BUILDING A CIRCULAR ECONOMY

2023 CIRCULAR ECONOMY AMBASSADOR PROGRAM REPORT





CONTENTS

Executive Summary	3
What are the Issues?	6
Current Governmental Actions	7
Circular Economy Ambassador Program	7
CEAP Cleanups	8
Data Analysis	9
What Was Discovered?	10
Waste Items	11
Locations	12
Discussion	16
Advice and Alternatives	18
CIGARETTE BUTTS	18
PLASTIC	18
SINGLE-USE ITEMS AND FOOD PACKAGING	20
PAPER	20
ALUMINUM/TIN FOIL AND CANS	20
Recommendations on Reducing Waste	21
Single-Use Items Recommendations	21
Education Recommendations	21
Limitations	22
Conclusion	23
Acknowledgments	24
References	25
Appendix	29



Out of the 17,018 waste items collected, 74% were plasticbased, and nearly 90% of these items had the potential for recycling.



EXECUTIVE SUMMARY

Mind Your Plastic (MYP) is a Canadian registered charity that focuses on promoting circularity through different programs that provide the necessary tools for municipalities, businesses, and schools to reduce waste. The mission is to eliminate plastic pollution through preventative efforts by advocating for municipal policy change, working with businesses, and delivering direct action and educational programs. MYP launched the Circular Economy Ambassador Program (CEAP) in 2021 to teach youth about the importance of circularity in resources, specifically plastics, and product consumption. Within its first year, 243 students across Canada participated and collected 6,400 waste items, of which 52% were composed of plastic material. This past school year, 2022/2023, the number of students that participated in the CEAP program was seven times greater, with a total of 1,880 students from 35 schools across Canada, and 17,018 waste items collected.

Considering that students currently compose one-sixth of Canada's population, their role in advocating and implementing a circular economy in their daily lives and within their communities is imperative. Hence, the objectives of the CEAP initiative were to:

- identify and hypothesize potential sources of litter debris present in different locations;
- provide potential alternative measures; and
- suggest recommendations for governmental officials, industries, and individuals to mitigate, and eventually eliminate waste production.

Out of the 17,018 waste items collected, 74% were plastic-based, and nearly 90% of these items had the potential for recycling. The most collected items were Cigarette Butts, Plastic Pieces, Paper and single-use Food Packaging. Waste percentages within different established location types (Shorelines, School Property, Neighbourhood, and Park), were analyzed to determine what types of waste was mostly present. The majority of the waste collected by CEAP participants came from School Properties, since it was the most convenient cleanup location for both teachers and students. When compared to other location types, School Property had the least percentage of Cigarettes Butts present possibly due to the smoking prohibition on the property, but the highest percentage of Plastic Bottles and Cups, probably because of the numerous facilities surrounding the area (community centres, stores, businesses,

etc.) and different activities that occur on school grounds. Shorelines showed a high presence of Cigarette Butts and Plastic Pieces, possibly due to group gatherings, and the lowest values in Cups, Face Masks, and Food Packaging, potentially due to the lack of supermarkets and restaurants in the near vicinity. Neighbourhoods had the second highest presence of Cigarette Butts and Plastic Pieces, potentially due to citizens fulfilling daily activities or hobbies and the improper design of residential waste bins. Park locations showed the lowest percentage of Plastic Pieces, but it had the highest presence of Food Packaging, possibly due to the lack of recycling and garbage bins and individuals that, when aggregated, allowed for both intentional or unintentional littering to occur. Essentially, most littering sources we hypothesized to be related to people's behaviours and lack of convenient bins. However, if sustainable/reusable packaging options were more readily available for the public than the materials found as litter, the waste collected could have had a different fate.

The abundance of plastic pollution negatively impacts economies, wildlife, and human health. Identification of items collected through the CEAP program was fundamental to hypothesize the waste sources and to consider sustainable alternatives to reduce waste. The program identified that the majority of the litter collected could have been recycled, hence, using waste as a resource to fuel a circular economy that produces reusable items should be more effective at eliminating waste in our environments. Additionally, the program inspired students to advocate for change within their local community by seeking municipal council and requesting single-use plastics bans. Although Canadian governments have begun to set regulations and acts to mitigate national plastic pollution, it is recommended that Canadian governments use a multi-leveled approach to reduce and mitigate plastic waste.

We believe that combining the following actions listed below will lead to the reduction of plastic pollution:

- enhancement of public education by adding formal courses to curriculum;
- establishing effective sustainable/reusable product design and systems from industries;
- regulating the amount and type of packaging materials;
- applying rigorous litter monitoring;
- increasing littering consequences;
- expanding extended producer responsibility;
- installing effective waste disposal bins in public areas;
- providing funds to non-profit organizations and charities to enhance awareness, adjusting regulations to contain a bigger list of single-use plastic items; and
- include clear actionable steps for future mitigation and prevention plans.

We hope that by adopting these actions we will see an extensive behaviour change with how everyone, from individuals to major corporations, uses and disposes of plastics, thus leading to a reduction of plastic pollution.

Within its first year, 243 students across Canada participated and collected 6,400 waste items, of which 52% were composed of plastic material.

OUR 2022/2023 CLEANUPS

From coast to coast, schools from eleven provinces and territories conducted cleanups!







Total Area = 1.5 km² according to CTV, that's roughly the size of **112 blocks in downtown Ottawa**

27% of items were single-use plastics, (4,725) excluding cigarettes







WHAT ARE THE ISSUES?

The commercial demand for plastic products has increased production by 239%, from producing 1.5 million metric tonnes of plastics in the 1950s, to producing 359 million metric tonnes in 2018 (Filho et al., 2021).

Throughout its production and at the end of its life, plastics pollute our environment, due to resource extraction and inappropriate waste management from both industries and individuals. The efficient production of this material comes at a high cost after it is inserted into our economy. Plastic waste recycling lags far behind its production, as only about 30% of global plastics are recycled, reused and/or incinerated, while the other 70% is discarded and can eventually land in different natural environments (Geyer et al., 2017). The physical properties that have made plastic a commercial staple material, such as being lightweight, of high durability, and inexpensive, are the same properties that negatively impact ecosystems as it persists both in its original form and slowly degrades, releasing toxins into habitats (Filho et al., 2021).

Plastic can remain in both terrestrial and aquatic environments for thousands of years, negatively impacting economies, microscopic and macroscopic wildlife, and human health (Stevens. 2022; UNEP, 2017). Plastic pollution affects economies as it interferes with commercial fisheries (Nash, 1992), decreases ecotourism through waste presence within destination landscapes (Jang et al., 2014), and increases the requirement of costly cleanup initiatives (UNEP, 2014), amongst other issues that affect all levels of government. Wildlife is also impacted by plastic litter through ingestion, which causes digestive blockage and absorption of toxins, and entanglement, which can decrease animal fitness, and habitat destruction. All of these increase the likelihood of animal mortality (ECCC, 2020). Furthermore, since ingestion of plastic particles has been found within animals at the bottom of the food chain, such as copepods, as well as top predators, such as tuna, whales, and sharks, the bioaccumulation and biomagnification of plasticbased toxins is already present in the marine food chains (Karami et al., 2017). This results in a negative effect on human health, as it is estimated that humans consume 112 to 842 microplastic particles per year through fish consumption (Barboza et al., 2020). The current linear economy concept extracts, uses, and then disposes of materials, which is continuously putting pressure

on our natural systems, communities, and public health. A circular economy could potentially significantly reduce waste, by transforming it into a reusable resource.



CURRENT GOVERNMENTAL ACTIONS

Currently, the government of Canada has several federal acts that focus on the prohibition and prevention of waste being deposited within marine and terrestrial environments (Linnebjerg et al., 2021).

The Microbeads in Toiletries Regulations (2017) is reducing plastic pollution as it has banned the usage and manufacturing of microbeads within the cosmetic sector. The <u>Canada-wide Strategy</u> on Zero Plastic Waste presents the objectives that the federal government aims to reach by transforming plastic waste into a resource within a circular economy. The Arctic Waters Pollution Prevention Act (2019) was created to prohibit any type of waste from being discarded within Arctic waters or locations that may allow waste to enter the Arctic's aquatic environment. The Single-Use Plastics Prohibition Regulations (2023), prohibited the production, importation, and distribution of six single-use plastic items such as plastic cutlery, straws, shopping bags, stir sticks, food service

ware, and ring carriers (ECCC, 2023). The <u>Canadian</u> <u>Environmental Protection Act</u> (ECCC, 2019; Linnebjerg et al., 2021) is able to label certain plastics as toxic substances to monitor products. In addition, Canada was the leading country that developed the <u>Ocean Plastic Charter</u> (ECCC, 2021; Linnebjerg et al., 2021) which included several goals to be met by the G7 countries, such as collecting all plastics by 2040.

Although Canada has developed several acts and policies at all governmental levels, there is a lack of enforcement, monitoring, and research to increase the effectiveness of these new regulations. In addition, due to the long-range transportation of plastic waste, there is still a need for international collaboration to further eliminate, or at the very minimum, reduce plastic pollution. Furthermore, governments, industries, and individuals must unite against this major issue. Therefore, educating the next generation by implementing subjects such as waste management into their curriculum may lead to behavioural change that potentially eliminate further plastic waste in the future.

