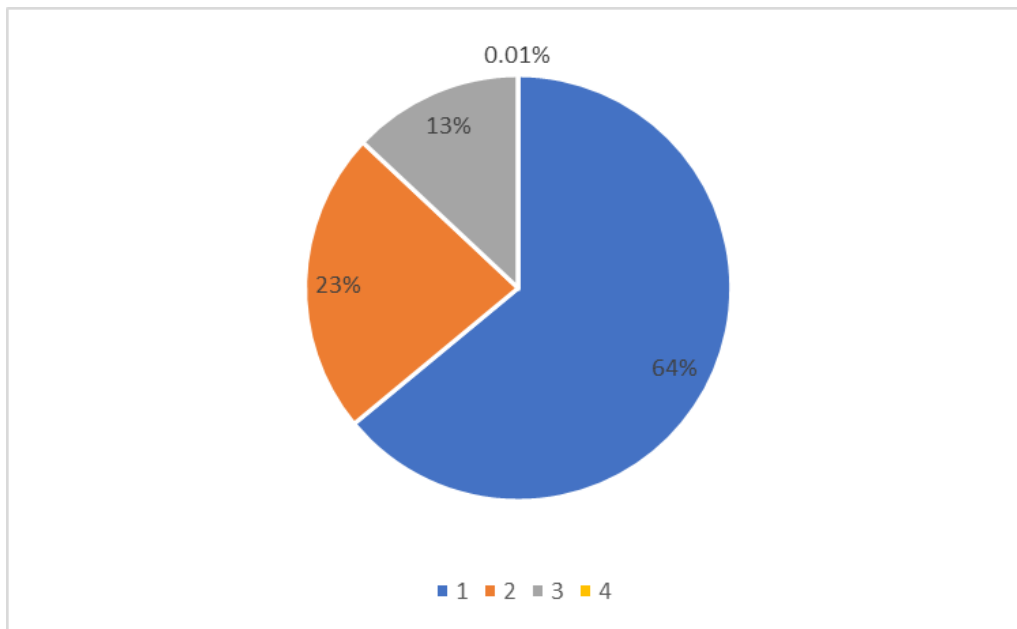


Figure 1. A percentage breakdown of litter index scores across roadside points surveyed. Positively, the most common score is a one.

4.0 Analysis – Litter Index 2022

Keep America Beautiful reports a national litter index score average of 1.67. This is slightly higher than our observed score of 1.51, which means that Georgetown County is slightly

less littered than the national average. However, it is important to note that these averages are only reported based on roadside surveys only. Among these surveys, state highways are not allowed to be surveyed, which is where most of Georgetown County's litter is resided, or on other major roads that were not surveyed. These roads are not surveyed as it does not follow the Keep America Beautiful survey protocols. If those roads were to be surveyed, it would have to be a separate project from the litter index used for personal data collection alone.

When looking at Figure 2, specific geological trends can be seen in the litter scoring. Majority of sites that were surveyed on the more interior portion of the county are indicated with higher scores, whereas areas located along the Waccamaw neck and in Pawley's Island were scored much lower, despite the large difference in point density. Many more points were located in Pawley's Island in very close range of each other, whereas in other areas the points were more spread out.

