Final Report
Virginia Marine Debris Reduction Plan Refinement

Submitted to the Virginia Coastal Zone Management Program by
Katie Register, Executive Director, Clean Virginia Waterways of Longwood University

Contributors to this report:
Katie Register, Executive Director, Clean Virginia Waterways of Longwood University.
Virginia Witmer, Outreach Coordinator, Virginia Coastal Zone Management Program
Christina Trapani, Christina Trapani Consultant
Kathy O'Hara, Marine Debris Researcher Consultant

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Virginia Coastal Zone MANAGEMENT PROGRAM

NOAA

CLEAN VIRGINIA WATERWAYS
Of Longwood University

The Virginia Coastal Zone Management Program is a network of state agencies and coastal localities.
The Virginia Department of Environmental Quality serves as the lead agency for the network.

DEQ Virginia Department of Environmental Quality

PROJECT SUMMARY

This task supported the Virginia Coastal Zone Management (CZM) Program's commitment to provide leadership in reducing the amount of trash and marine debris from land-based and water-based sources in Virginia and the Mid-Atlantic region. This grant from the VA CZM Program to Clean Virginia Waterways (CVW) of Longwood University supported various projects that furthered the implementation of the Virginia Marine Debris Reduction Plan (funded under FY11 Task 95.03).

The work on this grant was accomplished by CVW in close collaboration with the staff of the Virginia CZM Program, and stakeholders in Virginia as well as other mid-Atlantic states.

About the Virginia Marine Debris Reduction Plan

The Virginia Marine Debris Reduction Plan serves as a roadmap for nonprofit organizations, local governments, state agencies, regional partners, researchers, and industry as they work together on sustained approaches to reducing the flow of plastic trash and other trash items into our coastal waters.

The Virginia Marine Debris Reduction Plan utilizes multiple approaches. Solutions to marine debris will come from a combination of:

- Behavior change campaigns;
- Policies and enforcement;
- Increased responsibilities of producers, manufacturers and distributors;
- Informed consumers;
- Acceptable and readily available substitutes (e.g., fabric shopping bags);
- Increased infrastructure to capture materials at sources and increase "ease" in doing the right thing with waste items

Funding for this grant:

This grant was originally funded at $60,000. Then $2,400 was removed from this grant by the VA CZM Program and added to a grant to Wetland Watch. So total funding for this grant was $57,600.

Product #1

Marine Debris Reduction in Virginia and the Mid-Atlantic

During this grant period, progress was made on implementing many aspects of the Virginia Marine Debris Reduction Plan through work described below. Under direction of the Virginia CZM Program, Clean Virginia Waterways (CVW) fostered collaboration between agencies, local governments, researchers, manufacturers and businesses, non-profits and citizens.

Engaging the stormwater management community on land-based sources of marine debris

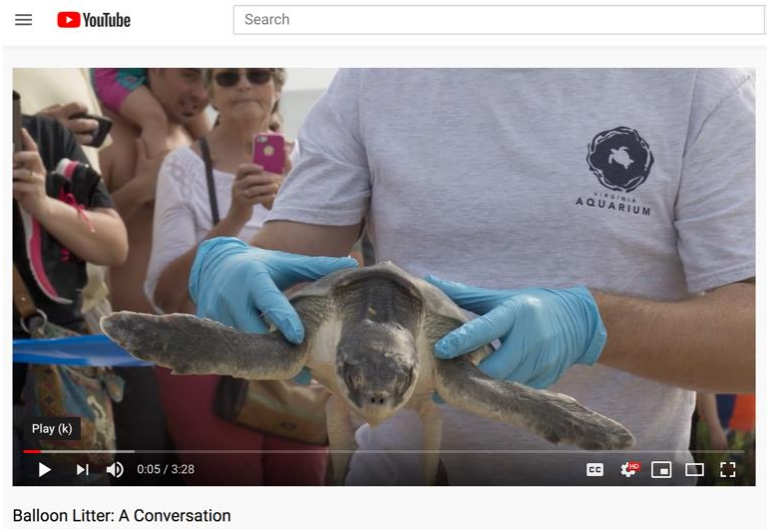
After consulting with stormwater managers in Virginia about their litter-related concerns, CVW and CZM organized a "Stormwater + Litter Workshop" (June 13, 2018 in Richmond, VA). The workshop provided a forum for sharing litter monitoring protocols, solutions to intercepting land-based debris items, and preventing litter from entering storm drains. Stormwater managers discussed challenges and solutions to land-based sources of marine debris during workshop. The workshop featured presentations from NOAA's Marine Debris Program, VA CZM Program, CVW, VA Dept of Environmental Quality and others, and provided a forum for sharing litter monitoring protocols, solutions to intercepting land-based debris items, and preventing litter from entering storm drains.

As a result of the workshop, two high-population counties--Fairfax and Prince William--developed on-going work groups to address plastic pollution and litter in stormwater. These work groups, made up of government staff and NGOs, focus on local solutions to land-based sources of marine debris. CVW consulted with the Fairfax County task force about writing a marine debris reduction plan, and obtaining local authority to create a policy that will result in a decline in the distribution of single-use plastic bags. CVW staff contributed to these work groups by offering guidance as they developed action plans, built partnerships, and sought funding to support local litter monitoring and litter prevention projects.

Raising awareness
Resources, data, and information about the VMDRP, Joyful Send-off Community-Based Social Marketing campaign, balloon monitoring and mid-Atlantic regional planning on marine debris prevention were shared with attendees of the Trash Summit (Washington, D.C., November 2017), 6th International Marine Debris Conference (San Diego, March 2018), CZM Partners Workshop (January 2018), and the Virginia Green Tourism Conference (VA Beach, March 2018) as well as through web sites (CZM & CVW), Facebook and other social media platforms.