CIRCULAR ECONOMY AMBASSADOR PROGRAM

Non-profit organizations and charities have been crucial in creating awareness of the plastic pollution crisis by teaching the public about alternatives,

organizing cleanups, and advocating for a positive shift toward eliminating plastic usage through policy change. Mind Your Plastic (MYP) is a Canadian registered charity that focuses on eliminating plastic pollution through preventative efforts by advocating for municipal policy change, working with businesses, and delivering direct action and educational programs. Considering that plastic pollution affects all living things directly and/or indirectly, MYP launched the Circular Economy Ambassador Program (CEAP) in 2021 to teach youth about the importance of circularity in resources, specifically plastics, and product consumption. Within its first year, 243 students across Canada participated and collected 6,400 waste items, of which 52% were composed of plastic material. This past school year, 2022/2023, the number of students that participated in the CEAP program was seven times greater, with a total of 1,880 students within 35 schools across Canada that have learned about the circular economy movement. According to the Collins Dictionary, a circular economy is: "an economic system based on using renewable resources, eliminating waste, and reusing and recycling material goods". In a circular economy, nothing is wasted. The circular economy reuses, repairs, refurbishes, remanufactures, repurposes, and/or recycles products and materials to be reinserted into the economy. Therefore, waste becomes a resource and circularity helps develop innovative ways to improve the environment and the economy.

CEAP Cleanups

Today's youth are tomorrow's future. Since youth from the age of 9 to 24 compose approximately one-sixth of Canada's population (Statistics Canada, 2022), their role in advocating and implementing a circular economy in their daily lives and within their communities is imperative. As students collected data, sorted waste, recycled materials and concluded the CEAP program, some were further inspired to advocate for change within their communities. This year, after participating in the CEAP, a group of Grade 5 and 6 students presented the plastic issue to their municipal council members, requesting a bylaw to ban and support using less single-use plastics. Therefore, schools, teachers, students, and local communities have all benefited from the CEAP program.

MYP has made the CEAP very accessible to all students, teachers, and schools by providing complimentary physical supplies (reusable gloves, bags and t-shirts) and detailed instructions to fulfill a cleanup with participants from ages 5–18+. MYP also provided teachers with educational materials according to the education level of participants at no cost. Teachers lead the program by conducting a cleanup with their students, collecting data, diverting waste, and sending acceptable plastics to our recycling partners who transform waste into something new to be reinserted into the economy.

Plastic solutions are developed as the issue and its consequences are better understood. The CEAP seeks to comprehend what types of waste are constantly being introduced within the different Canadian environments, identify the sources, and provide alternative measures for governmental officials, industries, and individuals to mitigate, and eventually eliminate, waste production.



DATA ANALYSIS

Data analysis performed for the waste collected at cleanups was based on item counts and proportions within the datasheets submitted by teachers and students from participating schools: Location, Sorting and Diverting, and Data Tally Sheet.

Since not all schools provided the estimated weights for the waste collected, it was not analyzed. Further research on geographical locations was conducted through Google Maps, while calculations and data organization were fulfilled through Google Sheets. This included pivot tables and the creation of charts and visuals. Each datasheet contained different cleanup components to be recorded so that the waste collected could be analyzed.

Plastic items were categorized as all items composed of at least 50% plastic. This included Cigarette Butts as well, under the assumption that the cellulose filter remaining made up most of each item collected. Single-Use Items were categorized as non-refillable (e.g. lip balm) or non-reusable (e.g. diapers) items. Objects with an unspecified purpose but a high probability of being single-use were also included, such as food packaging, while those that were more vague, like "chopsticks", were excluded. Reusable Items were more frequently or permanently used or had a high chance of being donated or upcycled for better use (e.g. clothes). Anything that was not clearly in either category was classified as Inapplicable (e.g. banana peel).

After completing the cleanups, teachers were instructed to discuss with their students what actions could be taken to prevent debris from accumulating in our environments again.

The hands-on experience that the CEAP provides has inspired students to advocate for better waste management, single-use source reductions, and shifting to reusable materials, within their municipalities in the past two years. This past year, one school from Port Hope, Ontario collected such a high quantity of single-use plastics that they created a presentation of their results for the Port Hope Council. The students advocated to enact a bylaw to ban and support decreasing the usage of these types of plastics. After their presentation, councillors unanimously passed the motion to have the Environmental Advisory Committee search for a bylaw concerning single-use-plastic usage. Our hope is that as their awareness of plastic pollution grows, the younger generation will feel more compelled to seek alternatives as they search for a more permanent solution.



WHAT WAS DISCOVERED?

After their cleanup, teachers provided MYP with their completed datasheets (Data Tally Sheet, Location, and Sorting and Diverting). Out of the 35 schools (1,880 participants) that participated and conducted a cleanup in the 2022/2023 program, only 28 (1,428 participants) were able to provide data due to different circumstances in the teachers' professional responsibilities. Therefore, the analyzed data reflects the data provided by the 1,428 participants. Participants recorded the count of items present in each of the categories in the Data Tally Sheet. The item counts were then converted to total counts and percentages.



CEAP program in each participants in the 2022/2023 CEAP program in each participating province and territory. Percentage calculation was based on a total of 1,880 participants from 35 different schools.

WASTE ITEMS

During every cleanup in the years of 2022 and 2023, Circular Economy Ambassador Program **students from ten Canadian Provinces** sorted and counted waste items collected from different environments. Percentage values were calculated from the total number of items collected (N = 17,018).



4.7%

Plastic

Bags

2.9%

Glass

19.5% Cigarette Butts



3.9%

2.9%

Cans

Cups

COLD DRINK - 2.5%

HOT DRINK – 1.5%

Pieces SMALL (0-10 CM) - 10.5% MEDIUM (10-30 CM) - 5.1% LARGE (>30 CM) - 2.7%



 18.5%

 Commonly

 Found Items

 CM) - 10.5%
 PAPER - 10.4%

 SO CM) - 5.1%
 BOTTLE CAPS - 2.3%

 M) - 2.7%
 STRAWS - 1.8%

OTHER – 4%

3.2%

2.7%

Styrofoam

SMALL (0-10 CM) - 1.4%

Face-Masks

Pieces



9.7%

Food

Packaging

3.1% Plastic Bottles

0.6%

Take-Out

Containers



6.8%

Miscellaneous

ALUMINUM/TIN FOIL - 1.35%

2.9% Plastic Lids

OT DRINK – 1.3%



0.04% Fishing Gear

TOP 10 ITEMS COLLECTED

The top ten items collected by 2022/2023 CEAP participants across the ten Canadian provinces. Total percentage was calculated from the total number of collected items: 17,018.



Locations

Participants conducted cleanups in accessible locations near their school. The different areas were divided into four different location types; Shoreline, Neighbourhood, Park, and School Property. Within the different Location types, Cigarette Butts, Plastic Pieces, Commonly Found Items and Food Packaging were the most prevalent categories present. However, Take-out Containers were inconspicuous. Item percentage of each waste category present was analyzed for each location type. School Property has the least percentage of Cigarettes Butts present, but the highest percentage of Plastic Bottles and Cups when compared to the other locations. Shorelines show a high presence of Cigarette Butts and Plastic Pieces, and the lowest values in Cups, Face Masks, and Food Packaging. However, Shorelines had the highest amount of waste diverted. Neighbourhood has the second highest presence of Cigarette Butts and Plastic Pieces. The Park locations show the lowest percentage of Plastic Pieces, but it has the highest presence of Food Packaging. Within all the location types, over 70% of their total waste was composed of plastic!

2.495 2.569 9.936 2.018 100% Take-Out Containers Styrofoam Pieces Plastic Pieces Plastic Bags Miscellaneous 75% Lids Glass Food Packaging Fishing Gear 50% Face Masks Cups Commonly Found Items Cigarette Butts Cans 25% Plastic Bottle 0% Neighbourhood Park School Property Shoreline

NEIGHBOURHOOD, PARK, SCHOOL PROPERTY, AND SHORELINE

Percentage of Waste Categories within each location type.

Each bar has a total value of 100% based on the total count of items within each waste category in the different location types.

Although schools from ten Canadian provinces and one territory participated, the Nunavut school did not provide waste data, hence it could not be included in the analyses. From the total percentage of items that were collected only in **Newfoundland and Labrador**, most of it was composed of Plastic Bottles, Miscellaneous and Plastic Pieces, but it had the lowest percentage of Food Packaging, Cups and Commonly Found Items when compared to all other provinces. **New Brunswick** had the highest percentage of Cans, and the lowest percentage of Face Masks. **British Columbia** had the highest proportion for Commonly Found Items, and Styrofoam. **Alberta** has the biggest proportion of Cups, Lids, and Face Masks collected. **Nova Scotia** held the highest percentage for Food Packaging, Plastic Bags and Glass and the lowest for Miscellaneous. **Prince Edward** Island had the highest proportion of Cigarette Butts, and the lowest proportion of Styrofoam and Plastic Bags. **Saskatchewan** had the least amount of Plastic Bottles and Lids. **Manitoba** has the lowest percentage of Glass and Plastic Pieces collected.



PROVINCES VERSUS WASTE CATEGORIES

Percentage of waste categories within each participating Canadian Province.

Each bar has a total value of 100% based on the total value of items collected within waste categories of the designated Province. Note, although a school conducted a cleanup in Nunavut, the participants did not provide data.

The top three provinces with the most collected plastic items are: Ontario (34.7%, n = 4,376), Saskatchewan (21.5%, n = 2,703), Alberta (11.4%, n = 1,430). Meanwhile, the provinces with the least amount of plastic items collected were New Brunswick (1.1%, n = 136), Nova Scotia (2.8%, n = 357), and British Columbia (4.1%, n = 514).

All items collected were divided into three categories: Reusable, Single-Use/Disposable, and Inapplicable. The "Inapplicable" label refers to items that could not be labelled either as reusable or disposable, such as organic waste. When considering Cigarette Butts, Plastic Pieces, and Styrofoam Pieces as Single-Use/Disposable items, 80.7% (n = 13,727) of the items collected were single-use items. Only 5.6% (n = 947) was reusable and 13.8% (n = 2,344) was labelled as Inapplicable.

