



Final Project Report
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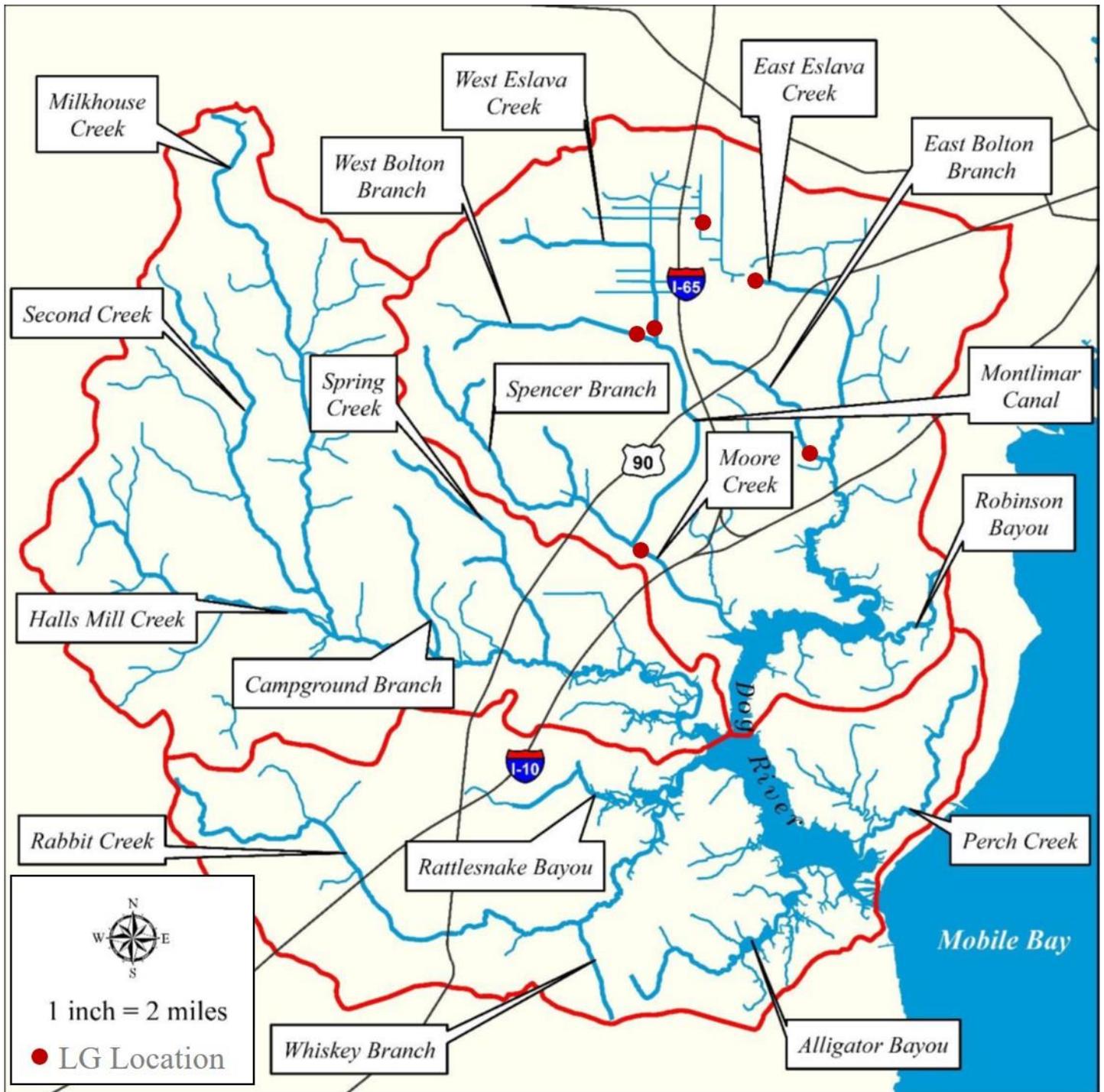


Figure 1 - Overview of Dog River Watershed (2019, MBNEP – Dog River Watershed Management Plan)

1.0 Project Overview

This report provides a detailed summary of the efforts by Osprey Initiative, LLC (Osprey) in support of Dog River Clearwater Revival's (DRCR) "Comprehensive Trash Abatement Program for the Dog River (DR) watershed, AL" project. As part of this project, Osprey was contracted to deploy and maintain six (6) Litter Gitters at strategically located stormwater outfalls for 18 months, collect data using a modified version of the U.S. EPA's Escaped Trash Assessment Protocol (ETAP), provide on-call field crews to clean identified litter "hotspots," and facilitate training in ETAP data collection methodology for designated groups.

This project built upon previous litter abatement efforts by Osprey in the DR watershed which included the deployment and maintenance of three (3) Litter Gitters dating back to August 2017. Additionally, this project remained closely connected to the City of Mobile Litter Boat Program – another project being executed by Osprey in the DR watershed. Finally, Osprey deployed several experimental litter collection booms at select stormwater outflows to further refine the collective understanding of litter conveyance within the DR watershed. While these booms were not specifically affiliated with this grant, they served to inform its principal goals and objectives.

2.0 Goals & Objectives

As outlined by DRCR, the purpose of this project was to improve water quality in the Dog River watershed by reducing trash at or near its source. The stated goals were to 1. Establish a community trash monitoring program to inform litter management; 2. Promote the introduction and use of effective trash reduction technologies and approaches; 3. Improve people's awareness, knowledge, and behavior relating to littering; 4. Improve the enactment and enforcement of laws to reduce trash.

The intended objectives were to: 1.1 Reduce trash in one stream segment of the Upper Dog River watershed by 50% through the demonstration of alternative, sustainable, litter capture devices; 2.1 Train 10 high school students and 10 community members in strategic watershed assessment to implement trash monitoring strategy; 3.1 Increase by 10%, the number of truck-owners who use a truck-bed trash can to secure litter and debris as a result of a public awareness campaign; 3.2 Present project findings and results at a minimum of three conferences to transfer lessons learned to other communities; and 4.1 Publish a Trash Reduction Strategy for the City of Mobile providing recommendations for strategically siting trash capture, engaging community in monitoring, and improving enforcement activities.

In the Quality Assurance Project Plan, the intended objectives were transposed into four overarching tasks:

- **Task A - Reduce by 50-percent, trash in one stream segment of the Upper Dog River watershed by deploying alternative, sustainable trash capture devices at strategically located stormwater outfalls.**

- **Task B** - Train 10 High School Students and 10 community members in Strategic Watershed Assessment Protocol (SWAMP) to implement trash monitoring strategy.
- **Task C** – Increase by 10 percent, the number of truck owners who use a Truck Bed Trash Can to secure litter and debris as the result of a Green Design competition and a public awareness campaign.
- **Task D** - Publish a Trash Reduction Strategy for the City of Mobile, providing recommendations for developing sustainable trash abatement through strategic placement and maintenance of litter containment devices, improved community engagement, and improving regulation and enforcement.

The primary focus for Osprey during this project was supporting the successful completion of **Task A**. While there were several specific actions associated with this task, the efforts by Osprey can best be organized into three distinct lines of effort – 1. Deploy and maintain six (6) Litter Gitters with integrated data collection; 2. Provide on-call field crews to clean identified litter “hotspots” with integrated data collection; and 3. Facilitate training in ETAP data collection methodology for designated groups.

3.0 Outcomes & Measurables

The following sections will look at these three distinct lines of effort to demonstrate the outcome with measurable impact.

