PLASTIC PERCEPTIONS: SURVEYING PUBLIC OPINION OF PLASTIC POLLUTION IN RHODE ISLAND

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PLASTIC PERCEPTIONS: SURVEYING PUBLIC OPINION
OF PLASTIC POLLUTION IN RHODE ISLAND

BY

SABRINA PEREIRA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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OF

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UNIVERSITY OF RHODE ISLAND
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ABSTRACT

This research surveyed 200 coastal and noncoastal Rhode Island residents to determine their perceptions of marine plastic debris and their support for plastic and paper bag legislation. The results suggest that one’s residency, or geographic distance from the coast, has no bearing on plastic and paper bag policy support and that most participants, 77%, classify plastic pollution as a serious threat to various types of wildlife, the marine environment, human health, and Rhode Island’s economy. The data also seems to suggest support for a statewide plastic bag ban and a statewide fee of 10 cents on paper bags as a means to address the problem. Approximately 77% of participants support the bag ban while 68% support, or are neutral towards, a statewide paper bag fee of 10 cents. While this research was being completed, Governor Gina Raimondo’s Task Force to Tackle Plastics published its final report in February of 2019 ultimately proposing that the state enact both a statewide ban on single-use plastic bags and a statewide 5 cent fee on recyclable paper bags. Rhode Island Senate bill S0410, the Plastic Waste Reduction Act, was modeled after the final report’s recommendations to the Governor and was introduced on February 27, 2019. The results from this research generally support and endorse the recommendations and S0410. Approximately 86% of participants were also found to be aware of, and 75% were found to be highly knowledgeable of, the severity of this global issue. The high levels of concern, awareness and knowledge are associated with participants’ pro-ecological worldviews measured by the New Ecological Paradigm.
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CHAPTER 1

INTRODUCTION

Plastic pollution in the ocean is a global tragedy adversely affecting marine organisms and humans alike. As externalities of modern industrialization, increasing amounts of plastic are finding their way into the oceans and onto beaches around the world. For more than 50 years, global production and consumption of plastics have continued to rise, and today, researchers report billions of pounds of plastic can be found in the ocean, making up 40% of the world’s ocean surfaces (Center for Biological Diversity, 2018), and outweighing plankton by a ratio of six to one (Moore et al., 2001). Great demand for plastics persists, and continues to increase, due to its versatility, flexibility, strength and relatively inexpensive cost. The attractiveness of plastics, coupled with rising modernization and industrialization around the globe, has generated an international plastic pollution problem whose severity is often invisible to the everyday consumer; meanwhile, large plastic debris degrades fragile ocean habitats, and marine organisms fatally ingest that plastic, sometimes returning microplastics to humans through our diets.

Marine pollution, including plastic pollution, causes several environmental, social and economic issues for coastal communities and animals (Schultz et al., 2013), but since the sources of plastic pollution are expansive and the issues surrounding it are still largely misunderstood, it is often difficult for policy makers and scientists alike to address mitigation of marine plastic pollution. Due to the increasing nature of
this global issue, Rhode Island’s shores and beaches are among the many coastal areas that could soon be profoundly affected. As a state that relies heavily on coastal tourism throughout the summer months, Rhode Island and its economy could experience negative, financial repercussions if no measures are taken to mitigate plastic pollution inputs into the ocean. Evidence of ocean plastics around Newport, Rhode Island, a significant tourist destination, has already been found by the local non-profit organization Clean Ocean Access. In 2018 alone, the organization reported that over 870 plastic items, including plastic particles, straws, stirrers, caps, lids, beverage bottles and bags, were collected from its Newport harbor marina trash skimmer, one of 4 skimmers on Aquidneck Island. Since 2016, Clean Ocean Access’s Newport trash skimmers have removed 18,786 pounds of marine debris, indicating that plastic pollution, among other types of marine debris, are affecting Rhode Island’s marinas and coastlines (Kraimer et al., 2019). Therefore, Rhode Islanders’ awareness of marine plastic pollution, and their reactions to policies that might help prevent the issue from rising, must be researched in order to best address the problem statewide. In addition, the perceptions of Rhode Island residents from different parts of the state must be explored as some parts of Rhode Island, like Aquidneck Island, already have specific plastic bag legislation enacted, while others, like Providence, have recently rejected similar policies.

This research is particularly timely as Rhode Island’s Governor Gina Raimondo established a Task Force to Tackle Plastics in July of 2018 to combat marine plastic pollution. During the course of this research, the Task Force released a report that recommended a series of initiatives to be implemented around the state to
mitigate plastic pollution and among these is the S0410 Plastic Waste Reduction Act that, as of April 2019, has been proposed to the Rhode Island state legislature. This act proposes a statewide ban on single-use plastic bags and a statewide 5 cent fee on paper bags, and the research put forth here will help determine whether or not Rhode Islanders support a statewide plastic bag ban among other types of disposable bag legislation.

This paper will present the findings of the investigation into how proximity of residence to, or distance from, the coast affects, or does not affect, Rhode Islanders perceptions and knowledge of marine plastic pollution, and their reception to plastic legislation similar to the ideas proposed in S0410. The second chapter will detail the impacts of marine plastic pollution on wildlife, human beings and coastal tourism in addition to surveying the literature on public attitudes and perceptions, proximity and pro-environmental behavior. The third and fourth chapters will present the methodology and results of the study followed by a discussion of the findings and recommendations for future research and policy implications. The information gathered will be helpful for policy-makers to better understand which policies might be best for Rhode Islanders, at the state or municipal levels, to prevent plastic from entering the marine environment. Mitigating plastic pollution in Rhode Island will help to set an example for plastic policies to be implemented on a larger scale which will decrease marine plastic pollution and its associated negative effects.
CHAPTER 2

REVIEW OF LITERATURE AND BACKGROUND

This section will explore some of the existing literature on the impacts of plastic pollution to humans, wildlife and coastal economies. It will also provide literature on public attitudes and perceptions, studies of proximity, and pro-environmental behavior, and the hypotheses and research questions for this study will be overviewed.

2.1 Impacts of Plastic Pollution

With more than 5 trillion pieces of plastic floating in the world’s oceans (Eriksen et al. 2014), many complications arise from plastic pollution, including the widespread, direct and negative effects on both wild and human life. Since many types of plastic pollution take hundreds, and sometimes thousands, of years to decay, fish and wildlife get sick from these plastics they inadvertently ingest (Secretariat of the Convention on Biological Diversity, 2012). Consequentially, the toxins from the plastics have entered the food chain and now could threaten human health from the consumption of corrupted fish.

One of the most direct effects on humans derives from the ingestion of sick fish. A scientific team from the College of Pharmacy at Nihon University in Japan found that degrading plastics leach potentially toxic chemicals, like bisphenol A, into the seas (Saido, 2009). According to lead researcher Katsuhiko Saido, the team found derivatives of polystyrene, Styrofoam and DVD cases in the water samples it collected from the US, Europe, India, Japan and other sites. Although scientists had previously
thought plastics broke down only at very high temperatures over hundreds of years, this research team found that “plastic breaks down at cooler temperatures than expected, and within a year of the trash hitting the water” (Saido, 2009). When plastic breaks down and releases harmful chemicals into the ocean, these chemicals harm the marine life that human beings consume as seafood and can easily progress through the food chain. According to Charles Moore (2008), an oceanographer and chemist at the Algalita Marine Research Foundation, “Pollutants also become more concentrated as animals eat other contaminated animals—which could be bad news for us, the animals at the top of the food chain”. Some of these pollutants include polyethylene and polypropylene, which can affect many organisms (Galgani et al., 1996). Rochman et al. also found anthropogenic debris in over half of the species they purchased or collected from the fish market and noted that there is great concern over chemicals from debris that could be transferred to humans through biomagnification (2015).

Plastics might also endanger human lives since they absorb dangerous, highly toxic pollutants like PCBs, DDT and PAH that have a wide range of chronic effects, including endocrine disruption and cancer-causing mutations. The Center for Biological Diversity (2018) reports that animals absorb these toxins when they eat plastics, causing their eventual progression up the food chain and hazardous effects on humans. For example, a study by Moore on the ingestion of microplastics by filter feeders raises concerns over biomagnification: filter feeders, some of which are at the bottom of the marine food chain, ingest plastics, which could then cause the chemicals within plastics, including hydrophobic pollutants, to move up the food chain (Moore, 2008). It is noted in many studies, however, that more research is needed on plastics.
and microplastics to determine the long-term effects on humans (Moore, 2008; Rochman et al., 2015; Taylor et al., 2016). Although research on the associated health effects on humans from plastic chemicals is far from conclusive, since it is very difficult for scientists to control for the multitude of variables involved in health studies, the existing data on chemicals leached by plastic pollution suggests that plastic could potentially affect, and harm, human lives in the future.

In the ocean, plastic debris also negatively affects wildlife as it injures and kills fish, marine mammals, and seabirds. The most visible environmental impact of plastic pollution on wildlife is the harming and killing of marine organisms through entanglement and ingestion. After reviewing 280 papers on entanglement in and ingestion of marine debris, the Secretariat of the Convention on Biological Diversity (2012), reported that all marine litter, not just plastic, has impacted 663 species, and more than half of impacted species ingested, or were entangled by plastic. Among the wildlife affected are multiple endangered species, like Pacific loggerhead sea turtles, that eat and become entangled in plastic bags since they resemble jellyfish in the mid-ocean (Moore, 2008).

Plastic pollution on beaches can also pose social and economic issues for beach goers as it is aesthetically unpleasing. Studies conducted by Iníguez, Conesa, and Fullana (2016) and Sheavly and Register (2007) indicate that the aesthetic of any marine debris floating in the water and washing up on beaches can discourage visitation to coastal areas, which affects local economies that depend on tourism and recreation. The local economies of coastal communities might also be negatively impacted by the aesthetics of plastic pollution since litter deters visitors from beaches
and more frequent cleanups are required to maintain optimal levels of tourism and recreation (Sheavly and Register, 2007). The presence of plastic debris on beaches then also increases the collection and total disposal cost of beach litter for coastal communities, which negatively affects their economies (Muñoz-Cadena et al., 2012). Californian communities experienced some of the detriments of plastic pollution prior to enacting a statewide plastic bag ban in November 2016. According to California’s Secretary for Natural Resources John Laird, up until 2017 “every Californian, on average, used about 400 plastic bags a year, forcing the state to spend an estimated $400 million — or roughly $10 per resident — every year trying to clean them up” (ctd. In Mercury News, 2017). As Rhode Island is comprised of many coastal communities, the aesthetic impacts of plastic pollution alone might be enough to severely impede the state’s tourism industry.

2.2 Public Attitudes and Perceptions

Although there exists very little literature regarding perceptions of marine plastic pollution specifically, public attitudes surrounding environmental issues and pro-environmental behaviors have been thoroughly studied. Survey work conducted by Slavin et al. (2012) on the linkages of social drivers of marine debris and actual quantities of marine debris on beaches has found that residency, income, age and gender influence littering behavior, which is reflected in the amount of debris detected on Tasmanian beaches. Although the researchers involved in this study hypothesized that participants “would not acknowledge that marine debris was a pressing issue, and hence their actions would reflect littering behaviors” (2012, p. 1584) they found to the contrary that a majority of participants acknowledge that marine debris is a pressing
issue, and report that they do not litter while at the beach; presumably to keep more debris from entering the ocean. This perception of marine debris as a threat to marine and coastal environments is reflected in other studies (for instance Jedrezejczak, 2004; Scott and Parsons, 2005; Fletcher et al., 2009) indicating that many individuals are aware that their actions contribute to the marine debris issue.

Although little research has been published concerning coastal perception, many studies focused on hazard perception of climate change and oil spills can be applied to perception of plastics pollution research, as plastic debris on the coasts can be considered hazardous. In Brody et al.’s (2007) study of public perceptions of climate change, researchers correlated physical distance to shore with their own measure of perceived vulnerability in a national U.S. data set. In this study, they found a very small but significant correlation of perceived vulnerability to physical distance. However, physical vulnerability accounted for only 4% of the variance in perceived vulnerability. Burroughs’ and Dyer’s (1996) place-based research on public perceptions of the Rhode Island oil spill, on the other hand, found comparable opinions, anger and concern towards the oil spill, “despite geographic separation and disparate cultural settings.”