5.6% (947)

REUSABLE TOTAL



Count and Percentage of Plastic Items collected within each participating Province. Percentage was calculated from the total number of plastic collected (n = 12,598). Percentage and Count of Reusable and Disposable items collected by CEAP participants. This calculation was based by considering Cigarette Butts, Plastic Pieces and Unknown Bags as a Single-Use Disposable Item. Percentage was calculated from the total number of items collected (n = 17,018).

Disposable &

Reusable Items

80.7% (13,727)

SINGLE-USE/ DISPOSABLE TOTAL



DISCUSSION

The results show that plastic waste continues to dominate the litter found within different environments. Within the two years of the Circular Economy Ambassador Program (CEAP), Cigarette Butts and Plastic Pieces have been the most prevalent items within the cleanups conducted by students across Canada. This year alone, these two items were responsible for 38% of the total collected waste, while the total plastic waste summed to a total of 74%!

A total count of 17,018 items was collected by students in ten different Canadian provinces. To analyze the results, several considerations are required: the total number of participants within each location, the presence or lack of litter, the type of cleanup area coverage, and activities and structures within cleaning areas. Most importantly, it must be noted that the collected items only represent a small fraction of the actual litter quantity that can be present within the cleaned environment. Within the two years of the Circular Economy Ambassador Program (CEAP), Cigarette Butts and Plastic Pieces have been the most prevalent items within the cleanups conducted by students across Canada.



LOCATION DETAILS

Details from the cleanup location types were provided by participants and obtained by viewing a map within an area of ~1 km².

TYPE OF LOCATION	COUNT OF SCHOOLS	TOTAL COUNT OF ITEMS COLLECTED	RESTAURANTS COUNT	STORM DRAIN COUNTS	STORES ON SITE	SUPERMARKET COUNT	SCHOOLS/ PARKS ON SITE	WASTE/ RECYCLE FACILITIES	OTHER ACTIVITIES
School Property	19	9,936	17	4	4	5	Schools Present	Recycling bins were mentioned eight times	 » Churches » Dental Office » Public Library » Business Park » Community Centre » Bowling alley » Movie Theatre » Bingo Palace » Fire Hall
Park	4	2,569	4	3	1	0	 » School Present » Daycare Centre Present 	None	 » Baseball Diamond » Playground » Biking » Picnics » Tennis Court
Neighbour- hood	1	2,495	2	1	2	1	None	Recycling bins mentioned once	» Post Office » Church
Shoreline	4	2,018	1	Unknown	0	1	None	Recycling bins mentioned twice	 » Hiking » Picnics » Swimming » Camping » Bonfires » Fishing » Parties

Advice and Alternatives

CIGARETTE BUTTS

Cigarette Butts was the most collected waste item in the 2022/2023 CEAP program. About 4.5 trillion cigarettes pollute aquatic and terrestrial environments globally every year (World Health Organization: WHO, 2022). Numerically cigarette butts are the most littered item in the world (Cleanup Australia, 2022). These results match with the Great Canadian Shoreline Cleanup 2021 Dirty Dozen and Ocean Conservancy (Ocean Conservancy, 2023). The Cigarette Litter Reduction report in the City of Vancouver (2023), it estimated that about one million cigarette butts become litter on a daily basis! The cellulose acetate found within cigarettes deems them to be non-biodegradable, taking years for it to break down and decompose (Torres et al., 2019; Enactus Canada, 2017). Although there could be several reasons for the source of cigarette butts in the cleanup locations in the CEAP Program, such as lack of ashtrays, absence of proper recycle bins and garbage bins, and intentional littering, most cigarette butts are still found only a small distance away from an ashtray (TerraCycle, 2021). According to Rath et al. (2012), even though smokers seem to be familiar with the environmental impact of cigarette butt litter, most of them still do not recognize it as litter debris.

Therefore, both appropriate waste disposal and education are still needed to inform smokers of the negative effects of cigarette litter, and benefit from the help of creative and sustainable business solutions. The Enactus team from the University of Ottawa has started to solve the lack of cigarette disposal bins (Enactus Canada, 2017). The team has developed a practical and fireproof cigarette disposal unit called CigBins, with affordable installation and pick-up charges. Enactus provides employment to individuals with mental illnesses or disabilities to manage the bins, transforming cigarette butt waste into industrial materials to be reinserted into the economy. In addition, TerraCycle (2023) has further facilitated the recycling of cigarette waste in their "<u>UNSMOKE Cigarette Recycling Program</u>". Smokers can now download a free shipping label to send their cigarette waste to be recycled by TerraCycle, which

In Vancouver alone, it is estimated that about one million cigarette butts become litter on a daily basis!

uses them as a resource to fabricate plastic pellets, ashtrays, and benches. Although cigarette waste recycling programs exist, they are not well-known by the public, therefore, these organizations should enhance their outreach efforts by partnering with NGOs, municipal/provincial/federal governments, and other organizations to better diffuse their services.

Another potential solution for this cigarette butt pollution issue could be to take the same approach that was established in Spain at the beginning of 2023. In 2019, an agreement to ban single-use plastics by 2021 was signed by the European Union. In January of 2023, Spain developed regulations in which tobacco manufacturers will now have to pay for the cost of cigarette waste cleanups (Boletín Oficial del Estado, 2022). Since Canada produces about 8,000 tonnes of cigarette butts litter annually, this could be a step towards reducing the pollution, and potentially decreasing the cost of environmental cleanups (TerraCycle, 2023). Furthermore, Canada could continue to ban smoking in public areas such as beaches and parks, to reduce the amount of litter found within these areas. Despite the fact that programs exist and the government can develop new regulations, awareness campaigns are still required to inform individuals of the harmful effects of cigarette butt litter within our environments to establish a behavioural change within society.

PLASTIC

It is estimated that about 230 million metric tonnes of plastic waste will be produced annually worldwide by 2025 (Lebreton 2019), which is equivalent to the weight of over 1 million blue whales, the heaviest animal on earth. Out of the total number of waste items collected (n = 17,018) by CEAP participants, 74% (n = 12,598) were entirely or partially composed of plastic. Additionally, out of the Top Ten Items collected, eight are entirely

The amount of plastic present in all the litter collected cannot be ignored and must be managed.

composed of plastic and plastic items were found in all the locations cleaned. The most commonly found plastic items were Plastic Pieces of different sizes (18.6%, n = 3,163) and Single-Use Plastic Items (27.7%, n = 4,725) which were mostly composed of single-use Food Packaging. However, Plastic Bottles, Cold Drinks Cups, and Plastic Bottle Caps were highly present as well. The amount of plastic present in all the litter collected cannot be ignored and must be managed.

Certain plastics are easily noticed and recovered from environments due to their colour and size. Plastic Bottles, Cold Drinks Cups and Bottle Caps, were the most collected plastic items apart from Plastic Pieces and Food Packaging. These collected plastic items all relate to the transportation of liquids. Therefore, governments should adopt new regulations for manufacturers to choose a more effective product design that prioritizes the reduction of plastic by making products reusable, or more circular for liquid storage, transportation and distribution. Potentially, if companies followed the example of the European Union where containers should be produced with "caps and lids" attached, while producing caps with a single material type allowing it to be recycled with the attached container, it could reduce cap pollution (European Union, 2019). Additionally, the replacement of plastic caps with sustainable alternatives could further reduce this type of pollution. Furthermore, the propagation of "deposit-refund" programs within local supermarkets, shops, and commercial centers, could reduce plastic bottle littering (ECCC 2020). As for the Cold Drink Cups, businesses should opt for reusable/returnable foodware like the <u>Sharewares</u> and <u>Friendlier</u> programs that have partnered with businesses such as Tim Hortons and Skip the Dishes, to reduce single-use plastic waste, while creating awareness about a circular economy way of life. Furthermore, an example that could be followed within the supermarket industry is the Prefill Model by City to Sea in the United Kingdom. The "Ready to prefill?" report by Morley et al. (2023) demonstrates how refillable, reusable and returnable product packaging benefits different industrial brands/retailers, consumers, and the environment.

SINGLE-USE ITEMS AND FOOD PACKAGING

The participants of the CEAP program collected a total of 6,474 Single-Use Items in which over half of the items (n = 4,725) were Single-Use Plastics mostly composed of Food Packaging (n = 3,318). Food Packaging is composed of

hard-to-recycle materials (Williams and Rangel-Buitrago, 2019), which possibly leads them to be a source of microplastics. The United Nations Environment Program (UNEP) has established a global environmental pollution crisis due to the single-use plastic waste (UNEP,2014). Single-use plastics are a prevalent component contributing to plastic waste within Canada and internationally (ECCC, 2020). According to the Great Canadian Shoreline Cleanup, and Government of Canada, 17% of debris collected within shoreline cleanup efforts was composed of single-use plastics (ECCC, 2020). Since areas with a higher presence of human activities and industrial actions tend to have higher plastic pollution (Driedger et al., 2015), this could explain the presence of single-use plastics within all cleanup locations and provinces, along with the total number of single-use disposable items (80.7%, n = 13,727). Therefore, governments should establish regulations, policies, and programs to aid in the transition of replacing single-use items with reusable alternatives.

