

Ban the Bag: Support for Plastic Bag Reduction Strategies in Northeast Ohio

*Jill F. Bartolotta^{1,2} and Scott D. Hardy²

¹Ohio Sea Grant College Program, Columbus, OH

²The Ohio State University, College of Food, Agriculture, and Environmental Sciences, Columbus, OH

*Corresponding Author

Abstract: Society's use of plastic is increasing, while the ability to properly manage plastic waste is decreasing. In response, improved waste management systems and the adoption of reusable products made from sustainable materials are needed. Municipal governments in the United States are beginning to institute policies reducing unlimited free access to plastic products such as bags, straws, and Styrofoam. However, some state governments in the Great Lakes region, and elsewhere, have responded by making these pro-environmental policies illegal. Such policies shift the onus of using less plastic to local businesses and conscious consumers. In response, this project sought to determine the effectiveness of a plastic bag ban, supported by targeted education and outreach, at several local businesses in northeast Ohio. Results suggest that the initial implementation and non-enforcement phase of the bag ban did not lead to a reduction in the use of plastic bags. However, survey respondents indicate they are supportive of policies reducing accessibility and unlimited availability of plastic bags. Results further show most people have access to their own reusable bags and support businesses who charge for, or no longer offer, plastic bags. In conclusion, voluntary reduction of bag use by customers is not effective and store policies or legislation is needed to reduce the use of plastic bags.

Keywords: *plastic pollution, behavior change, single-use plastics, pro-environmental behaviors, sustainable business practices, Extension, education, Great Lakes*

The majority of products made worldwide contain plastic because of its ability to be shaped into almost anything, its durability, and low production cost (Sigler 2014). Estimates based on prediction models developed by Geyer et al. (2017) suggest over 350 million metric tons of plastic are produced each year, with this number expected to increase by 2050. In the Great Lakes region, plastic accounts for 90% of the litter profile on beaches (Alliance for the Great Lakes 2019) and floating debris (Derraik 2002). Plastic is problematic in the environment because the characteristics making plastic a desirable product (lightweight, malleability, durability) also allow it to wreak havoc on living organisms (ingestion, entanglement, leaching of harmful chemicals) (Katsanevakis 2008; Andrady 2011). Plastic debris makes its way into the water system via land-based activities and through stormwater discharge, runoff,

Research Implications

- Inform single-use and disposable plastics reduction legislation at the local level.
- Serve as a case study for businesses looking to adopt sustainable business practices.
- Identify consumer response to government and business plastic bag reduction strategies.
- Determine which reminder strategies, if any, are successful at encouraging customers to bring their own bags.

intentional and unintentional littering, unregulated disposal, leakage of waste (industry and residential), recreational activities such as fishing, and the shipping industry (Katsanevakis 2008; Andrady 2011; Lambert et al. 2014). It is estimated that 9,887 metric tons of plastic debris are entering the

Great Lakes each year, with almost half entering Lake Erie alone (Hoffman and Hittinger 2017).

Plastic pollution negatively affects coastal and marine environments (Derraik 2002; Teuten et al. 2009; Thompson et al. 2009) because it poses a risk to wildlife (especially birds) and fish health from ingestion, entanglement, and exposure to toxic chemicals (Moore et al. 2001; Derraik 2002; Moore 2008; Barnes et al. 2009; Cole et al. 2011; Lavers et al. 2014). Improper disposal of plastics also threatens human health (Alabi et al. 2019) by negatively affecting gut health (Lu et al. 2019) and increasing reproductive risks and infertility issues caused by exposure to endocrine disrupting chemicals (Swan and Colino 2021). Plastic in the water or along coasts negatively affects the economy, due to expensive debris removal (Stickel et al. 2012) and loss of tourism revenue because visitors are less likely to recreate on trash filled beaches (English et al. 2019).

Plastic Bag Reduction Legislation in the United States

Beach cleanup data show disposable plastic bags made of polyethylene (hereafter plastic bags) are a major source of plastic pollution in coastal environments (Ocean Conservancy 2020). Plastic bags clog storm drains and pipes causing road (Adane and Muleta 2011; Xanthos and Walker 2017) or basement flooding. In response, government policies at various jurisdictional levels (citywide to statewide) are being implemented in the United States to curb the environmental, economic, and infrastructure issues arising from the improper disposal of plastic bags (Sea Grant Law Center 2020). Although no federal legislation exists in the United States, several countries have implemented countrywide bag bans (Clapp and Swanston 2009). Currently nine states in the United States have laws banning the use of plastic bags, up from one state (California) in 2018. In contrast, there are 15 states that have passed preemption laws making any type of legislation regulating the use of plastics bags illegal. Cuyahoga County, located in northeast Ohio and the project location for this study, passed a countywide bag ban in December 2019 (Sea Grant Law Center 2020). Implementation began in January 2020 with enforcement, through

fines and legal action, to begin six months later in July 2020. However, due to the coronavirus (COVID-19) pandemic (hereafter pandemic), use of reusable bags for shopping was paused in northeast Ohio from March 2020 to August 2020, and the moratorium on plastic bags postponed. Reusable bags are now allowed again for shopping in Ohio, but the Governor has prohibited any type of plastic bag ban legislation to go into effect until January 2022 (The Ohio Legislature 2021). Therefore, customers can use their own bags, but are not required to do so by government regulation. All stores that were phasing out plastic bags in response to the pending bag ban are no longer doing so because of the pandemic.

Given the amount of coastal area in northeast Ohio and documented concern from citizens and tourists regarding plastic debris on area beaches and in Lake Erie (Bartolotta and Hardy 2018), this study seeks to better understand the efficacy of the proposed countywide bag ban and explore strategies for helping local businesses transition to more sustainable practices. The study is guided by the following research questions:

1. Are customers willing to support businesses that charge for the use of plastic bags or no longer offer plastic bags?
2. Do businesses that engage in sustainable business practices such as a storewide bagless initiative see an increase or decrease in profits?
3. Do residents support regulatory or incentive-based public policies such as bag bans or bag fees?
4. What are the best behavior change strategies for encouraging customers to use their own bags?

Methods

Data collection for this study included observation, online surveys, and semi-structured interviews since a variety of qualitative data collection methods allows us to understand the complex nature of consumer behavior (Maxwell 2005). The varying methodologies were used to determine bag use preferences by customers when shopping, support for legislation or business practices that reduce access to plastic bags, and

waste management concerns for plastic bags. The study involved the use of human research subjects, and in accordance with protocol established by the Institutional Review Board for The Ohio State University, received exempt status meaning no potential risk to the human research subjects was observed by a panel of experts. The project took place during fall of 2019 through winter of 2020.

Educational Outreach Events (Grocery Stores and Clothing Resale Store)

Ten educational outreach events took place (six at the grocery stores, one at the clothing resale store, and three at community events within the study area) in summer and fall of 2019 (Table 1). Information about the harms of plastic pollution in the environment and options for reusable bag alternatives were presented to shoppers. Customers were asked to choose reminder strategies (store signage, keychains, magnets, and window decals) (Figure 1) to help remind them to bring their own bags when they shop, with the goal of reducing the use of plastic bags. Information on the upcoming countywide bag ban to go into effect in January of 2020, with legal enforcement occurring in July of 2020 (currently paused because of pandemic), was also given to customers. The staff of the clothing resale store was trained on the issue of plastic pollution so they could answer customer questions regarding a storewide, recently enacted, bagless initiative implemented by the store owner.

Observation (Grocery Stores)

Unobtrusive structured observation pro-forma and direct observation were used to analyze customer behavior in a natural setting without interference from the data collectors (Walshe et al. 2011; Guest et al. 2013) to complement other data collection methods (surveys and interviews) (Guest et al. 2013; Robson and McCartan 2016). Observation was chosen because it allowed customer bag use to be studied without participant awareness, which could cause participants to alter their bag use if they were aware of the observers' intentions. To ensure data validity more than one observer was used (four observers were used for this study) and all were trained on the data collection instrument (Table 2). Consumer observation regarding bag preference took place at two grocery

markets located within the Lake Erie watershed in northeast Ohio. Each store was observed 12 times (four times pre-educational outreach events, four times post educational outreach events, and four times post implementation, but not enforcement, of the countywide plastic bag ban) for a total of 24 store observations (Table 1). Observations occurred for two hours (48 total observation hours) and took place during various days of the week at various store hours to prevent bias towards one shopping demographic. For example, it was noted that in general elderly customers shopped in the morning and afternoon, whereas younger clientele shopped in the late afternoon and evening hours. Customers were observed for the bag type and quantity used (plastic, paper, reusable, store branded reusable, box, no bag, and no purchase). Plastic bag use changes amongst the three observation periods were observed for statistical significance using a one-way ANOVA test. The test was calculated using Microsoft Excel. Based on standard observation methodology (Schensul et al. 1999; Guest et al. 2013) demographics were only recorded for age, race, and sex. Customer demographics were based on observation only and were not self-reported by the individual. Observers understand the concerns that can arise from observing demographics versus self-reporting demographics but determined it the best strategy to collect demographic information without risking participant awareness. Practice sessions with two observers comparing demographic observations and familiarity with the study area assisted observers in determining accurate demographic observations.