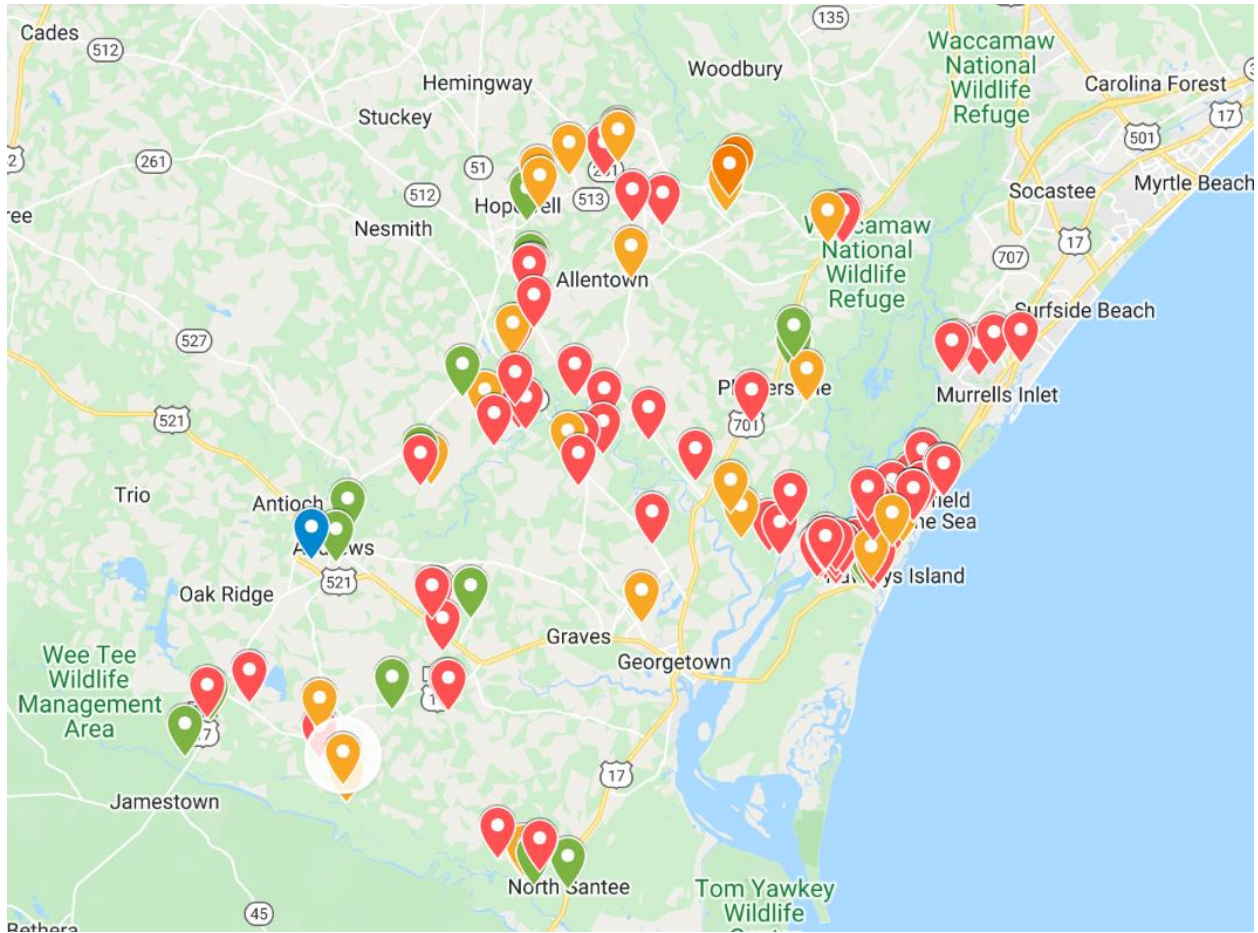


Figure 2. This map shows all 146 points individually throughout the index. The red pins indicate a value of one, the orange pins are a value of two, the green pins are a value of three, and the one blue pin is a value of four.

Figure 3 shows a heat map of the litter recorded in Georgetown County. This figure easily shows the “hotspots” where areas of amplified litter were reported. Contrary to Figure 2, the heat map (Figure 3) shows Pawley’s Island to be an important hotspot. This comes from a small road loop in Pawley’s Island that was heavily littered, located behind a shopping center. Other than that small loop, the majority of the other points in the area were scored as a one, with the exception of two points scored as a two.