Governments play an important role in introducing a circular economy into society and should continue to introduce policies that require a systemic change from businesses and manufacturers, allowing consumers to make balanced decisions on sustainable and plastic-free shopping, since this is not the current reality. Individuals also have the power to take steps toward that change. Consumers can choose to purchase and use reusable, sustainable, or biodegradable alternatives to single-use items. Alternatively, they can opt for shopping from zero-waste stores such as the NU grocery, where customers bring their containers to purchase local and package-free items. Although these small daily choices can have a big impact in reducing the accumulation of plastic waste in both terrestrial and aquatic environments, these choices are not yet convenient, affordable, and accessible to the public, forcing them to opt for the more affordable and nonsustainable options.

PAPER

Similar to plastics, paper has become an essential material within our economy due to its numerous uses. However, on average 10% of residential and 14% of commercial paper waste composition is destined for landfills or incineration within Canada (ECCC, 2020). Although paper is recyclable and degradable, it is one of the top three degradable materials sent to landfills (ECCC, 2020). Furthermore, Canada is the fourth biggest paper producer globally, with over 30 million tonnes of paper yearly but only 25% is recycled (NRC 2003; Pulp and Paper Products Council, 2023). Since it takes several trees, hundreds of litres of water, and pollution associated with paper production and transportation, enhancing paper recycling is essential to reduce deforestation, diminish water contamination and divert it from our landfills (Beckline, 2016). As industries transition out of single-use plastic items, there has been an increase in demand for paper alternatives. This could be the reason Paper was the most Commonly Found Item (10.4%, n = 1,775) in the CEAP program and most prevalent type of waste in School Properties and Parks. These two locations have the highest number of restaurants and/or human gatherings where food, tableware and other items may be stored or composed of paper, to be shared among a group of people. Due to technological advances,

there are several alternatives to paper materials. Stationary paper items can easily be digitized with a computer and/or tablets such as the Remarkable Notebook Paper Tablet (Williams and Rangel-Buitrago, 2019; ReMarkable). While in the food industry, reusable tableware and cloth napkins could be effective alternatives. The importance of reducing waste could still be a notorious topic for many people, and education on this matter is a much-needed requirement that has been proven to encourage individuals to adopt sustainable behaviours (Torres et al., 2019).

ALUMINUM/TIN FOIL AND CANS

Waste collected by the CEAP participants in the Miscellaneous Items category were mainly composed of Aluminum/Tin Foil (n = 224), while several Cans were also collected (n = 486). These types of metals are commonly used in the food industry to store canned goods and carbonated drinks, both of which are easy to carry and purchase within public areas such as Shorelines, whose waste contained the highest percentage of Cans and Miscellaneous Items categories. In addition, when compared to the percentages of these items within other provinces, due to the low number of participants and waste items collected. New Brunswick's waste contained the highest percentage of Cans, while Newfoundland and Labrador had the highest percentage of Miscellaneous Items (Aluminum/Tinfoil). Canada is the fourth aluminum manufacturer in the world and yet, according to Environment and Climate Change Canada (2020), metals such as aluminum/tin foil and cans are responsible for about 3.2% of all Canadian municipal solid waste (NRC 2023;ECCC, 2020). Even though aluminum is interminably recyclable, it is still found in our landfills and environments as litter. This is possibly due to the lack of public awareness of how to properly recycle this type of metal after it has come in contact with contaminants, such as food. In addition, as most canned foods and beverages contain interior plastic lining, there is an unaccounted for percentage of plastic litter associated with these items that degrades in the environment (Lorber et al., 2015). Therefore, further education for both industries and individuals should be provided to eliminate this recyclable item from the litter found in different locations.



Although several of the items commonly collected by CEAP participants through cleanups are recyclable, or reusable, they were still found as litter. Further studies are required to clearly identify if there is a lack of knowledge, waste disposal resources, available/ affordable reusable options, or if it is a behavioural choice that is causing these items to enter our environment. Based on the results of these studies, both governments and individuals can grow to adapt to the recommended solutions.



RECOMMENDATIONS ON REDUCING WASTE

SINGLE-USE ITEMS RECOMMENDATIONS

The Canadian Single-Use Plastics Prohibition Regulations (LSB, 2023), prohibited the production, importation and distribution of six single-use plastic items: plastic cutlery, straws, shopping bags, stir sticks, foodservice ware, and ring carriers (ECCC, 2023). However, this regulation does not target items such as Food Packaging, Plastic Bottles, Cold Drink Cups, and Plastic Bottle Caps that were mostly collected in the CEAP program and the Great Canadian Shoreline Cleanup (Vandermeer, 2022). Therefore, governments need to adapt the regulation to further address the main single-use plastic items littering Canadian provinces and territories. Therefore, as bans are developed they must be standardized across all provinces and territories and continue to promote additional taxes for single-use items, but also shift the focus to transitioning single-use plastic items to reusable

alternatives. The extended producer responsibility approach could be ameliorated by increasing the number of products covered (Baxter et al. 2022). Additionally, it must bear not just the cost of waste management and litter cleanups, but also the social and environmental costs associated with single-use plastic pollution, along with the costs of awareness programs to reduce the littering of their products (Baxter et al., 2022; Khan 2015; EU 2019).

EDUCATION RECOMMENDATIONS

The Canada-wide Strategy on Zero Plastic Waste mentions that consumer and public education are activities that would support the Strategy, however, it does not include a detailed plan of what actionable steps will be taken to provide this education to the interested parties (CCME, 2018). According to Kerscher (2019) education and awareness are fundamental to decreasing and impeding the accumulation of litter. Canadian governments can focus on developing anti-littering campaigns while educational systems must focus on adding formal courses (Baxter et al. 2022) that introduce the plastic pollution implications to the environment, to create awareness and encourage behavioural change by future generations at the individual level. The introduction of litter environmental impacts, waste reduction, reuse of materials and active participation in a circular economy, should be immersed in different educational course subjects, including activities from inside and outside the classroom while also incorporating informal educational programs, such as the CEAP program and museum and recycling facilities visits, into the school syllabus (Pettipas et al., 2016). Through theoretical and hands-on experience, youth would then be able to

comprehend the full extent of the issues related to plastic pollution, and what approaches can reduce and prevent it through small daily actions, leading to behavioural changes towards a circular economy. In addition, if Canada expands their extended producer responsibility, the costs related to these educational and awareness efforts would be covered by the producers themselves reducing the governmental expenses.

LIMITATIONS

Environmental cleanups can have several limitations. In the case of the CEAP program, the participants collecting waste were between the ages of 4-18. If the participants saw a type of debris which they did not feel safe collecting, they were advised to not touch it. The debris collected was of visible size and location, hence there is an underestimation of fragmented litter and debris that may have been under sediment. In addition, participants were not able to collect data on plastic types and colours, along with the brand names of items, which could further aid in the source determination of waste. Furthermore, the estimated waste weights and measurement of areas cleaned by participants were not accurate due to the lack of portable scales and recorded area sizing, and several schools did not provide an estimated weight or distance with the data. These components will be added to the recording datasheets for a better analysis of the data collected through the CEAP program in the upcoming years.



CONCLUSION

Due to its abundance, plastic pollution negatively impacts economies, wildlife, and human health.

Identification of items collected through the CEAP program was fundamental to hypothesizing sources of each item and considering more sustainable alternatives to reduce waste. Additionally, through the program, students were inspired to advocate for change within their local community by seeking municipal council and requesting single-use plastics bans. Therefore, as 74% of the total waste collected in the CEAP program was entirely or partially composed of plastic, along with the similarity of the data collected through the two years of the CEAP program, it evidently illustrates that Cigarette Butts, Plastic Pieces, Paper, Food Packaging and other plastic items are highly present as litter in environments across Canada. This information can help inform stakeholders, policymakers, municipal councils, and governmental parties on which items their policies and regulations should target to reduce the amount of plastic litter.

Based on the discussed findings of the CEAP program, it is recommended that Canadian governments use a multifaceted approach to reduce and mitigate plastic waste:

- Enhance public education by adding formal courses on this topic to curriculums;
- Establish product design that focuses on circularity of materials and reusability;
- Regulate the amount and type of packaging materials;
- Add more single-use plastic items to the Single-use Plastics Prohibition;
- Invest in reusable and circular infrastructure in Canadian industries;
- Diffuse programs that transform retailers into waste-free stores;
- Include clear, actionable steps in mitigation and preventions plans;
- Increase litter monitoring and consequences for those who are caught littering;
- Install effective waste disposal bins in public areas combined with stronger waste management, and Provide funds to non-profit organizations and charities that enhance awareness.

With one dump truck of plastic entering the oceans every minute, it is impossible to keep up with removing it from our environment by cleaning it up (Fela, 2018).

Since cleanups are a short-term remedy to this issue, long-term solutions must be developed by the combined effort of federal governments, provincial and territorial governments, municipalities, policymakers, industrial stakeholders, individuals, educational systems, non-profit organizations, and charities. Together, an efficient plan can be developed and implemented on a global scale, producing multinational results.



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REFERENCES

Barboza, L. G., Lopes, C., Oliveira, P., Bessa, F., Otero, V., Henriques, B., Raimundo, J., Caetano, M., Vale, C., & Guilhermino, L. (2020). Microplastics in wild fish from North East Atlantic Ocean and its potential for causing neurotoxic effects, lipid oxidative damage, and human health risks associated with ingestion exposure. Science of The Total Environment, 717, 134625. www.doi.org/10.1016/j.scitotenv.2019.134625.

Baxter, L., Lucas, Z., & Walker, T. R. (2022). Evaluating Canada's single-use plastic mitigation policies via Brand Audit and beach cleanup data to reduce plastic pollution. Marine Pollution Bulletin, 176, 113460. www.doi.org/10.1016/j.marpolbul.2022.113460.