Survey (Grocery Stores and Clothing Resale Store)

Two online surveys were administered to explore customer support for plastic bag reduction legislation and for businesses that no longer offer plastic bags. Both surveys (Appendices) followed standard social science protocols, including creation and testing of the survey instrument, identification of the study population and sampling frame, a set survey response period, and weekly reminders to increase response rate (Dillman 2007). Both surveys were sent to participants via an online platform (Qualtrics). Respondents had three weeks to respond to the survey and weekly

email reminders were used to encourage responses. One survey (Appendix A) was sent to customers enrolled in the messaging platform for a clothing resale store, located in northeast Ohio. Customers shopping in the store were also asked if they would like to participate in the survey by store employees and members of the research team. If a customer

said yes, their email was taken, and they were sent the online survey to complete on their own. The other survey (Appendix B) was sent to customers who participated in educational outreach events at the two grocery stores. Demographic information recorded though the surveys was self-reported by survey respondents.

Table 1. Observation and outreach schedule.

<p><i>Produce Place</i> Grocery store located in Cuyahoga County, OH.</p> <p><u>Observation Hours (12 observations for two hours each = 24 total observation hours)</u> <i>Pre-Outreach (July and August 2019)</i></p> <ul style="list-style-type: none"> • 7/30/2019 (1-3 pm, Tuesday) • 8/3/2019 (2-4 pm, Saturday) • 8/6/2019 (3-5 pm, Tuesday) • 8/12/2019 (2:15-4:15 pm, Monday) <p><i>Post Outreach (December 2019)</i></p> <ul style="list-style-type: none"> • 12/10/2019 (1-3 pm, Tuesday) • 12/13/2019 (10 am-12 pm, Friday) • 12/14/2019 (11:40 am-1:40 pm, Saturday) • 12/16/2019 (2-4 pm, Monday) <p><i>Post Ban Implementation (February 2020)</i></p> <ul style="list-style-type: none"> • 2/8/2020 (9-11 am, Saturday) • 2/14/2020 (4-6 pm, Friday) • 2/17/2020 (2-4 pm, Monday) • 2/19/2020 (10:30 am-12:30 pm, Wednesday) <p><u>Outreach Events (September and October 2019)</u> Three outreach events in fall of 2019. Survey recruitment occurred at all outreach events.</p> <p><u>Survey Given</u> Sent via email and taken online. Appendix B survey.</p> <p><u>Staff Interviews</u> No staff interviews were conducted.</p>	<p><i>Sun Plum</i> Grocery store located in Lake County, OH.</p> <p><u>Observation Hours (12 observations for two hours each = 24 total observation hours)</u> <i>Pre-Outreach (July and August 2019)</i></p> <ul style="list-style-type: none"> • 7/14/2019 (11 am-1 pm, Sunday) • 7/16/2019 (4-6 pm, Tuesday) • 7/20/2019 (10 am-12 pm, Saturday) • 8/8/2019 (9-11 am, Thursday) <p><i>Post Outreach (December 2019)</i></p> <ul style="list-style-type: none"> • 12/12/2019 (1-3 pm, Thursday) • 12/14/2019 (9:30-11:30 am, Saturday) • 12/16/2019 (1-3 pm, Monday) • 12/18/2019 (11 am-1 pm, Wednesday) <p><i>Post Ban Implementation (February 2020)</i></p> <ul style="list-style-type: none"> • 2/7/2020 (4-6 pm, Friday) • 2/8/2020 (11 am-1 pm, Saturday) • 2/18/2020 (1-3 pm, Tuesday) • 2/20/2020 (10 am-12 pm, Thursday) <p><u>Outreach Events (September and October 2019)</u> Three outreach events in fall of 2019. Survey recruitment occurred at all outreach events.</p> <p><u>Survey Given</u> Sent via email and taken online. Appendix B survey.</p> <p><u>Staff Interviews</u> No staff interviews were conducted.</p>
<p><i>Revolve Kids Fashion</i> Clothing resale store located in Cuyahoga County, OH.</p> <p><u>Observation Hours</u> N/A</p> <p><u>Outreach Events (August 2019)</u> One outreach event in summer of 2019. Survey recruitment occurred via store’s online email listserv.</p> <p><u>Survey Given</u> Sent via email and taken online. Appendix A survey.</p> <p><u>Staff Interviews (December 2019)</u> Seven store staff participated.</p>	

Interviews (Clothing Resale Store and Solid Waste Districts)

Personal interviews were conducted with employees and the owner (seven interviews) of a clothing resale store to determine customer response to the removal of plastic bags from the store. Solid waste district employees for northeast Ohio were also interviewed (one interview with the Lake County Solid Waste District and one interview with the Cuyahoga County Solid Waste District) to determine the fate of plastic bags sent for recycling and the costs associated with managing discarded bags in the area. The interviews included development of an interview guide and randomized participant recruitment, in

accordance with standard qualitative protocols (Maxwell 2005; Bryman 2012; Yin 2014).

Results

Bag Use at Grocery Stores

Plastic bags were the bag of choice during each phase of observation at the two grocery stores in this study. A total of 1,081 people were observed, over 48 observation hours, at both store locations. Of the bag choice options, plastic was the most commonly used with 2,205 plastic bags being used for an average of 2.040 bags per person and 45.938 bags used per hour. Using an online survey, 68% of respondents stated on average they most commonly use between one to three plastic bags



Figure 1. Reminder items (keychain, magnet, and window decal) taken by store customers to encourage them to bring their own reusable bags. Reminder signs given to stores reminding people to grab their own bags.

Table 2. Observation data collection sheet.

Total Customers									
Total Spoken to									
Store Branded Bag Total Observed									
Date									
Time									
Temperature									
Cloud Cover									
Plastic	Paper	Reusable	Produce Palace Bag	Box	No Bag	No Purchase	Race	Age	Sex

when shopping. Reusable bags were the second most common bag used with 138 being used, (0.128 per person on average, and 2.875 per hour). As reported by survey respondents, customers do not always use their own bags because they either forget them at home (36% of respondents) or in the car (25% of respondents). The other common reasons for taking a plastic bag from the store include using the plastic bag to pick up pet waste (16% of respondents) or to line garbage bins at home (15% of respondents). Customers stated having access to reusable bags. Survey results indicate that 98% of respondents have access to their own bags with over half of respondents (66%) having access to at least 10 reusable bags.

The third most common bag choice was no bag being used, meaning items were hand carried from the store. This carrying option occurred 32 times for an average of 0.030 occurrences per person and 0.667 occurrences per hour. There were 30 times when no purchase was made for an average of 0.028 occurrences per person and 0.625 occurrences per hour. Paper bags were used 12 times for an average use of 0.011 per person and 0.250 times per hour. Boxes were used nine times for an average use of 0.008 times per person and 0.188 times per hour. Lastly, a store branded reusable bag was used four times for an average of 0.004 uses per person and 0.083 times per hour (Table 3).

To determine the effectiveness of outreach activities and beginning implementation stages of the bag ban, observation of customer bag use behavior was collected pre-outreach activities,

post outreach activities, and during the initial implementation but non-enforcement phase of a countywide plastic bag ban. Observation data show plastic bags were the most common bag used during each observation phase, followed by reusable bag, no bag, no purchase, paper bag, box, and store branded reusable bag carrying options (Table 4). Using a one-way ANOVA, it was found that there was no statistically significant difference in plastic bag use amongst the three observation periods, $F(2,1009)=0.612$, $p=0.542$ (Table 4). Therefore, the null hypothesis is accepted and outreach activities and the initial implementation, but non-enforcement phase of the bag ban, do not significantly reduce the amount of plastic bags being used.

The average age of customers observed at the grocery stores were persons determined through observation to be in their 50s with customers primarily being observed as Caucasian with an even representation of male and female sexes. We understand it is difficult to determine exact age, race, and sex via observation. However, we feel the benefits of documenting the demographics for this study outweigh possible miscalculations when assigning demographics for age, race, and sex based on observation. Especially since we want to identify the skewing of the observational data toward a Caucasian population.

Customer Response to Plastic Bag Reduction Strategies

An online survey (Appendix B) sent to 2,116 clothing and grocery store customers received 158 responses (response rate 7.4%), similar to

Table 3. Bag use by customers for all observation periods at both grocery store locations.

	Plastic	Reusable	No Bag	No Purchase	Paper	Box	Store Branded Reusable Bag
Bag Use	2205	138	32	30	12	9	4
Average Bag Use Per Person (n=1081)	2.040	0.128	0.030	0.028	0.011	0.008	0.004
Average Bag Use Per Hour (n=48)	45.938	2.875	0.667	0.625	0.250	0.188	0.083

other studies on consumer behavior pertaining to plastic bag use (Crowley 2020; Macintosh et al. 2020). Survey results indicate customers are mostly supportive of businesses reducing the accessibility to plastic bags with either a fee or ban. Many survey respondents (68%) are very likely to support stores charging for plastic bags, while 67% are supportive of removing plastic bags from stores. Ten percent do not support charging for or banning plastic bags, whereas the remaining respondents (23%) are moderately or somewhat likely to support stores that reduce the accessibility of plastic bags (Figure 2).

Customers are more supportive of legislative policies such as bag fees or bans that limit the accessibility to plastic bags (Figure 3). Almost all respondents (95%) are in favor of legislation reducing unlimited access to plastic bags (43% support both a bag fee or ban; 41% support only a bag ban; 11% support only a bag fee). Five percent of respondents do not support legislation reducing the access to plastic bags in stores.

About half of the survey respondents took reminder items during the educational outreach events. Customers (29%) found the keychains to be most helpful, with the magnets and window decals

Table 4. Bag use preference per person, pre and post outreach and during initial bag ban implementation, at both grocery store locations. Statistical analysis to determine if outreach activities and initial implementation phase of a bag ban significantly reduce the use of plastic bags. Differences between the three groups were found not to be statistically significant.