Balloon Litter Prevention
VA CZM Program & CVW created a new hub for balloon litter to support various balloon-litter prevention efforts: www.PreventBalloonLitter.org and also wrote & produced two videos that focus on the harm that balloon litter can cause to wildlife.

VA Dept. of Environmental Quality and CVW issued a joint press release to 1700 media outlets highlighting the balloon litter monitoring report (submitted to CZM from CVW as a deliverable for the FY 16 grant), the two videos, and the unique research that led to the Joyful Send-off Community-Based Social Marketing campaign. The press release generated media coverage on NPR, CBS, an AP story that was widely re-printed, and a video by ATTN: Media that has been viewed more than 2 million times. BirdWatching Magazine also published an article in its on-line publication that generated more interest than any other article according to its editor.



VA CZM Program staff, working with CVW and a professional media company, created two videos that address the sources, impacts, and solutions to balloon-related litter.

Chesapeake Bay Magazine published an extensive story by Wendy Mitman Clarke about balloon litter in the Chesapeake Bay, highlighting the efforts of CZM, CVW and its partners: *What Goes Up…Clean Water Activists say the party's over for balloons.*
https://www.chesapeakebaymagazine.com/features/2019/4/9/what-goes-up

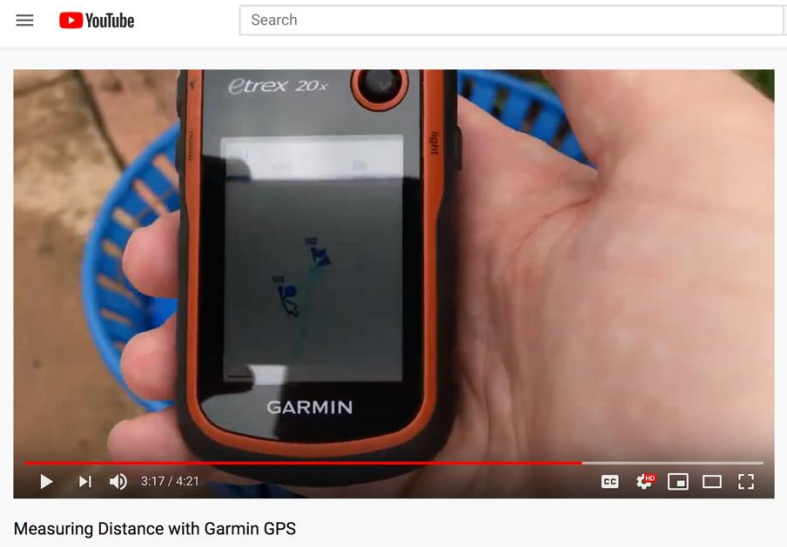
> *"There is documentation of several species of birds and sea turtles impacted by balloon litter in Virginia through ingestion (balloons look like food items) and entanglement in the ribbons attached to balloons," says Laura McKay, Program Manager of the Virginia Coastal Zone Management Program (CZM). "We are proud that Virginia has provided leadership on preventing balloon litter. The Virginia CZM Program, Clean Virginia Waterways and our partners are excited to be working with other mid-Atlantic states to further change people's behavior when it comes to balloons."*

Regional Solutions to Marine Debris: The Mid-Atlantic Marine Debris Work Group

CVW staff were engaged in monthly discussions of the Mid-Atlantic Regional Planning Body marine debris work group as well as smaller task groups working on development of regional approaches to prevent or remove marine debris. Because of Virginia's earlier work in creating a marine debris reduction plan and creating a CBSM campaign to address balloon litter, CVW and VA CZM Program staff often provided guidance and background information to the Mid-Atlantic RPB marine debris work group.

VA CZM Program and CVW contributed to the **expansion of the *Joyful Send-off* CBSM campaign in Mid-Atlantic states** as it assisted MARCO with many aspects of its new grant from NOAA Marine Debris Program including development of surveys, analysis of input, creation of new fact sheets, and overall grant work. This grant supported master coaching with Dr. Doug McKenzie-Mohr, the premier expert on Community-Based Social Marketing.

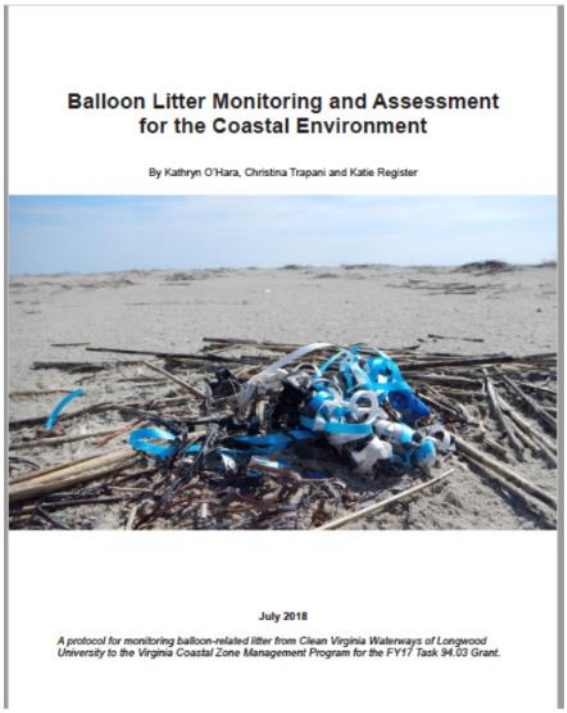
CVW also created an instructional video for Mid-Atlantic partners on how to use the GPS units that were provided to them through a previous VA CZM Program grant.



Balloon Litter Monitoring and Assessment for the Coastal Environment: A Protocol

CVW produced and delivered to the VA CZM Program this 25-page protocol. Originally a deliverable anticipated for the FY18 grant, CVW completed it early in order to have it available for use in the Mid-Atlantic states as grant partners monitor balloon litter on their beaches.