Boletín Oficial del Estado. (2022). Ley 7/2022, de 8 de Abril, de Residuos y Suelos Contaminados Para Una Economía Circular. www.boe.es/buscar/act.php?id=BOE-A-2022-5809&p=20221224&tn=2.

Branch, L. S. (2023, November 30). Consolidated federal laws of Canada, microbeads in toiletries regulations. Microbeads in Toiletries Regulations. www.laws-lois.justice.gc.ca/eng/regulations/SOR-2017-111/page-1.html.

Canadian Council of Ministers of the Environment. (2018, November 23). STRATEGY ON ZERO PLASTIC WASTE. www.ccme.ca/en/res/strategyonzeroplasticwaste.pdf.

Canadian Council of Ministers of the Environment (2021, January 1). Canada-wide Strategy on Zero Plastic Waste. Government of Canada. Retrieved September 24, 2023, from www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/canada-action.html.

City of Vancouver (n.d.). Cigarette Litter Reduction. Retrieved August 12, 2023, from www.vancouver.ca/green-vancouver/cigarette-litter-reduction.aspx.

City Population (n.d.). City Population - Population Statistics in Maps and Charts for Cities, Agglomerations and Administrative Divisions of All Countries of the World. Retrieved August 11, 2023, from www.citypopulation.de/.

Cleanup Australia (2022). Rubbish Report: A Snapshot. Cleanup Australia, Sydney, Australia. Retrieved July 11, 2023, from https://www.cleanup.org.au/rubbish-report.

Driedger, A. G. J., Dürr, H. H., Mitchell, K., & Van Cappellen, P. (2015). Plastic debris in the Laurentian Great Lakes: A Review. Journal of Great Lakes Research, 41(1), 9–19. www.doi.org/10.1016/j.jglr.2014.12.020.

Ellis, S., Kantner, S., Saab, A., & Watson, M. (2005). Plastic Grocery Bags: The Ecological Footprint. Environmental Changes are Spreading Infectious Diseases-UN Study. Victoria, 1-19. www.yumpu.com/en/document/view/35448984/plastic-grocery-bags-the-ecological-footprint-vipirg.

Enactus Canada (2017, June 29). CigBins - Enactus Canada. Retrieved August 12, 2023, from www.enactus.ca/project/cigbins.

Environment and Climate Change Canada (2020). National Waste Characterization Report: The Composition of Canadian Residual Municipal Solid Waste. Canada.ca. Retrieved June 29, 2023, from www.publications.gc.ca/collections/collection_2020/eccc/en14/En14-405-2020-eng.pdf.

Environment and Climate Change Canada (2020, October). Science Assessment Of Plastic Pollution. Canada.ca. Retrieved June 29, 2023, from www.canada.ca/en/environment-climate-change/services/ evaluating-existing-substances/science-assessment-plastic-pollution.html.

Environment and Climate Change Canada (2021, December 9). Ocean Plastics Charter. Canada.ca. Retrieved June 30, 2023, from www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html.

Environment and Climate Change, E. and C. C. (2021, July 12). Government of Canada. Zero plastic waste initiative. www.canada.ca/en/environment-climate-change/services/environmental-funding/programs/zero-plastic-waste-initiative.html.

Environment and Climate Change Canada (2023, April 18). Single-use Plastics Prohibition Regulations: Overview. Canada.ca. Retrieved June 30, 2023, from www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/single-use-plastic-overview.html.

European Union (2019). Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain plastic products on the environment. Official Journal of the European Union, 62. eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2019:155:FULL&from=EN.

Fab Habitat (n.d.). Our Materials: Giving Waste a New Life. Retrieved June 30, 2023, from www.fabhabitat.com/our-materials.

Fela, J. (2018, April 13). Every minute of every day, the equivalent of one truckload of plastic enters the Sea. Greenpeace International. Retrieved June 30, 2023, from www.greenpeace.org/international/story/15882/every-minute-of-every-day-the-equivalent-of-one-truckload-of-plastic-enters-the-sea.

Filho, W. L., Salvia, A. L., Bonoli, A., Saari, U. A., Voronova, V., Klõga, M., Kumbhar, S. S., Olszewski, K., De Quevedo, D. M., & Barbir, J. (2021). An assessment of attitudes towards plastics and bioplastics in Europe. Science of The Total Environment, 755, 142732. www.doi.org/10.1016/j.scitotenv.2020.142732.

Friendlier (n.d.). Who Are We? Retrieved June 30, 2023, from www.friendlier.ca/who-are-we.

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. Science Advances, 3(7), 1–5. www.doi.org/10.1126/sciadv.1700782.

Green Toys eCommerce (n.d.). Green Toys* Our Story. Retrieved June 30, 2023, from www.greentoys.com/pages/our-story.

Greenwell Plastics (n.d.). Poly Lumber Suppliers Ontario Canada. Retrieved August 6, 2023, from www.greenwellplastics.ca.

Hammani, M. B., Mohammed, E. Q., Hashem, A. M., Al-Khafaji, M. A., Alqahtani, F., Alzaabi, S., & Dash, N. (2017). Survey on awareness and attitudes of secondary school students regarding plastic pollution: Implications for environmental education and public health in Sharjah City, UAE. Environmental Science and Pollution Research, 24(25), 20626–20633. www.doi.org/10.1007/s11356-017-9625-x.

Hannah R. Torres, C. J. Reynolds, Anna Lewis, Frank Muller-Karger, Kamal Alsharif & Katie Mastenbrook (2019) Examining youth perceptions and social contexts of litter to improve marine debris environmental education, Environmental Education Research, 25:9, 1400-1415, DOI: 10.1080/13504622.2019.1633274.

Harris, L., Liboiron, M., Charron, L., & Mather, C. (2021). Using citizen science to evaluate extended producer responsibility policy to reduce marine plastic debris shows no reduction in pollution levels. Marine Policy, 123, 104319. www.doi.org/10.1016/j.marpol.2020.104319.

Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: Challenges and opportunities. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1526), 2115–2126. www.doi.org/10.1098/rstb.2008.0311.

Jang, Y. C., Hong, S., Lee, J., Lee, M. J., & Shim, W. J. (2014). Estimation of lost tourism revenue in Geoje Island from the 2011 marine debris pollution event in South Korea. Marine Pollution Bulletin, 81(1), 49–54. www.doi.org/10.1016/j.marpolbul.2014.02.021.

Karami, A., Golieskardi, A., Ho, Y. B., Larat, V., & Salamatinia, B. (2017). Microplastics in eviscerated flesh and excised organs of dried fish. Scientific Reports, 7(1), 1–9. www.doi.org/10.1038/s41598-017-05828-6.

Kerscher, U. (2019). Towards a sustainable future? the EU policies concerning plastics and their didactical potential for primary and secondary teaching. Discourse and Communication for Sustainable Education, 10(1), 47–62. www.doi.org/10.2478/dcse-2019-0005.

Khan, M. (2015). Polluter-pays-principle: The Cardinal Instrument for addressing climate change. Laws, 4(3), 638–653. www.doi.org/10.3390/laws4030638.

Lebreton, L., & Andrady, A. (2019). Future scenarios of Global Plastic Waste Generation and disposal. Palgrave Communications, 5(1). www.doi.org/10.1057/s41599-018-0212-7.

Legislative Services Branch. (2023, November 30). Consolidated federal laws of Canada, single-use plastics prohibition regulations. Single-use Plastics Prohibition Regulations. www.laws-lois.justice.gc.ca/eng/regulations/SOR-2022-138/.

Leslie, H. A., van Velzen, M. J. M., Brandsma, S. H., Vethaak, A. D., Garcia-Vallejo, J. J., & Lamoree, M. H. (2022). Discovery and quantification of plastic particle pollution in human blood. Environment International, 163, 107199.

Linnebjerg, J. F., Baak, J. E., Barry, T., Gavrilo, M. V., Mallory, M. L., Merkel, F. R., Price, C., Strand, J., Walker, T. R., & Provencher, J. F. (2021). Review of Plastic Pollution Policies of Arctic countries in relation to seabirds. FACETS, 6(1), 1–25. www.doi.org/10.1139/facets-2020-0052.

Liu, T., Nafees, A., khan, S., Javed, M. F., Aslam, F., Alabduljabbar, H., Xiong, J.-J., Ijaz Khan, M., & Malik, M. Y. (2022). Comparative study of mechanical properties between irradiated and regular plastic waste as a replacement of cement and fine aggregate for manufacturing of Green Concrete. Ain Shams Engineering Journal, 13(2), 101563. www.doi.org/10.1016/j.asej.2021.08.006.

Lorber, M., Schecter, A., Paepke, O., Shropshire, W., Christensen, K., & Birnbaum, L. (2015). Exposure assessment of adult intake of bisphenol A (BPA) with emphasis on canned food dietary exposures. Environment International, 77, 55–62. www.doi.org/10.1016/j.envint.2015.01.008.

Morley, J., Drake, L., Martin, J., Chidley, S., & Walkley, S. (2023, July 11). Ready to prefill report. City to Sea. www.citytosea.org.uk/ready-to-prefill-report/.

Mukete Beckline, Sun Yujun, Zama Eric, Monono Samuel Kato. (2016). Paper Consumption and Environmental Impact in an Emerging Economy. Journal of Energy, Environmental & Chemical Engineering, 1(1), 13-18. www.researchgate.net/publication/311545958 Paper Consumption and Environmental Impact in an Emerging Economy.

Nash, A. D. (1992). Impacts of marine debris on subsistence fishermen an exploratory study. Marine Pollution Bulletin, 24(3), 150-156. www.doi.org/10.1016/0025-326x(92)90243-y.