2.3 Proximity

Proximity is the degree of closeness that one feels towards another entity in space, time or relationships (Li, Luo, & Qin, 2013). This concept is applied with cultural, social, psychological and physical contexts but, for the purpose of this study, will only be examined within the physical dimension. Physically, proximity is the distance between two regions or locations and multiple studies have been conducted to
determine the effects of proximity on pro-environmental behavior. In a 2013 study by Li, Luo and Qin, the researchers found that higher degrees of physical proximity to areas of environmental pollution, like the heavily polluted Xiangjiang River, had “significant positive effects on individuals’ environmental protection behavior” (p. 663). The researchers involved in this study defined high proximity as a place “very close” to the participants and ultimately found that the closer an individual lives to a polluted area, the more likely the individual was to engage in pro-environmental behaviors, like holding oneself accountable for the pollution in that area (Li, Luo, & Qin, 2013, p. 666).

Environmental psychologists support this notion that location, place and space can influence environmental protection. Many experts in this field hypothesize that proximity and exposure to natural features, like wildlife habitat or water bodies, may be important factors in forming an individual’s understanding, and views toward, the quality of the surrounding natural environment (Brody, Highfield, & Alston, 2004). A Brody, Highfield and Alston (2004) study on environmental perceptions of polluted creeks in San Antonio supports this hypothesis. After surveying 2,400 households the researchers found that driving distance significantly influenced respondents’ perceptions of the environment in that those residents who lived closer to the polluted Salado and Leon Creeks were more likely to believe that it was unsafe for human use and consumption by livestock (p. 242). The study also found that those who lived closer to the creeks were more familiar with them and were significantly more likely to believe the water was polluted (p. 244). It is worth noting that these perceptions were consistent with the TNRCC’s views on the safety of these creeks from the year
2000. Research has also found that proximity to coasts specifically affects climate change beliefs. Results from a Milfont et al. (2014) study of New Zealanders found that distance from the coast significantly predicted decreased levels of belief in climate change. Proximity to the coast was associated with increased belief that climate change is real and increased support for government regulation of carbon emissions and other similar policies (Milfont et al., 2014).

Findings from these studies on proximity and environmental protection and behavior suggest that the perceptions of Rhode Island coastal residents will differ from those who live inland, and that coastal residents might be more aware and concerned of the plastic pollution issue.

2.4 Pro-Environmental Behavior

The reasoning behind pro-environmental attitudes and behaviors has also been heavily researched since the dawn of environmental psychology in the 1960s. According to Kollmuss and Agyeman (2002), multiple theoretical frameworks have been formulated to help explain the gap of knowledge between environmental awareness and pro-environmental behavior, including the US linear progression models of the 1960s, prosocial behavior models and sociological models. Some simple linear models indicate that environmental knowledge affects environmental attitudes, which in turn affects pro-environmental behavior. While many other models, like Hines’ Hungerford’s and Tomera’s (1987) Model of Responsible Environmental Behavior or Ajzen’s & Fishbein’s (1967) Theory of Reasoned Action, are more sophisticated and include a multitude of variables that are associated with responsible pro-environmental behavior (Kollmuss & Agyeman, 2002). Although many models
have been created to explain the gap between attitudes and actions, all have been found to only have some degree of validity in certain circumstances and none are able to singlehandedly predict behavior with success. This implies that no single framework can fully incorporate all the factors that shape and influence pro-environmental behavior since there are many conflicting factors that sway humans’ attitudes and actions (Kollmuss & Agyeman, 2002).

What makes people care about the environment is a complex topic that scientists continue to research. Kollmuss and Agyeman (2002) argue that some of the most influential factors of pro-environmental behavior are demographics, external factors (e.g. institutional, economic and social) and internal factors like motivation, environmental knowledge, values, and awareness. Many theories only examine pro-environmental behavior or environmentalism in terms of people’s values. A wide range of studies over the past 30 years has found that multiple values and views affect an individual’s concern for the environment including the belief that the environment is sacred (Dietz et al., 1998 ctd. In Stern, 2000, p. 411), an individual’s propensity to be sympathetic to others (Allen & Ferrand, 1999 ctd. In Stern, 2000 p. 411), or one’s affinity towards nature (Kals, Schumacher & Montada, 1999 ctd. In Stern, 2000 p. 411). Although a range of complex factors has been found to influence pro-environmental attitudes and behavior and although the interconnectedness of these ideas is still not fully understood, these relationships must be considered in order to advance environmental protection.

One way to measure pro-environmental behavior is by utilizing the New Ecological Paradigm (NEP) scale. Originally created as the New Environmental
Paradigm in 1978 by Dunlap and Van Liere, the NEP scale is one of the most widely used measures of environmental attitudes towards environmental issues and policies and advocacy efforts to address them (Hawcroft & Milfont, 2010; Dunlap, 2008). The NEP scale is used to understand a person’s broader environmental worldview, which can help to determine whether or not he or she may engage in certain pro-environmental behaviors. This measure has become a common predictor in environmental behavior studies (Wynveen, Kyle & Sutton, 2014; Brick & Lewis, 2016; Barr, 2007) and Boubonari, Markos and Kevrekidis found in 2013 that a higher NEP score resulted in stronger pro-environmental behavior towards marine pollution in general.

2.5 Hypotheses and Research Questions

A substantial body of research has been conducted on the detriments of plastic pollution, and public attitudes and perceptions of marine debris and hazards to the natural environment. Theories of prosocial behavior have also been developed to better understand which elements invoke concern for the environment. Further study of the linkages between varying groups’ perceptions of the Rhode Island coast and marine plastic pollution and the reasons behind these perceptions will ultimately lead to a better understanding of local policy implications and management outcomes concerning this extensive issue.

After exploring the literature, multiple hypotheses might be drawn to help answer the main research question due to the complexity of the issue. For instance, Burroughs’ and Dyer’s (1996) study Perceptions of the Rhode Island Oil Spill found that “…communities that are seasonally connected to resources, even though not
geographically proximate, can also perceive threats to resources at levels equal to those living near the resource base” (p. 13). To the contrary, other studies have shown that proximity to forms of land or air pollution negatively affects perception of water pollution (Shi, 2012). Therefore inland residents who might be more subjected to viewing trash or plastic on the streets, instead of the beaches, could hold less severe opinions of marine plastic pollution than those of the coastal residents.

Having reviewed and considered the aforementioned literature, the hypothesis for this research is that “H1: Residents from coastal areas of Rhode Island more negatively perceive marine plastic pollution since they live closer to the coast,” and “H2: Coastal residents are more aware of the severity of the issue.” Finally, “H3: The perceptions from coastal and inland residents will differ from each other.”

This study seeks to answer the primary question, “How does proximity to the coast affect Rhode Islanders’ perceptions of plastic pollution and associated policies?” This research will identify whether or not a Rhode Island resident’s immediacy to the coast affects his or her perception of marine plastic pollution. This study will specifically try to answer the sub research questions:

“How aware/how knowledgeable are Rhode Island residents of the marine plastic pollution issue?”

“Do Rhode Islanders classify marine plastic pollution as a significant threat to human health, the marine environment or the local economy?”

“Do Rhode Islanders support plastic legislation?”

“Do Rhode Islanders already participate in pro-environmental behavior related to mitigating plastic pollution?”
This study seeks to answer these questions and evaluate whether or not the answers are statistically related to Rhode Islanders’ places of residency.
CHAPTER 3

METHODOLOGY

3.1 Research Design

An intercept survey of closed-ended questions was conducted at 2 locations in Rhode Island in order to study various Rhode Islanders’ perceptions and knowledge of and concern about marine plastic pollution. After being approached and agreeing to complete the survey, participants were given the option to either be read the questions and answers and have their answers selected for them on an IPad or privately take the survey themselves. To maintain the validity of the study, the 2 research locations were split between coastal and noncoastal environments to produce a more balanced data set, which more accurately represents the state’s geographic diversity. A total sample size of 200 responses was collected between both locations. Once the data set was compiled, it was downloaded from Kobo Toolbox, the online survey tool used to collect data and entered into the statistical software SPSS. Analyses were conducted amongst variables to explore potential associations and patterns within the data.

Participants were asked 18 questions that measured their proximity to the coast, their awareness and knowledge of marine plastic pollution along with their concern for the issue. They were also asked if they engage in pro-environmental behaviors like recycling or non-environmental behaviors like purchasing bottled water and using plastic bags from the grocery store. Participants also had to provide their support or opposition for 6 policy initiatives that could be introduced at the state or
municipal levels and rate their agreement on statements taken from the New Ecological Paradigm (NEP). The NEP was included in this survey to control for ecological worldview in regression analyses. Finally, age, gender, income range and education level were gathered to gain insight into the demographics of the sample. The survey itself can be found in Appendix A.

3.2 Data Collection

This study utilized systematic sampling to choose which participants to potentially engage in the study at both study locations, Belmont Market in South Kingstown, RI and the Hope Street Farmers’ Market in Providence, RI. Every third adult that walked past an established point at the locations was asked to participate in the study. When first approached by the researcher, prospective participants were asked if they would like to participate in an anonymous research study through the University of Rhode Island about marine plastic pollution. If the individual did not wish to participate, he or she was not pursued or asked any further questions to respect his or her privacy. If the person agreed, he or she was read a script before providing his or her verbal consent. Only adults aged 18 years or older were considered for this study and they had to be Rhode Island residents. The researcher conveyed that the survey was entirely voluntary, would not collect any identifiable information, the data would be kept safe and confidential and that the participant could terminate the survey at any point if he or she wished.

Data collection began in August of 2018 and continued until the middle of September 2018. The survey was distributed at each location twice a week for approximately 2 hours at a time. Surveying was conducted at Belmont Market on
Monday and Thursday afternoons since the store manager was in the office those days and conducted at the Hope Street Farmers’ Market on Wednesday afternoons and Saturday mornings since these were the only times the market was open.

3.3 Data Analysis

After downloading an Excel file of respondents’ answers from Kobo Toolbox, all answers were coded for the initial statistical analyses. The responses to each question were coded with numbers ranging from 1 to 8 based on the order and quantity of the response options. In other words, the first response was coded 1, the second coded 2 etc. However, not all numbers from 1 to 8 were used as codes for every question's responses since not all questions had 8 responses. For instance, if there were only 4 responses to a question then only the numbers 1 through 4 were used. These codes were only used initially to run frequency and descriptive statistics on each individual question and they are especially appropriate for the questions with Likert scale response options that become increasingly positive from strongly disagree to strongly agree. It is worth noting that the zip code responses were not coded in this manner and their coding will be detailed further. A table of all codes can be found in Appendix B.

All zip codes provided by respondents were recorded in the researcher’s spreadsheet of codes and then researched to determine which cities or towns they correspond to. These locations were then documented in the spreadsheet as well and each city or town was given a code of 1, 2 or 3. All zip codes that border the Atlantic coast and lower Narragansett Bay, south of East Greenwich and Bristol, were considered “coastal” towns or cities and were coded with a 1. The zip codes that
border the upper Narragansett Bay were deemed “upper bay” and coded with a 2. Finally, all other zip codes in Rhode Island were considered “inland” and coded with a 3. Although this research initially aimed to test the perceptions of coastal and inland residents, it was very difficult to define where a “coastal” resident lives in a state that has over 400 miles of coastline. Many participants who live in Warwick, East Greenwich, Providence, Cranston and Pawtucket considered themselves coastal residents since they live close to bodies of water like Greenwich Bay and the Providence River. Therefore, it was determined by the researcher that those who live around upper Narragansett Bay should be considered a separate category from the “inland” residents who live in zip codes that do not surround any bodies of water and the “coastal” residents who reside in zip codes that surround the lower Narragansett Bay and the Atlantic coast. Multiple governmental authorities in Rhode Island, including the Rhode Island Department of Environmental Management (RIDEM) and the Narragansett Bay Commission, have informally used the term “Upper Narragansett Bay” on their websites and in literature regarding the Bay’s water quality, shellfish operations and other activities. When announcing an emergency closure of “Upper Narragansett Bay,” RIDEM defined the region as the waters, “bounded by the RIDEM range marker on Conimicut Point to the center of the tower at Nayatt Point to the northern tip of Prudence Island and the southern tip of Warwick Point…” (RIGOV, 2018). Since many Rhode Island organizations use the term “Upper Narragansett Bay” and either loosely define it, or do not define it all, the researcher chose to use the aforementioned RIDEM definition to determine the zip codes that border upper Narragansett Bay. All zip codes and their respective codes for statistical analyses,
either “coastal,” “upper Bay” or “inland,” can be found in Appendix B and a map of Rhode Island’s zip codes with these respective classifications can be found in Appendix C.