The protocol can be downloaded from the CVW Publications page:
http://www.longwood.edu/cleanva/publications.html



This protocol will allow groups to monitor balloon litter in coastal environments and create comparable data.

Product #2

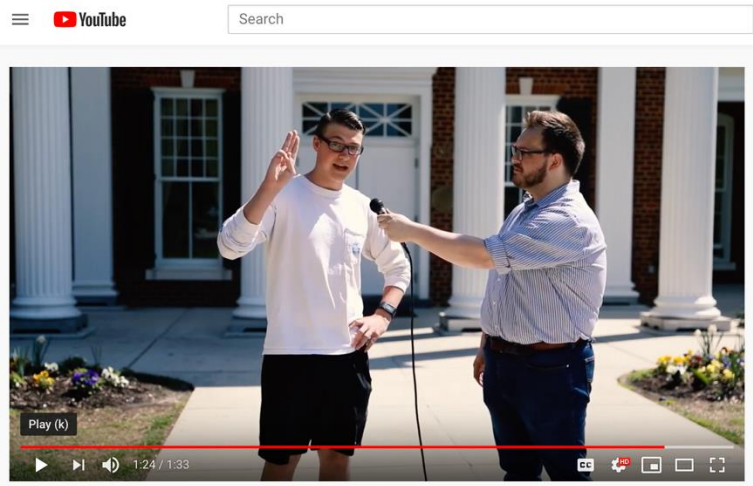
Balloon Release Reduction Campaign: outreach to venues and universities

CVW staff compiled a list of public universities in Virginia, Maryland, Delaware, New Jersey & New York, and identified key decision makers (sustainability offices, facilities management offices, faculty members, or an environmentally-focused student group) at each. Student policy handbooks at 13 VA universities were examined for pre-existing balloon/sky lantern release policies – only Longwood University had a policy in place. Key contacts for 11 VA universities were contacted requesting that their universities pursue an educational campaign about balloons as litter, and consider adding balloons and sky-lanterns to their anti-litter policy in order to decrease the intentional release of balloons on their campuses. Previous CBSM research shows that universities are considered midstream target audiences and are key components to reaching people who might be planning a balloon release.

The University of Virginia took many steps to minimize balloons at graduation. Steps included a student pledge, a social media campaign, articles in newsletters and the student newspaper, and messages from the president to all graduates and parents. These actions resulted in media coverage (TV news and newspaper articles) and an apparent decrease in balloons at graduation. The University cited the harm that balloon litter causes in the environment as well as how balloons slow down the security check-in process prior to the graduation ceremony. The College of William and Mary also started discussions on reducing litter from balloon releases.

Through this grant, CVW created closer ties with the other Association for the Advancement of Sustainability in Higher Education (AASHE) members in Virginia, and shared with them the videos that were produced by CZM and CVW that highlight the impacts and alternatives to balloon releases.

Students at Longwood University interviewed students on campus about balloon releases, and made a video that was shared with other universities.



Balloon Awareness at Longwood University

VA State Park staff informed CVW that brochures for all parks will eventually carry the “no balloon release or sky lantern” language.

Product #3

Balloon Debris Monitoring

Researchers Christina Trapani and Kathy O'Hara (sub-contracted by CVW to conduct monitoring of balloon litter on barrier islands) and others continued to monitor False Cape, Smith Island, Cedar Island, and Fisherman Island to better understand the abundance, distribution, accumulation and fate of balloon litter in coastal environments of Virginia.

An extensive report by Christina Trapani, Kathy O'Hara and Katie Register entitled *"Balloon Litter on Virginia's Remote Beaches***;** *Results of Monitoring from 2013 through 2017,"* was submitted to the Virginia Coastal Zone Management Program in August 2018 as a deliverable of FY16 grant.

The 2018 report can be downloaded from: https://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/MarineDebris/MarineDebris-Balloons.aspx and also from: www.longwood.edu/cleanva/publications.html

This grant supported an additional year of monitoring (February 2018—March 2019), so to supplement the August 2018 report, CVW is submitting a companion report attached to this report.

Some highlights from this year of monitoring:

From February 2018 through March 2019, 11 balloon-related litter surveys were conducted on Fisherman Island (N=6), False Cape State Park (N=3), Smith Island (N=1), and Hog Island (N=1). The total number of balloon-related litter items from these 11 surveys was 1,907 pieces. This included 823 balloons (latex and foil), 957 plastic ribbons, and 127 other plastic items such as disks, pieces of tape, and clips used to tie-off balloons and attach plastic ribbons. No weather balloons or sky lanterns were recorded during this study period.

Product #4

Derelict & Used Clam Netting

Clam net disposal: Given the high costs of sending used clam netting to landfills, CVW worked to determine if there are lower-cost disposal or recycling options for used clam nets. CVW collected derelict clam netting and sent it to the R&D department of Terracycle which determined that plastic recycled from netting could be good for application in other outdoor products made from polypropylene, especially if the industry would switch to white nets as light-colored recycled plastic has more end-uses than dark plastics.

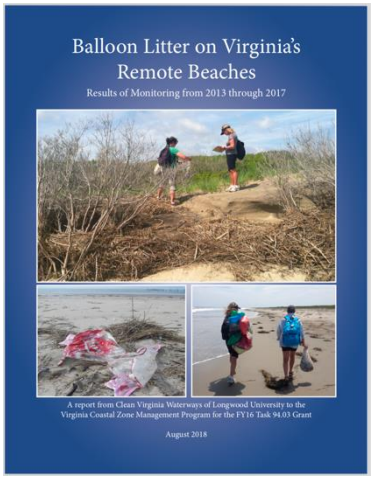
Derelict clam netting on VA's beaches: Discussions between CZM, CVW, clam farmers and other stakeholders led to a system where clam aquaculture businesses promptly collect clam nets that become loose after ice storms and similar events. Removing derelict netting demonstrates the industry's commitment to being good stewards and wanting to maintain good relations with neighbors.