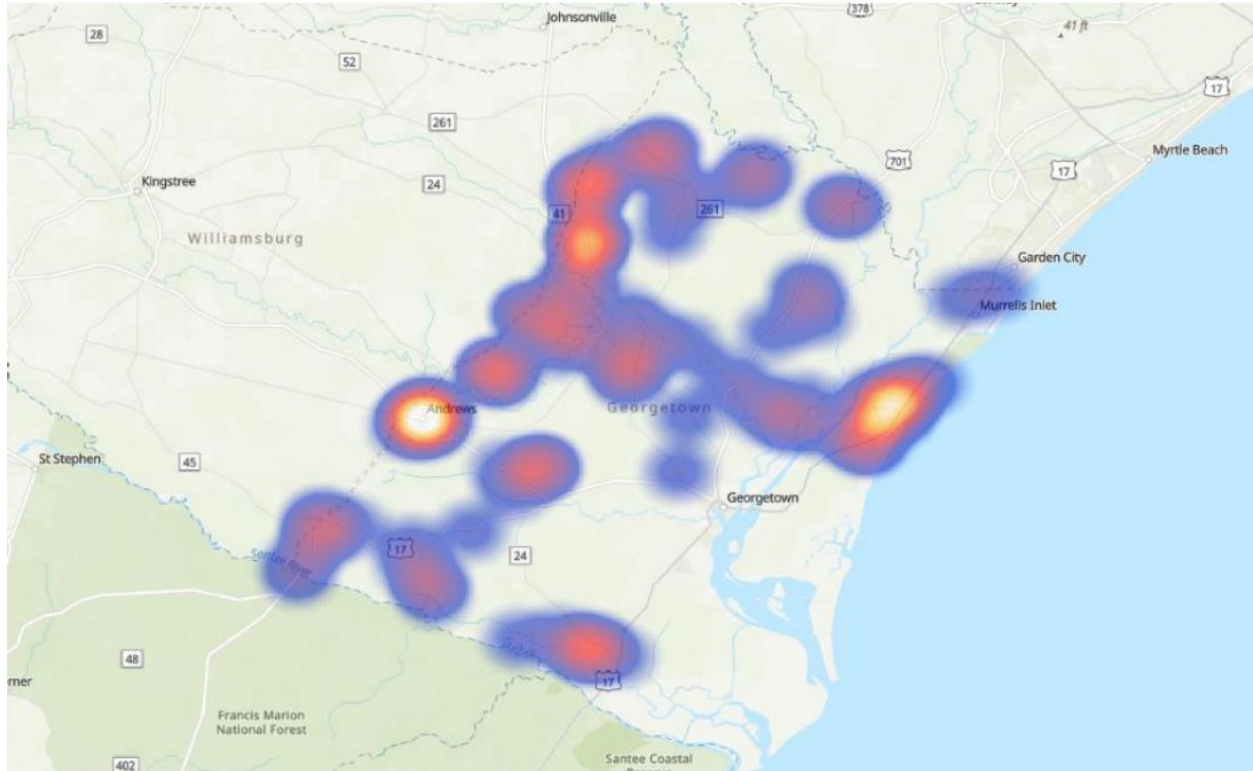


Figure 3. 2022 heat map distribution of litter throughout all of Georgetown County. Hot spots include the city of Andrews and Pawley's Island, along with areas near rural highways.