3.1 Litter Gitters

The first line of effort for Osprey’s activities centered around the use of in-stream litter collection devices to reduce to downstream flow of litter by 50%. This project called for the deployment and maintenance of six (6) Litter Gitters in the Upper Dog River watershed over an 18-month period. Site selection was coordinated with project partners and based on a number of factors – anticipated volume of stormwater litter, permitting requirements/constraints, accessibility, visibility to local community. While initial discussion revolved around the intent to deploy in-stream trash collection devices focused on a single stream segment of the Upper Dog River Watershed, it was decided that it would be more effective to deploy the Litter Gitters across several stream segments to assist in the identification of trash flow throughout the watershed. The final list of sites selected for the placement of Litter Gitter devices is reflected in *Table 1* below:

Site ID	Device Type	Latitude	Longitude	Deploy Date
DR – Bolton Branch @ Navco Rd	Litter Gitter	30.64415	-88.10227	29 Jun 2018
DR – Eslava Creek @ Emogene St	Litter Gitter	30.68169	-88.12309	30 Nov 2018
DR – Eslava Creek @ Sage Ave	Litter Gitter	30.67321	-88.11316	27 Mar 2019
DR – Moore Creek @ Halls Mill Rd	Litter Gitter	30.62627	-88.13541	22 Jan 2020
DR – Moore Creek @ Michael Blvd	Litter Gitter	30.66267	-88.13180	22 Jan 2020
DR – Montlimar Canal @ Michael Blvd	Litter Gitter	30.66329	-88.13669	22 Jan 2020

Table 1 - List of selected sites for Litter Gitter deployment

It should be noted that three (3) sites were existing locations that began supporting litter abatement efforts associated with this project immediately. The remaining three (3) sites

were delayed in their deployment due to permitting requirements. These sites were serviced routinely (every two weeks at a minimum and around major rain events) to remove and record any collected litter, monitor site functionality, and determine effectiveness of site to inform future recommendations. Weight and volume of collected litter was documented by recyclable and disposable category and all material was catalogued according to a modified version of ETAP to further define litter type, condition, and potential sources. Furthermore, Osprey completed a baseline reduction comparison assessment to determine effectiveness of Litter Gitters in decreasing the downstream flow of litter. Specific discussions related to individual sites and reduction comparison assessment are detailed below. Collection totals by site for entire project and a graphical depiction of site locations in the DR watershed can be seen in *Table 2* and *Figure 2* respectively below. Full summary of Litter Gitter data can be found in *Appendix 1*.

	Amount - Recycle		Amount - Dispose		Amount - Total		Debris
	Lbs.	cf	Lbs.	cf	Lbs.	cf	
DR-Bolton Branch@Navco Rd	328	270	1,148	470	1,477	740	593
DR-Eslava Creek@Emogene St	80	77	441	246	522	323	10
DR-Eslava Creek@Sage Ave	250	222	764	412	1,015	634	96
DR-Moore Creek@Halls Mill Rd	106	106	283	158	389	263	0
DR-Moore Creek@Michael Blvd	134	121	411	185	545	307	52
DR-Montlimar Canal@Michael Blvd	123	118	333	164	456	282	40
Project Totals	1,022	915	3,380	1,634	4,403	2,549	791

Table 2 - Litter Gitter Collection Totals

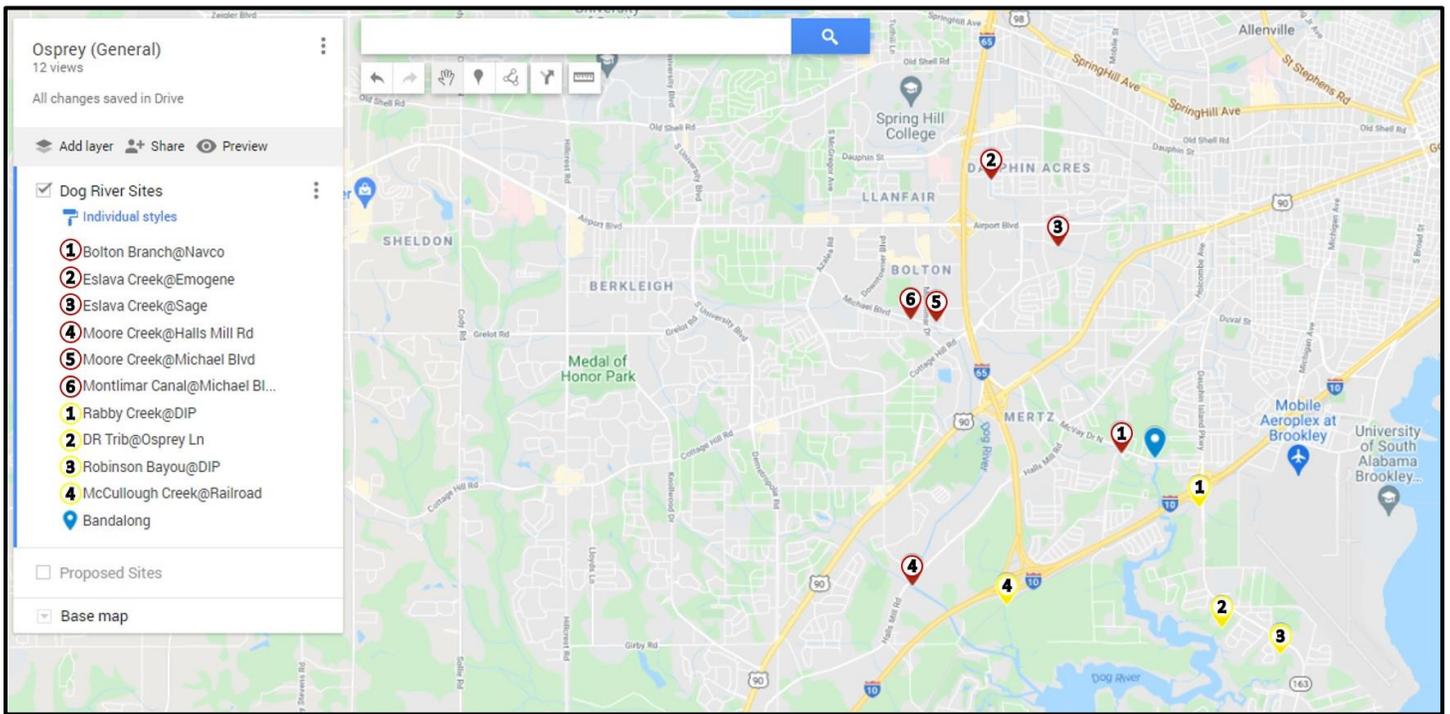


Figure 2 - Laydown of Litter Collection Devices in the DR watershed (Red = Litter Gitter; Yellow = Litter Boom; Blue = Bandalong)

3.1a DR – Bolton Branch at Navco

Site Description - The site is located on East Bolton Branch of Dog River just downstream of the Navco Drive intersection. This waterway predominantly drains a low-income residential and commercial area as it flows through concrete lined drainage ditches towards the location of the trap. The site is situated adjacent to a small nightclub with sheetpile walls directly upstream and muddy clay banks with dense vegetation downstream. Initially, we deployed a single trap, constructed with coated wire mesh basket and a PVC frame, in the center of the creek with narrow-angled, equilateral booms comprised of reinforced light weight foam floats. The trap was upgraded in late October 2019 to a heavier duty aluminum design with high-tensile strength anchor rope and high-density foam boom floats. The trap is clearly visible to pedestrian and vehicular traffic traveling nearby.

Site Discussion - The area around the site had been a common illegal dumping location with numerous tires. Also, Osprey field crews routinely found copious amounts of glass bottles (presumably from patrons of the nightclub), metal cans, and other beverage containers. This site requires special attention when entering the waterway as the metal sheetpile walls can be slippery when wet and the water surface can be 8' below the top of the wall at times. Additionally, as this site is subject to tidal influences, field crews planned their cleanouts around low-tide to gain efficiencies. Overall, this site has been an incredibly effective site as preventing the downstream flow of litter into Dog River. Due to its performance, visibility, and accessibility, Osprey recommends continued operation of this site with possible improvement through the addition of signage to educate local community members and raise awareness.

3.1b DR – Eslava Creek at Emogene St

Site Description - The site is located on the upper portion of East Eslava Creek just downstream of Emogene Street. This waterway predominantly drains a large area of high density commercial / retail development and medium density low-income housing with several high-traffic roadways, such as I-65 and Dauphin St. These areas are highly urbanized and impervious. The site is prone to litter introduction from vehicular traffic on the adjacent roadway as well as wind-conveyed litter from surrounding commercial shopping centers. Initially, we deployed a single trap, constructed with coated wire mesh basket and a PVC frame, in the center of the creek with narrow-angled, equilateral booms comprised of reinforced light weight foam floats. The trap was upgraded in late October 2019 to a heavier duty aluminum design with high-tensile strength anchor rope and high-density foam boom floats.