For regression analyses, additional codes were used to create average, index and dummy variables within SPSS. To measure ecological worldview, policy support and concern, each participant’s Likert scale responses to these questions were averaged. Running Cronbach’s alpha tests for reliability gave the values .761, .889 and .893 for ecological worldview (NEP score), policy support and concern, respectively.

To measure knowledge about marine plastic pollution, correct responses to each true or false statement in question 7 were added together to create an index variable. For some questions, dummy variables had to be created in order to control for a particular response. For gender, awareness of plastic pollution, plastic bag usage, bottled water purchases, recycling and zip code dummy variables were created and the codes for these variables, and their reference categories, can be found in Appendix B. Before creating dummy variables for plastic bag usage and bottled water purchases, however, the responses to these questions, 8 and 12, needed to be recoded so that the 1s corresponded to pro-environmental behaviors to measure whether or not the pro-environmental behaviors not using plastic bags and not purchasing bottled water affected the dependent variables.
CHAPTER 4

RESULTS

4.1 Profile of Survey Respondents

Of the 200 people surveyed, 72 of the participants were male while the remaining 128 were female leading to a skewed perspective. Those surveyed ranged from 18, the minimum age required to participate, to over 75 years old. It can be seen in Table 1 below that almost one fourth of participants were between 55 and 64 years old, closely followed by the 25 – 34 years old age group and the 65 – 74 years old group. 50.5% of participants were 54 years or younger and 49.5% were aged 55 and above, indicating a stronger prevalence of older residents than younger.

Table 1: Frequencies of Age Groups

| Age Group          | Frequency | Percent | Cumulative Percent |
|--------------------|-----------|---------|--------------------|
| 18 – 24 years old  | 17        | 8.5     | 8.5                |
| 25 – 34 years old  | 40        | 20.0    | 28.5               |
| 35 – 44 years old  | 20        | 10.0    | 38.5               |
| 45 – 54 years old  | 24        | 12.0    | 50.5               |
| 55 – 64 years old  | 49        | 24.5    | 75.0               |
| 65 – 74 years old  | 35        | 17.5    | 92.5               |
| 75 years or older  | 15        | 7.5     | 100.0              |
| Total              | 200       | 100     |                     |
The combined household income levels of respondents can be seen in Table 2 below. Most participants, 45.5%, come from homes that make less than $100,000 per year, 41.5% make greater than that, 12.5% did not wish to report their income and 1 participant did not answer the question.

**Table 2: Frequencies of Household Income Levels**

| Combined Household Income Level | Frequency | Percent | Cumulative Percent |
|---------------------------------|-----------|---------|--------------------|
| Less than $25,000               | 14        | 7.0     | 7                  |
| $25,000 to $49,999             | 23        | 11.5    | 18                 |
| $50,000 to $74,999             | 32        | 16.0    | 34                 |
| $75,000 to $99,999             | 22        | 11.0    | 45                 |
| $100,000 to $149,999           | 36        | 18.0    | 63                 |
| $150,000 to $199,999           | 26        | 13.0    | 76                 |
| $200,000 or more               | 21        | 10.5    | 87                 |
| Prefer not to answer           | 25        | 12.5    | 100                |
| Total                          | 199       | 99.5    |                    |

A bar chart of the percentages can also be seen in Figure 1 on the following page.
Education level frequencies are seen in Table 3 below and it is worth noting that nearly half of respondents, 44.5%, have graduate or professional degrees, 80.5% have at least a bachelor’s degree and no respondents had less than a high school diploma.

Table 3: Frequencies of Education Levels

| Education Level                        | Frequency | Percent | Cumulative Percent |
|----------------------------------------|-----------|---------|--------------------|
| Less than high school                  | 0         | 0       | 0                  |
| High school                            | 20        | 10.0    | 10.0               |
| Associate's or junior college          | 19        | 9.5     | 19.5               |
| Bachelor's degree                      | 72        | 36.0    | 55.5               |
| Graduate or professional degree        | 89        | 44.5    | 100.0              |
| **Total**                              | **200**   | **100.0**|                    |

According to the U.S. Census’s American Community Survey (ACS) from 2013 to 2017, the median household income for Rhode Islanders was approximately
$61,043 while the mean was $82,407 (U.S. Census, 2018). For this study, the mean income was approximately 4.66, which denotes the income range from $75,000 to $99,999. Although the Rhode Island mean income from the ACS is included in this range, it is important to recognize that roughly 42% of participants in this study make $100,000 or more, which is far greater than the 28.4% of Rhode Islanders who made $100,000 or more from 2013 to 2017 (U.S. Census, 2018). Therefore, the surveyed population in this study is generally wealthier than the majority of Rhode Islanders.

The disparity in education experience of Rhode Islanders as a whole and the Rhode Islanders surveyed in this study must be acknowledged as well. In this study, 36% of participants hold bachelor’s degrees while 44.5% have graduate or professional degrees. These numbers are far greater than the 19.8% of all Rhode Islanders that have bachelor’s degrees and the 13.1% who have graduate or professional degrees (U.S. Census, 2018), indicating that the surveyed population in this study does not accurately represent the education levels of Rhode Island’s majority.

The frequencies of the zip code regions described in the Methodology section, coastal, upper Bay and inland, are provided below in Table 4. It should be noted that 8 participants did not provide their zip codes. The percentages in the Percent column are the proportion of respondents out of the total sample size, 200, whereas the percentages in the Valid Percent column represent that percentage of individuals out of the 192 respondents who answered the question. It should be noted that only 30 inland residents were surveyed, which is only a fraction of the coastal and upper Bay residents surveyed.
Table 4: Frequencies of Zip Code Regions

| Zip Code Region | Frequency | Percent | Valid Percent |
|-----------------|-----------|---------|--------------|
| Coastal         | 85        | 42.5    | 44.3         |
| Upper Bay       | 77        | 38.5    | 40.1         |
| Inland          | 30        | 15.0    | 15.6         |
| Total           | 192       | 96.0    | 100.0        |
| Missing         | 8         | 4.0     |              |
|                 | 200       | 100.0   |              |

Finally, the frequencies of participants’ estimates of how far they live from the coast can be seen on the following page in Table 5. 1 respondent did not answer this question.
Table 5: Frequencies of Distance to the Coast Estimates

| Distance Estimate Response | Frequency | Percent | Valid Percent |
|----------------------------|-----------|---------|---------------|
| I can see the shoreline and/or coastal waters from my home. | 19 | 9.5 | 9.5 |
| My home is a short walk from the shoreline and/or coastal waters. | 26 | 13.0 | 13.1 |
| My home is a bicycle ride from the shoreline and/or coastal waters. | 22 | 11.0 | 11.1 |
| To get from my home to the shoreline, I have to drive less than 15 minutes. | 45 | 22.5 | 22.6 |
| To get from my home to the shoreline, I have to drive between 15 and 30 minutes. | 32 | 16.0 | 16.1 |
| To get from my home to the shoreline, I have to drive between 31 and 45 minutes. | 33 | 16.5 | 16.6 |
| To get from my home to the shoreline, I have to drive more than 45 minutes. | 22 | 11.0 | 11.1 |
| Total | 199 | 99.5 | 100.0 |
| Missing | 1 | .5 | |
| | 200 | 100.0 | |
4.2 Hypotheses Tests

This section summarizes the results of statistical analyses that ultimately tested whether or not zip code, distance from the coast, and other independent variables, affect knowledge and awareness of and concern for marine plastic pollution. To begin the analyses, the first hypothesis, “Residents from coastal areas of Rhode Island more negatively perceive marine plastic pollution since they live closer to the coast,” was tested by comparing the means for the variable “concern.” It is important to note that the tests detailed in this section only constitute a preliminary analysis and results from regression analyses to test the aforementioned variables for statistical significance will be provided in section 4.3. As previously stated in the Methodology section, “concern” was measured by creating an average score for each participant of the Likert scale ratings they provided for each item in question 6. Since the Cronbach’s alpha for these “concern” items is .893, creating an average “concern” score was a feasible calculation for this data set. Participants were asked to rate how much of a threat they believe plastic pollution poses to the marine environment, marine wildlife, terrestrial wildlife, human health and the local economy. The highest concern score an individual could have was a 5, indicating that plastic pollution is “very serious” to all items, and the lowest was a 1 signifying plastic pollution is “not at all serious” to all items.

The mean concern scores for coastal, upper Bay and inland residents can be seen in Table 6 below. While the coastal residents do have a higher mean, and therefore appear to more negatively perceive plastic pollution and how it affects the marine environment, marine wildlife, terrestrial wildlife, human health and the economy, the mean is not substantially higher than the Upper Bay residents’ or inland
residents’ mean concern scores. In addition, a one-way ANOVA test between concern and zip code regions gave a p value of .11, indicating that the means across zip code groups are not statistically different from each other. In the regression that tested concern against all other independent variables, results seen below in tables 13 and 14, individuals’ NEP and knowledge scores and their propensity to donate to environmental organizations were found to be significant predictors of concern but residency did not.

Table 6: Concern Score Means for Zip Code Groups

| Zip Code Region | Mean   | N  | Std. Deviation |
|-----------------|--------|----|----------------|
| Coastal         | 4.4256 | 78 | .73950         |
| Upper Bay       | 4.4237 | 76 | .58966         |
| Inland          | 4.1333 | 30 | .80573         |
| Total           | 4.3772 | 184| .69794         |

The second hypothesis, “Coastal residents are more aware of the severity of the issue,” was then tested by looking at each zip code groups’ responses to question 5, which asked whether or not they had heard of marine plastic pollution prior to taking the survey. This question was asked to determine if they were aware of the issue and by viewing Table 7 below, it appears that more coastal residents had heard of the issue prior to taking the survey than upper Bay or inland residents. However, it is difficult to further test statistical difference in these means due to the small amount of participants that said they had not heard of plastic pollution, or that they did not know whether they had heard of the issue. The frequencies of the responses to the awareness question
can be seen in Table 8. Due to little variance in the awareness variable, 86% of the sample indicated they were aware of the issue, further statistical tests could not be run and it is difficult to determine if one group is more aware than another.

Table 7: Awareness Means for Zip Code Groups

| Zip Code Region | Mean  | N   | Std. Deviation |
|-----------------|-------|-----|----------------|
| Coastal         | .9412 | 85  | .23669         |
| Upper Bay       | .8831 | 77  | .32339         |
| Inland          | .7667 | 30  | .43018         |
| Total           | .8906 | 192 | .31293         |

Table 8: Awareness Frequencies for Zip Code Groups

| Zip Code Region | Response to Q5 | Total |
|-----------------|----------------|-------|
|                 | Yes | No | I Don’t Know |
| Coastal         | 80  | 4  | 0             |
| Upper Bay       | 68  | 8  | 1             |
| Inland          | 23  | 7  | 0             |
| Total           | 171 | 19 | 1             |

The second hypothesis was also tested by comparing the knowledge scores of coastal, upper Bay and inland residents. The knowledge scores are indexes of each participants’ responses to the 6 true or false statements provided in question 7. Since H2 seeks to study how aware residents are of the severity of marine plastic pollution, and not just whether they were previously aware of the issue, it was determined by the researcher that the means for the knowledge question should also be looked at to test
this hypothesis. As can be seen in Table 9 below, the upper Bay residents have a higher average knowledge score, therefore, they are presumed to be the most knowledgeable about plastic pollution and its effects on the environment. However, a one-way ANOVA test between knowledge scores and zip codes groups found that these means are not statistically different from each other as the p value was .15. Therefore, it cannot be determined from this sample which group is truly more knowledgeable about marine plastic pollution.