	Plastic	Reusable	No Bag	No Purchase	Paper	Box	Store Branded Reusable Bag
Pre-Outreach	1232	69	18	17	12	1	0
Average Bag Use Per Person (n=618)	1.994	0.112	0.029	0.028	0.019	0.002	0.000
Average Bag Use Per Hour (n=16)	77.000	4.313	1.125	1.063	0.750	0.063	0.000
Post Outreach	516	36	6	8	0	4	1
Average Bag Use Per Person (n=251)	2.056	0.143	0.024	0.032	0.000	0.016	0.004
Average Bag Use Per Hour (n=16)	32.250	2.250	0.375	0.500	0.000	0.250	0.063
Ban Implementation (No Enforcement)	457	33	8	5	0	4	3
Average Bag Use Per Person (n=212)	2.156	0.156	0.038	0.024	0.000	0.019	0.014
Average Bag Use Per Hour (n=16)	28.563	2.063	0.500	0.313	0.000	0.250	0.188
ANOVA							
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>	
Between Groups	4.511957	2	2.255979	0.612756	0.542057	3.004644	
Within Groups	3714.827	1009	3.681692				
Total	3719.339	1011					

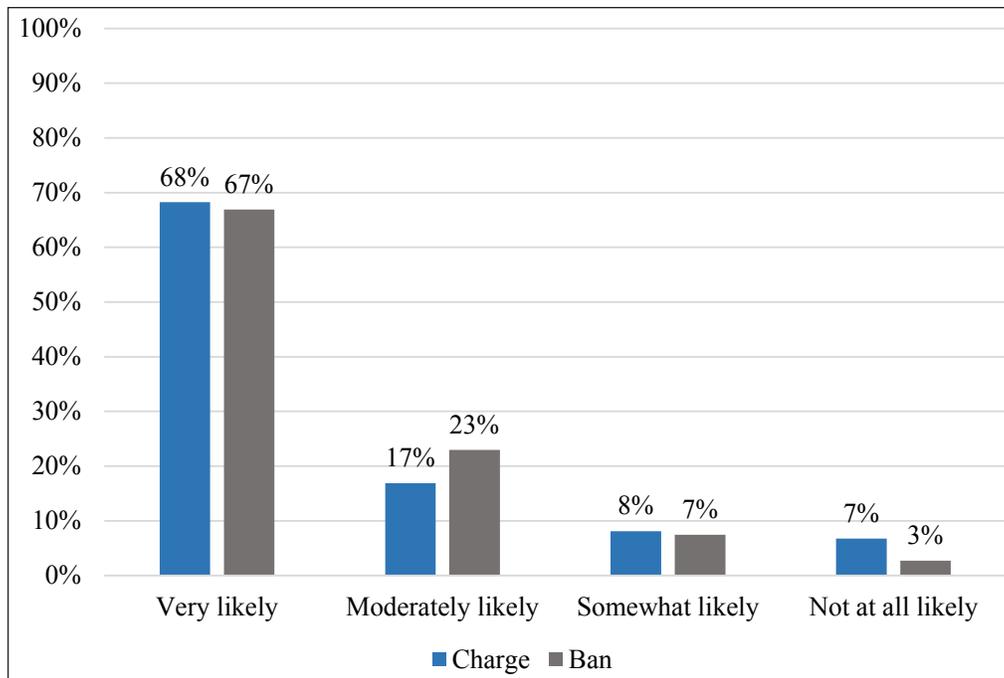


Figure 2. Customer support for businesses reducing the accessibility of single-use plastic bags.

helping 15% of customers. Twenty-two percent of respondents stated none of the items were helpful at reminding them to bring their own bags (Figure 4). Sixty-eight percent of survey respondents said signs were helpful at getting them to bring their own bags from their cars (Figure 5).

Customer Response to Storewide Bag Ban (Clothing Resale Store)

Through an online survey (Appendix A) with shoppers at the clothing resale store and interviews with store staff, it was determined that customers will continue to shop and purchase items from a store that no longer offers any bag type (plastic, paper, or reusable). This survey had additional questions than the Appendix B survey and asked specific questions about the clothing resale store's bagless initiative. The survey was sent to 2,049 customers who enrolled in the online messaging platform for the store. Seventy-four people responded to the survey for a response rate of 3.6%. The majority (80%) of store customers who took the survey were very supportive of the storewide bag ban. The remaining customers were moderately supportive (10%), somewhat supportive (7%), and not at all supportive (3%). Since the store no longer offers plastic bags to

customers, they were asked which options they preferred to use for carrying items. Of the options offered in the survey, 82% of responses support the option to bring their own bag, 69% are willing to hand carry items, 57% support being given a reusable bag once to reuse, 34% support having their items wrapped in string (current store offering), 26% support receiving a reusable bag each time they shop, and 22% suggest the store go back to offering plastic bags (Figure 6).

Customers were asked to provide comments on the storewide plastic bag ban. The responses were coded using descriptive coding methods outlined by Corbin and Strauss (1998) and Saldana (2013).

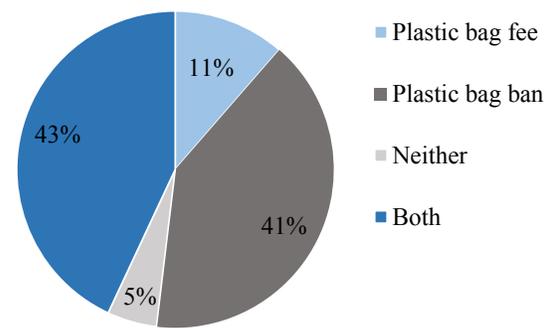


Figure 3. Support for legislation reducing the accessibility of single-use plastic bags at stores.

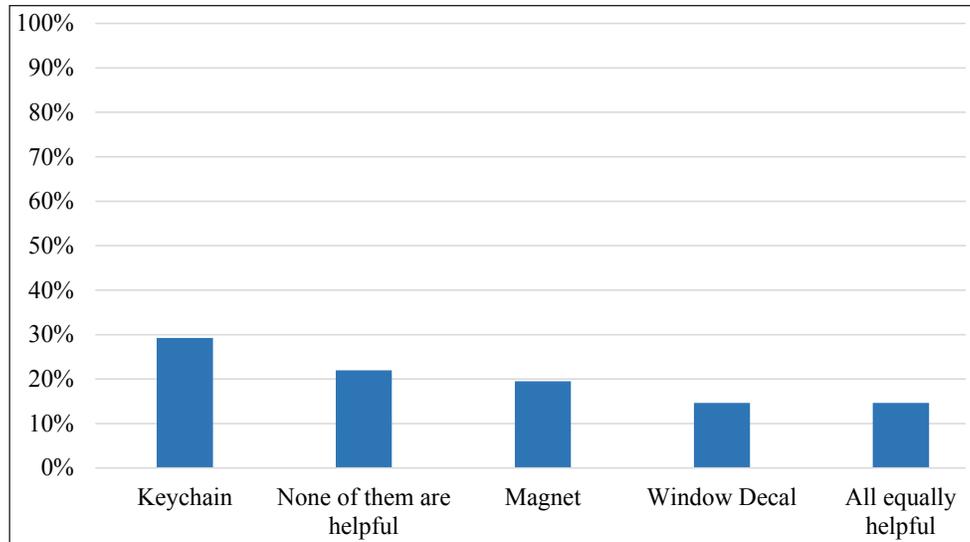


Figure 4. Effectiveness of reminder items taken by store customers.

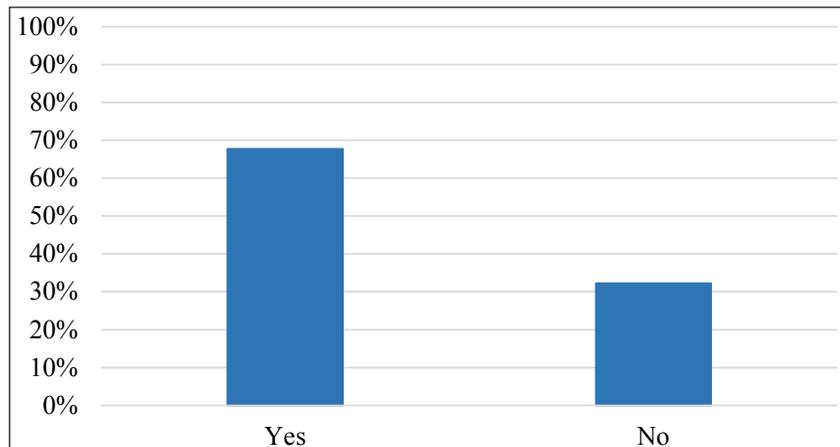


Figure 5. Effectiveness of the signs given to stores.