Site Discussion - This site consistently has single use plastic bags caught in the vegetation both upstream and downstream. The banks are steep and the exposed clay substrate can create a slipping hazard when approaching the trap system for maintenance. The creek runs adjacent to Springdale Blvd which is moderately traveled by local community members seeking to avoid the main thoroughfares. In addition to the litter removed, this site is ideally situated to promote public awareness due to its highly visible location to the

public. Overall, this site proved to be an effective location to intercept the flow of litter and Osprey recommends continued operation of this site with possible improvement through the addition of signage to educate local community members and raise awareness.

3.1c DR – Eslava Creek at Sage Ave

Site Description - The site is located on the upper portion of East Eslava Creek just downstream of Sage Ave and approximately 2,200 yds downstream of the trap at Emogene St. This waterway predominantly drains a large area of high density commercial / retail development with several high-traffic roadways, such as I-65 and Airport Blvd, and large commercial shopping centers just upstream. These areas are highly urbanized and impervious. Initially, we deployed a trap constructed with coated wire mesh basket and a PVC frame with reinforced light weight foam boom floats configured as an in-line tandem trap setup. The trap was upgraded in late October 2019 to a heavier duty aluminum design with high-tensile strength anchor rope and high-density foam boom floats and based on the performance of the upgraded trap in previous locations, we adjusted the deployment configuration to a single trap vice tandem.

Site Discussion - The location of the site provided excellent access for our field crews. While it was located to a heavily trafficked area with dense commercial development, the site itself was relatively isolated from the busy streets just upstream. The trap proved to be highly effective at capturing litter in stormwater runoff from the upstream area. On one occasion, we received a request from a local resident with property adjacent to the trap to relocate the trap further downstream. Following an initial analysis, we determined that it would be feasible to move the trap about 100 yds downstream. This positive interaction with the local community once again demonstrated the value of engaging and incorporating the public in watershed management. This site also provides excellent visibility for the public and could be improved with some additional signage to educate local community members and raise awareness. Osprey recommends continued operation of this site.

3.1d DR- Moore Creek at Halls Mill Rd

Site Description - The site is located on the main branch of Moore Creek just downstream of Halls Mill Rd and the Spencer Branch fork from Moore Creek. This site consists of wide gently sloped banks with grassy covering over a rocky substrate. The Moore Creek segment serves to drain a medium density suburban residential area with pockets of commercial development and industrial centers. The waterways extend across a large section of middle and upper Mobile. We deployed a single, aluminum design trap in the center of the creek with high-tensile strength anchor rope and high-density foam boom floats arrayed in a narrow-angled ‘V.’

Site Discussion - This site proved to be an excellent location for a litter collection device as it served to screen and capture being litter conveyed from the headwaters of West Bolton Branch and West Eslava Creek, Spencer Branch, Moore Creek, and Montlimar Canal. The site also had great accessibility for our crews and was highly visible to vehicular /

pedestrian traffic as well as local community members. Based on its location, Osprey recommends continued operation of this site.

3.1e DR – Moore Creek at Michael Blvd

Site Description - The site is located on the upper portion of Moore Creek just upstream of Michael Blvd. The site is also located approximately 100 yds upstream of the convergence of Moore Creek with Montlimar Canal. This portion of Moore Creek drains a predominantly commercial development area in vicinity of several moderate-traffic roadways. These areas are highly urbanized and impervious. This site consists of wide gently sloped banks with grassy covering over a sand and clay substrate. We deployed a single, aluminum design trap in the center of the creek with high-tensile strength anchor rope and high-density foam boom floats arrayed in a narrow-angled ‘V.’

Site Discussion - This site was coupled with the nearby trap on the Montlimar Canal to assist in identifying the contributing sources of litter between the two upstream headwaters of West Bolton Branch and West Eslava Creek. While this location captured more litter in terms of both weight and volume, the totals between the two sites was fairly comparable which indicates that both streams equally contribute to the flow of litter into the lower Dog River watershed. This site had good accessibility and high visibility. Based on the impact of this site on reducing the downstream flow of litter, Osprey recommends continued operation of this site.

3.1f DR – Montlimar Canal at Michael Blvd

Site Description - The site is located on Montlimar Canal adjacent to Michael Blvd approximately 300 yds upstream of Montlimar Drive. Montlimar Canal serves to drain a medium density low-income residential area with some commercial development. This site consists of steep banks with grassy covering over a rocky substrate. We deployed a single, aluminum design trap in the center of the creek with high-tensile strength anchor rope and high-density foam boom floats arrayed in a narrow-angled ‘V.’

Site Discussion – Accessibility at this site proved to be a challenge for our field crews as there was no good staging area near the trap. This required our crews to park offsite and walk with gear across a busy street to maintain the trap. The banks at this location are prone to erosion and can be unstable at times presenting an additional challenge. However, this site is ideally located to capture litter. The high flows routinely observed at this site coupled with the stormwater designs upstream result in the movement of large volumes of litter in a short amount of time. It was also noted by field crews that the nearby roadways were consistently littered which the wind and traffic often conveyed into the waterway downstream of the trap. The trap is highly visible from the roadway and provides an excellent platform to raise awareness and educate the public on the impact of litter in our waterways. Osprey recommends continued operation of a trap on this segment of Montlimar Canal but potentially to a location further upstream with better access.

3.1g Litter Booms

While not a specific action associated with this grant, Osprey deployed several test booms at designated locations to inform watershed management decisions regarding future litter abatement and prevention efforts. As part of an effort to address local citizen concerns regarding stormwater outfalls suspected of being a significant contributing source to litter conveyance into the DR watershed, site selection was coordinated with project partners and based solely on the recommendations from local citizens living in the DR watershed area. The collected data would seem to indicate that these outfalls are not a significant source of litter into Dog River. However, we recommend that these locations remain a location for continued assessment. Below is the list of sites selected for the deployment of test booms (*Table 3*) and the collection totals associated with each site (*Table 4*):

Location	Device Type	Latitude	Longitude	Deploy Date
DR – Rabby Creek @ DIP	Boom	30.63713	-88.09004	19 Nov 2020
DR – Dog River Tributary @ Osprey Ln	Boom	30.62067	-88.08632	20 Nov 2020
DR – Robinson Bayou @ DIP	Boom	30.61700	-88.07682	29 Dec 2020
DR – McCullough Creek @ Railroad	Boom	30.62368	-88.12065	19 Nov 2020

Table 3 - List of selected sites for Litter Boom deployment

	Amount - Recycle		Amount - Dispose		Amount - Total		Debris
	Lbs.	cf	Lbs.	cf	Lbs.	cf	Lbs.
DR-Rabby Creek@DIP	6	6	20	9	26	15	0
DR-DR Trib@Osprey Ln	0	0	3	1	3	1	0
DR-Robinson Bayou@DIP	1	1	8	4	8	5	0
DR-McCullough Creek@Railroad	1	1	8	6	9	7	0
Project Totals	8	7	39	20	47	27	0

Table 4 - Litter Boom Collection Totals

3.1h Baseline Reduction Comparison Assessment

In conjunction with DRCR, Osprey selected two sites – Bolton Branch at Navco Drive and Eslava Creek at Emogene Street – to conduct a baseline reduction comparison assessment to determine effectiveness of Litter Gitters in decreasing the downstream flow of litter. While the original project plan only called for one site, Osprey recommended that the assessment be conducted at two distinct sites to ensure a more comprehensive assessment. Bolton Branch at Navco is tidally influenced and so the downstream section is subject to litter being conveyed via tidal movement of water; however, the downstream section is relatively isolated from vehicular and pedestrian traffic. Conversely, Eslava Creek at Emogene is not tidally influenced but the downstream section is subject to litter introduction from vehicular traffic on the adjacent roadway as well as litter conveyed via wind from surrounding commercial shopping centers.