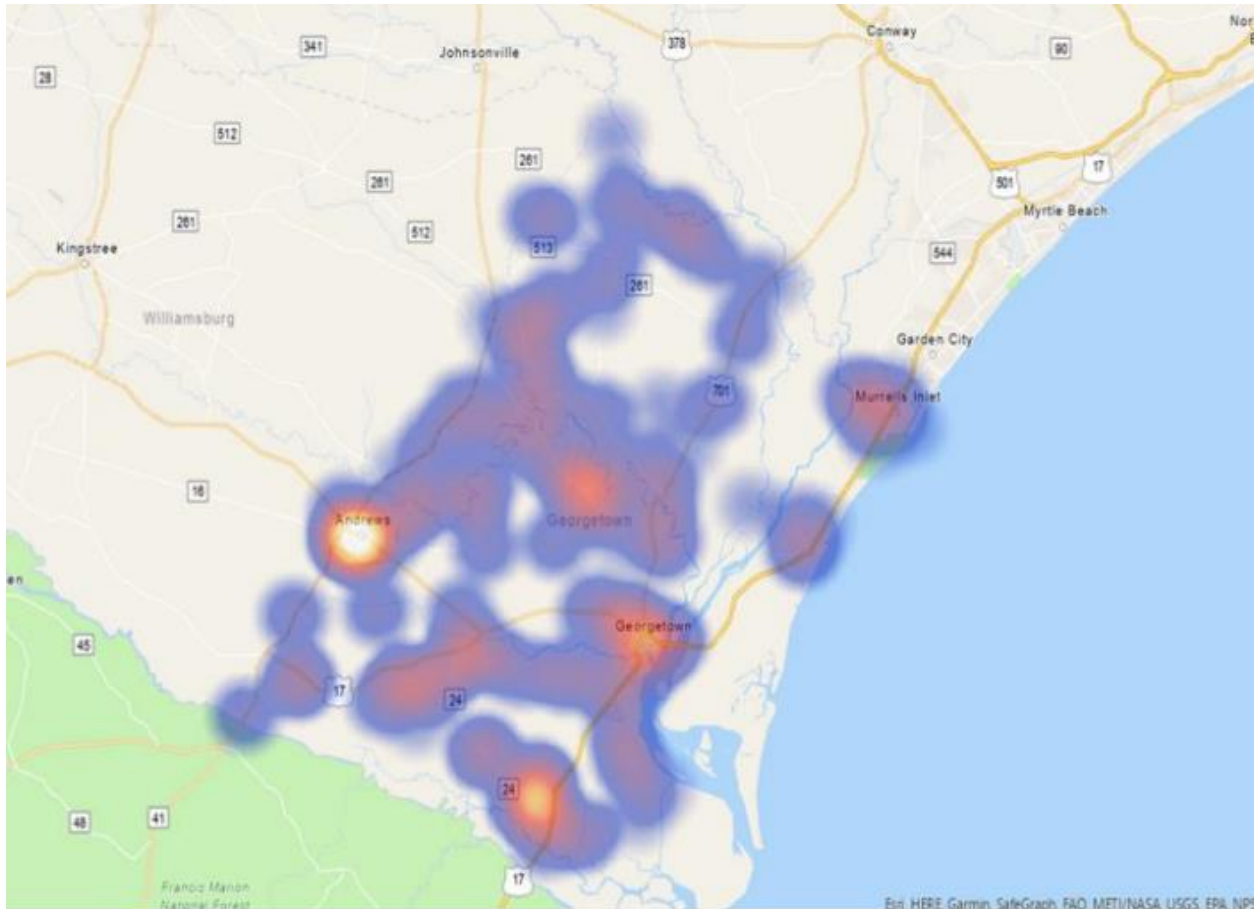


Figure 4. 2021 heat map distribution of litter throughout all of Georgetown County. Hot spots include the City of Andrews and City of Georgetown, the area near the Santee river, and rural highways.

4.1 Analysis – Litter Index 2021 Comparison

Last year’s litter index for Georgetown County contained more than just roadside points. They were able to incorporate areas such as parks, boat landings, and beach access points. This year, we were not able to complete that portion of the project, due to lack of time and manpower, so the only comparisons that are able to be made are the data points involving the roadsides. In 2021, the total number of roadside survey points was 152, only 6 more points than the 2022 data. In 2021 they had 61 points classified as one, 36 points classified as two, 42 sites scored as three,

and 13 sites scored as four⁸. In comparison to this year's data, there are a lot more one scoring this year and a lot less four scorings, which is a good improvement. Overall, last year's average score of roadside points was a 2.05⁹ and this year is a 1.51, which again, is a good improvement. When comparing this data from last year to this year, there is an obvious improvement. But this might not be the case as every year the same points are not used.

When comparing the heat maps from both years, they are very similar except with a few differences in hotspots. Both years there seems to be a large hotspot right over the City of Andrews. Along this year's data, there seems to be more litter in the northern end of the county than there was before, whereas in last year's data, there was more litter in the southern end of the county, especially near the City of Georgetown.

4.2 Analysis – Litter Cleanups

Since this study was conducted last year in 2021, there have been 30 organized cleanups throughout the county with the help of the Environmental Services Offices. Throughout these cleanups, 344 people have participated in the help to cleanup the county, whether these people were volunteers or part of the litter cleanup crew. In total, 142 hours have been documented that have been used for these cleanups, as well as 436 bags of trash have been collected, resulting in 29,404 pounds of trash.

5.0 Case Studies/Literature Review

⁸ Shayne Doone and Dean Wrobel, "Georgetown County Environmental Services Office 2021 Spring Litter Index United Nations Youth Corps Internship," 12.

⁹ Doone and Wrobel, "Georgetown County Environmental Services Office 2021 Spring Litter Index United Nations Youth Corps Internship," 12.