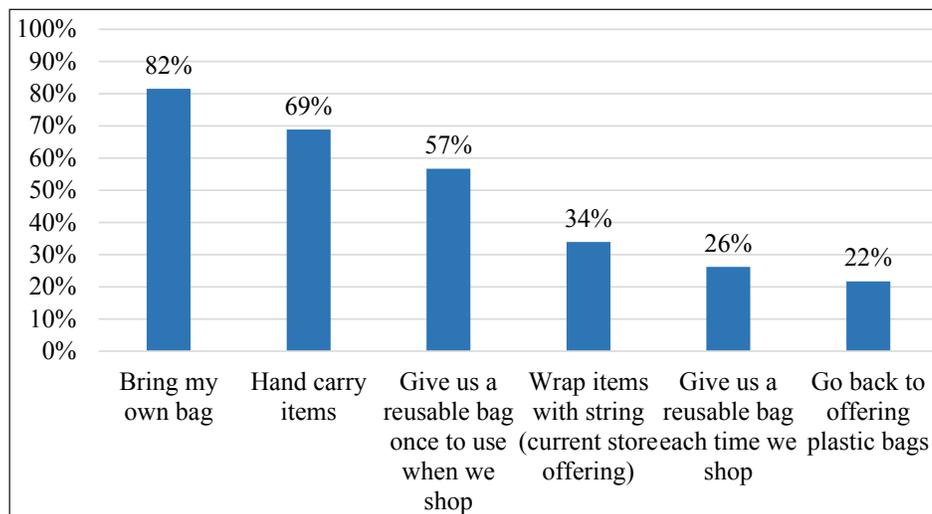


Figure 6. Customer support for options offered by the store to carry purchased items.

Nineteen respondents offered comments coded into the following three categories: supportive of the bag ban, neutral, or not supportive of the bag ban. After coding the comments, we found 68% provided feedback in support of the bag ban with some customers stating:

“Love it.”

“This helps solidify the idea so I might remember to take my bags into other stores.”

“I think if forced to use reusable bags I would make the necessary adjustments to do so.”

Eleven percent of comments were neutral on the subject and 21% of comments were unsupportive of the bag ban. Examples of negative comments include:

“I just like bags. I DO NOT want to try and remember to bring a bag to a store...At least offer me a paper bag or a \$1 bag to buy.”

“Sometimes it can be awful without a bag if you are purchasing a lot of items and do not have a bag to put your items in.”

“It’s one thing to stop plastic waste in water; but it’s just downright unsanitary to walk out of a clothing store and bring clothing you’ve just purchased like a thief.”

Survey Respondent Demographics

Survey respondents recruited via the grocery stores self-reported demographics at the end of their survey. Respondents primarily ranged in age from 35-74, were Caucasian females, with at least some college education and an average household income of at least \$25,000. Customers from the clothing resale store also self-reported their demographics. Clothing resale store survey respondents identified as female only, in the age range of 25-44, with half of the respondents identifying as Caucasian and one-third of respondents identifying as African American. Respondents had at least some college learning and there was an even distribution in income ranges. Survey respondents, for the most part, were environmentally aware (very aware = 40%, somewhat aware = 49%, a little aware = 8%, not at all aware = 3%) with almost all respondents familiar with the amount of plastic pollution in our waterways (very familiar = 44%, somewhat familiar = 33%, a little familiar = 18%, not at all

familiar = 5%), and familiar with the effects of plastic pollution on wildlife, human health, and water quality (very familiar = 46%, somewhat familiar = 36%, a little familiar = 16%, not at all familiar = 2%).

Clothing Resale Store Staff Interviews

To assess customer response and staff experience, interviews with seven of the store staff were conducted. Staff interviewed were serving in various positions within the store such as owner, manager, and cashier, and have been with the store for varied amounts of time from one month to several years. Interview questions focused on customer response to the store bagless initiative and advice offered to other businesses who want to adopt pro-environmental business practices.

Of the staff interviewed, all gave similar responses to the questions. When questioned about customer response it was noted that most customers (staff estimate over 75%) are accepting of the bag ban with a few customers being angry. When asked to provide quotes about customer support for, or against, the bagless initiative staff often gave similar responses.

“Most comments are positive, and they say how good it is that we are bagless.”

“Most are fine with it; some are enthusiastic about it. Very few get upset.”

Staff did note that some African American customers were concerned about not receiving a bag out of fear of being accused of stealing if they do not have a bag and paper receipt from the store to prove their purchase. Staff also indicated that most elderly customers preferred to receive a bag (as opposed to younger customers who were indifferent). Those who take public transportation prefer a bag because it is harder for them to carry items on the bus without a bag. Giving all customers time to adjust was noted as an important way to introduce the new initiative.

The interviews also determined that the store was not losing or gaining customers or seeing a decline or increase in profits because of the bagless initiative.

“We have not lost customers and they feel offended in the moment, but we offer cheap clothes, so they get over it. If it were very

upscale it may be different. We have not gained customers because of the bagless initiative.”

“No. No one walked away because they did not get a bag. No. No one is buying more because of the initiative.”

“No, we have not lost any customers, the store is growing like crazy (though I do not think it has to do with the bagless stance).”

Staff were asked how they successfully went bagless and kept a customer base.

“I think our owner has a strong vision and [is] very committed to what she believes in so that made it happen successfully and we got our customers to support what we’re doing and cooperate very well.”

“Now is the time! As it (countywide bag ban) [is] coming to most areas near us, starting to prepare your clientele now is a great service. It makes them aware and gives them time to be adequately prepared.”

“Knowing why. If we were just going bagless because the owner wanted to save money it would be harder. We sometimes feel embarrassed telling people who have spent money that we cannot give them a bag. The training [on the issue of plastic pollution] helped you understand the why...”

When asked to offer advice to other stores about going bagless, the staff were positive it can be done elsewhere. Most mentioned the importance of letting customers know about the removal of bags, educating them on the issue of plastic pollution so they understand why bags have been removed from the store, and giving them time to adjust.

“Place signs, do some social media, training employees on the issues and keep training them so that they are true advocates.”

“...educating customers.”

Waste Management Issues for Single-use Plastic Bags

Plastic bags cannot be recycled in curbside recycling in northeast Ohio and must be taken to a store that offers plastic film recycling. There are approximately 200-250 retail store locations within a 60-mile radius of the study area for this project that offer plastic film recycling

(American Chemistry Council 2021). Interviews were conducted with the two solid waste districts (SWD) within the study area: Cuyahoga County and Lake County SWDs. Representatives from the SWDs were asked about the financial costs associated with processing plastic bags sent to landfills (entities processing curbside trash) and Materials Recovery Facilities (MRF) (entities processing curbside recycling). Financial costs and processing issues arise when items in curbside recycling are placed in plastic bags or plastic bags themselves are placed in the curbside recycling bin.

“Plastic bags and potentially recycled material in plastic bags have to be removed from the process at the facilities. They tangle around the sorting equipment, cause equipment downtime and increasing the expense of recycling efforts.”

Plastic bags can be recycled at local grocery stores and large retail stores (e.g., Kohls, Target, Walmart) that offer plastic film recycling in northeast Ohio. However, very few plastic bags are taken to plastic film drop offs and those that are taken often do not get recycled. Plastic bags sent to the landfill will not be sorted and thus are not able to be recycled.

“Only 1% of all bags get recycled in retail drop-offs. The rest end up as plastic pollution or in landfills.” (personal interview, Carin Miller, Cuyahoga County Solid Waste District, January 12, 2021)

Not only do plastic bags cause equipment issues at landfills and MRFs, but they are also costly to manage. The cost to process one ton of landfill material is \$41-50 per ton. According to SWD employees, plastic bags comprise 1.4% of the waste stream sent to landfill in Cuyahoga County, equaling 7,061 tons of bags and costing taxpayers \$300,000 per year (personal interview, Carin Miller, Cuyahoga County Solid Waste District, January 12, 2021). Bags sent to plastic film recycling facilities will be used to make plastic composite lumber. With a weakened plastic structure and polymer contamination from the recycling process (Demets et al. 2021), plastic composite lumber is not a material that can be recycled and must be landfilled at the end of its lifecycle.

Discussion

Access to Reusable Bags

Consumers have access to their own reusable bags when shopping; however, they forget to bring them into the store (Bartolotta and Hardy 2018). Even if they are given reusable bags to use when shopping, it does not guarantee customers will remember to bring the bags (Hardy and Bartolotta 2021). The best method for getting people to use their own bags is not giving them more reusable bags but helping them remember to bring the bags they already own. However, based on concerns mentioned by clothing resale store staff in their interviews, removal of bags, which can serve as a proof of purchase, may negatively affect communities who are racially profiled for felonious behavior. Removal of bags from a store may also negatively impact those who require a bag to carry items to their car (elderly or persons with disabilities) or those taking public transportation. To our knowledge this is the first study that identifies potential risks associated with plastic bag ban initiatives on certain communities. We continue to suggest policies that limit free access to plastic bags with the caveat of extensive public outreach to and involvement of all racial, age, economic, and persons with disability communities.