Balloon-Litter Monitoring

Feb 2018-March 2019

This report contains data collected during a year of monitoring (February 2018—March 2019), and is a supplement to the August 2018 report, *"Balloon Litter on Virginia's Remote Beaches*; *Results of Monitoring from 2013 through 2017,"* by Christina Trapani, Kathy O'Hara and Katie Register

The 2018 report can be downloaded from: https://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/MarineDebris/MarineDebris-Balloons.aspx and also from: www.longwood.edu/cleanva/publications.html



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Detailed findings on these balloon-related litter items are organized in this report as follows:

Density of Balloon Litter Among Study Sites
Abundance
Types, Amounts and Condition of Balloons
Plastic Ribbons and Other Balloon Attachments
Balloon Shapes and Characters
Event and Greeting Messages
Business, Organization and Other Names and Logos
Personal Notes and Messages
Shoreline Location of Balloon Litter
Seasonality of Event and Greeting Balloons
Comparison of Balloons vs. Other Types of Debris

Density of Balloon Litter Among Study Sites

In order to standardize monitoring and assessment of balloon-related litter, CVW developed and began using a new protocol entitled *Balloon Litter Monitoring and Assessment for the Coastal Environment* (O'Hara, Trapani and Register 2018). These protocols will enhance the ability to determine where balloon litter is most prevalent in specific coastal areas and provide a basis for monitoring and assessment of balloon litter on a regional, national or international level. Per the protocol, surveys are conducted along a premeasured one mile of coastline at each site four times per year—fall, summer, spring and fall when feasible.

The standardized balloon monitoring methodology was implemented for the first time at Fisherman Island and False Cape State Park in fall 2018. A subsequent survey was conducted at these sites in winter 2019. Preliminary comparisons show the amount of balloon-related debris in fall to be two times greater on Fisherman Island as compared to False Cape State Park (Figure 1). In winter, the amount of balloon-related debris was nearly six times greater at Fisherman Island as compared to False Cape State Park.

Location	# of Surveys	Total Miles Surveyed	Number of Pieces of Balloon-Related Litter per Mile
Fisherman Island Fall 2018	2	1	279
Fisherman Island Winter 2019	2	1	441
False Cape State Park Fall 2018	1	1	126
False Cape State Park Winter 2019	1	1	73

Figure 1. Number of pieces of balloon-related litter per mile of beach using standardized balloon monitoring protocol.

Abundance of Balloon Litter

Since survey frequency varied among all samples during this study period, comparison of relative abundance was used to determine variations in types and quantities of balloon-related litter. These comparisons show latex balloons were the most commonly recorded balloon type for most surveys (Figure 2). An exception was the survey conducted on Smith Island where foil balloons were more prevalent. The finding of greater numbers of foil as compared to latex balloons on Smith Island is consistent with survey findings in previous years. More foil balloons than latex were also found in May 2018 at False Cape State Park.

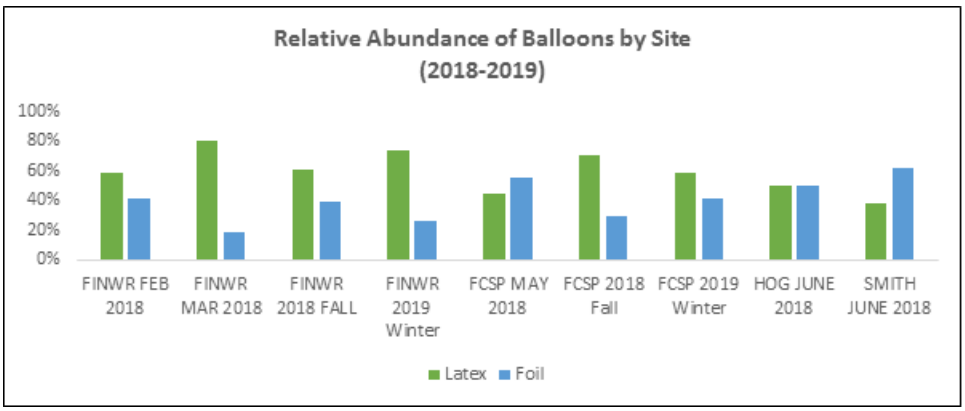

Figure 2. Comparison of balloon types by study site.

Comparison of the actual number of balloons versus plastic ribbons per site shows plastic ribbons were most abundant on Fisherman Island, particularly in winter 2019, and False Cape State Park as compared to the other sites (Figure 3). This finding is consistent with previous years' findings.

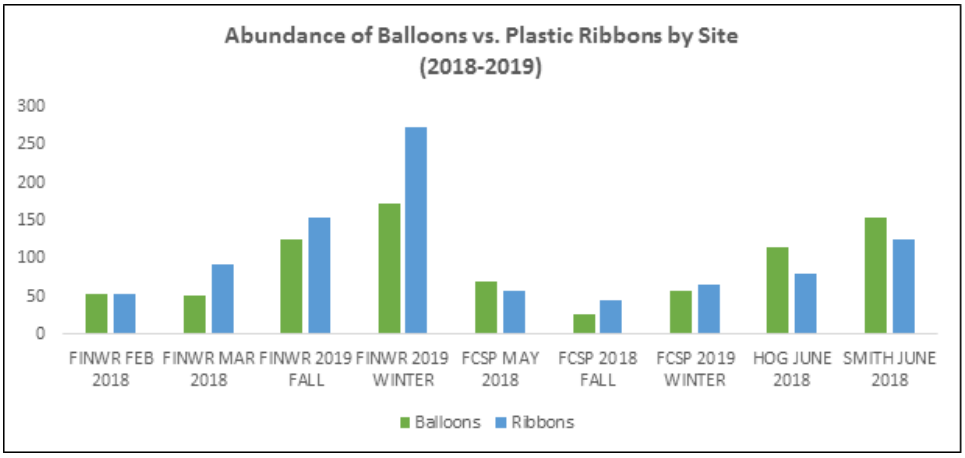

Figure 3. Comparison of balloons vs. plastic ribbons by study site.