Trying to figure out why people litter is a key step in figuring out how to fix the problem. A study conducted in 2009 by Keep America Beautiful investigated across the country into the littering motives. The study reported that males under the age of 19 are the most likely group to litter,¹⁰ and males are more likely to litter over females¹¹. Education level, type of residence, or vehicle model were not found to be significant indicators for tendencies to litter. The study also found that the majority of 81% of recorded littering instances were done with the intention to litter. Littering is also found to be a positive feedback loop. If someone else already littered in the area, then it would not matter if I did too.¹² It was also found in another study that younger generations, ages 18-36 are more willing to admit to littering than ages above 36 who would not admit to littering.¹³

Street signs are used to help to encourage people not to litter. Studies have shown people are likely to dispose of trash properly when signs are present to remind them not to litter. Signs and verbal prompts tend to work best if they are positive and concise, meaning less room for

¹⁰ Schultz, "Littering Behavior in America," 42.

¹¹ Fatin Shukor et al., "LITTER REDUCTION: A REVIEW FOR THE IMPORTANT BEHAVIORAL ANTECEDENT APPROACHES," *Third International Conference on Business and Economic Research*, (2012)
https://www.researchgate.net/publication/259470229_LITTER_REDUCTION_A_REVIEW_FOR_THE_IMPORTANT_BEHAVIORAL_ANTECEDENT_APPROACHES

¹² Ruggero Ragoni and Wander Jager, "Social Dynamics of Littering and Adaptive Strategies Explored Using Agent-Based Modelling," *Journal of Artificial Societies and Social Simulation* 20, no. 2 (March 2017) <https://doi.org/10.18564/jasss.3269>.

¹³ Campbell, Marnie L., Chloe Paterson de Heer, and Amber Kinslow. "Littering dynamics in a coastal industrial setting: The influences of non-resident populations." *Marine Pollution Bulletin* 80, no. 1-2 (March 2014):179-185.
<https://doi.org/10.1016/j.marpolbul.2014.01.015>.

interpretation. Verbal reminders against litter and pollution were also found to be the most effective when coming from people of power who have earned respect within that community.¹⁴

6.0 Recommendations

First, I recommend that the litter index continue to be conducted annually. This helps to monitor the litter density and distribution throughout the county and provides updated program efficiency as well as monitoring trends in amounts of litter. Although, I do not think the same points need to be used every year as using roughly 150 randomized points still helps to monitor the same areas, just in slightly different places.

Allowing other people to work on this project, instead of just the interns from the Environmental Services Office, would also be a major improvement to this project. To do this, it would be beneficial to hold training classes for community members to allow them to follow the Keep America Beautiful survey protocols. Adding community members to this project would allow for more data to be collected in a shorter amount of time.

Collecting data points along major highways and roads in Georgetown County would completely change the litter index altogether. If this were to occur the real issue of the litter problem in Georgetown County would be presented, instead of just the smaller issue of the backroads and some illegal dumpsites. Almost every major road or highway in the county is covered in bags of trash and bulk items, or at the very least high amounts of litter. Each road would most likely be surveyed as a three or four in the scoring if they were used in the study.

Reaching into the classroom is another recommendation for the improvement of litter in the county. Living in a county with a noticeable litter issue should warrant a mandatory class for

¹⁴ Shukor et al., "LITTER REDUCTION," 9-10.

younger children to be taught in school about the negative side effects of littering. This class could also teach the proper ways to dispose of waste and all about reduce, reuse, recycle. Children can influence family, friends, and peers. It's been proven in a study that educating young people about current problems and encouraging them to be apart of the change in the world motivates them to influence others.¹⁵ This mandatory class could also allow for the start of a program or club for kids wanting to do something about the issue that would allow them to do so in a safe, constructed environment.

7.0 Relation of Project to SDGs

The litter index conducted for the Environmental Services Office helps Georgetown County to focus on the current litter problems within the area but analyzing the index data and how to improve the problem fits into the United Nations Sustainable Development Goals. Analyzing this data together will help to allow county officials to ensure sustainable development and improvement within the county. The primary SDG that this project relates to are goals 6 and 12.