Effectiveness of Outreach and Potential Policies

Signs in the store entrance were seen as an effective tool for reminding customers to grab their own bags from their car. However, this reminder strategy is not effective if the person forgets their bags at home. Signs should be used but should not be the only tool used to reduce plastic bag consumption. Store outreach, with customer education and the use of reminder items, and initial bag ban implementation were not seen as effective measures for getting customers to use fewer plastic bags because they were not publicized broadly, and the bag ban was five months away from the enforcement phase. Plastic reduction policies (ban or fee) are effective at reducing the use of plastic bags when there is effective public engagement and strict enforcement (Zhu 2011; Miller 2012; Rivers et al. 2017; Bharadwaj et al. 2021). Results from this study show that voluntary

plastic bag reduction by customers is not seen as a successful strategy for reducing the use of plastic bags, as has been suggested by similar studies in the literature (Sharp et al. 2010; Miller 2012). Therefore, other strategies need to be considered. Strategy suggestions include a phone application alerting customers to grab their bags when they enter a store parking lot, placement of bags near car keys or face masks, and lastly, consequences for customers if they do not have their own bag. In most areas in the United States, customers are not affected if they do not bring their own bag into the store because plastic bags are freely available. If no plastic bags were available or there was a fee for use, customer behavior would be encouraged to change because of the incurred consequences. Currently, because of the pandemic, customers are experiencing consequences if they do not wear a mask in some stores across the United States. If a customer does not have a mask (behavior), they may not be able to enter the store (adverse stimulus) leading to a negative reinforcement scenario. Negative reinforcement occurs when a behavior (forgetting mask) leads to an adverse response or stimulus (possibility of not being able to enter the store). Behavior will strengthen as a result of negative reinforcement because the individual will want to avoid an unpleasant experience in the future (Skinner 1938). If we apply this same logic to the use of reusable bags, evidence suggests customers will alter behavior and bring their own bags or other carrying options into the store because they want to avoid possible consequences (i.e., inability to carry items out of the store or increased money spent to purchase a bag). Bag bans or bag fees are recommended as the most effective way to reduce the use of plastics bags, as supported by results from this study, and studies conducted around the world (Clapp and Swanston 2009; Sharp et al. 2010; Zhu 2011; Martinho et al. 2017; Rivers et al. 2017; Bartolotta and Hardy 2018; Hardy and Bartolotta 2021).

Customer Support for Plastic Bag Reduction Policies

To effectively implement a successful plastic bag reduction campaign there must be widespread support for the initiative. As evidenced in this study (with self-selected participants) and supported by

two other studies in northeast Ohio (Bartolotta and Hardy 2018; Hardy and Bartolotta 2021), consumers support policies or businesses that seek to reduce the free availability of plastic bags. How a more general sampling of survey participants would respond is unknown since other studies documenting support for plastic bans do not exist in the literature for the Midwest/Great Lakes region of the United States. However, we can look to other U.S. and global studies to better understand support for plastic bag bans. A study conducted in Rhode Island, with self-selecting participants by Costa (2020), shows similar support rates to our study for plastic bag bans from residents with a bag ban already in place (88%) and residents without a bag ban already in place (82%). One study from Australia, conducted in major store chains, with a more randomized sample, demonstrates a lower support rate (58%) for bag bans at the beginning of a bag ban than our study, and a support rate of 68% eight years into the bag ban (Macintosh et al. 2020). For any policy to be successful, extensive outreach to the affected community must occur for plastic bag ban or fee programs to be successful (Bezerra et al. 2021).

Legislative Support for Plastic Bag Reduction Policies

With an increase in environmental concern for the over and misuse of plastics, municipalities and entire countries are implementing plastic bag reduction policies (Clapp and Swanston 2009). As of 2020, nine U.S. states have bans or restrictions on plastic bag use and 13 states have local ordinances pertaining to bag use (Sea Grant Law Center 2020). In contrast, 15 U.S. states are implementing bag ban preemption laws (Sea Grant Law Center 2020) preventing local governments from enforcing plastic bag bans or bans on other single-use plastic items such as Styrofoam or carryout containers. Recently, Ohio is in the process of eliminating the local plastic bag ban for Cuyahoga County, which has currently been paused by the Governor because of the pandemic. The establishment of preemption laws in Ohio is contrary to what has been shown by several studies in Ohio (Bartolotta and Hardy 2018; Hardy and Bartolotta 2021), including this study, which shows survey respondents are in favor of bag ban or fee legislative policies. Results

from these pro-environmental legislative studies have been shared with decision-makers as well as statewide advocacy groups to no avail. Pro plastic and oil lobbying organizations are very powerful in Ohio, and they have been successful at preventing municipalities from implementing plastic ban policies.

Plastic Bag Recycling

Recycling is not seen as a viable option for most plastics, especially low value plastics like plastic bags. As evidenced by interviews with solid waste professionals in this study, a small percentage of bags are sent to be recycled in northeast Ohio, with only 5% of the 1 trillion bags used in the United States being sent for recycling each year (Sivan 2011). Plastics that are recycled are often of low value (Alabi et al. 2019) and therefore, it is often cheaper to make items out of virgin plastic than recycled plastics. Since plastic bags are made of plastic film, they are considered low value and not a desirable material for recycling (Clapp and Swanston 2009). Therefore, a switch away from plastic bags is needed because they are a single-use plastic item, with little market value. There are more sustainable alternatives such as organic cotton bags or the use of bag-like items you already own.

Conclusion

Plastic bags are commonly found in the environment negatively affecting water quality and human and wildlife health and safety. They are costly to manage at the end of their lifecycle, costing taxpayers hundreds of thousands of dollars annually. A simple solution is reusable bags - a readily available and inexpensive alternative that many consumers already own. Yet, voluntary actions by consumers to limit their plastic bag use are not occurring because there are no consequences as plastic bags are readily available for free. Outreach to educate customers and the early implementation phase of a countywide plastic bag ban were not seen as effective tools at limiting use of plastic bags. Therefore, enforced bag reduction policies at the business and government level are important and supported by participants in this study.

A clothing resale store, which adopted a bagless initiative, has seen positive responses from

customers and has not seen a decline in profits or customer base. Educating staff and customers about plastic pollution is seen as an important measure for businesses to take when adopting pro-environmental business practices. Informing customers of upcoming bag ban or bag fee initiatives and giving them time to adjust is another important step in attaining customer support for plastic bag reduction strategies. This practice can be especially important to customers of color, disabled shoppers, the elderly, and users of public transportation. Our study identified concerns around bagless initiatives creating potential risks when these customers take items out of the store without a bag or receipt for proof of purchase. Moving forward, digital strategies proving purchase and encouraging consumers to bring their own bags from their home or car and into the store are needed, as well as the gradual implementation and eventual enforcement of plastic bag reduction government policies or business initiatives.

While we feel this project offers a compelling contribution to work on reducing plastic pollution, especially plastic carrier bags, limitations for this study include a small sample size for survey responses and a bias toward the Caucasian, middle aged population for bag observation. Most respondents had some awareness about the issue of plastics bags in the environment, potentially skewing results as well. Future studies can address these limitations through random instead of self-selection for survey participants, sampling (observation, surveys, and interviews) at more stores with a larger customer base and more diverse clientele, and comparison of results from a smaller store with a larger store. Moreover, additional research is needed to better understand the potential negative impact of bag bans on people of color, elderly, disabled, and users of public transportation, and how retailers and policy makers can support them while also reducing plastic bag use.

Acknowledgements

Funds to support this project were provided by the National Oceanic Atmospheric Administration (NOAA) Marine Debris Program. Thank you to Sarah Lowe of the NOAA Marine Debris Program for your assistance with project logistics. A special thank you to Felice Pierce

of Revolve Kids and Rob Teriaca of Produce Place and Sun Plum Market for allowing us to train and interview their employees and for allowing us to conduct outreach with customers. We also thank the Lake and Cuyahoga County Solid Waste Districts for information about the end-of-life management issues for plastic bags, especially Carin Miller, Beth Bollas, David Schick, and Tim Gourley. Lastly, thank you to student workers, Jasmine Butcher and Sophia Sokoloski, for assisting with data collection and outreach initiatives.

Author Bio and Contact Information

JILL BARTOLOTTA (corresponding author), Extension Educator for Ohio Sea Grant College Program, works with coastal communities to conduct outreach and education about Lake Erie, identifies community needs for research, funding, or scientific expertise, develops partnerships to foster a collaborative approach to management of natural resources, and brings science into the decision-making process at the individual and community level. Her areas of focus include experiential environmental education, marine debris, climate change impacts, interdisciplinary approach to problem solving, engagement of relevant stakeholders, and use of science in the decision-making process. She may be contacted at bartolotta.2@osu.edu or by mail at Lake County Extension Office, 105 Main St., Suite B402, Painesville, OH 44077.

DR. SCOTT HARDY is an Extension Educator with the Ohio Sea Grant College Program based in Cleveland. He conducts applied research and develops education and outreach programs on collaborative watershed management, coastal storm resiliency, community-based response to ecological change, and other issues facing Lake Erie and the broader Great Lakes region. The results of his work help to inform decision-making among practitioners and policymakers, as well as educate local and regional stakeholders about issues impacting Lake Erie, its tributaries, and the surrounding watershed. He may be contacted at hardy.116@osu.edu or by mail at Ohio Sea Grant College Program, 1314 Kinnear Road, Area 100, Columbus, OH 43212.

References

- Adane, L. and D. Muleta. 2011. Survey on the usage of plastics bags, their disposal and adverse impacts on the environment: A case study in Jimma City, Southwestern Ethiopia. *Journal of Toxicology and Environmental Health Sciences* 3(8): 234-248. Available at: <http://www.academicjournals.org/JTEHS>. Accessed March 2, 2021.