As per the Quality Assurance Project Plan, we established three collection zones for each site. The upstream zone consisted of the banks, stream bed (when accessible) and waterway from the start of the boom system to 100 yards upstream. The trap zone consisted

of the entire trap system. The downstream zone consisted of the banks, stream bed (when accessible) and waterway from the back of the trap to 100 yards downstream of the trap. The reduction comparison assessment was conducted a total of 4 times per site with every piece of trash being collected, removed, and catalogued according to volume and weight of recyclables and disposables in addition to individual ETAP data collection for each section. While the three zones were used to ensure distinct data sets were collected, the data was aggregated into two Zones (Upstream + Trap and Downstream) during the analytical phase for purpose of evaluating the effectiveness of the Litter Gitter in reducing downstream conveyance of litter. The reduction comparison assessment resulted in the demonstrated effectiveness of the Litter Gitter devices to reduce downstream flow by **over 80%** as depicted in the analyzed data sets shown below in *Table 5*:

Site Name	Date	Section	Total (lbs)	Total (cf)	Percent Decrease (Up+Trap vs. Down)	Average Reduction			
BoltonBranch_Navco	7/30/2020	Upstream	32.74	19.00	85.09	80.71			
		Trap	26.88	12.00					
		Downstream	8.89	2.50					
BoltonBranch_Navco	8/20/2020	Upstream	6.38	9.00	59.90		80.71		
		Trap	28.73	43.00					
		Downstream	14.08	10.50					
BoltonBranch_Navco	10/15/2020	Upstream	8.59	10.00	84.07			80.71	
		Trap	24.61	21.00					
		Downstream	5.29	6.00					
BoltonBranch_Navco	2/8/2021	Upstream	12.11	5.00	93.80				80.71
		Trap	25.47	7.00					
		Downstream	2.33	2.00					
Eslava_Emogene	8/17/2020	Upstream	11.12	7.00	75.21	85.15			
		Trap	12.88	19.00					
		Downstream	5.95	5.00					
Eslava_Emogene	8/20/2020	Upstream	3.64	7.00	86.34		85.15		
		Trap	8.66	8.00					
		Downstream	1.68	1.00					
Eslava_Emogene	10/22/2020	Upstream	5.97	5.00	95.59			85.15	
		Trap	5.36	4.00					
		Downstream	0.50	0.50					
Eslava_Emogene	12/7/2020	Upstream	0.25	0.50	83.45				85.15
		Trap	27.00	20.00					
		Downstream	4.51	2.00					

Table 5 - Baseline Reduction Comparison Assessment

3.2 Litter Hotspot Tactical Cleanups

The second line of effort for Osprey was to provide on-call field crews with rapid response capability to clean an identified litter “hotspot” based on notification from partners and local citizens. These field crews would respond to calls to conduct comprehensive cleanups of identified hotspots, remove all litter and debris from the site to restore its natural, pristine condition. Data collection was fully integrated into their litter removal activities and this data was provided to project partners. Osprey was able to maintain a rapid response crew for the duration of the project.

However, this would not have been feasible if it had not been for the extensive work our crews were already conducting in the Dog River watershed as part of the City of Mobile Litter Boat Program. From a programmatic standpoint, it would not be economically sustainable to maintain a work-force that only responded to complaints or alerts; rather, this capability and capacity must be incorporated into the overarching litter abatement strategy and funding must be programmed to cover the costs of maintaining a similar program to the City of Mobile Litter Boats or Litter Patrol. Throughout the project, Osprey field crews were able to respond a number of times to clean an identified hotspot or remove a particularly large debris item.

3.3 ETAP Data Collection Methodology Training

The third and final line of effort for Osprey was to facilitate training in ETAP data collection methodology for designated groups in an effort to expand the use of ETAP within the Dog River Watershed. Osprey was able to assist in the training of 10 individuals on two separate occasions. Unfortunately, the impact of the Coronavirus-19 pandemic greatly reduced Osprey’s opportunities to facilitate additional training events.