Types and Amounts of Balloons

For each balloon litter item recorded, specific information was obtained on the type (latex, foil, weather balloon) and quantity. Latex balloons were our most common finding, accounting for 58% (N=475) of all balloons (Figure 4). Foil balloons comprised 42% (N=348) of the remaining balloons. Findings from the previous five-year study were similar with latex balloons (56%) being more abundant than foil (43%). No weather balloons or sky lanterns were found during this reporting period.

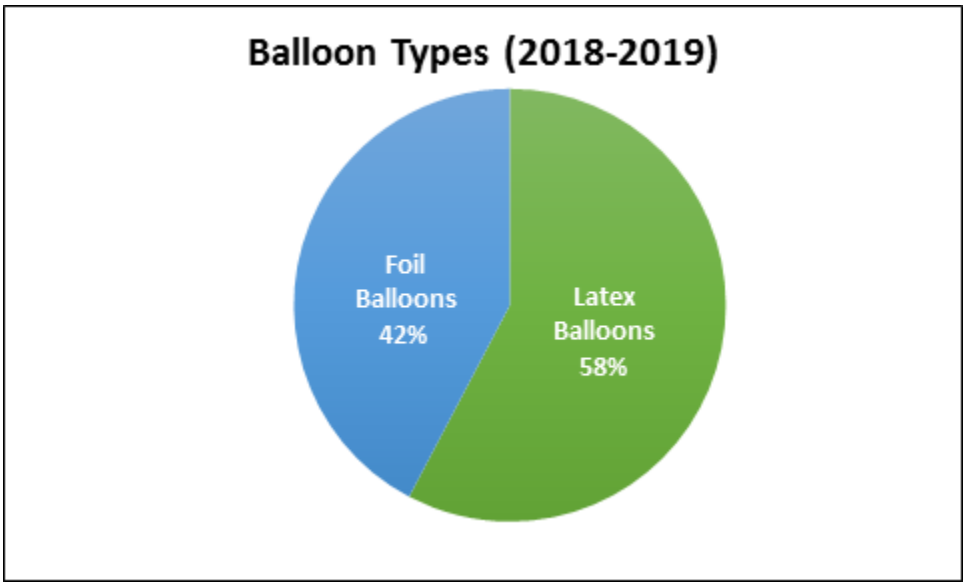

Figure 4. Comparison of types of balloons recorded indicates that latex balloons are the most common type of balloon in the study area.

Condition of Latex and Foil Balloons

Descriptive data were recorded for every balloon as to whether it was burst, deflated, a nub, a piece, or the condition was unknown. Of all latex balloons for which condition code could be determined, most (55%) were in a burst condition (Figure 6). Most foil balloons were deflated (58%) (Figure 5). Overall, burst latex and deflated foil are the most common forms of balloons on Virginia's beaches (Figure 6). These balloons may also pose the greatest threat to wildlife. As previously reported in this study, burst latex balloons may resemble prey items (such as squid and jellyfish) for sea turtles and other wildlife. Deflated foil balloons, especially those that have lost their metal coating, may also resemble prey items such as jellyfish. Therefore, wildlife may have the greatest potential to become entangled and/or ingest these types of balloons.

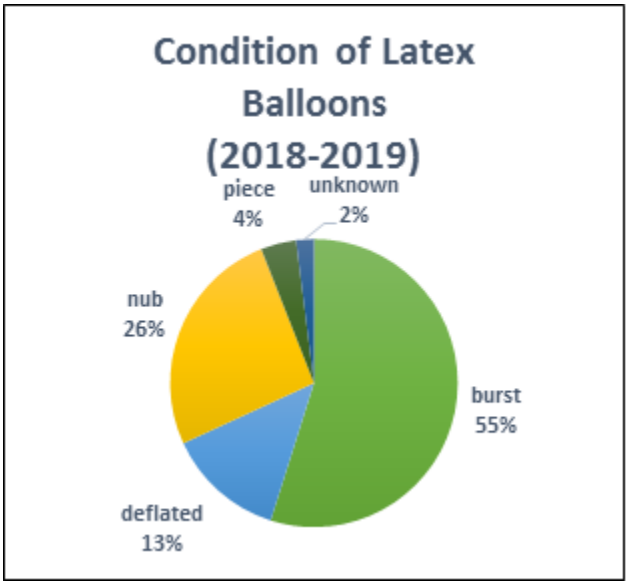

Figure 5. The majority (55%) of latex balloons recorded were burst, compared to 13% that were deflated.

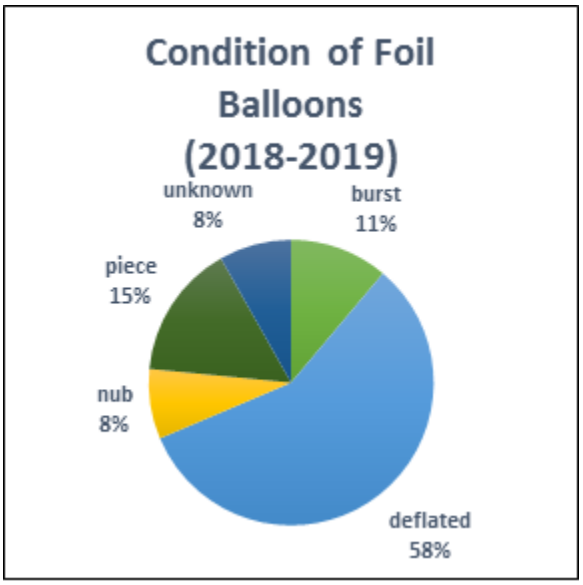

Figure 6. The majority (58%) of foil balloons were deflated, compared to 11% that were burst.