- Alabi, O.A., K.I. Ologbonjaye, O. Awosolu, and O.E. Alalade. 2019. Public and environmental health effects of plastic wastes disposal: A review. *Journal of Toxicology and Risk Assessment* 5(1): 5:021. DOI: 10.23937/2572-4061.1510021.
- Alliance for the Great Lakes. 2019. Adopt-a-Beach 2019. Available at: <https://greatlakes.org/2019/11/adopt-a-beach-2019-results/>. Accessed March 2, 2021.
- American Chemistry Council. 2021. Plastic Film Recycling: Find a Drop Off Location. Available at: <https://www.plasticfilmrecycling.org/recycling-bags-and-wraps/find-drop-off-location/>. Accessed August 18, 2021.
- Andrady, A.L. 2011. Microplastics in the marine environment. *Marine Pollution Bulletin* 62(8): 1596-1605. Available at: <https://doi.org/10.1016/j.marpolbul.2011.05.030>. Accessed March 2, 2021.
- Barnes, D.K.A., F. Galagni, R.C. Thompson, and M. Barlaz. 2009. Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364(1526): 1985-1998. Available at: <https://doi.org/10.1098/rstb.2008.0205>. Accessed March 2, 2021.
- Bartolotta J.F. and S.D. Hardy. 2018. Barriers and benefits to desired behaviors for single use plastic items in northeast Ohio's Lake Erie basin. *Marine Pollution Bulletin* 127: 576-585. DOI: 10.1016/j.marpolbul.2017.12.037.
- Bezerra, J.C., T.R. Walker, C.A. Clayton, and I. Adam. 2021. Single-use plastic bag policies in the Southern African development community. *Environmental Challenges* 3: 100029. Available at: <https://doi.org/10.1016/j.envc.2021.100029>. Accessed August 18, 2021.
- Bharadwaj, B., M.N. Subedi, and B.K. Chalise. 2021. Where is my reusable bag? Retailers' bag use before and after the plastic bag ban in Dharan Municipality of Nepal. *Waste Management* 120: 494-502. DOI: 10.1016/j.wasman.2020.10.019.
- Bryman, A. 2012. *Social Research Methods*. 4th Edition. Oxford University Press, Oxford, United Kingdom.
- Clapp, J. and L. Swanston. 2009. Doing away with plastic shopping bags: International patterns of norm emergence and policy implementation. *Environmental Politics* 18(3): 315-332. DOI: 10.1080/09644010902823717.
- Cole, M., P. Lindique, C. Halsband, and T.S. Galloway. 2011. Microplastics as contaminants in the marine environment: A review. *Marine Pollution Bulletin* 62(12): 2588-2597. Available at: <https://doi.org/10.1016/j.marpolbul.2011.09.025>. Accessed March 2, 2021.
- Corbin, J. and A. Strauss. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Ground Theory*. Sage Publishing, Thousand Oaks, California.
- Costa, K. 2020. Public perceptions of single-use plastic bans in Rhode Island. Thesis, University of Rhode Island, Kingston, Rhode Island. Available at: <https://digitalcommons.uri.edu/theses/1848>. Accessed August 12, 2021.
- Crowley, J. 2020. Plastic bag consumption habits in the northern Philippines. *Resources, Conservation and Recycling* 160: 104848. Available at: <https://doi.org/10.1016/j.resconrec.2020.104848>. Accessed August 18, 2021.
- Demets, R., K. Van Kets, S. Huysveld, J. Dewulf, S. De Meester, and K. Ragaert. 2021. Addressing the complex challenge of understanding and quantifying substitutability for recycled plastics. *Resources, Conservation and Recycling* 174: 105826. Available at: <https://doi.org/10.1016/j.resconrec.2021.105826>. Accessed August 12, 2021.
- Derraik, J.G.B. 2002. The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin* 44(9): 842-852. Available at: [https://doi.org/10.1016/S0025-326X\(02\)00220-5](https://doi.org/10.1016/S0025-326X(02)00220-5). Accessed March 2, 2021.
- Dillman, D.A. 2007. *Mail and Internet Surveys: The Tailored Design Method*. 2nd Edition. John Wiley and Sons, Hoboken, New Jersey.
- English E., C. Wagner, and J. Holmes. 2019. *The Effects of Marine Debris on Beach Recreation and Regional Economies in Four Coastal Communities: A Regional Pilot Study*. Prepared for NOAA Marine Debris Division by Bear Peak Economics, CW Research and Consulting, and Abt Associates Inc. Available at: <https://marinedebris.noaa.gov/reports/study-economic-impacts-marine-debris-beaches>. Accessed March 2, 2021.
- Geyer, R., J.R. Jambeck, and K.L. Law. 2017. Production, use, and fate of all plastics ever made. *Science Advances* 3(7): 1-5. Available at: <https://advances.sciencemag.org/content/3/7/e1700782.full>. Accessed March 2, 2021.
- Guest, G., E.E. Namey, and M.L. Mitchell. 2013. *Collecting Qualitative Data: A Field Manual for Applied Research*. SAGE Publications Inc., Los Angeles, California.
- Hardy, S. and J. Bartolotta. 2021. In press. Farmers

- markets and single-use plastic: Why environmentally conscious consumers don't bring reusable bags. *Journal of Extension* 59(4).
- Hoffman, M.J. and E. Hittinger. 2017. Inventory and transport of plastic debris in the Laurentian Great Lakes. *Marine Pollution Bulletin* 115(1-2): 273-281. Available at: <https://doi.org/10.1016/j.marpolbul.2016.11.061>. Accessed March 2, 2021.
- Katsanevakis, S. 2008. Marine debris, a growing problem: Sources, distribution composition, and impacts. In: *Marine Pollution, New Research*, T.N. Hofer (Ed.). Nova Science Publishers, New York, pp. 53-100.
- Lambert, S., C. Sinclair, and A. Boxall. 2014. Occurrence, degradation, and effect of polymer-based materials in the environment. *Reviews of Environmental Contamination and Toxicology* 227: 1-53. DOI: 10.1007/978-3-319-01327-5_1.
- Lavers, J.L., A.L. Bond, and I. Hutton. 2014. Plastic ingestion by Flesh-footed Shearwaters (*Puffinus carneipes*): Implications for fledgling body condition and the accumulation of plastic-derived chemicals. *Environmental Pollution* 187: 124-129. Available at: <https://doi.org/10.1016/j.envpol.2013.12.020>. Accessed March 2, 2021.
- Lu, L., T. Luo, Y. Zhao, C. Cai, Z. Fu, and Y. Jin. 2019. Interaction between microplastics and microorganisms as well as gut microbiota: A consideration on the environmental animal and human health. *Science of The Total Environment* 667: 94-100. Available at: <https://doi.org/10.1016/j.scitotenv.2019.02.380>. Accessed March 2, 2021.
- Macintosh, A., A. Simpson, T. Neeman, and K. Dickson. 2020. Plastic bag bans: Lessons from the Australian Capital Territory. *Resources, Conservation and Recycling* 154: 104638. Available at: <https://doi.org/10.1016/j.resconrec.2019.104638>. Accessed August 12, 2021.
- Martinho, G., N. Balaia, and A. Pires. 2017. The Portuguese plastic carrier bag tax: The effects on consumers' behavior. *Waste Management* 61: 3-12. Available at: <https://doi.org/10.1016/j.wasman.2017.01.023>. Accessed March 10, 2021.
- Maxwell, J.A. (Ed.). 2005. *Qualitative Research Design: An Interactive Approach*. 2nd Edition. Sage Publications, Inc., Thousand Oaks, California.
- Miller, R.M. 2012. Plastic shopping bags: An analysis of policy instruments for plastic bag reduction. Thesis, University Utrecht, Utrecht, Netherlands.
- Moore, C.J., S.L. Moore, M.K. Leecaster, and S.B. Weisberg. 2001. A comparison of plastic and plankton in the North Pacific central gyre. *Marine Pollution Bulletin* 42(12): 297-300. Available at: [https://doi.org/10.1016/s0025-326x\(01\)00114-x](https://doi.org/10.1016/s0025-326x(01)00114-x). Accessed March 2, 2021.
- Moore, C.J. 2008. Synthetic polymers in the marine environment: A rapidly increasing, long-term threat. *Environmental Research* 108(2): 131-139. Available at: <https://doi.org/10.1016/j.envres.2008.07.025>. Accessed March 2, 2021.
- Ocean Conservancy. 2020. *Together We Are Team Ocean 2020 Report*. Available at: <https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/annual-data-release/>. Accessed March 2, 2021.
- The Ohio Legislature. 2021. House Bill 242. Available at: <https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA133-HB-242>. Accessed March 3, 2021.
- Rivers, N., S. Shenstone-Harris, and N. Young. 2017. Using nudges to reduce waste? The case of Toronto's plastic bag levy. *Journal of Environmental Management* 188: 153-162. DOI: 10.1016/j.jenvman.2016.12.009.
- Robson, C. and K. McCarten. 2016. *Real World Research*. 4th Edition. John Wiley and Sons Ltd., West Sussex, United Kingdom.
- Saldana, J. 2013. *The Coding Manual for Qualitative Researchers*. 2nd Edition. SAGE Publications, Inc., London, England.
- Schensul, S.L., J.J. Schensul, and M.D. LeCompte. 1999. *Essential Ethnographic Methods: Observations, Interviews, and Questionnaires* (Book 2 in Ethnographer's Toolkit). AltaMira Press, Walnut Creek, California.
- Sea Grant Law Center. 2020. Plastic Legislation. Available at: <http://nsglc.olemiss.edu/Advisory/pdfs/plastic-legislation.pdf>. Accessed March 3, 2021.
- Sharp, A., S. Hoj, and M. Wheeler. 2010. Proscription and its impact on anti-consumption behaviour and attitudes: The case of plastic bags. *Journal of Consumer Behavior* 9(6): 470-484. Available at: <https://doi.org/10.1002/cb.335>. Accessed March 2, 2021.
- Sigler, M. 2014. The effects of plastic pollution on aquatic wildlife: Current situations and future solutions. *Water, Air, & Soil Pollution* 225(2184). Available at: <https://doi.org/10.1007/s11270-014-2184-6>. Accessed March 2, 2021.
- Sivan, A. 2011. New perspectives in plastic biodegradation. *Current Opinion in Biotechnology* 22(3): 422-426. Available at: <https://doi.org/10.1016/j.copbio.2011.02.001>.