4.0 Litter Breakdown

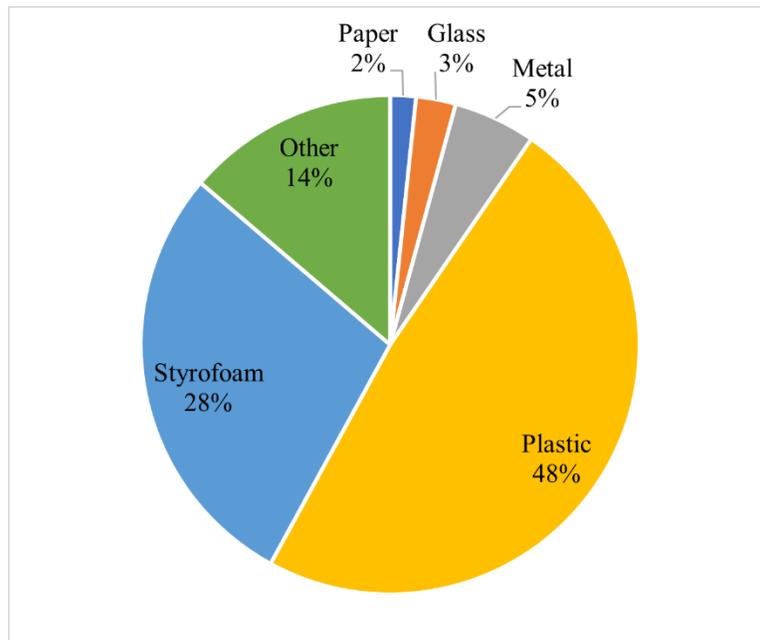


Figure 3 - ETAP Major Category Breakdown

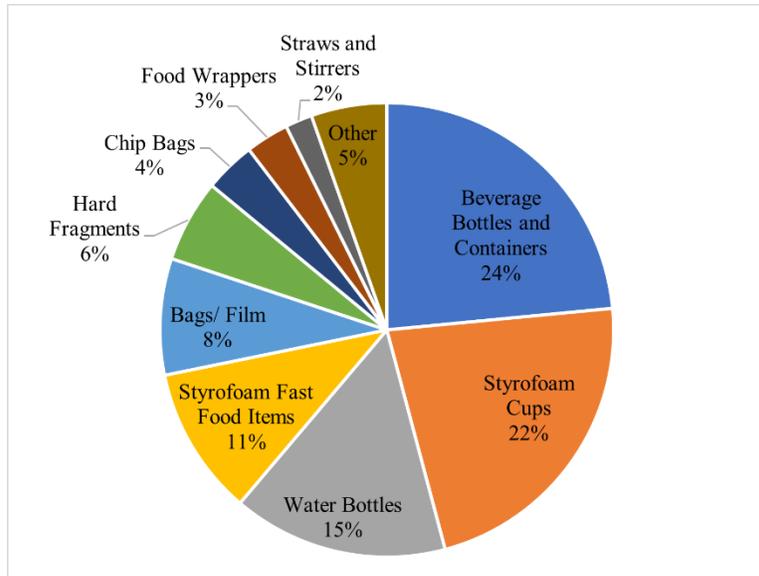


Figure 4 - ETAP Plastic/Styrofoam Breakdown

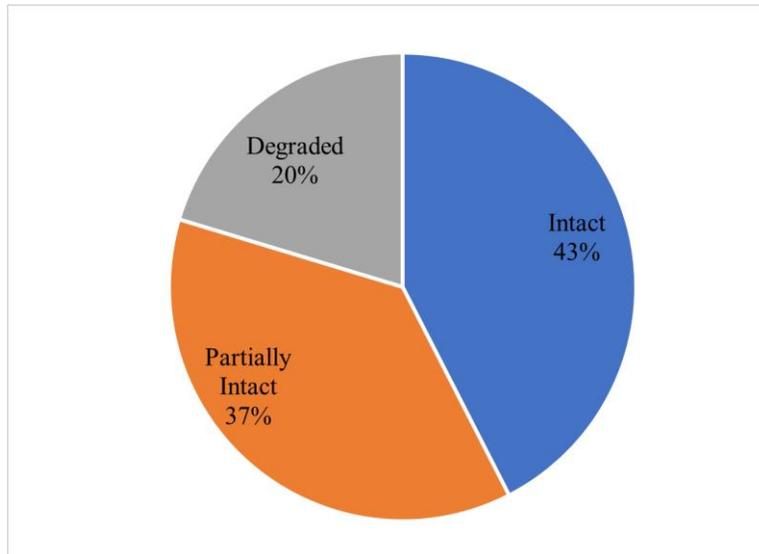
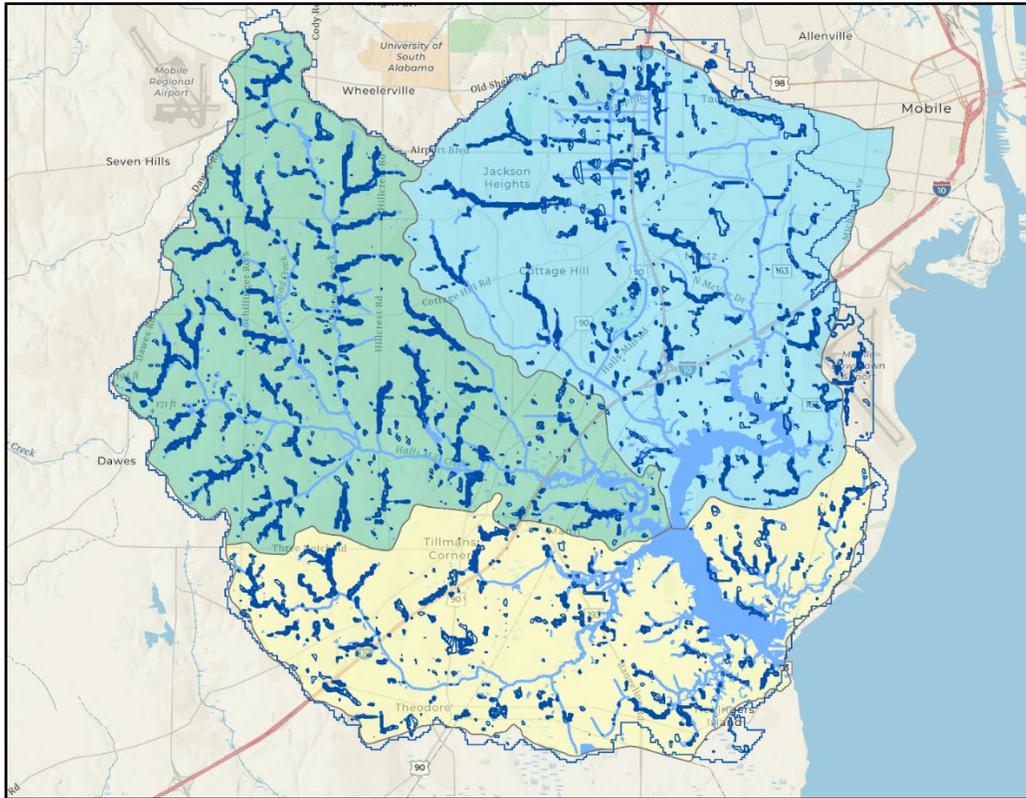


Figure 5 - ETAP Condition Breakdown

5.0 Conclusion

Overall, Osprey considers this project to have been incredibly successful due to the data-driven and team-building approach to first understand the flow of litter across a specific segment of a watershed and then develop a comprehensive litter abatement strategy. When developing a litter abatement plan for any watershed, the project should include a systematic tactical cleanup and strategic placement of interception devices. This approach allows for legacy trash to be removed from the watershed and new trash to be collected before it can impact the waterways. This can only be feasibly achieved on a sustainable level through the confluence of all parties working in partnership to leverage each organization, agency, and individual's unique skills and resources to execute the strategic vision and litter abatement plan.

Dog River Watershed Trash Abatement Program Hydrologic and Land Use GIS Analysis to Identify Trash Concentrations



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Table of Contents

Introduction..... 5

Watershed Landscape Characterization..... 5

 The Watershed..... 5

 Hydrologic Units..... 5

 Land Use/Land Cover..... 6

 Hydrologic Flows..... 8

Methodology..... 9

 Data..... 9

 Geospatial Analysis: The Landscape..... 9

 Geospatial Analysis: Litter Zones..... 9

 Geospatial Analysis: The Hydrology..... 10

 Geospatial Analysis: Litter Gitters..... 10

 Ground Truthing of Geospatial Data..... 10

 Refinement of Geospatial Analysis: Commercial and Residential Concentrations..... 10

 Refinement of Geospatial Analysis: Low-Income Areas..... 11

Results: Overview of Target Catchments..... 12

 Prioritization Criteria..... 12

 Field Surveys..... 16

 Excluded Catchments..... 17

 Residential vs. Commercial Areas..... 18

 Low-to-Moderate-Income Areas..... 20

Results: The 10 Target Catchment Descriptions..... 21

 Field Surveyed Target Catchments..... 22

 Target Catchment 2 – Site SC-1: Creekwood Drive..... 22

 Target Catchment 1 – Sites MC-1, MC-1a, and MC-2: Schillinger Road/Airport Boulevard..... 23

 Target Catchment 10 – Sites RC-1 and RC-2: Highway 90/Carol Plantation Road..... 25

 Target Catchment 3 – Site MC-UT-2: Hillcrest Road/Grelot Road..... 27

 Target Catchment 9 – Sites RB-1 and RB-UT-1: Highway 90/Tillman’s Corner..... 28

 Target Catchments with Installed Litter Gitters..... 30

 Target Catchment 8 –Litter Gitter 4 on Moore Creek..... 30

 Target Catchment 4 – Two Litter Gitters (1 and 2) installed in Eslava Creek..... 31

 Target Catchment 7 –Litter Gitter 3 on Bolton Branch..... 33

Target Catchment 6 –Litter Gitter, 3, on Bolton Branch downstream of Navco Road/McVay Drive	34
Target Catchment 5 –Litter Gitters: 5 on the Montlimar Canal and 6 on the Michael Boulevard Canal	35
Discussion.....	37
Litter Gitters.....	37
Cleanups/Community Engagement.....	37
Deployment of Municipal Resources to Address Litter Near or Related to Commercial Uses.....	38
Data Gaps.....	39
Conclusions.....	39
Literature Cited.....	40
Appendices.....	41
Appendix A. Target catchment site assessments	41
Appendix B. Potential strategies for management of each field surveyed site.....	42

Figure 1. The greater Dog River Watershed, comprising three 12-digit HUCs, the Upper Dog River, Halls Mill Creek, and Lower Dog River watersheds, and 101 smaller drainage units, called catchments.	6
Figure 2. Developed areas within the Dog River Watershed Complex with catchment boundaries indicated.	7
Figure 3. Hydrologic model results for the Dog River Watershed Complex showing areas where water accumulates or pools to depths of at least two inches during a six-inch rain event.	8
Figure 4. Litter zones identified by Osprey Initiative during City-contracted trash collection and analysis.	10
Figure 5. Eddy locations identified in hydrologic model locations.	10
Figure 6. Map of Dog River Watershed Complex showing the 12 catchments meeting criteria for designation as target catchments. These target catchments retain the numbers designated in the NHDPlus dataset.	13
Figure 7. Locations of Litter Gitter instream litter capture devices. The location of the City of Mobile's Bandalong Boom System (not within a target catchment) is also indicated.	15
Figure 8. Locations of the 11 sites ground-truthed through field surveys within the seven target catchments without Litter Gitters collection devices.	16
Figure 9. Catchments 11 and 12, which were excluded from further analysis.	17
Figure 10. Residential and commercial areas represented by low, medium, and high intensity developed.	19
Figure 11. Catchments intersecting census blocks with greater than 50% of the households earning less than 80% of the area's medium income.	20
Figure 12. The Dog River Watershed Complex geospatial analysis.	21
Figure 13. Target catchment 2 with field survey site SC-1.	22
Figure 14. Target catchment 1 with field survey sites MC-1, MC-1a, MC-2.	23
Figure 15. Target catchment 10 with two field survey sites, RC-1, and RC-2.	25
Figure 16. Target catchment 3 with field survey sites MC-UT-2.	27
Figure 17. Target catchment 9 with two field survey sites, RB-1, and RB-UT-1.	28
Figure 18. Target catchment 8 with Litter Gitter downstream of confluence of Moore Creek and Montlimar Canal indicated.	30
Figure 19. Target catchment 4 with two Litter Gitters installed in Eslava Creek.	31
Figure 20. Target catchment 7 with location of Litter Gitter (the same one catching target catchment 6 drainage) indicated.	33
Figure 21. Target catchment 6 with location of Litter Gitter 3, downstream of the southeastern catchment boundary, (and City of Mobile Bandalong System) indicated.	34
Figure 22. Target catchment 5 with Litter Gitter 5 on the channelized Montlimar Canal just upstream of its confluence with the Michael Blvd. Canal and Litter Gitter 6 on the Michael Blvd. Canal indicated.	35

List of Tables

Table 1: Area of target catchments	12
Table 2. Target Catchments with percent imperviousness, percent area within Mobile City Limits, and whether a Litter Gitter is installed.	14
Table 3 Target catchments with percent Residential and percent Commercial.	18

Introduction

Of all the efforts to better manage trash throughout the Dog River Watershed, no previous studies were designed to determine the composition of the trash; its sources; or the types of businesses, institutions, or neighborhoods responsible for the trash escaping into area waterways. This information is necessary to determine how best to stop the generation of waterborne trash at the source.