**Table 9: Knowledge Score Means for Zip Code Groups**

| Zip Code Region | Mean   | N   | Std. Deviation |
|-----------------|--------|-----|----------------|
| Coastal         | 4.8824 | 85  | .91823         |
| Upper Bay       | 5.1558 | 77  | .81216         |
| Inland          | 4.9000 | 30  | 1.18467        |
| Total           | 4.9948 | 192 | .92943         |

Since it is difficult to say which zip code group is more knowledgeable or aware about plastic pollution, the researcher wondered whether there was a discrepancy between her classification of coastal residency and participants’ idea of what it means to be “coastal.” This was asked of participants in question 4 and it can be seen in Table 10 below that 22.4% of upper Bay residents considered themselves coastal residents compared to 80.7% of coastal residents and 17.2% of inland residents that considered themselves coastal. It appears that the researcher’s classification of coastal residency is supported by a majority of participants’ responses to this question and therefore it is difficult to determine whether or not H2 is supported. Since the
means for zip code groups for both awareness and knowledge were not statistically
different from each other, H2 is not supported but more research into awareness or
knowledge of plastic pollution across zip code groups is needed to draw stronger
conclusions.

Table 10: Self-Identification of Coastal Residency by Zip Code Group

| Coastal Residents | Count | Coastal | Not Coastal | Unsure | Total |
|-------------------|-------|---------|-------------|--------|-------|
|                   | 67    | 14      | 2           | 83     |
| % of Coastal Residents | 80.7% | 16.9%   | 2.4%        | 100.0% |
| % of Total         | 35.6% | 7.4%    | 1.1%        | 44.1%  |
| Upper Bay Residents | Count | 17      | 58          | 1      | 76    |
| % of Upper Bay Residents | 22.4% | 76.3%   | 1.3%        | 100.0% |
| % of Total         | 9.0%  | 30.9%   | .5%         | 40.4%  |
| Inland Residents   | Count | 5       | 22          | 2      | 29    |
| % of Inland Residents | 17.2% | 75.9%   | 6.9%        | 100.0% |
| % of Total         | 2.7%  | 11.7%   | 1.1%        | 15.4%  |
| Total              | Count | 89      | 94          | 5      | 188   |
| % of Total         | 47.3% | 50.0%   | 2.7%        | 100.0% |
The third hypothesis was not supported in that all the aforementioned means for concern, awareness and knowledge across zip code groups were not significantly different from each other. Therefore, these results suggest that the individuals sampled from coastal, upper Bay and inland areas have similar perceptions of plastic pollution, and H3 is not supported.

4.3 Research Questions Tests

4.3.1 Main Research Question

The main research question, “How does proximity to the coast affect Rhode Islanders’ perceptions of plastic pollution and associated policies?” was tested using multiple linear regression. The regression tested the dependent variable, policy support, against all independent variables since the researcher was curious about what, if anything, correlated with policy support. The policy support variable was calculated by taking the average of each participants’ responses to the questions regarding support or opposition for 6 different policies. This average was taken to create an indicator for policy support as a whole. The Cronbach’s alpha for all combined policies is .889, indicating that taking an average policy support score is a reliable measure. The responses were structured as a 5 point Likert scale from “Strongly Opposed” to “Strongly Support” and the policies in question included:

1. A ban on plastic bags in your city/town
2. A 10 cent fee on paper bags in your city/town
3. A 10 cent fee on plastic bags in your city/town
4. A statewide ban on plastic bags
5. A 10 cent fee on paper bags statewide
6. A 10 cent fee on plastic bags statewide

The regression tested the policy support average scores against all independent variables surveyed, including: gender, income, age, education level, residency (coastal, upper bay area or inland based on the zip codes they provided), the number of beach visits in a year, New Ecological Paradigm (NEP) score, knowledge score, concern score, awareness of plastic issue, and engagement in the pro-environmental behaviors recycling, not buying bottled water, not using single-use plastic bags from the grocery store, and donating to an environmental organization. The output can be seen below. It should be noted that alpha was .05 for all regression analyses and that dummy variables were created for both coastal and upper Bay residents. The results can be seen in Tables 11 and 12.

**Table 11: Model Summary of Regression Analysis – Policy Support as Dependent**

| Model | R     | R Square | Adj. R Square | Std. Error of Estimate | R Square Change | F Change | Df1 | Df2 | Sig. F Change |
|-------|-------|----------|---------------|------------------------|-----------------|----------|-----|-----|--------------|
| 1     | .640  | .410     | .355          | .75118                 | .410            | 7.446    | 15  | 162 | .000         |
Table 12: Regression Analysis – Policy Support as Dependent

| Independent Variable    | Standardized Coefficient | Sig. |
|-------------------------|---------------------------|------|
| Age                     | -.169                     | .014 |
| Bottled Water Avoidance | .134                      | .040 |
| Plastic Bag Avoidance   | .225                      | .001 |
| Concern                 | .284                      | .000 |
| NEP Score               | .159                      | .039 |
| Beach Visit             | .112                      | .120 |
| Income                  | -.023                     | .728 |
| Education               | .094                      | .162 |
| Gender                  | .073                      | .251 |
| Recycle                 | .029                      | .659 |
| Coastal Resident        | -.124                     | .200 |
| Upper Bay Resident      | .002                      | .979 |
| Awareness               | -.022                     | .750 |
| Knowledge Score         | .046                      | .499 |
| Donate                  | .126                      | .075 |

The only statistically significant variables found to influence policy support are age (p = .014), NEP score (p = .039), not purchasing bottled water (p = .040), not using plastic bags (p = .001) and the concern score (p = .000). Residency, i.e. zip code classification, had no statistically significant effect on policy support. Therefore, it can be deduced that part of the answer to the primary research question is “geographic proximity to the coast does not affect Rhode Islanders’ perceptions of policies
associated with plastics.” It is also worth noting that the only demographics variable with any significance is age and with a negative correlation coefficient indicates that older individuals might not favor policies as much as younger people do. After finding statistically significant relationships between the indicated covariates and policy support, regression analyses were performed that tested NEP score, bottled water use, plastic bag use and concern as dependent variables, against all independent variables listed in the above section, to learn which parameters might affect these influencers of policy support. Age was not tested. The results from the concern regression are provided below, as it was the only test that yielded unexpected findings that differ from the literature on pro-environmental attitudes and behavior. Only the statistically significant variables are provided in Table 14.

It seems that a participant’s NEP score, knowledge score and propensity to donate to environmental organizations have slightly significant effects on concern for the marine environment, marine and terrestrial wildlife, human health and the local economy. What is particularly noteworthy is that the knowledge score from the true or false questions is negatively correlated with concern, potentially implying that educational programs to increase knowledge about plastic pollution might not be the most effective measure to mitigate plastic pollution in Rhode Island. In addition to the regression findings, it was calculated that most respondents, 77%, are concerned about plastic pollution to the degree that they classify it as a “serious” or “very serious” threat to the environment, wildlife, health and Rhode Island’s economy.
Table 13: Model Summary of Regression Analysis – Concern as Dependent

| Model | R     | R Square | Adj. R Square | Std. Error of Estimate | R Square Change | F Change | Df1 | Df2 | Sig. F Change |
|-------|-------|----------|---------------|------------------------|-----------------|----------|-----|-----|--------------|
| 1     | .563  | .317     | .259          | .54659                 | .317            | 5.440    | 14  | 164 | .000         |

Table 14: Regression Analysis – Concern as Dependent

| Independent Variable | Standardized Coefficient | Sig. |
|----------------------|--------------------------|------|
| NEP Score            | .455                     | .000 |
| Knowledge Score      | -.193                    | .007 |
| Donate               | .161                     | .029 |

4.3.2 Sub Research Questions

The first sub research question that was asked was, “How aware/how knowledgeable are Rhode Island residents of the marine plastic pollution issue?” By looking at the table of crosstabulation below it is clear that, as a whole, survey participants are highly knowledgeable about marine plastic pollution.
Table 15: Knowledge Score Percentages for Zip Code Groups

|                  | Knowledge Score |    |    |    |    | Total |
|------------------|-----------------|----|----|----|----|-------|
|                  | 2   | 3   | 4   | 5   | 6   |       |
| Coastal Residents| Count | 1   | 6   | 17  | 39  | 22    | 85    |
|                  | % of Coastal Residents | 1.2% | 7.1% | 20.0% | 45.9% | 25.9% | 100.0% |
|                  | % of Total | .5% | 3.1% | 8.9% | 20.3% | 11.5% | 44.3% |
| Upper Bay Residents| Count | 0   | 3   | 11  | 34  | 29    | 77    |
|                  | % of Upper Bay Residents | 0.0% | 3.9% | 14.3% | 44.2% | 37.7% | 100.0% |
|                  | % of Total | 0.0% | 1.6% | 5.7% | 17.7% | 15.1% | 40.1% |
| Inland Residents | Count | 2   | 1   | 7   | 8   | 12    | 30    |
|                  | % of Inland Residents | 6.7% | 3.3% | 23.3% | 26.7% | 40.0% | 100.0% |
|                  | % of Total | 1.0% | .5% | 3.6% | 4.2% | 6.3% | 15.6% |
| Total            | Count | 3   | 10  | 35  | 81  | 63    | 192   |
|                  | % of Total | 1.6% | 5.2% | 18.2% | 42.2% | 32.8% | 100.0% |

From here it can be seen that at least 75% of all participants got at least 5 of the 6 true or false questions correct and 94% of the sample got at least 4 correct.
A multiple linear regression test was then performed on the knowledge score to learn about which variables might associate with knowledge since much of the surveyed population got high knowledge scores. The results of this test can be seen below. After all independent variables were tested in the model, gender, awareness of plastic pollution, NEP score and concern were found to be significant predictors of knowledge. It appears that women got more answers correct on the knowledge questions that tested how much individuals know about plastic pollution and how it affects the environment. It is also interesting to note that awareness and NEP score are both positively correlated with knowledge but concern is negatively correlated.

**Table 16: Model Summary of Regression Analysis – Knowledge as Dependent**

| Model | R    | R Square | Adj. R Square | Std. Error of Estimate | R Square Change | F Change | Df1 | Df2 | Sig. F Change |
|-------|------|----------|---------------|------------------------|----------------|----------|-----|-----|---------------|
| 1     | .471 | .221     | .133          | .87109                | .221           | 2.496    | 18  | 158 | .000          |

**Table 17: Regression Analysis – Knowledge as Dependent**

| Independent Variable | Standardized Coefficient | Sig. |
|----------------------|--------------------------|------|
| Gender               | -.150                    | .039 |
| Awareness            | .155                     | .046 |
| Concern              | -.224                    | .007 |
| NEP Score            | .296                     | .001 |

To answer this question, the researcher also looked at the question that asked participants whether or not they had heard of marine plastic pollution prior to taking the survey. This question was asked in order to test “awareness” and it was found 86%
of the surveyed population knew of this issue before taking the survey. Since awareness did not affect policy support, further analyses into which covariates affect the variable were not conducted.

The next question that was tested was, “Do Rhode Islanders classify marine plastic pollution as a significant threat to human health, the marine environment or the local economy?” Although a one-way ANOVA test between zip code categories and concern did not indicate statistically significant differences in concern means, overall Rhode Islanders across zip code categories seem very concerned about plastic and its effects. This result is evident in the magnitude of the means for each zip code group’s concern for human health, the marine environment and the local economy.

Below are the means for the threat to human health question for each zip code group. The means are all very high in magnitude, which indicates that the survey respondents classify plastic as a serious threat to human health, as opposed to a very serious threat which would be denoted by a 5.

**Table 18:** Threat to Human Health Means for Zip Code Groups

| Zip Code Region | Mean | N   | Std. Deviation |
|-----------------|------|-----|----------------|
| Coastal         | 4.28 | 82  | .946           |
| Upper Bay       | 4.27 | 77  | .837           |
| Inland          | 4.03 | 30  | .964           |
| Total           | 4.24 | 189 | .906           |
Below are the means for the threat to the marine environment question for each zip code group. All the means are very high indicating that most survey respondents classify plastic as a serious or very serious threat to the marine environment.