The SDG Goal 6 is clean water and sanitation; is to ensure availability and sustainable management of water and sanitation for all. Specifically, the target that is focused on in this project relates to 6.3, which aims to improve water quality by reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials. My work done this year directly relates to this target through means of identifying heavily littered areas, which can become dumpsites. By promoting better education and strict plans that help prevent and remove

¹⁵ Institute of Physics (IOP). "Kids teach parents to respect the environment." ScienceDaily. Accessed April 27, 2021. www.sciencedaily.com/releases/2013/02/130212210042.htm.

litter, it will help to reduce pollution and the release of hazardous chemicals and materials into the Earth. These factors will help create healthier water for the county by reducing the number of plastics and trash that end up in our rivers from storm-water runoff and littering.

Goal 12 is responsible consumption and production; to ensure sustainable consumption and production patterns. The litter index's main objective is to report how the litter in the county is affecting the environment, specifically the county's many water sources. This directly relates to target goal 12.2, which strives to achieve sustainable management and efficient use of natural resources. The goal is to use the index's data to manage the litter so that we can improve the water quality in the county and decrease the amount of litter that is entering into the water systems.

Target 12.5 is intended to reduce waste generation through prevention, reduction, recycling, and reusing. This target directly relates to all of the recommendations that were made for the county in how to reduce the amount of litter and pollution in the county. Target 12.8 is used to ensure that people have the relevant information and awareness for sustainable development and lifestyles in harmony with nature. To meet this target one of the recommendations made was adding environmental education awareness into the classrooms of younger children. Providing this information to them helps to improve the entirety of the county as children have the ability to share the information and to teach their elders the information they learned on how to improve the community.

8.0 Bibliography

Campbell, Marnie L., Chloe Paterson de Heer, and Amber Kinslow. "Littering dynamics in a coastal industrial setting: The influences of non-resident populations." *Marine Pollution*

Bulletin 80, no. 1-2 (March 2014):179-185.

<https://doi.org/10.1016/j.marpolbul.2014.01.015>.

“Environmental Monitoring – North Inlet-Winyah Bay.” n.d. Accessed April 11, 2022.

<http://northinlet.sc.edu/environmental-monitoring/#:~:text=The%20watershed%20drains%20a%2024.8%20km%20%20area>.

Environmental Protection Agency. “Movement of Aquatic Trash.” Accessed March 18, 2021.

<https://www.epa.gov/trash-free-waters/movement-aquatic-trash>.

Geller, E. Scott, William Brasted, and Millard Mann. “Waste Receptacle Designs as Interventions for Litter Control.” *Journal of Environmental Systems* 9, no. 2 (1980)

<https://doi.org/10.2190/5P46-8H2N-41JR-C2EJ>.

Institute of Physics (IOP). "Kids teach parents to respect the environment." *ScienceDaily*.

Accessed April 27, 2021. www.sciencedaily.com/releases/2013/02/130212210042.htm.

Rangoni, Ruggero and Wander Jager. “Social Dynamics of Littering and Adaptive Strategies Explored Using Agent-Based Modelling.” *Journal of Artificial Societies and Social Simulation* 2, no. 20 (March 2017) <https://doi.org/10.18564/jasss.3269>.

Schultz, P. Wesley. “Littering Behavior in America: Results of a National Study.” *Keep America Beautiful*. January 2009.

https://kab.org/wpcontent/uploads/2019/10/NewsInfo_Research_LitteringBehaviorinAmerica_2009Report_Final.pdf.

Shayne Doone, Dean Wrobel. 2021 Spring Litter Index. UNYC (2021).

Shukor, Fatin, Miswan Abdul Hakim Bin Mohammed, Mariah Awang, and Suwaibatul Sani.

“LITTER REDUCTION: A REVIEW FOR THE IMPORTANT BEHAVIORAL ANTECEDENT APPROACHES.” Third International Conference on Business and Economic Research. 2012.

https://www.researchgate.net/publication/259470229_LITTER_REDUCTION_A_REVIEW_FOR_THE_IMPORTANT_BEHAVIORAL_ANTECEDENT_APPROACHES.

University of Florida. “UF Study Points to Garbage, Recycling Trucks as Source of Litter,”

University of Florida News, February 23, 2000.

<https://news.ufl.edu/archive/2000/02/ufstudy-points-to-garbage-recycling-trucks-as-source-of-litter.html>.