Plastic Ribbons and Other Balloon Attachments

At least 957 plastic ribbons were collected during this study period. This count is a conservative since multiple plastic ribbons entangled in a bunch could not be accurately counted in the field. In these cases, ribbon bunches were recorded as one unless distinct colors were noted. For example, a bunch of white plastic ribbons were counted as a single plastic ribbon but if three distinct colors were noted, the bunch was counted as three ribbons. Therefore, while our plastic ribbon count was large, it is also an underestimate of true amounts.

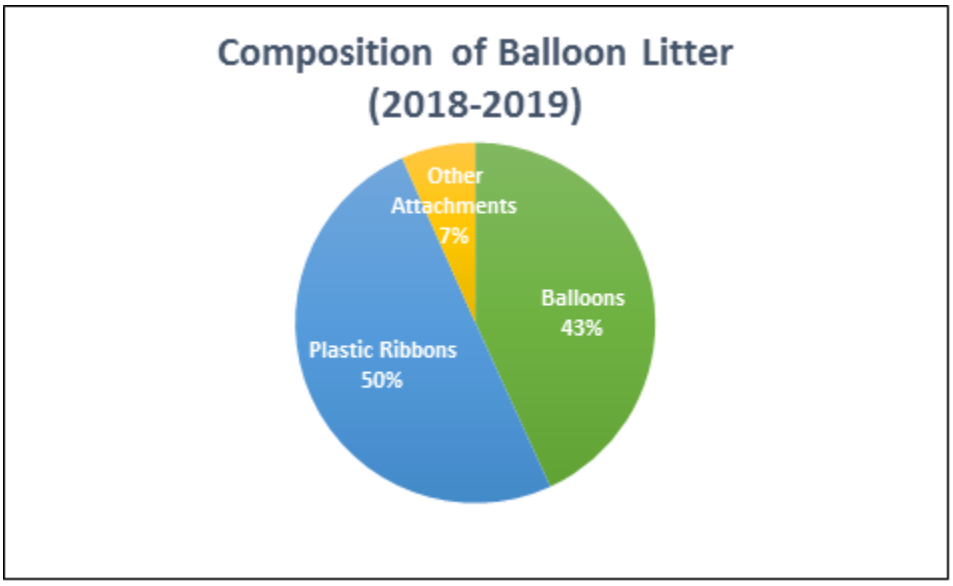

Figure 7. Plastic ribbons were the most abundant balloon-related litter item accounting for 50%.

Most plastic ribbons found during this study were attached to balloons (54%) (Figure 10). The remaining 46% had become detached from balloons and were categorized as plastic "ribbon-only."

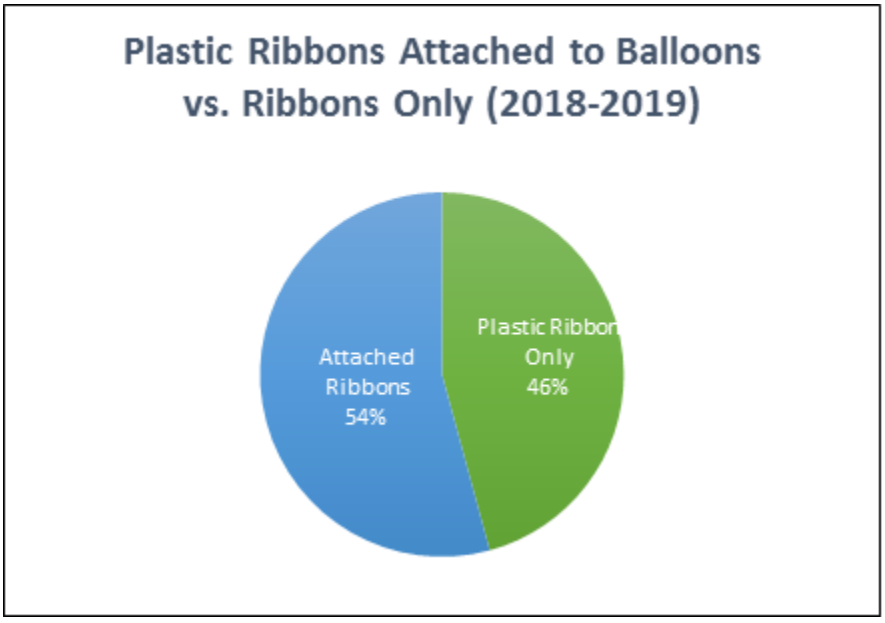

Figure 8. 54% of all plastic ribbons were attached to balloons.

Comparisons of balloon types with plastic ribbons show most latex balloons had plastic ribbons attached (81%) (Figure 9). In contrast, most foil balloons were found without attached plastic ribbons (Figure 10). This is consistent with previous years' findings and may be attributed to the fact that plastic ribbons are tied to latex balloons whereas they are usually taped or glued to foil and are therefore more likely to fall off when exposed to the environment.