- [org/10.1016/j.copbio.2011.01.013](https://doi.org/10.1016/j.copbio.2011.01.013). Accessed March 2, 2021.
- Skinner, B.F. 1938. *The Behaviour of Organisms: An Experimental Analysis*. Prentice Hall, Englewood Cliffs, New Jersey.
- Stickel, B.H., A. Jahn, and W. Kier. 2012. The Cost to West Coast Communities of Dealing with Trash, Reducing Marine Debris. Prepared by Kier Associates for U.S. Environmental Protection Agency, Region 9, pursuant to Order for Services EPG12900098, 21 p. + appendices. Available at: https://kierassociates.net/Cost_of_Dealing_With_Marine_Debris_Kier%20Associates.pdf. Accessed March 2, 2021.
- Swan, S.H. and S. Colino. 2021. *Count Down: How Our Modern World is Threatening Sperm Counts, Altering Male and Female Reproductive Development, and Imperiling the Future of the Human Race*. Scribner, New York, New York.
- Teuten, E.L., J.M. Saquing, D.R.U. Knappe, M.A. Barlaz, S. Jonsson, A. Björn, S.J. Rowland, R.C. Thompson, T.S. Galloway, T. Yamashita, D. Ochi, Y. Watanuki, C. Moore, P.H. Viet, T.S. Tana, M. Prudente, R. Boonyatumanond, M.P. Zakaria, K. Akkhavong, Y. Ogata, H. Hirai, S. Iwasa, K. Mizukawa, Y. Hagino, A. Imamura, M. Saha, and H. Takada. 2009. Transport and release of chemicals from plastics to the environment and wildlife. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364(1526): 2027-2045. DOI: 10.1098/rstb.2008.0284.
- Thompson, R., S. Swan, C. Moore, and F. vom Saal. 2009. Our plastic age. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364(1526): 1973-1976. Available at: <https://doi.org/10.1098/rstb.2009.0054>. Accessed March 2, 2021.
- Walshe, C., G. Ewing, and J. Griffiths. 2011. Using observation as a data collection method to help understand patient and professional roles and actions in palliative care settings. *Palliative Medicine* 26(8): 1048-1054. DOI: 10.1177/0269216311432897.
- Xanthos, D. and T.R. Walker. 2017. International policies to reduce plastic marine pollution from single-use plastics (plastics and microbeads): A review. *Marine Pollution Bulletin* 118(1-2): 17-26. Available at: <http://dx.doi.org/10.1016/j.marpolbul.2017.02.048>. Accessed March 2, 2021.
- Yin, R.K. 2014. *Case Study Research: Design and Methods*. 5th Edition. SAGE Publications, Inc., Los Angeles, California.
- Zhu, Q. 2011. An appraisal and analysis of the law of “plastic-bag ban.” *Energy Procedia* 5: 2516-2521. DOI: :10.1016/j.egypro.2011.03.432.

Appendix A: Clothing Resale Store Survey

The Ohio State University Consent to Participate in Research

Study Title: Behavior change and marine debris: What strategies work best to encourage reusable bags instead of single use plastic bags?

Protocol Number: 2019E0438

Researchers: Jill Bartolotta and Scott Hardy, Ph.D.

Sponsor: National Oceanic and Atmospheric Administration

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate. Your participation is voluntary. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

Purpose: This study seeks to determine the effectiveness of education and reminder strategies to encourage people to use reusable bags when they go shopping.

Procedures/Tasks: As a customer of Revolve Kids, you are being asked to complete an online survey. The survey includes questions about your awareness of environmental issues and your willingness to support a bagless store initiative.

Duration: The survey should take no more than 10-15 minutes to complete. You can skip any questions if you prefer not to answer. You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

Risks and Benefits: Although risks are minimal in this study, several questions about your demographics are asked. You can skip or choose the “Prefer not to answer” option if desired. There are some questions you cannot skip since they must be answered in a certain order. Individual responses will only be identifiable in aggregate, yet may be traceable to respondents depending on trends within the results. Given the low level of risk associated with the project, the anticipated benefits to participants compare quite favorably. The information from this study will be used to help Revolve Kids reduce their impact on the environment. They will also serve as a model to other businesses in the area. The health, aesthetic, economic, and wildlife benefits that derive from having trash free living environments will outweigh the minimal risk associated with participating in the online survey.

Confidentiality: We will work to make sure that no one sees your online responses without approval. But, because we are using the Internet, there is a chance that someone could access your online responses without permission. In some cases, this information could be used to identify you. Also, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Future Research: Your de-identified information may be shared with other researchers interested in conducting similar work, for use in a research publication, or as requested or required by the funding agency.

Incentives: You will receive 20% off one full price item. The discount is available for use one time and will expire on August 15, 2019. Those who complete the survey will be asked to provide their name and number so store staff know who is eligible to receive the 20% off discount. Only those who complete the survey and provide their contact information are eligible to receive 20% off. By law, payments to participants are considered taxable income.

Participant Rights: You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status. If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By agreeing to participate, you do not give up any personal legal rights you may have as a participant in this study. This study has been determined exempt from IRB review.

Contacts and Questions: For questions, concerns, or complaints about the study you may contact Jill Bartolotta at bartolotta.2@osu.edu or 440-350-2267, or Scott Hardy at hardy.116@osu.edu. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Office of Responsible Research Practices at 1-800-678-6251 or hsconcerns@osu.edu.

Providing consent: I have read (or someone has read to me) this page and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my

satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by agreeing to participate. To print or save a copy of this page, select the print button on your web browser.

Please click the button below to proceed and participate in this study. If you do not wish to participate, please close out your browser window.

Environmental Awareness

How environmentally friendly do you consider yourself?

- Very environmentally friendly
- Somewhat environmentally friendly
- A little environmentally friendly
- Not at all environmentally friendly

How familiar are you with the amount of plastic pollution in waterways?

- Very familiar
- Moderately familiar
- Slightly familiar
- Not familiar at all

How familiar are you with the effects of plastic pollution on wildlife, human health, and water quality?

- Very familiar
- Moderately familiar
- Slightly familiar
- Not familiar at all

Use of Shopping Bags

On average how many pieces of plastic trash do you throw away each day?

- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21 or more

On average how many disposable plastic bags do you use on one shopping trip to the grocery store?

- 0
- 1-3
- 4-6
- 7-9
- 10 or more

On average how many disposable plastic bags do you use on one shopping trip to the clothing store?

- 0
- 1-3
- 4-6
- 7-9
- 10 or more

Does your household recycle plastic bags?

- Yes
- No
- Do not use them.

If yes, where? (Please select all that apply.)

- In my curbside recycling.
- I take them to a grocery store recycling bin.
- I take them to the recycling center.
- I use them to make artwork.
- I use them to line my garbage bins.
- I use them to pick up pet waste.
- Other (please explain).

Use of Reusable Bags

Do you have access to reusable bags for shopping?

- Yes
- No

If no, why don't you have access to reusable bags?
(Please select all that apply.)

- I do not like to use them.
- I cannot afford to buy them so I do not have any.
- I have never considered using them.
- Other (please explain).

If yes, how many reusable bags do you own?

- 1-5
- 6-10
- 11-15
- 16-20
- 21 or more

If yes, which types of reusable bags do you prefer?
(Please select all that apply.)

- Cotton
- Plastic lined bags
- Thermal bags for keeping items hot or cold
- Other (please explain).

On average, how many reusable bags do you use on one shopping trip to the grocery store?

- 0
- 1-3
- 4-6
- 7-9
- 10 or more

On average, how many reusable bags do you use on one shopping trip to the clothing store?

- 0
- 1-3
- 4-6
- 7-9
- 10 or more

What prevents you from always using your reusable bags? (Please select all that apply.)

- I always use reusable bags.
- They are not suitable for the items I carry.
- I do not think they are clean or sanitary.
- I take public transportation and do not want to carry them with me.
- I forget them at home.
- I forget them in the car.
- My friends and family do not use them so I do not use them.
- I use the plastic bag I get from the store to pick up pet waste.
- I use the plastic bag from the store to line my garbage bins.
- I use the plastic bag to make art pieces.
- I like getting a bag that shows the logos or brand names of where I shop.
- I am spending money at the store and deserve to be given something to put my items in.
- Other (please explain).

Bagless Initiative at Revolve Kids

Are you aware Revolve Kids has gone bagless as of March 1, 2019, meaning they will no longer offer you a disposable plastic bag for the items your purchase?

- Yes
- No

If you are aware that Revolve Kids has gone bagless, how supportive are you of this change?

- Very supportive
- Moderately supportive
- Somewhat supportive
- Not at all supportive

Which options do you prefer Revolve Kids provide for you to carry your purchased items?

	Prefer	Do not prefer
I will hand carry my items.	<input type="radio"/>	<input type="radio"/>
I will bring my own bag.	<input type="radio"/>	<input type="radio"/>
I would like my items wrapped together with string.	<input type="radio"/>	<input type="radio"/>
I would like Revolve Kids to give customers a reusable bag once that I can use each time I shop.	<input type="radio"/>	<input type="radio"/>
I would like Revolve Kids to provide reusable bags to customers with every purchase.	<input type="radio"/>	<input type="radio"/>
I would like Revolve Kids to offer disposable plastic bags.	<input type="radio"/>	<input type="radio"/>

Please use the space below to offer any thoughts and opinions on the bagless initiative at Revolve Kids.