**Table 19:** Threat to Marine Environment Means for Zip Code Groups

| Zip Code Region | Mean | N   | Std. Deviation |
|-----------------|------|-----|----------------|
| Coastal         | 4.61 | 85  | .709           |
| Upper Bay       | 4.69 | 77  | .520           |
| Inland          | 4.33 | 30  | .884           |
| Total           | 4.60 | 192 | .679           |

The means for the threat to the local economy question for each zip code group can be seen below. All the means are high indicating that most survey respondents classify plastic as a serious threat to the local economy. It is also important to note that the mean concern for the local economy is lower for each zip code group than they were for the marine environment and human health.

**Table 20:** Threat to Local Economy Means for Zip Code Groups

| Zip Code Region | Mean | N   | Std. Deviation |
|-----------------|------|-----|----------------|
| Coastal         | 4.09 | 80  | .996           |
| Upper Bay       | 3.89 | 76  | 1.053          |
| Inland          | 3.80 | 30  | 1.031          |
| Total           | 3.96 | 186 | 1.026          |
The next sub question that was tested was, “Do Rhode Islanders support plastic legislation?” To answer this, the mean of the policy support score for the whole dataset was calculated. The mean was 3.7576, which indicates more support than opposition as a whole since the highest average could have been 6. It was also found that 48% of participants scored a 4.0 or above indicating that almost half of the sample supports a majority of the policies proposed. The individual policies proposed in the survey were then examined to learn about which policies in particular got the most support from respondents. By looking at the means in the table below it is clear that the town and state plastic bag bans received the most support. The fees are less popular. More specifically, it was found that 77% of the total population supports a statewide plastic bag ban and 68% is neutral towards or supportive of a statewide 10 cent fee on paper bags.

**Table 21: Means for Individual Policy Support**

|           | Town Plastic Ban | Town Paper Bag Fee | Town Plastic Bag Fee | State Plastic Ban | State Paper Bag Fee | State Plastic Fee |
|-----------|------------------|--------------------|----------------------|-------------------|---------------------|------------------|
| N Valid   | 199              | 200                | 200                  | 200               | 200                 | 199              |
| Missing   | 1                | 0                  | 0                    | 0                 | 0                   | 1                |
| Mean      | 4.26             | 3.31               | 3.84                 | 4.10              | 3.26                | 3.79             |

The researcher was also curious about which age groups, if any, most support plastic and paper policies. It can be seen in the table below that the youngest age group (18-24 year olds) has the highest mean for support and then means decrease for the 25-34 year olds, 35-44 year olds and 45-54 year olds have the lowest average support
scores. Interestingly, the means for the 55-64, 65-74 and 75+ age groups are higher than the mean for the 45-54 year olds but these still are not as high as the means for the 3 youngest age groups (including people from 18-44). This can also be seen in the MLR test results for policy support. Age correlated with policy support and had a standardized coefficient of -.169, indicating a weak and negative relationship between age and policy support.

Table 22: Policy Support Means for Age Groups

| Age Group   | Mean  | N   | Std. Deviation |
|-------------|-------|-----|----------------|
| 18 - 24 years old | 4.0196 | 17  | .76803         |
| 25 - 34 years old  | 3.9333 | 40  | .89459         |
| 35 - 44 years old  | 3.9000 | 20  | 1.01509        |
| 45 - 54 years old  | 3.5000 | 24  | 1.05752        |
| 55 - 64 years old  | 3.8160 | 48  | 1.03670        |
| 65 - 74 years old  | 3.5049 | 34  | .92885         |
| 75 years or older  | 3.6000 | 15  | .65101         |
| Total          | 3.7576 | 198 | .95049         |

The next question that was examined was, “Do Rhode Islanders already participate in pro-environmental behavior related to mitigating plastic pollution?” To answer this question, participants were asked whether or not they recycle, purchase bottled water and use plastic bags. Recycling is considered a pro-environmental behavior but using plastic bottles and bags are not, therefore, not engaging in these behaviors is considered pro-environmental. The percentages of answers to these questions, for all participants, can be seen in the table below.
Table 23: Pro-Environmental Behavior Participation

| Behavior         | Response to Question |
|------------------|----------------------|
|                  | Yes (%)   | No (%)   | Unsure (%) |
| Recycle          | 96        | 3.5      | .5         |
| Bottled Water    | 44.5      | 55.5     | 0          |
| Plastic Bag Use* | 46.5      | 52       | .5         |

*1 participant did not answer this question

It is clear from this that most participants engage in recycling but the other pro-environmental behaviors do not have as much participation. Almost half of the respondents use plastic bags, which is not a pro-environmental behavior. Many participants indicated to the researcher, however, that they like to use the bags for multiple purposes around their homes like for litter boxes, trash can inserts and to pick up their pets’ waste. It can also be seen that a majority of the participants for this study do not purchase bottled water, which is good but not ideal as alternatives for plastic water bottles, like reusable bottles, have been readily available for many years.
CHAPTER 5

DISCUSSION

5.1 Findings

The goal of this study was to investigate whether or not geographical proximity to the coast affects a Rhode Islander’s support for policies used to mitigate plastic pollution. After distributing an intercept survey to 200 Rhode Islanders, 100 surveyed in Providence and 100 surveyed in South Kingstown, it has been found that where a person lives in Rhode Island has no bearing on his or her support for plastic and paper bag policies. When tested against policy support as a whole, the coastal residency and upper Bay dummy variables yielded p values of .200 and .979, respectively, which indicates no significant correlation between zip code residency and policy support. The average policy support score of the surveyed population indicated more support than opposition towards the policies presented in the survey and it is also interesting to note that plastic bag bans, at both the town and state levels, were the policies most supported by the surveyed population. This data suggests that wealthier and more educated Rhode Islanders across the state might support a statewide plastic bag ban since geographical location does not affect one’s support for plastic bag policies.

What was found to predict support for policies were NEP score, i.e. pro-ecological world view, age, plastic bottle and bag use and concern over how plastic affects the marine environment, different types of wildlife, human health and the local economy. These findings are not surprising, as many studies have found that older
individuals are less likely to be supportive of environmental policies, and that those who have pro-environmental attitudes or engage in pro-environmental behaviors are more likely to support environmental policy. The idea that ecological worldview affects support for pro-environmental policies or initiatives has also been found in a number of studies. This finding is consistent with Ntanos et al.’s recent 2018 study of NEP scores in Greece, which reported that a person’s NEP score was correlated with respondents’ willingness to pay for renewable energy development (2019, p. 16). A study by Stern et al. also found that NEP score, as a part of their conjectured Values Beliefs Norms (VBN) theory, impacted a person’s environmental movement and policy support (1999).

Since most Rhode Islanders surveyed in this study support policies to mitigate plastic pollution, live in different parts of the state and have high ecological worldviews, it is worthwhile for Rhode Island policy makers to explore the potential for a statewide plastic bag ban and fees on paper bags to encourage the use of reusable bags. Although a handful of municipal bans have already been enacted throughout Rhode Island, namely in Aquidneck Island, Barrington, North Kingstown and South Kingstown, a statewide ban could significantly limit the potential for plastic to enter the marine environment. As a large contributor to the estimated eight million metric tons of plastic entering the ocean every year (Jambeck et al., 2015), single-use plastic shopping bags could be banned across the United States but only California has been able to pass a statewide plastic bag ban after years of litigation. Although Hawaii was the first state to ban single-use plastic bags from grocery stores, this measure passed in
each county over the course of many years and was never passed at the state legislature (Surfrider Foundation, 2012).

On February 14th, 2019, Rhode Island Governor Gina Raimondo’s Task Force to Tackle Plastics released a report of recommendations to the Governor that included a model of plastic bag legislative language. The Task Force recommended a statewide ban on single-use plastic bags and a 5 cent fee on recyclable paper bags that would override existing local ordinances on plastic and paper bags (RIDEM, 2019). The 5 cent fees would be collected and kept by the retailer in order to partially alleviate the costs of purchasing more recyclable paper bags. The bill also calls for a “state-led program to distribute reusable bags to vulnerable populations, leveraging existing community organizations...” (RIDEM, 2019). The reasoning for this provision is to “…ensure the policy does not create an undue burden on environmental justice communities, seniors, low-income communities, and other vulnerable populations” (RIDEM, 2019). The recommendations outlined here ultimately informed the content of an identical bill that was proposed to the state House of Representatives nearly two weeks later on February 27, 2019.

The bill, as well as the recommendation to the Governor, defines what constitutes a banned plastic or paper bag (banned paper bags include those that are not recyclable and usually given by restaurants) and what is an acceptable, reusable alternative. There are numerous types of plastic bags that still are not banned by this legislation, however. Some of the exclusions include “bags used…to package loose items, such as fruits, vegetables, nuts, ground coffee, grains, candies, or small hardware items,” “bags used to contain unwrapped prepared foods or bakery goods,” “laundry, dry
cleaning, or garment bags…” and “bags used to contain live animals, such as fish or insects sold in pet stores” among others (RIDEM, 2019). These exclusions are among some of the concerns of a few Task Force members. Another concern noted within the report is the fact that the proposed bill would override existing municipal bans. Some Task Force members offered the opinion that local leaders should be able to create more stringent requirements and they only advocate for a statewide ban if it is more rigorous than all of the existing bans throughout the state (RIDEM, 2019). Other Task Force members advocated for a harsher definition of reusable alternatives that includes “requirements for stitched handles” since many areas around the US that have enacted bag bans have seen retailers turn to reusable plastic bags (RIDEM, 2019). If a requirement for stitched handles existed, a feature not compatible with plastic bags, then this would help eliminate the potential for stores to get away with selling thicker polyethylene bags as “reusable alternatives,” when they are still in fact non-recyclable, single-use plastic bags. Some Task Force members also hoped that polyester would be excluded from the definition of reusable bags since it is another form of plastic. These concerns over semantics within the legislation have been voiced in order to decrease the potential for any loopholes that could be taken advantage of by retailers in the future and allow more plastic bags to enter the marine environment.

5.2 Limitations

It is worth noting that this study had multiple limitations and that the equity of plastic bag bans and paper bag fees needs to be considered before these are enacted at the state level. Since this study’s population included mostly people of middle to upper class incomes, and individuals with at least bachelor’s degrees, it is recognized
by the researcher that this sample is not necessarily indicative of the state’s lower income populations and thus it might not be prudent to extrapolate this study’s findings to the whole state of Rhode Island. As previously stated, 42% of surveyed Rhode Islanders make a combined household income of $100,000 or more which is nearly one and a half times greater than the 28.4% of Rhode Islanders that reported earning this income on the American Community Survey from 2013-2017. Also, 80.5% of Rhode Islanders surveyed in this study hold at least a bachelor’s degree, which is almost two and a half times the 32.9% of Rhode Islanders that hold at least a bachelor’s degree across the state as a whole. Since this study’s population is not indicative of most Rhode Islanders’ income and education levels, the following policy alternatives should be considered with caution as they might not be as highly received by those with lower income and education levels.

This sample was also limited in that women were substantially more represented than men. 64% of the surveyed population was female, while the remaining 36% was male, which skews this dataset. Although the systematic sampling technique was chosen to avoid bias and skewed data, perhaps using the convenience sampling method to engage potential respondents would have been more effective at reaching both men and women to create more equal representation. Finally, the surveyed population was also skewed towards coastal and upper Bay residents since only 30 inland residents were sampled. The greater representation of coastal and upper Bay residents is most likely due to the fact that the 2 survey locations were within a coastal and an upper Bay zip code. If the researcher had surveyed in an inland zip code, like one in Coventry, Burrillville or Woonsocket, in addition to coastal and upper Bay
locations, a more balanced data set could have been acquired. Perhaps a more representative dataset of Rhode Islanders’ residencies, genders, and education and income levels would yield differing results.

5.3 Policy Alternatives and Recommendations

This study suggests that some Rhode Islanders support plastic bag bans at the state and municipal levels and plastic and paper bag fees and that the passing of S0410 would be consistent with the policy support of the 200 survey respondents. Although municipal bans were also highly supported by participants, a statewide ban could prevent more plastic bags from entering the marine environment than a few municipal bans. A statewide ban will also make implementation and enforcement more consistent, especially for chain stores that have used plastic bags in the past. Fees on paper bags, to discourage their use since they are resource intensive to produce, are also encouraged to promote the utilization of reusable bags.