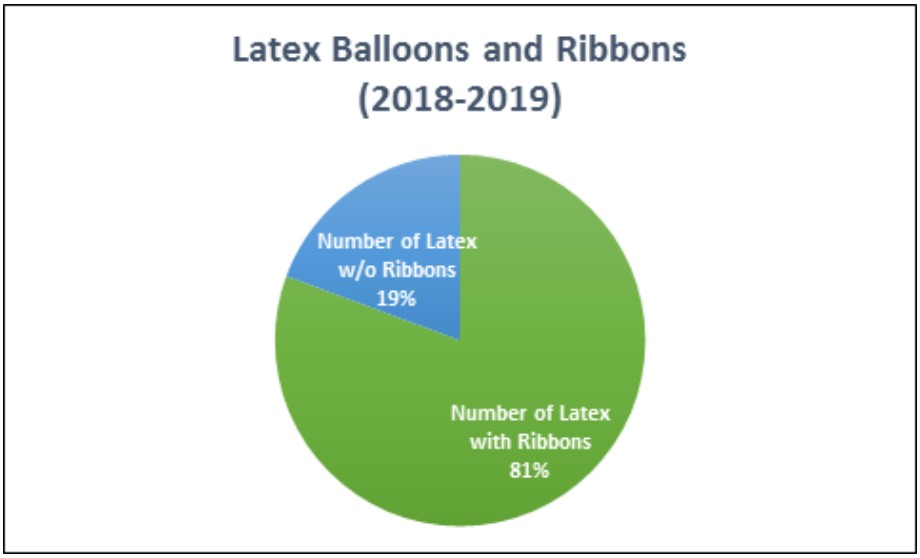

Figure 9. Most of latex balloons (81%) had plastic ribbons attached.

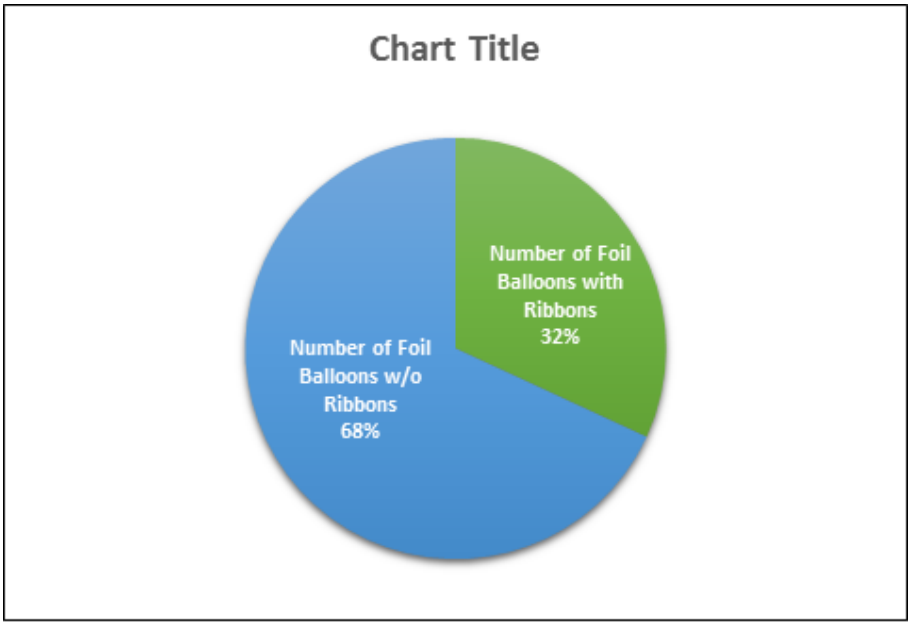

Figure 10. Most of all foil balloons (68%) did not have plastic ribbons attached.

Other Attachments

In addition to plastic ribbons, 127 other balloon-related litter items were recorded. These included plastic discs (N=67), clips (N=23) and pieces of tape (N=27) used to seal balloons or attach plastic ribbons. More unusual items found attached to balloons and plastic ribbons were hairbands and a ring. The most unusual find was a burst foil balloon found on Smith Island with two pens attached to 10 ribbons. The pens were inscribed with the name and logo of Jane's Cottage of Abington, Pennsylvania. The owners of this establishment were contacted and stated that they were not aware of the release of these balloons.

Balloon Shapes and Characters

Of the 348 foil balloons recorded, 171 were noted for their unique shape ranging from angles and a snowman, to flower baskets and a large champagne bottle. Star shaped balloons were most common with 101 counted. Other abundant shapes were hearts (N=40) and squares (N=11). This information is consistent with findings from previous years monitoring.

Eleven foil balloons were imprinted with popular cartoon characters. This included Smiley Faces (N=5), Minnie Mouse (N=4), and Spiderman (N=2). Surprisingly these three characters were the most prevalent characters found during the previous five-year study.

Event and Greeting Messages

Both foil and latex balloons can be purchased with pre-printed messages indicating specific events and greetings such as “Happy Birthday,”” Congratulations,” and “I Love You.” During this study period a total of 76 event and message balloons were recorded. Of these, 34 were “Happy Birthday” balloons. Mother’s Day (N=10), Graduation (N=8) and Valentine’s Day (N=5) were also among our top finds. These findings of the most prevalent occasion balloons are consistent with our previous 5-year study.

Event/Occasion	**Latex**	**Foil**
Baby	1	4
Baptism		1
Congratulations		6
Get Well		1
Graduation	1	7
Happy Birthday	2	32
Love		3
March Down Madness		1
Mother's Day		10
Sale	1	
Valentine's Day		5
You're Special		1
Total	5	71

Business, Organization and Other Names and Logos

While it is nearly impossible to identify the source of most balloons found in the environment, on occasion balloons were printed with names and/or logos. And while the exact sequence of events that lead to their release was unknow, these types of balloons provide some clue as to their source and perhaps even their distance traveled.

During this year of monitoring, balloons imprinted with the following company names were found:

"The Future is Bright" @AMSCAM

Farm Fresh

Guapos Restaurant

Jane's Cottage, Abington, PA

REMAX Southern Lifestyles 828-430-7212

Toyota

Weichert Realty

Balloons from food establishments and real estate companies were also the most common during the previous five-year study.

Personal Notes and Messages

Personal notes and messages written and/or attached to balloons were found on two occasions. These messages were handwritten directly on the balloons. In both cases the intent of the messages appeared to be in remembrance of a deceased loved one.