Environmental Friendliness of Other Businesses

How important is it for businesses to take action to make less of an impact on the environment?

- Very important
- Moderately important
- Somewhat important
- Not at all important

How likely are you to support a business that no longer offers disposable plastic bags for free, but will charge you for them?

- Very likely
- Moderately likely
- Somewhat likely
- Not at all likely

How likely are you to support a business that no longer offers any disposable bags in the store?

- Very likely
- Moderately likely
- Somewhat likely
- Not at all likely

Demographics

We are collecting this information to help inform our communication with customers.

What is your age?

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65 - 74
- 75 - 84
- 85 or older
- Prefer not to answer

What is your race/ethnicity?

- White or Caucasian
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Hispanic or Latino
- Other
- Prefer not to answer

What is your gender?

- Male
- Female

- Transgender
- Gender Neutral
- Gender Non-conforming
- Prefer not to answer

What is your highest level of education obtained?

- Less than high school
- High school graduate
- Some college
- 2 year degree
- 4 year degree
- Master's degree
- Professional degree
- Doctorate

What is your average household income level?

- Less than \$24,999
- \$25,000-\$44,999
- \$45,000-\$54,999
- \$55,000-\$74,999
- \$75,000-\$94,999
- \$95,000-\$114,999
- \$115,000-\$134,999
- \$135,000 or more
- Prefer not to answer

Coupon and Continued Involvement

If you would like to help Revolve Kids spread the word about plastic pollution awareness or participate in outreach events such as beach cleanups, please provide your information below. If not, leave it blank. (Your contact information will be used to help the owner of the store, Felice Pierce, reach out to you. The information will not be shared.)

- Name _____
- Phone Number _____
- Email _____

All those who complete the survey will receive 20% off one full priced item from Revolve Kids. The discount is available for use one time and will expire on August 23, 2019. Please provide the information below so store staff can keep track of who is eligible to receive the discount.

- Name _____
- Phone Number _____
- Email _____

To receive your 20% off one full priced item from Revolve Kids please reference the code **Bagless Survey OSU** when you visit the store to make your purchase.

Appendix B: Plastic Bag Survey for Grocery Stores

The Ohio State University Consent to Participate in Research

Study Title: Behavior change and marine debris: What strategies work best to encourage reusable bags instead of single use plastic bags?

Researchers: Scott Hardy, Ph.D., and Jill Bartolotta

Sponsor: Ohio Sea Grant College Program

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate. Your participation is voluntary. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

Purpose: This study seeks to determine the effectiveness of education and reminder strategies to encourage people to use reusable bags when they go shopping.

Procedures/Tasks: An Internet survey will be sent to visitors to Produce Place and Sun Plum Market and those who attended Ohio Sea Grant Programming. Questions will prompt respondents about their awareness of environmental issues and use of bags to carry items purchased at the store.

Duration: The survey should take no more than 15 minutes to complete. You can skip any questions if you prefer not to answer. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

Risks and Benefits: Although risks are minimal in this study, several questions about your demographics are asked. You can skip or choose the "Prefer not to answer" option if desired. Individual responses will only be identifiable in aggregate, yet may be traceable to respondents depending on trends within the results. Given the low level of risk associated with the project, the anticipated benefits to participants compare quite favorably. The information from this study will be used to help inform bag use and possible strategies to encourage use of reusable bags. The health, aesthetic, economic, and wildlife benefits that derive from having trash free living environments will outweigh the minimal risk associated with participating in the online survey.

Confidentiality: We will work to make sure that no one sees your survey responses without approval. However, because we are using the Internet, there is a chance that someone could access your online responses without permission. In some cases, this information could be

used to identify you. We will work to make sure that no one sees your survey responses without approval. Your de-identified information may be used or shared with other researchers without your additional informed consent. There may also be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives: There are no incentives to participate in this study.

Participant Rights: You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status. If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. This study has been determined exempt from the IRB Review. IRB Exemption Number: 2019E075.

Contacts and Questions: For questions, concerns, or complaints about the study, or you feel you have been harmed as a result of study participation, you may contact Scott Hardy via email at hardy.116@osu.edu, or telephone at 216-368-2588, or Jill Bartolotta via email at bartolotta.2@osu.edu, or telephone at 440-350-2267. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in The OSU Office of Responsible Research Practices at 1-800-678-6251.

Signing the consent form: I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

By continuing into the survey you are agreeing to participate in this research.

Environmental Awareness

How environmentally friendly do you consider yourself?

- Very environmentally friendly
- Moderately environmentally friendly
- A little environmentally friendly
- Not at all environmentally friendly

How familiar are you with the effects of plastic pollution on wildlife, human health, and water quality?

- Very familiar
- Moderately familiar
- Somewhat familiar
- Not at all familiar

How familiar are you with the amount of plastic pollution in waterways?

- Very familiar
- Moderately familiar
- Somewhat familiar
- Not at all familiar

Do you have access to reusable bags for shopping?

- Yes
- No

If no, why don't you have access to reusable bags?

- I do not like to use them.
- I cannot afford to buy them.
- I have never considered using them.

If yes, how many reusable bags do you own?

- 1-5
- 6-10
- 11-15
- 16-20
- 20 or more

If yes, how often do you use these bags when you shop?

- Always
- Most of the time
- Some of the time
- Never

What prevents you from always using your reusable bags? (Select all that apply.)

- They are not suitable for the items I carry.
- I do not think they are clean or sanitary.
- I take public transportation and do not want to carry them with me.
- I forget them at home.
- I forget them in the car.
- My friends and family do not use them so I do not use them.
- I use the plastic bag I get from the store to pick up pet waste.
- I use the plastic bag from the store to line my garbage bins.
- I use the plastic bag to make art pieces.

Reusable Bag Reminders



Did you receive one of these reminder items in the picture above from Ohio Sea Grant?

- Yes
- No

Have you placed the reminder items in a place that is reminding to use your own reusable bags?

- Yes
- No

If yes, where have you placed them? (Please select all that apply.)

- My car
- My keys
- In my purse or bag
- On my refrigerator
- On a door leading out of my house
- Other (please specify).

If no, why haven't you used them? (Please select all that apply.)

- I forgot.
- I lost it.
- I did not like it.
- It was too big.
- It was not helping me remember to bring my bags.
- Other (please specify).

Which items are the most effective at reminding you to bring your bags? (Please select all that apply.)

- Magnet
- Keychain
- Window decal
- All equally helpful
- None of them are helpful

Before you had these reminder items, how often did you use reusable bags?

- Always
- Most of the time
- Some of the time
- Never

Now that you have these reminder items, how often do you use reusable bags?

- o Always
- o Most of the time
- o Some of the time
- o Never



Have you seen these signs at the store or other signs reminding you to grab your bags?

- o Yes
- o No

Are they helpful at reminding you to bring your own bag?

- o Yes
- o No

If no, why not?

- o I am already in the store and do not want to go back to my car to get my bag.
- o I forget my bags at home and will not go back home to get them.
- o Other (please specify).

How much are you willing to pay for a single-use plastic bag from the store?

- o 1 cent
- o 5 cents
- o 10 cents
- o 25 cents
- o 50 cents
- o 1 dollar
- o 1 dollar or more

How much are you willing to pay for a paper bag from the store?

- o 1 cent
- o 5 cents
- o 10 cents
- o 25 cents
- o 50 cents
- o 1 dollar
- o 1 dollar or more

How much should a store offer off your purchase to encourage you to bring your own bags?

- o 1 cent

- o 5 cents
- o 10 cents
- o 25 cents
- o 50 cents
- o 1 dollar
- o 1 dollar or more

Support for Bagless Businesses

How important is it for businesses to take action make less of an impact on the environment?

- o Very important
- o Moderately important
- o Somewhat important
- o Not at all important

How likely are you to support a business that no longer offers bags for free but will charge you for them?

- o Very likely
- o Moderately likely
- o Somewhat likely
- o Not at all likely

How likely are you to support a business that no longer offers any bags?

- o Very likely
- o Moderately likely
- o Somewhat likely
- o Not at all likely

Of the following, which do you support?

- o Plastic bag ban
- o Plastic bag fee
- o Both
- o Neither

Demographics

In which Ohio county do you live?

- o Ashtabula
- o Lake
- o Cuyahoga
- o Geauga
- o Summit
- o Portage
- o Lorain
- o Medina
- o Other (please specify)
- o I do not live in Ohio.
- o Prefer not to answer

What is your zip code?

What is your age?

- o 18-24
- o 25-34

- 35-44
- 45-54
- 55-64
- 65-74
- 75 and older
- Prefer not to answer

What is your race? (Please select all that apply.)

- White/Caucasian
- Black/African American
- Hispanic or Latino
- Asian
- American Indian or Alaskan Native
- Native Hawaiian or Pacific Island
- Other
- Prefer not to answer

What is your gender?

- Female
- Male
- Transgender
- Gender Neutral
- Gender Non-conforming
- Prefer not to answer

What is your highest level of education obtained?

- Less than high school
- High school or GED
- Some college
- 2 year college degree
- 4 year college degree
- Master's Degree
- Doctoral Degree
- Professional Degree (ex. JD, MD)
- Prefer not to answer

What is your average household income level?

- Less than \$24,999
 - \$25,000-\$44,999
 - \$45,000-\$54,999
 - \$55,000-\$74,999
 - \$75,000-\$94,999
 - \$95,000-\$114,999
 - \$115,000-\$134,999
 - \$135,000 or more
 - Prefer not to answer
-