This study proposes new policy as the best chance to mitigate plastic pollution in Rhode Island and rejects educational programs to invoke behavior change. The latter are often suggested in the literature regarding marine plastic pollution or pro-environmental behavior and recommended by the Governor’s Task Force. (Ajaps & McLellan, 2015; Hunter & Rinner, 2003; RIDEM, 2019; Wynveen et. al, 2015). The results of this study, seen in Table 14, suggest that knowledge of marine plastic pollution and concern over its affects on the environment, human health and the local economy are negatively correlated; implying here that the more knowledgeable one is about the issue, the less concern he or she has over plastic’s effects. These findings are consistent with Barber et al.’s 2009 study that found a negative relationship between
environmental knowledge and attitudes towards environmental issues. Therefore, it seems counterintuitive to initiate educational programs that seek to increase Rhode Islanders’ knowledge or awareness of marine plastic pollution, especially since this study found that participants are already both knowledgeable and aware of the issue. Also, many studies have already found that education alone is seldom enough to promote behavior change (Geller, 1992) and that people often persist in old patterns of behavior despite awareness of the negative consequences for the environment and the presence of alternatives (Bolderdijk et al., 2012).

There are often multiple barriers to any behavior change, which can prevent people from acting pro-environmentally. This is often the case regarding using reusable bags. Without bans to keep plastic bags out of stores in the first place, some individuals find that using reusable bags, or remembering to bring them, is inconvenient. In a 2017 study by the Ohio Sea Grant and Stone Laboratory, researchers found that the most common reason people do not use reusable bags is because they forget them and then feel they need the plastic bags provided to them at the store (Hardy & Bartolotta, 2017). For many individuals, using reusable bags requires more planning, like keeping bags in the car or at workplaces, and increased maintenance, like having to wash the bags to prevent bacterial growth. This makes the case for plastic bag bans or other policies that keep plastics out of stores, since without plastic bags in the stores in the first place, consumers will not have this option to fall back on if they forget their reusable bags, thus decreasing potential plastic outputs to the ocean.
Taxes and fees on plastic and paper bags are other examples of bag policies that have been initiated across the United States. Figure 2 below depicts the states with enacted plastic bag legislation. It is interesting to note that some states have enacted preemption laws at the state level that prevent local governments within those states from banning or taxing plastic bags.

Figure 2: States with Enacted Plastic Bag Legislation. Source: National Conference of State Legislatures (2019)

The efficacy and equity of statewide plastic bag bans and fees on paper bags will be examined in the following sections. Final policy recommendations will then be provided and future research into how Rhode Islanders perceive plastic bottle bans will also be proposed as another type of policy that could prevent other plastics from entering the marine environment.
5.3.1 Effectiveness of Statewide Plastic Bag Bans

In August of 2014 California became the first state to impose a statewide ban on single-use plastic bags in retail stores. The bill also required a 10-cent minimum fee on recycled paper bags, reusable plastic bags, and compostable bags at certain locations. Eventually the ban passed in the November 2016 election (National Conference of State Legislatures, 2019). In 2015, Hawaii technically became the first state to prohibit non-biodegradable plastic bags at grocery stores in addition to paper bags that contain less than 40 percent recycled material. Bans in Kauai, Maui and Hawaii counties were established between 2011 and 2013, and Honolulu became the last county to approve the ban in 2015 (National Conference of State Legislatures, 2019).

Although there is limited data on the success and equity of Hawaii’s bans, it was public knowledge that many environmental groups and other stakeholders opposed Honolulu’s initial ban that allowed thicker, reusable plastic bags and compostable plastic bags to still be available at businesses (Honolulu’s Department of Environmental Services, 2017). Surfrider also reported that local residents had noted an increase in paper bag use after the Honolulu ban was first passed in April 2012 (Hickman & Coleman, 2012). Since this ban was instated, however, amendments have been made that now require consumers to pay a 15-cent fee on reusable and compostable plastic bags and recyclable paper bags. Also, effective January 1, 2020, plastic film bags with a thickness of 10 millimeters or less shall no longer be considered “Reusable Bags” and compostable plastic bags will no longer be considered “Acceptable Bags” (Honolulu’s Department of Environmental Services,
The Hawaii bag bans are examples of bans that have historically contained loopholes that are still being worked out today. If Rhode Island wishes to pass the proposed statewide ban, policy makers should learn from the mistakes Hawaii made when discussing or instituting these policies.

California has seen much success in the reduction of plastic bag litter since its statewide ban was passed. Data collected from the California Coastal Cleanup Day held in September 2017 shows that plastic bag litter had dropped by 72 percent when compared to 2010, making plastic bags now account for less than 1.5 percent of all litter, compared to nearly 10 percent in 2010 (California Coastal Cleanup Day Litter Data Summary 2010-2017 Report, 2017). According to California’s Secretary for Natural Resources John Laird, “We are seeing a substantial decline in plastic grocery bags litter on beaches, rivers and parkways” (ctd. In Mercury News, 2017). Also, as previously quoted, California now saves an estimated $400,000 million per year trying to dispose of plastic bags (Mercury News, 2017). This shows that substantial economic benefits, in addition to environmental benefits, can result from the enacting of plastic bag bans.

The California bag ban has proven effective and efficient in that it has curbed plastic bag usage and kept it from polluting the environment. This policy, however, may not be equitable for all stakeholders since retailers have to pay higher prices for paper bags to replace the single-use plastic bags. Disadvantaged members of certain communities may have also suffered from the legislating of the ban since they may have been forced to buy reusable bags they could not afford. This law is also enforceable at the county, city and state levels since violations can be reported to the
California Attorney General’s office, or the local District Attorney, City Attorney, or City Prosecutor’s office where the violation occurred (California Legislative Information, 2019). If retailers violate the ban, according to the California Attorney General’s Office, they “may be fined $1,000 per day for the first violation, $2,000 per day for the second violation, and $5,000 per day for the third and subsequent violations” (2019). Since there are penalties in place for violating the statewide California ban, this policy seems to have sufficient enforcement mechanisms but it may not be the most equitable solution because of how detrimental the large fees could be to smaller, local businesses. It should be noted, however, that the California ban requires stores to provide a reusable grocery bag or a recycled paper bag free of charge to customers using a WIC or EBT payment card (CalRecycle, 2018) making the policy more equitable to residents of lower income. Similar stipulations could also be instituted as part of a statewide ban in Rhode Island to increase legislation’s equitability.

5.3.2 Effectiveness of Paper Bag Fees and Taxes

Throughout the United States, municipalities have initiated legislation to charge consumers on paper bag usage. Towns and cities throughout California, Arizona, Alaska, Colorado, Washington DC, Maine, Massachusetts, New Jersey, New York, Texas, Washington, and Boston and Chicago have passed fees or taxes on paper bags to discourage their consumption. Taxes collected from paper bag sales are usually collected by the state or town’s government, while individual retailers collect and keep paper bag fees. Since paper bags are highly resource intensive to
manufacture, and sometimes difficult to industrially recycle, they are not the most ecologically responsible alternative to single-use plastic bags.

Although there is limited data on the reductions in paper bag use since the aforementioned areas enacted paper bag legislation, there is evidence in the social science literature that when taxes and fees on plastic bags are framed as “penalties,” shoppers are more motivated to bring reusable bags (Muralidharan & Sheehan, 2016; Dikgang & Visser, 2012). Muralidharan and Sheehan also found that not only does the prospect of a tax or fee increase the potential for pro-environmental behavior, in this case reusable bag use, but that both 10-cent penalties were perceived differently by shoppers as fees are considered “gains” in economics while taxes are framed as losses (2016). These researchers therefore recommended a tax as a penalty to more effectively motivate consumers to bring reusable bags from grocery stores and skip plastic bags. The findings from these studies support the Rhode Island Task Force’s stipulation for a fee on paper bags but a tax, instead of a fee, could perhaps enhance the current proposed legislation since the penalty it implies could better motivate consumers to switch to reusable bags. In Rhode Island, taxes or fees on paper bags could be considered, and are encouraged by the findings of this research, to deter consumers from seeking paper bags as alternatives to single-use plastics.

There is also evidence, however, that paper bag penalties might not actually decrease bag use as effectively as proponents might hope. A Washington Post article from 2015 highlights Washington DC’s revenue from plastic and paper bag fees after the initiation of these fees in 2010. Washington DC City Councilman David Greenfield told the Post that from 2010 to 2015 revenue from plastic and paper bags in
DC actually had not decreased in the 5 years since the fees were put in place and said, “What that means, logically, is that people are still paying to use [disposable] bags, and therefore you have not significantly reduced that” (Brittain & Rich, 2015).

Although this indicates that people were still paying for bags and potentially not making the switch to reusable alternatives, former DC council member Tommy Wells, who created the law in 2009, believes that the fees have been “extraordinarily successful,” and substantiates this claim by pointing to the Alice Ferguson Foundation’s report that found a 60 percent decrease in bags recovered in volunteer cleanups of the Potomac Watershed (Brittain & Rich, 2015). Since it is difficult to obtain quantitative metrics of the paper bag fee and tax successes or failures, this policy alone might not prove the most environmentally conscious for Rhode Islanders to decrease disposable bag waste and increase reusable bag use. This study did find, however, that participants were, overall, supportive of 10-cent fees on paper bags at the town and state levels. These results, coupled with the successes of fees and taxes as message frames to increase reusable bag use, make the case for Rhode Island to implement similar policies on paper bags in addition to a statewide plastic bag ban.

5.3.3 Effectiveness of the Combination of Ban and Fee

While these policies have helped curb behavior in some parts of the world, not all bans, at the state and municipal, and taxes have proven as effective as desired. In some places, the failures of fees and bans are due to the lack of social campaigns, while in others consumers are still willing to pay for convenience (Anastasio & Nix, 2016). Also, some policies are not comprehensive enough to fully mitigate marine plastic pollution because they contain loopholes. For instance, certain bans do not
distinguish between the types of plastic bags banned, like other non-biodegradable plastic bags or thicker plastic bags like those previously mentioned in Hawaii. Also, some legislation fails to tax paper bags, which become substitute litter products (Anastasio & Nix, 2016). Due to the inadequacies of these types of regulations, it seems that a combination of policies are the plausible way forward to work together to change consumer behavior and hopefully incentivize industry to innovate and create a plastic bag free market.

Since taxes and fees have the potential for success in developed countries (Xanthos & Walker, 22) Rhode Island could implement fees in conjunction with a bag ban at the state level. The Equinox Center, a San Diego-based nonpartisan environmental policy initiative, found that throughout the United States, the combination of bag bans and fees have been reportedly successful at the municipal level (Equinox Center, 2013). In addition, a Seattle survey found after the city instated a plastic bag ban and a fee on paper bags that 80 percent of retailers reported a significant reduction in single-use bags (Seattle Public Utilities and Solid Waste Division, 2013). Six months after enacting a plastic bag ban and fee ordinance, Portland, Oregon also reduced their plastic bag waste by over 52 million bags (Ban the Bag, 2012).

According to the Equinox Center’s report on the economic and environmental impacts of plastic bag bans in California, in order to more accurately judge the impacts of bans, observations of changes in Bag Use Profiles, i.e. the proportion of bag types used in retail venues, must be made in addition to looking at the reduction of single use plastic bags (2013). The Bag Use Profiles for San Jose, Santa Monica and LA
County, California from before and after the enacting of bans and fees on paper bags can be found in Figure 3 below. The Post Ban data was collected at least six months after the ordinances were passed. The values in the table represent the percentage of customers using single use plastic bags (SUPBs), paper and reusable bags and no bags. It should be noted that Santa Monica charges a 10-cent fee on paper bags, while San Jose charged 10 cents per bag until 2014 when it increased the fee to 25 cents, and Los Angeles’ fees are at the discretion of the retailer, but must be at least 10 cents (Equinox Center, 2013). It can be seen in Figure 3 below that after the ordinances took effect significant increases in paper and reusable bags were experienced.

|        | PRE - BAN |          |          | POST - BAN |
|--------|-----------|----------|----------|------------|
|        | SUPB | Paper | Reusable | No Bag | SUPB | Paper | Reusable | No Bag |
| San Jose | 75  | 3     | 3        | 19     | 0    | 22    | 35       | 43     |
| Santa Monica | 69  | 5     | 10       | 15     | 0    | 23    | 41       | 36     |
| LA County | 82  | 2     | 2        | 17     | 0    | 2     | 58       | 40     |
| Average | 75  | 3     | 5        | 17     | 0    | 16    | 45       | 40     |

Figure 3: California County Bag Use Profiles. Source: Equinox Center (2013)

Under these ordinances retailers retained fees collected for paper bags to partially recover the cost of purchasing more paper bags. Although policies like these may lead to increased baggage costs for retailers in the short-term, these costs can be mitigated in the long run if customers purchase their own reusable bags from those same businesses. This takes into account the fact that retailers will initially incur higher costs switching from plastic to paper bags if fees are only 10 cents since paper bags, on average, cost 15 cents per bag. With its “phased in” fee, the initial fee of 10 cents increased to 25 cents after two years, San Jose actually profited from the imposed fee and bag ban (Equinox Center). According to Mark Murray, executive
director of the nonprofit Californians Against Waste, since the induction of the bag bans and fees, cities like San Jose and Santa Monica have also experienced great reductions in plastic litter which in turn has saved taxpayers the cost of picking it up and unclogging storm drains (ctd. In Mercury News, 2017).