In one case, the message was written on a pink latex balloon with a pink ribbon attached found deflated at False Cape State Park in May 2018. It read: "Zoey sparkle in all the stars. Love, Aunt Tracey Tile we meet again B-day and many more." Also drawn on the balloon was heart with the name Zoey written inside.

The other was written on a deflated foil balloon found on Smith Island in June 2018.

Messages of remembrances were also the most common type of message found during the previous five years of surveys.

Weather Balloons

No weather balloons were found during this study period, although on two occasions pieces of latex were considered to potentially be weather balloons.

Shoreline Location of Balloon Litter

The location of all balloon debris was recorded according to the beach profiles of "low," "mid" and "high." The majority (63%) was found above the high tide line and in the dune vegetation. This is nearly the same as the previous findings when 60% of all balloon litter was found above the high tide line.

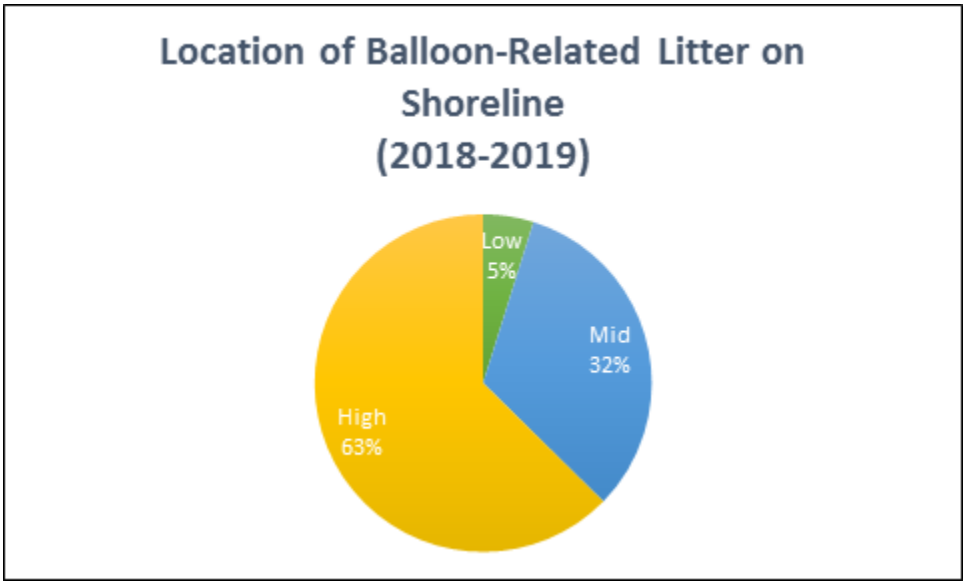

Figure 11. The majority of balloon-related litter was found above the high tide line and in the dune/vegetation.

It is assumed that winds eventually blow most marine debris items including balloons and plastic ribbons toward the highest portion of the beach where it becomes trapped by dune vegetation. As this area is critical for nesting birds, diamondback terrapins, and sea turtles, balloon-litter concentrated here may pose an increased threat of entanglement.

Seasonality of Event and Greeting Balloons

There was no clear pattern to when balloons attributed to certain events were found during this study period although most Mother's Day balloons were found in late spring (after Mother's Day) and Valentine's Day balloons were mostly found in February and March (after Valentine's Day).

Other Unusual Finds

In addition to recording standardized information on all balloon-related litter encountered during this study period, monitors noted some more unusual finds. Perhaps the most unusual find was an orange latex balloon tied to an oak leaf that had burst. It was found during the February 2019 survey at False Cape State Park. Since the balloon industry claims that a latex balloon will degrade faster than an oak leaf, monitors wondered if this may have been some type of homemade experiment.

Observations of Wildlife Interactions with Balloon Litter

Observations of wildlife interactions with balloon-related litter were noted during this year of monitoring. As in the past, ghost crab burrows were seen directly beneath foil balloons, bringing up the question as to whether there may be a benefit for a ghost crab to dig a burrow beneath a foil balloon especially when seeking shelter from winter cold. Could it be that foil balloons cause a change in or provide protection from predators? Several foil balloons found during this study period were embedded in the sand. The effects of these balloons on fauna below the sand's surface is also of concern.

Summary of Findings

The large amount of balloon-related litter recorded on Virginia's remote beaches continues to be of concern especially in areas designated for protecting wildlife. Most of this litter continues to accumulate on the highest portions of the beach, which is critical habitat for nesting diamondback turtles, sea turtles, and shorebirds. In many cases, balloons and plastic ribbons are not only prevalent but were the most abundant types of marine debris recorded on remote beaches of Virginia.

Consistent findings with the previous study highlight some trends. For one, latex balloons were again the most common type of balloon litter found and most latex balloons were in a burst condition. Second, foil balloons were most commonly found deflated. While the balloon industry continues to claim that latex balloons are biodegradable, and therefore safe for release, they remain the most prevalent type of balloon threat to Virginia's wildlife. The fact that burst latex balloons are even more prevalent than any other condition, and that these shapes most closely resemble jellyfish and other prey of sea turtles compounds this potential problem.

The prevalence of plastic ribbons on Virginia's remote beaches is also a consistent finding from the previous study. Since the balloon industry recommends not attaching ribbons intended for mass release, it appears consumers are either not complying with this suggestion or that these balloons are not from mass releases.

Findings of balloons from restaurants, and particularly real estate companies, indicates the need to reach out to these groups with concerted education efforts.

The introduction of standardized monitoring at all sites will continue to be important in examining the variables of "site name," "season," and "balloons per linear mile." While it appears that Fisherman Island collects more balloon-related litter as compared to False Cape, it will be interesting to examine these differences throughout the year. Moreover, implementation of the protocol at Smith Island, Hog Island and Cedar Island is needed in order to examine these variables statistically between sites.