This study was undertaken as a component of the Dog River Clearwater Revival's U.S. Environmental Protection Agency (EPA) Gulf of Mexico Program-funded Dog River Watershed Comprehensive Trash Abatement Program. To better reduce occurrences and extent of waterborne trash in the Dog River Watershed and the City of Mobile, the Mobile Bay National Estuary Program performed an analysis of the landscape, land uses, hydrology, demographics, and types of businesses, institutions, or neighborhoods responsible for trash escaping into area waterways. This study combined outputs of a hydrologic model with geospatial analysis of the Watershed to identify correlations between high-velocity runoff during peak flows, various upstream land uses, and high volumes of litter accumulation. It is intended to identify areas within the Watershed with the highest potential for stormwater-conveyed trash to enter waterways and locations where investments in enhanced litter abatement, recovery, and capture activities will be most productive.

The purpose of this effort is to promote the wise stewardship of the Dog River Watershed. The project goal was to guide reductions in waterborne trash/litter by informing strategies for infrastructure placement, citizen engagement, regulatory improvements, and City of Mobile resource management. Our objectives were to:

1. Use hydrologic models and geographic information system datasets to identify likely pathways of litter to receiving waters,
2. Identify strategic locations for placement of instream litter capture devices,
3. Identify areas to promote community clean-ups, and
4. Identify areas to mitigate litter near or related to commercial uses.

Watershed Landscape Characterization

The Watershed

The Greater Dog River Watershed encompasses approximately 93.3 square miles with 174 miles of streams and waterways (USGS, 2017). Its boundary begins just inland from Mobile Bay, runs west through the City of Mobile, sweeps north then runs south just east of the Mobile Airport before turning east again towards Mobile Bay and curving back to the north to encompass most of the commercial and many of the residential portions of the City of Mobile.

According to the Center for Business and Economic Research at the University of Alabama, in 2014 the population of the Greater Dog River Watershed was 146,237 and projected to increase to 152,627, or by 1.5%, by 2030.

Hydrologic Units

Occupying much of the area of the City of Mobile and located in Mobile County Alabama, the Greater Dog River Watershed, or Dog River Watershed Complex, is the geographical area comprising three individual U. S Geological Survey (USGS) 12-digit hydrologic unit codes (HUCs): the Upper Dog River (HUC 031602050102), Halls Mill Creek (HUC 031602050102), and Lower Dog River (HUC 031602050103) watersheds shown in Figure 1 (USGS, 2017). The Complex encompasses approximately 59,703 acres (or 93.3 square miles)(USGS, 2017), stretches approximately 12 miles inland from the

western shore of Mobile Bay, and spans almost 11 miles from north to south. This Complex also includes 101 smaller individual drainage areas, called “catchments.”

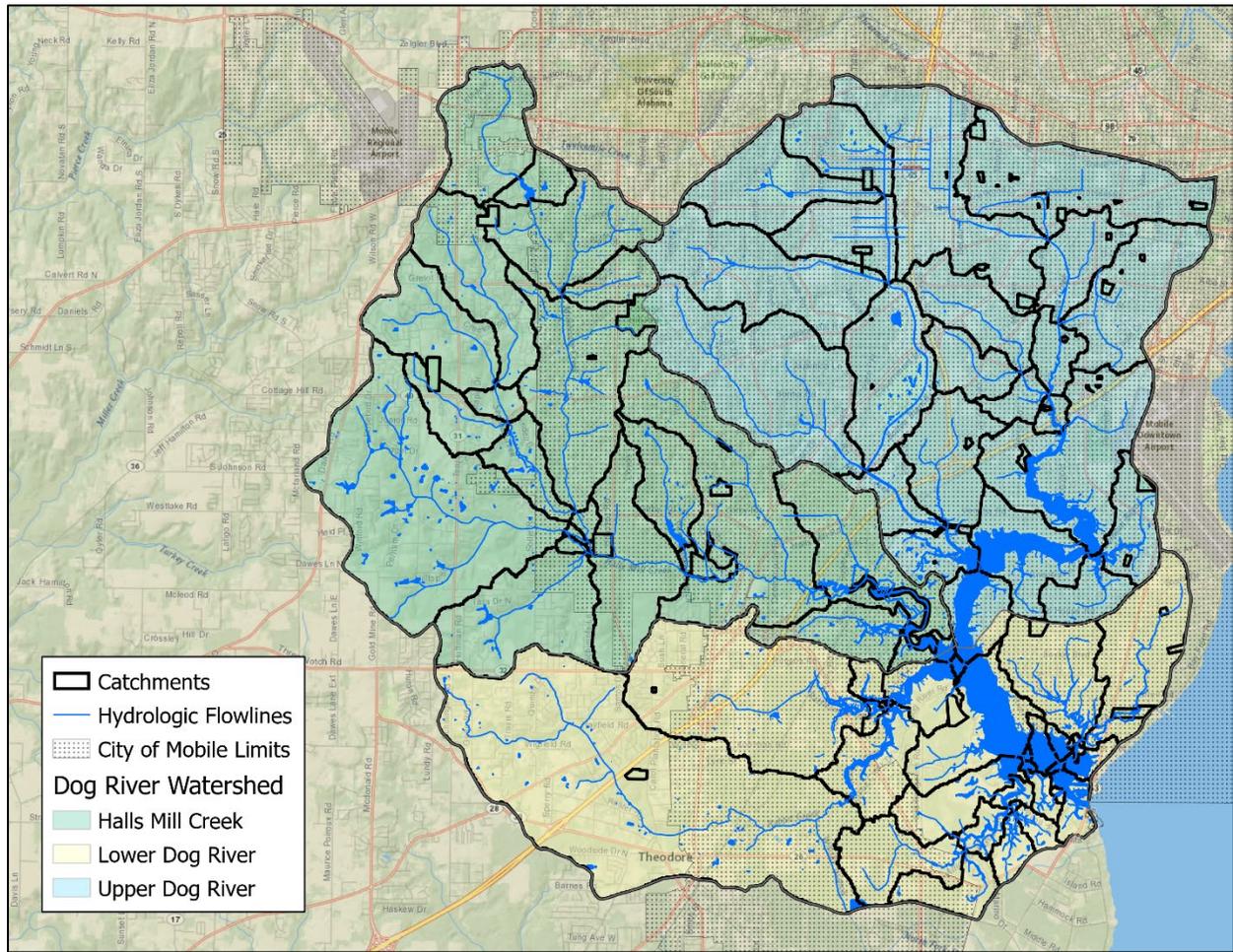


Figure 1. The greater Dog River Watershed, comprising three 12-digit HUCs, the Upper Dog River, Halls Mill Creek, and Lower Dog River watersheds, and 101 smaller drainage units, called catchments.

Land Use/Land Cover

Land use and land cover within the Dog River Watershed Complex is predominantly developed. The three greatest land uses are urban (60.4%), upland forests (17.7%), and woody wetlands (13.3%). Together, these three-major land use and land cover classifications account for 91.4% of the Complex (NLCD, 2011). Of the area of urban land use, 17,943 acres (or 30% of total Complex area) includes low, medium and high intensity urban centers, shown in Figure 2 (NLCD, 2016). Impervious cover includes elements in the urban landscape that limit water infiltration, like roads, parking lots, sidewalks, rooftops, and other hard surfaces. Increases in areas of impervious cover in a watershed are associated with increased volume and velocity of stormwater runoff and increased loading of pollutants, including litter.