The above-mentioned environmental and economic successes of the combined plastic bag ban and fees support Rhode Island’s S0410 bill to combat marine plastic pollution at the state level. In order to further prevent the destruction associated with marine plastic pollution nationwide, legislation incorporating a variety of policies must first be enacted in the states. Therefore, it is recommended that the Rhode Island state legislature pass the proposed S0410 bill. The research conducted on Rhode Islanders’ perceptions of marine plastic pollution and the policies to combat the issue coupled with the aforementioned studies on plastic bag bans and paper bag fees support the Task Force’s recommendations to the Governor.

5.4 Future Research – Plastic Bottle Bans

Other studies into Rhode Islanders’ support for other types of policies against plastics are strongly encouraged as this study only looked at support for plastic and paper bag legislation. This study found that those individuals who do not purchase plastic water bottles are more supportive of plastic and paper bag policies and that a majority of participants do not purchase bottled water. Therefore, the researcher encourages other studies into how plastic bottle bans might be perceived by Rhode Islanders and perhaps studies into the reasoning why some individuals still purchase bottled water since the U.S. is the largest market for bottled water in the world. Research by Hu et al. found that “U.S. consumers are more likely to report bottled
water as their primary drinking water source when they perceive that drinking water is not safe” (2011). Since perceptions of water quality have been found to affect bottled water consumption and since Americans consume 50 billion plastic water bottles each year alone (Fishman, 2007), research into plastic water bottle bans and their efficacy should be conducted in order to decrease this form of plastic consumption in Rhode Island and in the United States as a whole.

In the United States a few municipalities have already taken action to ban plastic water bottles including Concord, Massachusetts and San Francisco, California. In 2013, Concord became the first town to enact a ban that prohibited the sale of “single-serving polyethylene terephthalate (PET) bottles of 1 liter (34 ounces) or Less…” (The Commonwealth of Massachusetts Office of the Attorney General, 2012), and since the ban conflicting information has surfaced about its effectiveness and the perceptions around it. In a 2018 interview with WGBH Boston, Tom McKean, the chair of the Concord Select Board, indicated that the issue of banning plastic water bottles still proved to be a divisive issue in Concord as some people strongly support the ban and actually do not feel it has gone far enough, with plastic soda and juice bottles still being sold, while others find the ban unfair, inconvenient or a form of government overreach (Herwick III, 2018). Unfortunately it is hard for Concord residents, workers and public officials to quantify exactly how much plastic bottle waste has been mitigated since the ban’s inception in 2013, which makes it difficult to argue for plastic bottle bans. Concord’s public information officer, Erin Stevens, commented, “We ask the people who are driving the recycling trucks, 'What are you seeing,' and they say ‘We’ve definitely seen a decrease.’ But it’s hard to measure. So,
I can’t say how many bottles we’ve saved, unfortunately" (Herwick III, 2018). She also noted that the town put in “a lot more” filling stations and water fountains, at $5,000 a piece, that have provided thousands of gallons of water or the equivalent of approximately 4,000 small plastic bottles worth.

Despite Stevens’ positive feelings and hope for the ban, town officials claimed in 2016 that the ban has produced no measure reduction in plastic waste. Some stores in Concord responded to the ban by stocking their shelves with 1.5 liter bottles, instead of the banned 1 liter bottles, and Stanley Soshicki, Assistant Public Health director of Concord, noted that a statewide ban could have much more significant results since it would prevent residents from getting plastic bottles from adjacent towns (AMI Newswire, 2016). It is clear from these interviews with Concord’s town officials that there is not enough quantitative evidence to measure how much plastic waste has been mitigated and that perceptions of a ban’s effectiveness might not reflect its true successes or failures. More research into plastic bottle bans, like Concord’s and San Francisco’s, and their achievements or disappointments, should be conducted in order to inform policy makers who want to decrease plastic pollution in their towns or states. This research could eventually help Rhode Island’s scientists, lawmakers and residents determine whether or not this type of policy could successfully decrease the state’s plastic pollution without harm to residents or local businesses.
CHAPTER 6

CONCLUSION

This study looked at Rhode Islanders’ support or opposition for plastic and paper bag policies and found a majority of respondents supported legislation as a whole. The researcher hypothesized that coastal residents more negatively perceive marine plastic pollution, and are more aware of the issue than inland residents, because they live closer to the coast. This study found that a Rhode Island resident’s geographical proximity to the coast does not significantly affect his or her negative perceptions and awareness of plastic. Coastal residents were not found to be more concerned for or knowledgeable about plastic pollution than the other geographic groups surveyed. It was also hypothesized that coastal and inland residents would hold differing perceptions of plastic pollution, but this was not supported by this study’s findings as the means for concern, awareness and knowledge across zip code groups were not significantly different from each other in one-way ANOVA tests. The surveyed population overall is concerned about plastic’s affects on the marine environment, wildlife, human health and the local economy. Respondents are also, as a whole, supportive of plastic and paper bag policies in general.

This study found that the Rhode Islanders surveyed are highly aware and knowledgeable about marine plastic pollution and the great extent of its consequences on the marine environment. Most of the surveyed population, 77%, classified plastic pollution as a “very serious” or “serious” threat to different forms of wildlife, the
marine environment, human health and the local economy, and in turn, support was found for plastic bag bans and fees and paper bag fees at the city and state levels. This support can be attributed to respondents’ engagement in other pro-environmental behaviors, like recycling, bringing reusable bags to stores and not purchasing single-use plastic water bottles, and their already high pro-ecological worldviews according to the New Ecological Paradigm. These findings bode well for future pro-environmental legislation, either to mitigate plastic pollution or to address other conservation issues.

These findings could help inform programming efforts that aim to increase pro-environmental behaviors, because, ultimately, those surveyed that engage in these behaviors, and have a pro-ecological worldview, support policies to prevent plastic pollution. Additionally, it was found that concern over plastic pollution and knowledge about the issue are inversely correlated in the multiple linear regression model ($p = .007, \beta = -.193$) for this group of surveyed participants. Many articles suggest that more knowledge of environmental issues is positively correlated with concern and pro-environmental behavior (Ajaps & McLellan, 2015; Hunter & Rinner, 2003; Kollmuss & Agyeman, 2002; Wynveen et al., 2015); however, this study found different results which are supported by the similar findings in Barber et al.’s 2009 study that found a negative relationship between environmental knowledge and attitudes. This result suggests that educational programs to simply increase knowledge or awareness in Rhode Island may actually have little to no effect on concern over plastic pollution and policies to mitigate it. Educational programs are suggested by the Governor’s Task Force but are not strongly supported by this research.
This study did have its limitations, particularly in that the surveyed population is not fully representative of Rhode Island’s demographic population. The majority of those surveyed are of income and education levels higher than the Rhode Island average across the state, and a majority surveyed are women. Far more coastal and upper Bay residents were surveyed as well, which does not reflect the geographic diversity of the state. Therefore, it might be difficult to extrapolate the findings of this study to Rhode Island’s whole population. Future studies of Rhode Islanders’, or others’, perceptions, could aim to survey or study a more diverse group of participants that equally represent genders and a variety of zip codes, income, age and education levels to better reflect the demographic diversity of the state’s population. Future studies could also look into Rhode Islanders’ support or opposition toward policies aimed at reducing contributing factors to plastic pollution, like single-use plastic water bottles, and are encouraged by this study to learn about how else Rhode Islanders might be able to decrease plastic inputs into the ocean.

The surveyed individuals in this study might support legislation like Rhode Island Senate’s Bill S0410 that was introduced in February of 2019. The bill bans single-use plastic bags from major retail stores and includes the measures that were recommended by the governor’s Task Force to Tackle Plastics, including a 5 cent fee on recyclable paper bags (RIDEM, 2019). Since 77% of the surveyed population support or strongly support a statewide plastic bag ban and 68% are neutral, supportive or strongly supportive of a paper bag fee, this bill represents a step in the right direction for Rhode Island policy makers to decrease Rhode Island’s negative environmental impact on the ocean. It is acknowledged by the researcher that this bill
is imperfect in that it contains some loopholes that have been taken advantage of in other areas and states around the US that have enacted similar plastic bag bans. Some of the gaps in this proposed legislation include the descriptions of reusable bags, namely that these bags should not be made of any plastic materials and that they should have stitched handles. Ultimately, the legislation recommendations from the Task Force are substantiated by this research, and even if S0410 does not pass in the near future, a combination of a statewide plastic bag ban and a fee on paper bags are encouraged as future actions for Rhode Island policy makers to take to decrease marine plastic pollution.

In order to decrease plastic inputs into the ocean, consumers must switch from single-use plastics to reusable and more sustainable alternatives. One way to aid this switch and change in behavior is to enact policies that ban the material in the first place. Since plastic is still relatively cheap, producers will continue to manufacture billions of plastic bags, bottles and other materials each year for the foreseeable future. Therefore, to keep plastics from making their way into the ocean, Americans must refuse them all together and make change at the individual level. By purchasing or using one or two reusable bags, each American could keep as many as 1,000 single-use plastic bags from entering landfills around the country (Environmental Protection Agency, 2012). Reducing American reliance on and consumption of plastic is one of the first steps required to make widespread change around the world, and although this behavior change might be difficult at first for many individuals, it is a feasible change that becomes increasingly easier with continued practice. With policies put into place at the state level that ban or tax disposable bags, Americans can begin to adopt a
mindset that encourages reducing and reusing over wastefully disposing. Small changes by each state and each American, in terms of both mindsets and everyday practices, will begin to invoke the great change the ocean needs.
Appendix A: Plastic Perceptions in Rhode Island Survey

1. What is the zip code for your primary residence?

2. How often do you visit the beach (to walk, relax, swim etc.) in a year?
   - 0 times
   - 1-4 times
   - 5-10 times
   - 11-15 times
   - More than 15 times

3. Approximately how far is this home from the shoreline and/or coastal waters including the beach, saltwater marshes, coastal bays, inlets, and salt water ponds (choose the most applicable one)?
   - I can see the shoreline and/or coastal waters from my home.
   - My home is a short walk from the shoreline and/or coastal waters.
   - My home is a bicycle ride from the shoreline and/or coastal waters.
   - To get from my home to the shoreline, I have to drive less than 15 minutes
   - To get from my home to the shoreline, I have to drive between 15 and 30 minutes
   - To get from my home to the shoreline, I have to drive between 31 and 45 minutes
   - To get from my home to the shoreline, I have to drive more than 45 minutes

4. Do you consider yourself a coastal resident of Rhode Island?
   - Yes
   - No
   - I Don’t Know

5. Prior to this survey had you heard of marine plastic pollution?
   - Yes
   - No
   - I Don’t Know

6. How serious a threat do you think plastic pollution poses for each of the following?

|                       | Not at all serious | Slightly serious | Somewhat serious | Serious | Very serious |
|-----------------------|-------------------|------------------|------------------|---------|--------------|
| The marine environment| 0                 | 0                | 0                | 0       | 0            |
| Wildlife (marine)     | 0                 | 0                | 0                | 0       | 0            |
| Wildlife              | 0                 | 0                | 0                | 0       | 0            |
7. For each item below, indicate whether it is true or false.