Natural Resources Canada (2003). Canada Wood Annual Report 2002-2003. Canadian Forest Service Publications | Natural Resources Canada. Retrieved June 30, 2023, from https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/24922_e.pdf.

Natural Resources Canada (2023, February 24). Aluminum Facts. Government of Canada. Retrieved September 2, 2023, from www.natural-resources.canada.ca/our-natural-resources/minerals-mining/minerals-metals-facts/aluminum-facts/20510#L6.

Ocean Conservancy (2023). Charting a Course to Plastic Free Beaches - Ocean Conservancy. Retrieved June 30, 2023, from www.oceanconservancy.org/trash-free-seas/international-coastal-cleanup/plastic-free-beaches.

Official Journal of the European Union (2019). Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain plastic products on the environment. Cleanup Australia, Sydney, Australia. Retrieved July 11, 2023, from https://eur-lex.europa.eu/eli/dir/2019/904/oj.

Patagonia (n.d.). Recycled Polyester. Retrieved August 4, 2023, from www.patagonia.com/our-footprint/recycled-polyester.html.

PECO (n.d.). Plastic Essence Collaborative. Retrieved August 4, 2023, from www.peco-fab.com/our-process.

Pettipas, S., Bernier, M., & Walker, T. R. (2016). A Canadian policy framework to mitigate plastic marine pollution. Marine Policy, 68, 117–122. www.doi.org/10.1016/j.marpol.2016.02.025.

PLAEX Building Systems Inc (n.d.). Make it simple. Make it sustainable. Make it with PLAEX. Retrieved August 6, 2023, from www.peco-fab.com/our-process.

Preserve (n.d.). Overview. Retrieved August 6, 2023, from www.preserve.eco/pages/overview.

Provencher, J. F., Bond, A. L., & Mallory, M. L. (2015). Marine birds and plastic debris in Canada: A national synthesis and a way forward. Environmental Reviews, 23(1), 1–13. www.doi.org/10.1139/er-2014-0039.

Pulp and Paper Products Council (n.d.). GLOBAL PULP & PAPER. Paper Recycling Association,. Retrieved September 27, 2023, from www.pppc.org/info/index.html.

Raffoul, D. (2021). Informing Solutions through Canadian Cleanups. Mind Your Plastic. Retrieved August 8, 2023, from www.mindyourplastic.ca/wp-content/uploads/2022/07/CEAP-2021-Report.pdf.

Rath JM, Rubenstein RA, Curry LE, Shank SE, Cartwright JC. (2012). Cigarette Litter: Smokers' Attitudes and Behaviors. International Journal of Environmental Research and Public Health. 9(6), 2189-2203. www.doi.org/10.3390/ijerph9062189.

Recover Brands (n.d.). Our Story | Recycled Apparel and Gear | Recover Brands. Retrieved August 5, 2023, from www.recoverbrands.com/pages/our-story.

ReMarkable (n.d.). Home. Retrieved August 5, 2023, from www.remarkable.com/?gclid=Cj0KCQjw6KunBhDxARIsAKFUGs9v40xH4j6ol2cKbNrezuxZ46r2U44cW-fLfzXCbrgBIB653UWNsi8aAgTQEALw wcB.

ShareWares (n.d.). ShareWares | Reusable Cup-Sharing Program for Vancouver. Retrieved August 5, 2023, from www.sharewares.ca.

Statistics Canada (2022, April 27). A Generational Portrait of Canada's Aging Population From the 2021 Census. Government of Canada. Retrieved August 5, 2023, from www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-X/2021003/98-200-X/2021003-eng.cfm.

Stevens, E. S. (2002). Green Plastics: An Introduction to the New Science of Biodegradable Plastics. Princeton University Press. www.doi.org/10.2307/j.ctv10crf29.

Suga (n.d.). Wetsuit Recycling. Retrieved August 2, 2023, from www.sugamats.com/recycling.

TerraCycle. (2021.). UNSMOKE Cigarette Waste Recycling Program. Retrieved from www.terracycle.com/en-CA/brigades/cigarette-waste-en-ca#resources.

TerraCycle (2023). UNSMOKE Cigarette Free Recycling Program. Retrieved August 2, 2023, from www.terracycle.com/en-CA/brigades/cigarette-waste-en-ca.

The Rogerie - Sustainable Design Studio. (n.d.). The Rogerie - Recycled Products. Recover Brands. Retrieved August 5, 2023, from www.therogerie.com.

Torres, H. R., Reynolds, C. J., Lewis, A., Muller-Karger, F., Alsharif, K., & Mastenbrook, K. (2019). Examining youth perceptions and social contexts of litter to improve marine debris environmental education. Environmental Education Research, 25(9), 1400–1415. www.doi.org/10.1080/13504622.2019.1633274.

UNEP (2014). UNEP Year Book 2014: Emerging Issues In Our Global Environment. United Nations Environment Programme. Retrieved August 2, 2023, from wedocs.unep.org/20.500.11822/9240.

UNEP (2014, January 1). "Valuing plastic: The business case for measuring, managing and disclosing plastic use in the consumer goods industry. Knowledge Repository - UNEP. Retrieved September 24, 2023, from www.wedocs.unep.org/20.500.11822/25302.

UNEP (2017). Kenya Announces Breakthrough Ban On Plastic Bags. United Nations Environment Programme. Retrieved August 2, 2023, from www.unep.org/news-and-stories/story/kenya-announces-breakthrough-ban-plastic-bags.

Vandermeer, E. (2022, April 5). Dirty Dozen: Personal Protective Equipment Among Most Commonly Found Items on Canadian Shorelines - WWF.CA. Knowledge Repository - UNEP. Retrieved September 24, 2023, from <u>wwf.ca/stories/dirty-dozen-ppe-canadas-shorelines</u>.

Verghese, K., Jollands, M., & Allan, M. (2008). The litterability of plastic bags: Key design criteria. Global Plastics Environmental Conference 2008: Sustainability and Recycling for a Greener Environment, 1–10. www.researchrepository.rmit.edu.au/esploro/outputs/conferenceProceeding/The-litterability-of-plastic-bags-Key-design-criteria/9921858979901341#files_and_links_(1).

Williams, A. T., & Rangel-Buitrago, N. (2019). Marine Litter: Solutions for a major environmental problem. Journal of Coastal Research, 35(3), 648. www.doi.org/10.2112/jcoastres-d-18-00096.1.

World Health Organization: WHO, E. (2022, May 30). EU Ban on Microplastics Stubs Out Cigarette Butt Pollution. Knowledge Repository - UNEP. Retrieved September 27, 2023, from www.who.int/europe/news/item/30-05-2022-eu-ban-on-microplastics-stubs-out-cigarette-butt-pollution.

Yang, Y., Xie, E., Du, Z., Peng, Z., Han, Z., Li, L., Zhao, R., Qin, Y., Xue, M., Li, F., Hua, K., & Yang, X. (2023). Detection of various microplastics in patients undergoing cardiac surgery. Environmental Science & amp; Technology, 57(30), 10911–10918. www.doi.org/10.1021/acs.est.2c07179.



APPENDIX



TABLE 11: TOTAL AMOUNTS AND PERCENTAGES OF ITEMS FOUND WITHIN EACH CATEGORY.

CATEGORY	TOTAL PERCENTAGE	TOTAL COUNT
Cigarette Butts	19.50%	3,318
Plastic Pieces	18.59%	3,163
Commonly Found Items	18.49%	3,146
Food Packaging	9.77%	1,663
Miscellaneous	6.79%	1,156
Plastic Bags	4.77%	812
Cups	3.97%	675
Styrofoam Pieces	3.21%	547
Bottle	3.07%	522
Lids	2.87%	489
Glass	2.87%	488
Cans	2.86%	486
Face Masks	2.68%	456
Take-Out Containers	0.53%	90
Fishing Gear	0.04%	7
TOTAL	100.00%	17,018



TABLE 12: AMOUNT AND PERCENTAGE OF ALL PLASTIC ITEMS COLLECTED.

ITEM	RECYCLABLE OR GARBAGE	TOTAL PERCENTAGE	TOTAL COUNT
Cigarette Butts	Recyclable	26.34%	3,318
Plastic Pieces Small (0-10 cm)	Recyclable	14.26%	1,797
Food Packaging	Recyclable	13.20%	1,663
Plastic Pieces Medium (10-30 cm)	Recyclable	6.88%	867
Plastic Bottle	Recyclable	4.14%	522
Plastic Pieces Large (>30 cm)	Recyclable	3.64%	459
Cold Drink Cup	Recyclable	3.34%	421
Plastic Bottle Caps	Recyclable	3.06%	385
Disposable Face Mask	Recyclable	2.13%	268
Cold Drink Lids	Recyclable	2.10%	264
Ziplock Bags	Recyclable	1.94%	244
Styrofoam Piece Small (0-10 cm)	Garbage	1.86%	234
Unknown Bag	Garbage	1.79%	225
Hot Drink Lids	Recyclable	1.79%	225
Rope	Recyclable	1.65%	208
Wipes	Garbage	1.58%	199
Styrofoam Piece Large (>30 cm)	Garbage	1.57%	198
Shopping Bags	Recyclable	1.50%	189
Garbage Bags	Recyclable	1.22%	154
Plastic Cutlery	Recyclable	1.03%	130
Styrofoam Piece Medium (10-30 cm)	Garbage	0.90%	114
Таре	Garbage	0.73%	92
Take-Out Containers	Garbage	0.71%	90
Hair Elastics	Recyclable	0.48%	61
Vape	Recyclable	0.40%	50
Plastic Pieces All Sizes	Recyclable	0.32%	40
Feminine Hygiene Products	Garbage	0.25%	31
Bread Tags	Recyclable	0.23%	29
Dog Poop Bag	Garbage	0.20%	25
Lollipop Stick	Garbage	0.15%	19
6-Pack Rings	Recyclable	0.08%	10
Needle	Garbage	0.07%	9
Net-Rope	Recyclable	0.06%	7
Ziptie	Recyclable	0.05%	6
Тоу	Recyclable	0.04%	5
Pen	Recyclable	0.04%	5