Impervious surfaces cover an estimated 16.1% of the Dog River Watershed Complex, 21.9% of the Upper Dog River Watershed, 13.6% of the Halls Mill Creek Watershed, and 11.7% of the Lower Dog River Watershed (MBNEP, 2017).

Of the Dog River Watershed Complex’s approximately 174 miles (918,819 linear feet) of surface drainage systems that flow to Dog River, approximately 57.7 miles (304,761.79 linear feet) occur in the Upper Dog River Watershed (USGS, 2017). Named streams in this Watershed include Bolton Branch (East and West), Dog River, Eslava Creek, Montlimar Canal, Michael Boulevard Canal, Moore Creek, Robinson Bayou, and Spencer Branch. Approximately 65.2 miles (344,073 linear feet) of surface drainage occurs in the Halls Mill Creek Watershed, including Campground Branch, Halls Mill Creek, and Spring Creek. Approximately 51.1 miles (269,819 linear feet) of Lower Dog River Watershed streams include Alligator Bayou, Perch Creek, Rabbit Creek, Rattlesnake Bayou, and Whiskey Branch (MBNEP, 2017).

The National Land Cover Database (NCLD) defines “low intensity developed” areas as a mixture of constructed materials and vegetation with impervious surfaces accounting for 20 to 49 percent of total cover. These areas mostly commonly include single-family housing units. “Medium intensity developed” areas are defined as those accounting for imperviousness between 50 to 79 percent and containing a mixture of constructed materials and vegetation. “High intensity developed” areas are largely impervious (80 to 100 percent) and include apartment complexes, row houses, and commercial and industrial units (NLCD, 2016). Developed areas within the Dog River Watershed Complex are shown in Figure 2.

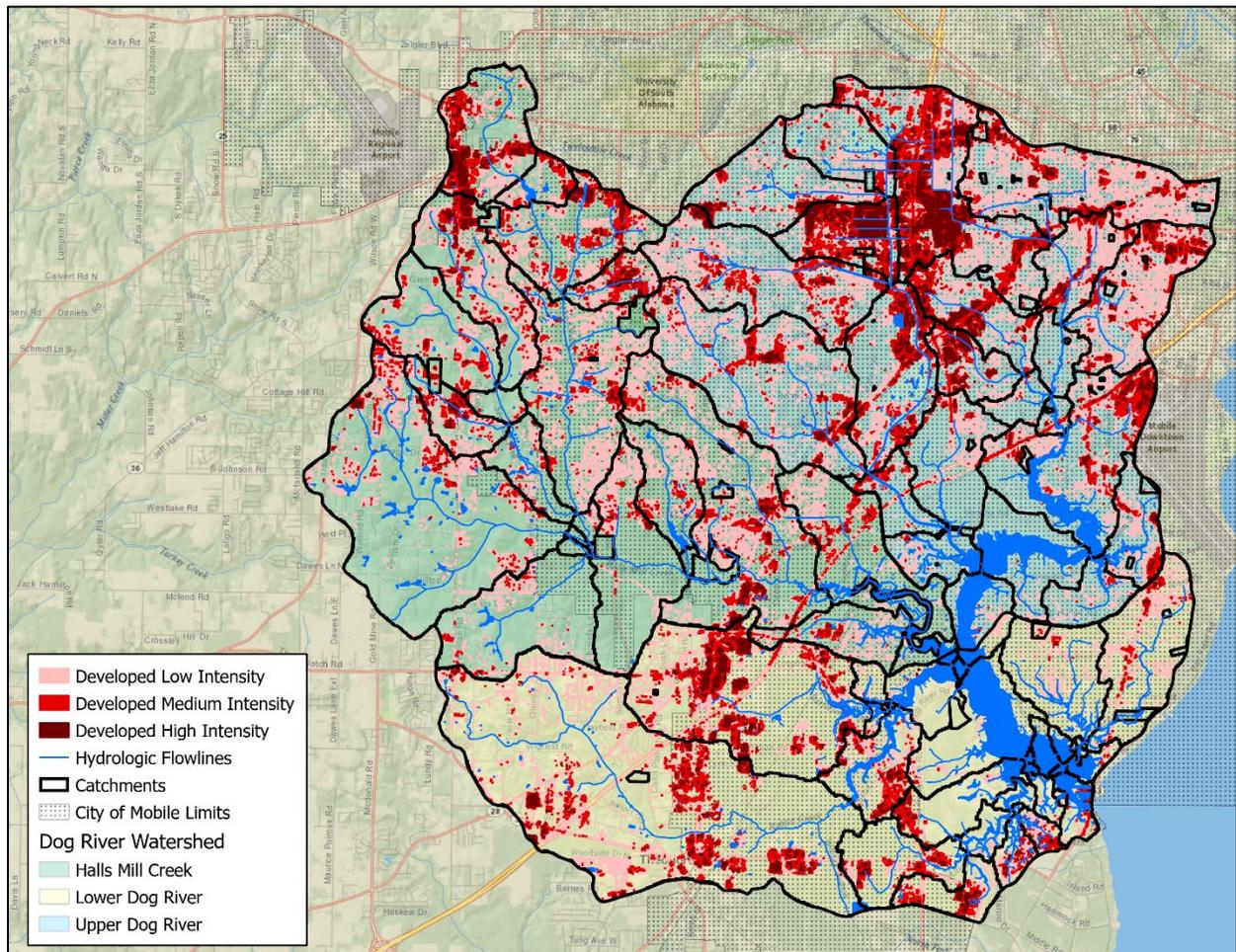


Figure 2. Developed areas within the Dog River Watershed Complex with catchment boundaries indicated.

Hydrologic Flows

The outputs of a hydrologic model built for the Dog River Watershed using the U.S. Army Corps of Engineers Gridded Surface Subsurface Hydrologic Analysis (GSSHA) system were introduced to the geospatial analysis described above. The hydrologic model output was developed using rainfall distributions, meteorological information supplied by the weather stations, and level loggers with telemetry supplemented by USGS gauges to determine where water aggregates and enters waterways in a watershed during different rain events. This output provided quantitative estimates of loadings simulating both upland runoff and instream processes, indicating how water moved through the system during rain events. The geospatial dataset used in the analysis indicated locations in each catchment, shown in Figure 3, where water accumulation, or pooling, reached depths of at least two inches during a six-inch rain event. This depth is indicative of stormwater runoff volumes sufficient to carry discarded litter towards or into receiving waters.