|                              | True | False | I Don’t Know |
|------------------------------|------|-------|--------------|
| Americans throw away billions of plastic bags annually. |     | ○     | ○            |
| Millions of tons of plastic reach the ocean every year.   | ○    |     | ○            |
| Marine animals can be negatively affected by plastic in the ocean. | ○    |     | ○            |
| Throwing plastic in the trash ensures that it will not harm the environment. | ○    |     | ○            |
| Scientists are unsure of how long it takes plastics to degrade in the environment. | ○    |     | ○            |
| A majority of plastics are recycled.                        | ○    |     | ○            |

8. Do you use plastic bags from the grocery store?
   ○ Yes
   ○ No
   ○ I Don’t Know

8a. If yes, would you consider switching from plastic bags to bringing your own reusable bags?
   ○ Yes
   ○ No
   ○ I Don’t Know

8b. If no, do you use reusable bags, paper bags or both?
   ○ Reusable bags
   ○ Paper bags
   ○ Both

9. In the past 12 months how many times have you volunteered for an environmental organization?
   ○ Not at all
   ○ Once
   ○ Between 2 and 5 times
   ○ More than 5 times
10. In the past 12 months how many times have you donated money to an environmental cause?
   o  Not at all
   o  Once
   o  Between 2 and 5 times
   o  More than 5 times

11. Do you recycle at home?
   o  Yes
   o  No
   o  I Don’t Know

12. Do you purchase bottled water?
   o  Yes
   o  No
   o  I Don’t Know

13. Consider each of the following initiatives to reduce plastic waste and indicate how much you support or oppose them.

| Initiative                                      | Strongly Opposed | Opposed | Neutral | Support | Strongly Support |
|-------------------------------------------------|------------------|---------|---------|---------|------------------|
| A ban on plastic bags in your city/town         | ○                | ○       | ○       | ○       | ○                |
| A 10 cent fee on paper bags in your city/town   | ○                | ○       | ○       | ○       | ○                |
| A 10 cent fee on plastic bags in your city/town | ○                | ○       | ○       | ○       | ○                |
| A statewide ban on plastic bags                 | ○                | ○       | ○       | ○       | ○                |
| A 10 cent fee on paper bags statewide           | ○                | ○       | ○       | ○       | ○                |
| A 10 cent fee on plastic bags statewide         | ○                | ○       | ○       | ○       | ○                |

14. Consider each of the following items below and indicate how much you agree or disagree with them.

| Statement                                                                 | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|--------------------------------------------------------------------------|-------------------|----------|-----------|-------|----------------|
| If things continue on their present course, we will soon experience a major ecological catastrophe | ○                 | ○        | ○         | ○     | ○              |
| The balance of nature is very delicate and easily upset                  | ○                 | ○        | ○         | ○     | ○              |
| The earth is like a spaceship with very limited room and resources       | ○                 | ○        | ○         | ○     | ○              |
| Humans are severely abusing the                                          | ○                 | ○        | ○         | ○     | ○              |
The balance of nature is strong enough to cope with the impacts of modern industrial nations.

The so-called ecological crisis facing humankind has been greatly exaggerated.

Human ingenuity will ensure that we do NOT make the earth unlivable.

15. How old are you?
   - 18 – 24 years old
   - 25 – 34 years old
   - 35 – 44 years old
   - 45 – 54 years old
   - 55 – 64 years old
   - 65 – 74 years old
   - 75 years or older

16. Do you identify as:
   - Male
   - Female
   - Other

17. What was your total household income, before taxes, last year?
   - Less than $25,000
   - $25,000 to $49,999
   - $50,000 to $74,999
   - $75,000 to $99,999
   - $100,000 to $149,999
   - $150,000 to $199,999
   - $200,000 or more
   - Prefer not to answer

18. What is the highest level of education you have completed?
   - Less than high school
   - High school
   - Associate’s or junior college
   - Bachelor’s degree
   - Graduate or professional degree
# Appendix B: Survey Response and Variable Codes

| Question # | Question Code | Original Response | Original Code | Notes | New Code (not applicable for all) | Dummy Variable (not applicable for all) |
|------------|---------------|-------------------|---------------|-------|-----------------------------------|------------------------------------------|
| 1          | Q1_zip_code   | Town/Village      | 2             | Dummy because there are 3 original categories. Coastal dummy: 1 = 1, all else = 0 (i.e. coastal; original zipcode code was 1) UpperBay dummy: 1 = 2, all else = 0. (i.e. upper Bay; original zipcode code was 2) Inland = ref category for all of zipcode | | |
|            |               |                   |               |       |                                   |                                           |
| 02813      | 1             | Charleston        |               |       |                                   |                                           |
| 02816      | 3             | Coventry          |               |       |                                   |                                           |
| 02817      | 3             | West Greenwich    |               |       |                                   |                                           |
| 02818      | 2             | East Greenwich    |               |       |                                   |                                           |
| 02830      | 3             | Harrisville (Burrillville) |     |       |                                   |                                           |
| 02835      | 1             | Jamestown         |               |       |                                   |                                           |
| 02840      | 1             | Newport           |               |       |                                   |                                           |
| 02852      | 1             | North Kingstown   |               |       |                                   |                                           |
| 02860      | 2             | Pawtucket         |               |       |                                   |                                           |
| 02864      | 3             | Valley Falls (Cumberland) |   |       |                                   |                                           |
| 02865      | 3             | Lincoln           |               |       |                                   |                                           |
| 02874      | 1             | Saunderstown      |               |       |                                   |                                           |
| 02879      | 1             | Peace Dale/Wakefield |               |       |                                   |                                           |
| 02880      | 3             | Wakefield         |               |       |                                   |                                           |
| 02881      | 3             | Kingston          |               |       |                                   |                                           |
| 02882      | 1             | Point Judith      |               |       |                                   |                                           |
| 02886      | 2             | Warwick           |               |       |                                   |                                           |
| 02888      | 2             | Warwick           |               |       |                                   |                                           |
| Zip Code | # Times  | Location          |
|----------|----------|-------------------|
| 02891    | 1        | Westerly          |
| 02892    | 3        | West Kingston     |
| 02895    | 3        | Woonsocket        |
| 02896    | 3        | North Smithfield  |
| 02903    | 2        | Providence        |
| 02904    | 3        | Providence        |
| 02905    | 2        | Providence/Cranston |
| 02906    | 2        | Providence        |
| 02907    | 3        | Providence/Cranston |
| 02908    | 3        | North Providence  |
| 02909    | 3        | Providence        |
| 02916    | 2        | Rumford           |
| 02917    | 3        | Smithfield        |
| 02919    | 3        | Johnston          |
| 02920    | 3        | Cranston          |

**Q2: beach visit**

| # Times | Count |
|---------|-------|
| 0 times | 1     |
| 1-4 times | 2 |
| 5-10 times | 3 |
| 11-15 times | 4 |
| More than 15 times | 5 |

**Q3: distance_coast**

| Option | Count |
|--------|-------|
| I can see the shoreline and/or coastal waters from my home. | 1 |
| My home is a short walk from the shoreline and/or coastal waters. | 2 |
| My home is a bicycle ride from the shoreline and/or coastal waters. | 3 |
| To get from my home to the shoreline, I have to drive less than 15 minutes. | 4 |
|   | Question | Options | Choice | 1 | 2 |
|---|----------|---------|-------|---|---|
| 4 | Q4_resident_coastal | Yes | 1 |
|   |          | No | 2 |
|   |          | I Don't Know | 3 |
| 5 | Q5_plastic_heard_of | Yes | 1 |
|   |          | No | 2 |
|   |          | I Don't Know | 3 |
| 6 | Q6_threat | Not at all serious | 1 |
|   |          | Slightly serious | 2 |
|   |          | Somewhat serious | 3 |
|   |          | Serious | 4 |
|   |          | Very serious | 5 |
|   | Q6_threat_marine | see Q6_threat | |
|   | Q6_threat_wildlife_marine | see Q6_threat | |
|   | Q6_threat_wildlife_terrestrial | see Q6_threat | |
|   | Q6_threat_human_health | see Q6_threat | |
|   | Q6_threat_economy | see Q6_threat | |
| 7 | Q7_true_false | True | 1 |
|   |          | False | 2 |
|   |          | I Don't Know | 3 |
|   | Q7_billions_bags | see Q7_true_false | |
|   | Q7_millions_tons | see Q7_true_false | |
| Q7_marine_animals_negative | see Q7_true_false |
| Q7_throwing_plastic | see Q7_true_false |
| Q7_scientists_unsure | see Q7_true_false |
| Q7_majority_recycled | see Q7_true_false |

8 Q8_bag_use

| | 1=NO don't use plastic 0=else |
|---|---|
| Yes | 1 |
| No | 2 |
| I Don't Know | 3 |

8a Q8a_switching

| | 1= YES | 0= else |
|---|---|---|
| Yes | 1 |
| No | 2 |
| I Don't Know | 3 |

8b Q8b_bag_types

| | 1=Reusable 2=Paper bags 3=Both |
|---|---|---|

9 Q9 VOLUNTEER

| | 1=Not at all 2=Once 3=Between 2 and 5 times 4=More than 5 times |
|---|---|---|---|---|
| Q10_donated | see Q9_volunteer |

11 Q11_recycle

| | 1=Yes recycle 0=else |
|---|---|
| Yes | 1 |
| No | 2 |
| I Don't Know | 3 |

12 Q12_bottled

| | 1=NO don't purchase 0=else |
|---|---|
| Yes | 1 |
| No | 2 |
| I Don't Know | 3 |

13 Q13_initiatives

| | 1=Strongly Opposed 2=Opposed 3=Neutral 4=Support 5=Strongly Support |

| Q13_ban_town | see Q13_initiatives |
| Q13_paper_fee_town | see Q13_initiatives |
| Q13_plastic | see |
|   |   | Q13_intitiv es |   |   |   |   |   |
|---|---|----------------|---|---|---|---|---|
| 13| ban_state| see Q13_intitiv es |   |   |   |   |   |
| 13| paper_fee_state| see Q13_intitiv es |   |   |   |   |   |
| 13| plastic_fee_state| see Q13_intitiv es |   |   |   |   |   |
| 14| Q14_paradigm| new codes (all pro-ecological)- only for cope, crisis and ingenuity |   |   |   |   |   |
| 14| catas trophie| see Q14_paradigm |   |   |   |   |   |
| 14| balance_delicate| see Q14_paradigm |   |   |   |   |   |
| 14| spaceship| see Q14_paradigm |   |   |   |   |   |
| 14| abusing| see Q14_paradigm |   |   |   |   |   |
| 14| cope_industry| see Q14_paradigm |   |   |   |   |   |
| 14| crisis_exaggerated| see Q14_paradigm |   |   |   |   |   |
| 14| ingenuity| see Q14_paradigm |   |   |   |   |   |

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 15| Q15_age|   |   |   |   |
|   | 18 - 24 years old|   |   |   |   |
|   | 25 - 34 years old|   |   |   |   |
|   | 35 - 44 years old|   |   |   |   |
|   | 45 - 54 years old|   |   |   |   |
|   | 55 - 64 years old|   |   |   |   |
|   | 65 - 74 years old|   |   |   |   |
|   | 75 years or older|   |   |   |   |
| 16| Q16_gender|   |   |   |   |
|   | Male|   |   |   |   |
|   | Female|   |   |   |   |
|   | Other|   |   |   |   | **Not actually used**
|   | Q17_income |   | because no one answered this** |   |
|---|------------|---|-------------------------------|---|
| 17 | Less than $25,000 | 1 |   |   |
|    | $25,000 to $49,999 | 2 |   |   |
|    | $50,000 to $74,999 | 3 |   |   |
|    | $75,000 to $99,999 | 4 |   |   |
|    | $100,000 to $149,999 | 5 |   |   |
|    | $150,000 to $199,999 | 6 |   |   |
|    | $200,000 or more | 7 |   |   |
|    | Prefer not to answer | 8 |   |   |

|   | Q18_education |   |   |   |
|---|--------------|---|---|---|
| 18 | Less than high school | 1 |   |   |
|    | High school | 2 |   |   |
|    | Associate's or junior college | 3 |   |   |
|    | Bachelor's degree | 4 |   |   |
|    | Graduate or professional degree | 5 |   |   |
Appendix C: Zip Code Classifications Map
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