TABLE 12: AMOUNT AND PERCENTAGE OF ALL PLASTIC ITEMS COLLECTED. (CONT'D)

ITEM	RECYCLABLE OR GARBAGE	TOTAL PERCENTAGE	TOTAL COUNT
Balloon	Recyclable	0.04%	5
Lighter	Recyclable	0.02%	3
Band-Aid	Garbage	0.02%	3
Vinyl String	Recyclable	0.02%	2
Vape Pod	Recyclable	0.02%	2
Stickers	Garbage	0.02%	2
Shoe	Recyclable	0.02%	2
Marker	Recyclable	0.02%	2
Lip Balm	Recyclable	0.02%	2
Flag	Recyclable	0.02%	2
Calculator	Recyclable	0.02%	2
Tennis Ball	Recyclable	0.01%	1
Styrofoam All Sizes	Garbage	0.01%	1
Shoe Sole	Recyclable	0.01%	1
Hand Sanitizer	Recyclable	0.01%	1
Floss	Garbage	0.01%	1
Diaper	Garbage	0.01%	1
Condom	Garbage	0.01%	1
Ball	Recyclable	0.01%	1
Grand Total		100.00%	12,598
Garbage Total		9.88%	1,245
Recyclable Total		90.12%	11,353



TABLE 13: TOTAL AMOUNTS AND PERCENTAGE OF ALL ITEMS COLLECTED.

ІТЕМ	TOTAL PERCENTAGE	TOTAL COUNT
Cigarette Butts	19.50%	3,318
Plastic Pieces Small (0-10 cm)	10.56%	1,797
Paper	10.43%	1,775
Food Packaging	9.77%	1,663
Plastic Pieces Medium (10-30 cm)	5.09%	867
Plastic Bottle	3.07%	522
Can	2.70%	460
Plastic Pieces Large (>30 cm)	2.70%	459
Cold Drink Cup	2.47%	421
Bottle Caps	2.26%	385
Glass Pieces/Fragments	2.01%	342
Straws	1.81%	308
Disposable Face Mask	1.57%	268
Cold Drink Lids	1.55%	264
Fishing Gear	0.04%	488
Hot Drink Cup	1.49%	254
Ziplock Bags	1.43%	244
Styrofoam Piece Small (0-10 cm)	1.38%	234
Unknown Bag	1.32%	225
Hot Drink Lids	1.32%	225
Aluminum/Tin Foil	1.32%	224
Rope	1.22%	208
Wipes	1.17%	199
Styrofoam Piece Large (>30 cm)	1.16%	198
Shopping Bags	1.11%	189
Reusable Face Mask	1.10%	188
Rubber Pieces	0.93%	159
Garbage Bags	0.90%	154
Rubber Bands	0.88%	150
Glass Bottle	0.86%	146
Plastic Cutlery	0.76%	130
Styrofoam Piece Medium (10-30 cm)	0.67%	114

ІТЕМ	TOTAL PERCENTAGE	TOTAL COUNT
Cardboard	0.64%	109
Таре	0.54%	92
Take-Out Containers	0.53%	90
Hair Elastics	0.36%	61
Can Tab	0.35%	59
Vape	0.29%	50
Plastic Pieces All Sizes	0.24%	40
Pencil	0.22%	37
Steel/Aluminum Bottle Caps	0.21%	35
Feminine Hygiene Products	0.18%	31
Bread Tags	0.17%	29
Clothes	0.15%	26
Dog Poop Bag	0.15%	25
Wood	0.13%	22
Metal	0.12%	21
Lollipop Stick	0.11%	19
Fabric	0.11%	18
Cloth	0.06%	11
Cigarette Packs	0.06%	10
6-Pack Rings	0.06%	10
Tissue/Kleenex	0.05%	9
Needle	0.05%	9
Net-Rope	0.04%	7
Ziptie	0.04%	6
Organic Waste	0.04%	6
Jewelry	0.04%	6
Cigar	0.04%	6
Тоу	0.03%	5
Pen	0.03%	5
Balloon	0.03%	5
Screws	0.02%	4
Screws	0.02%	4

TABLE 13: TOTAL AMOUNTS AND PERCENTAGE OF ALL ITEMS COLLECTED. (CONT'D)

ITEM	TOTAL PERCENTAGE	TOTAL COUNT
Pipe	0.02%	4
Car Part	0.02%	4
Lighter	0.02%	3
Glove	0.02%	3
Band-Aid	0.02%	3
Vinyl String	0.01%	2
Vape Pod	0.01%	2
Tube	0.01%	2
Stickers	0.01%	2
Shoe	0.01%	2
Marker	0.01%	2
Lip Balm	0.01%	2
Flag	0.01%	2
Coat	0.01%	2
Calculator	0.01%	2
Battery	0.01%	2
Tire	0.01%	1
Tennis Ball	0.01%	1
Styrofoam All Sizes	0.01%	1
Spring	0.01%	1
Sock	0.01%	1
Sled	0.01%	1
Shoe Sole	0.01%	1
Shingle	0.01%	1
Saw	0.01%	1
Rug	0.01%	1
Propane Tank	0.01%	1
Popsicle Stick	0.01%	1
Pokemon Card	0.01%	1
Metal Wire	0.01%	1
Hand Sanitizer	0.01%	1
Golf Ball	0.01%	1

ІТЕМ	TOTAL PERCENTAGE	TOTAL COUNT
Glasses	0.01%	1
Floss	0.01%	1
Diaper	0.01%	1
Condom	0.01%	1
Chopsticks	0.01%	1
Brick	0.01%	1
Blanket	0.01%	1
Bike Seat	0.01%	1
Banana Peel	0.01%	1
Ball	0.01%	1
Grand Total	100.00%	17,018



TABLE 14: SINGLE-USE/DISPOSABLE, REUSABLE, AND INAPPLICABLE CLASSIFICATION OF ALL ITEMS COLLECTED ALONG WITH QUANTITIES AND PERCENTAGE.

SINGLE-USE PLASTIC OR OTHER	ТҮРЕ	ITEM	TOTAL COUNT	%
Other	Inapplicable	Banana Peel	1	0.01%
Other	Inapplicable	Chopsticks	1	0.01%
Other	Inapplicable	Cloth	11	0.06%
Other	Inapplicable	Fabric	18	0.11%
Other	Inapplicable	Glass Pieces/Fragments	342	2.01%
Other	Inapplicable	Metal	21	0.12%
Other	Inapplicable	Metal Wire	1	0.01%
Other	Inapplicable	Organic Waste	6	0.04%
Other	Inapplicable	Paper	1,775	10.43%
Other	Inapplicable	Pipe	4	0.02%
Other	Inapplicable	Rubber Pieces	159	0.93%
Other	Inapplicable	Shingle	1	0.01%
Other	Inapplicable	Shoe Sole	1	0.01%
Other	Inapplicable	Spring	1	0.01%
Other	Inapplicable	Tube	2	0.01%
Other	Reusable	Ball	1	0.01%
Other	Reusable	Bike Seat	1	0.01%
Other	Reusable	Blanket	1	0.01%
Other	Reusable	Brick	1	0.01%
Other	Reusable	Calculator	2	0.01%
Other	Reusable	Car Part	4	0.02%
Other	Reusable	Clothes	26	0.15%
Other	Reusable	Coat	2	0.01%
Other	Reusable	Flag	2	0.01%
Other	Reusable	Glass Bottle	146	0.86%
Other	Reusable	Glasses	1	0.01%
Other	Reusable	Glove	3	0.02%
Other	Reusable	Golf Ball	1	0.01%
Other	Reusable	Hair Elastics	61	0.36%
Other	Reusable	Jewelry	6	0.04%
Other	Reusable	Lighter	3	0.02%
Other	Reusable	Net-Rope	7	0.04%
Other	Reusable	Pen	5	0.03%
Other	Reusable	Pencil	37	0.22%
Other	Reusable	Pokemon Card	1	0.01%
Other	Reusable	Propane Tank	1	0.01%
Other	Reusable	Reusable Face Mask	188	1.10%

TABLE 14: SINGLE-USE/DISPOSABLE, REUSABLE, AND INAPPLICABLE CLASSIFICATION OF ALL ITEMS COLLECTED ALONG WITH QUANTITIES AND PERCENTAGE. (CONT'D)

SINGLE-USE PLASTIC OR OTHER	ТҮРЕ	ITEM	TOTAL COUNT	%
Other	Reusable	Rope	208	1.22%
Other	Reusable	Rubber Bands	150	0.88%
Other	Reusable	Rug	1	0.01%
Other	Reusable	Saw	1	0.01%
Other	Reusable	Screws	4	0.02%
Other	Reusable	Shoe	2	0.01%
Other	Reusable	Sled	1	0.01%
Other	Reusable	Sock	1	0.01%
Other	Reusable	Tennis Ball	1	0.01%
Other	Reusable	Tire	1	0.01%
Other	Reusable	Тоу	5	0.03%
Other	Reusable	Vape	50	0.29%
Other	Reusable	Wood	22	0.13%
Other	Single-Use	Unknown Bag	225	1.32%
Single-Use Plastic	Single-Use	6-Pack Rings	10	0.06%
Other	Single-Use	Aluminum/Tin Foil	224	1.32%
Single-Use Plastic	Single-Use	Balloon	5	0.03%
Single-Use Plastic	Single-Use	Band-Aid	3	0.02%
Other	Single-Use	Battery	2	0.01%
Single-Use Plastic	Single-Use	Plastic Bottle Caps	385	2.26%
Single-Use Plastic	Single-Use	Bread Tags	29	0.17%
Other	Single-Use	Can	460	2.70%
Other	Single-Use	Can Tab	59	0.35%
Other	Single-Use	Cardboard	109	0.64%
Other	Single-Use	Cigar	6	0.04%
Single-Use Plastic	Single-Use	Cigarette Butts	3,318	19.50%
Other	Single-Use	Cigarette Packs	10	0.06%
Single-Use Plastic	Single-Use	Cold Drink Cup	421	2.47%
Single-Use Plastic	Single-Use	Cold Drink Lids	264	1.55%
Single-Use Plastic	Single-Use	Condom	1	0.01%
Single-Use Plastic	Single-Use	Diaper	1	0.01%
Single-Use Plastic	Single-Use	Disposable Face Mask	268	1.57%
Single-Use Plastic	Single-Use	Dog Poop Bag	25	0.15%
Single-Use Plastic	Single-Use	Feminine Hygiene Products	31	0.18%
Single-Use Plastic	Single-Use	Floss	1	0.01%
Other	Single-Use	Food Packaging	1,663	9.77%
Single-Use Plastic	Single-Use	Garbage Bags	154	0.90%

TABLE 14: SINGLE-USE/DISPOSABLE, REUSABLE, AND INAPPLICABLE CLASSIFICATION OF ALL ITEMS COLLECTED ALONG WITH QUANTITIES AND PERCENTAGE. (CONT'D)

SINGLE-USE PLASTIC OR OTHER	ТҮРЕ	ITEM	TOTAL COUNT	%
Single-Use Plastic	Single-Use	Hand Sanitizer	1	0.01%
Other	Single-Use	Hot Drink Cup	254	1.49%
Single-Use Plastic	Single-Use	Hot Drink Lids	225	1.32%
Single-Use Plastic	Single-Use	Lip Balm	2	0.01%
Single-Use Plastic	Single-Use	Lollipop Stick	19	0.11%
Other	Single-Use	Marker	2	0.01%
Single-Use Plastic	Single-Use	Needle	9	0.05%
Single-Use Plastic	Single-Use	Plastic Bottle	522	3.07%
Single-Use Plastic	Single-Use	Plastic Cutlery	130	0.76%
Other	Single-Use	Plastic Pieces All Sizes	40	0.24%
Other	Single-Use	Plastic Pieces Large (>30 cm)	459	2.70%
Other	Single-Use	Plastic Pieces Medium (10-30 cm)	867	5.09%
Other	Single-Use	Plastic Pieces Small (0-10 cm)	1,797	10.56%
Other	Single-Use	Popsicle Stick	1	0.01%
Single-Use Plastic	Single-Use	Shopping Bags	189	1.11%
Other	Single-Use	Steel/Aluminum Bottle Caps	35	0.21%
Single-Use Plastic	Single-Use	Stickers	2	0.01%
Other	Single-Use	Straws	308	1.81%
Single-Use Plastic	Single-Use	Styrofoam All Sizes	1	0.01%
Single-Use Plastic	Single-Use	Styrofoam Piece Large (>30 cm)	198	1.16%
Single-Use Plastic	Single-Use	Styrofoam Piece Medium (10-30 cm)	114	0.67%
Single-Use Plastic	Single-Use	Styrofoam Piece Small (0-10 cm)	234	1.38%
Single-Use Plastic	Single-Use	Take-Out Containers	90	0.53%
Single-Use Plastic	Single-Use	Таре	92	0.54%
Other	Single-Use	Tissue/Kleenex	9	0.05%
Single-Use Plastic	Single-Use	Vape Pod	2	0.01%
Other	Single-Use	Vinyl String	2	0.01%
Other	Single-Use	Wipes	199	1.17%
Single-Use Plastic	Single-Use	Ziplock Bags	244	1.43%
Single-Use Plastic	Single-Use	Ziptie	6	0.04%
		Single-use Total	13,727	80.6%
		Reusable Total	947	5.56%
		Inapplicable Total	2,344	13.7%
		GRAND TOTAL	17,018	

	CATEGORY															
LOCATION TYPE	PLASTIC BOTTLE	CANS	CIGARETTE BUTTS	COMMONLY FOUND ITEMS	CUPS	FACE- MASKS	FISHING GEAR	FOOD PACKAGING	GLASS	LIDS	MISCELLANEOUS	PLASTIC BAGS	PLASTIC PIECES	STYROFOAM PIECES	TAKE-OUT CONTAINERS	GRAND TOTAL
Neighbourhood	45	70	766	426	33	24		183	64	18	185	54	546	76	5	2,495
Park	74	42	713	499	93	51		379	44	46	118	141	236	123	10	2,569
School Property	344	284	1,236	2,030	530	375	4	1,084	342	410	669	572	1,677	306	73	9,936
Shoreline	59	90	603	192	19	6	3	17	38	15	183	45	704	42	2	2,018
Grand Total	522	486	3,318	3,147	675	456	7	1,663	488	489	1,155	812	3,163	547	90	17,018

TABLE 15: AMOUNT OF ITEMS WITHIN EACH WASTE CATEGORY ACROSS THE DIFFERENT LOCATION TYPES.

TABLE 16: AMOUNT OF ITEMS WITHIN EACH WASTE CATEGORY ACROSS THE DIFFERENT CANADIAN PROVINCES.

SUM OF QUANTITY	CATEGORY															
LOCATION TYPE	PLASTIC BOTTLE	CANS	CIGARETTE BUTTS	COMMONLY FOUND ITEMS	CUPS	FACE MASKS	FISHING GEAR	FOOD PACKAGING	GLASS	LIDS	MISCELLANEOUS	PLASTIC BAGS	PLASTIC PIECES	STYROFOAM PIECES	TAKE-OUT CONTAINERS	GRAND TOTAL
Alberta	55	37	45	488	226	230		102	48	215	273	110	342	182	33	2,386
British Columbia	19	27	106	278	21	30		51	12	20	40	38	69	64	5	780
Manitoba	77	50	360	365	36	36	4	232	17	32	72	104	47	48	20	1,500
New Brunswick	12	63	3	96	12	3		14	8	10	24	15	12	16	2	290
Newfoundland	47	31	1	42	10	10		5	25	9	157	10	268	24	1	640
Nova Scotia	17	10	1	76	9	12	З	151	71	8	7	63	70	10	2	510
Ontario	144	101	1,149	803	197	66		613	113	114	278	300	1,302	93	12	5,285
Prince Edward Island	46	22	485	104	76	14		64	105	42	37	18	123	7	2	1,145
Quebec	37	53	225	149	17	13		78	11	17	25	43	98	13	5	784
Saskatchewan	68	92	943	746	71	42		353	78	22	242	111	832	90	8	3,698
Grand Total	522	486	3,318	3,147	675	456	7	1,663	488	489	1,155	812	3,163	547	90	17,018

TABLE 17: PERCENTAGE AND AMOUNTS OF ALL THE MISCELLANEOUS ITEMS COLLECTED.

ITEM	TOTAL PERCENTAGE	TOTAL COUNT
Aluminum/Tin Foil	19.38%	224
Rope	17.99%	208
Rubber Pieces	13.75%	159
Cardboard	9.43%	109
Таре	7.96%	92
Vape	4.33%	50
Pencil	3.20%	37
Clothes	2.25%	26
Dog Poop Bag	2.16%	25
Wood	1.90%	22
Metal	1.82%	21
Lollipop Stick	1.64%	19
Fabric	1.56%	18
Cloth	0.95%	11
Cigarette Packs	0.87%	10
Tissue/Kleenex	0.78%	9
Needle	0.78%	9
Ziptie	0.52%	6
Organic Waste	0.52%	6
Jewelry	0.52%	6
Cigar	0.52%	6
Тоу	0.43%	5
Pen	0.43%	5
Balloon	0.43%	5
Screws	0.35%	4
Pipe	0.35%	4
Car Part	0.35%	4
Lighter	0.26%	3
Glove	0.26%	3
Band-Aid	0.26%	3
Vinyl String	0.17%	2
Vape Pod	0.17%	2
Tube	0.17%	2
Stickers	0.17%	2

ITEM	TOTAL PERCENTAGE	TOTAL COUNT
Shoe	0.17%	2
Marker	0.17%	2
Lip Balm	0.17%	2
Flag	0.17%	2
Coat	0.17%	2
Calculator	0.17%	2
Battery	0.17%	2
Tire	0.09%	1
Tennis Ball	0.09%	1
Spring	0.09%	1
Sock	0.09%	1
Sled	0.09%	1
Shoe Sole	0.09%	1
Shingle	0.09%	1
Saw	0.09%	1
Rug	0.09%	1
Propane Tank	0.09%	1
Popsicle Stick	0.09%	1
Pokemon Card	0.09%	1
Metal Wire	0.09%	1
Hand Sanitizer	0.09%	1
Golf Ball	0.09%	1
Glasses	0.09%	1
Floss	0.09%	1
Diaper	0.09%	1
Condom	0.09%	1
Chopsticks	0.09%	1
Brick	0.09%	1
Blanket	0.09%	1
Bike Seat	0.09%	1
Banana Peel	0.09%	1
Ball	0.09%	1
Grand Total	100.00%	1156