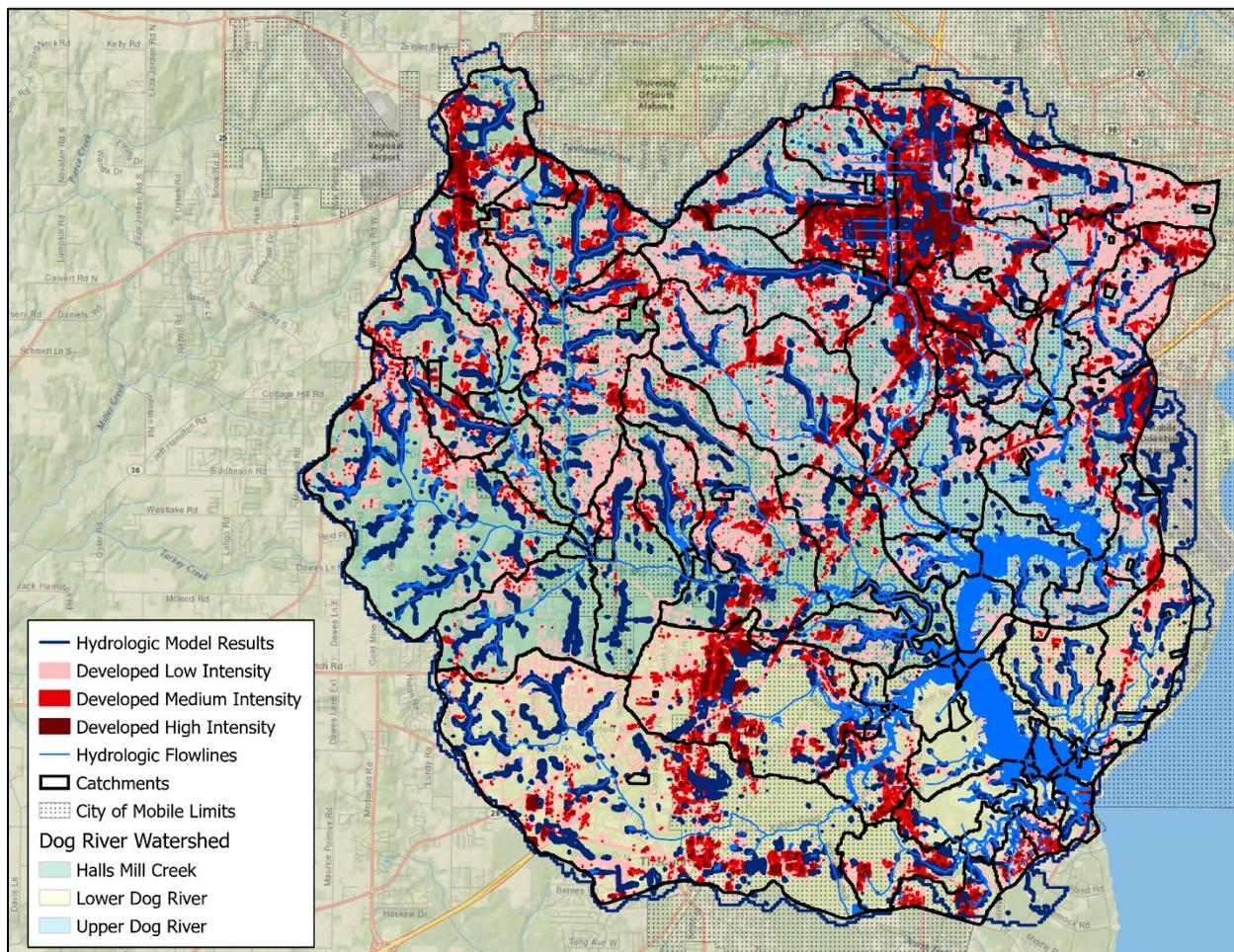


Figure 3. Hydrologic model results for the Dog River Watershed Complex showing areas where water accumulates or pools to depths of at least two inches during a six-inch rain event.

Methodology

This study combined outputs of a hydrologic model with geospatial analysis of the Watershed to identify correlations between areas of water accumulation/pooling during significant rain events, various upstream land uses, and high volumes of litter accumulation. The purpose of this analysis was to strategically target trash abatement and management efforts within the Dog River Watershed Complex and City of Mobile to areas where the greatest impact could be achieved.

Towards development of strategies to mitigate stormwater-conveyed and delivered waterborne trash and litter, the MBNEP first gathered datasets, then undertook a desktop geospatial (using geographic information systems [GIS] data) analysis to identify potential target catchments, identify the locations of instream waterborne-trash-capture devices, and guide field surveys to ground truth desktop analysis conclusions and refine selection of target catchments.

Data

The data used in conducting this analysis included data produced by federal and local agencies and data collected in the field, including through installation and maintenance of Litter Gitter instream trash capture devices by Osprey Initiative, LLC (Osprey). They evaluated and documented litter collected over a period between April and October 2020. Litter collected was characterized using the Escaped Trash Assessment Protocol (ETAP) developed by the EPA as a quantitative survey tool providing a standard method for collecting and assessing litter data (<https://www.epa.gov/trash-free-waters/best-management-practices-tools>).

Datasets secured to conduct the geospatial analysis included the following:

- USGS Watershed Boundary Dataset 12-digit HUCs
- National Hydrography Dataset Plus Version 2 (NHDPlus)
- Hydrologic Model Data 2019, John Curry, Hydro-Engineering Solutions. Model output indicated areas of two inches or greater of water accumulation/pooling during a six-inch rain event.
- Hydrologic Model Data 2019, John Curry, Hydro-Engineering Solutions. Model output identified instream eddy systems.
- National Land Cover Database (NLCD) 2016
- City of Mobile, Land Use 2010 (periodically updated)
- American Community Survey Dataset, Low to Moderate Income Census Tracts 2011-2015
- Osprey Initiative Litter Gitter Escaped Trash Assessment Protocol (ETAP) Collection Data

Geospatial Analysis: The Landscape

The USGS Watershed Boundary Database was used to delineate the Dog River Watershed Complex and its three constituent 12-digit HUCs, both within and outside the geopolitical boundaries of the City of Mobile.

The NHDPlus dataset was applied to the Dog River Watershed Complex to reduce this almost-60,000-acre area into *catchments*, smaller drainage areas more manageable for both analysis and subsequent mitigation. The 101 catchments of the Dog River Complex (shown in Figure 1) range in area from 25 to 6,406 acres.

Geospatial Analysis: Litter Zones

Contracted by the City of Mobile to collect litter from Dog River and its tributaries using the City's trash boat and walking banks, Osprey designated stream reaches as numbered "zones" for management, tracking,

and analysis. Figure 4 shows these 45 Zones, represented by a stream with a 250-foot buffer. Darker colors indicate greater total masses of litter collected. While these data were useful for management purposes and even informed locations for initial Litter Gitter installation, they were exclusively derived from wider, deeper, and more navigable stream reaches. With concerns that smaller, less-accessible waters were not as well represented by these data, this investigation employed a more inclusive analysis of data sets incorporating hydrology and land uses across the entire Dog River Watershed Complex.

Geospatial Analysis: The Hydrology

By combining the landscape data and hydrologic model outputs, catchments were identified where intersections were found between areas experiencing at least two inches of pooling during six-inch rain events and concentrations of urbanization. These catchments included both potential sources of litter and sufficient stormwater runoff to carry it into receiving waters.

Since eddy systems, often associated with stream confluences, were thought to be potential areas of litter accumulation, the hydrologic model output was used to identify their locations, which are shown in Figure 5. Upon field surveys, eddies were found to occur only during particularly high flow events, so no further assessments of this potential were examined in this exercise.

Geospatial Analysis: Litter Gitters

During this analysis, six Litter Gitter instream trash capture devices were in operation throughout the Watershed. The geospatial analysis assessed where Litter Gitters intersected with target catchments.

Ground Truthing of Geospatial Data

To validate the results of the geospatial analysis, several potential target catchments were ground-truthed through field surveys. Since five Upper Dog River Watershed target catchments were already equipped with Litter Gitter capture devices supplying field data, these target catchments were not ground-truthed. Locations field surveyed were informed by intersection of areas of pooling indicated by hydrologic models with significant development indicating potential for litter conveyance. Field surveys were undertaken to collect data at each of the remaining target catchments to secure data, including but not limited to waterbody type, site conditions and land use impacts.

Refinement of Geospatial Analysis: Commercial and Residential Concentrations

To characterize land uses as Residential or Commercial, and with the City of Mobile Land Use dataset only providing individual points to designate single units as Residential or Commercial, the NLCD

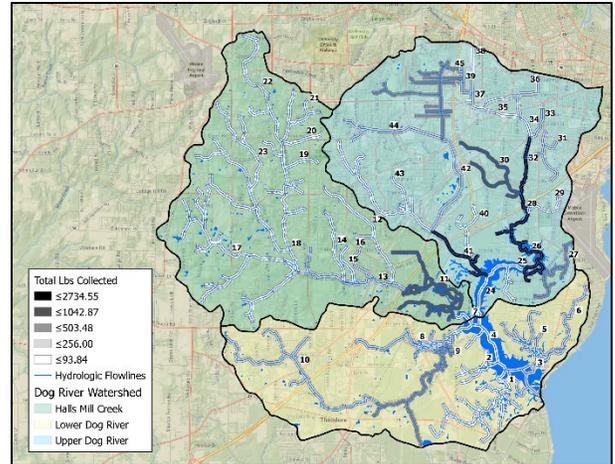


Figure 4. Litter zones identified by Osprey Initiative during City-contracted trash collection and analysis.

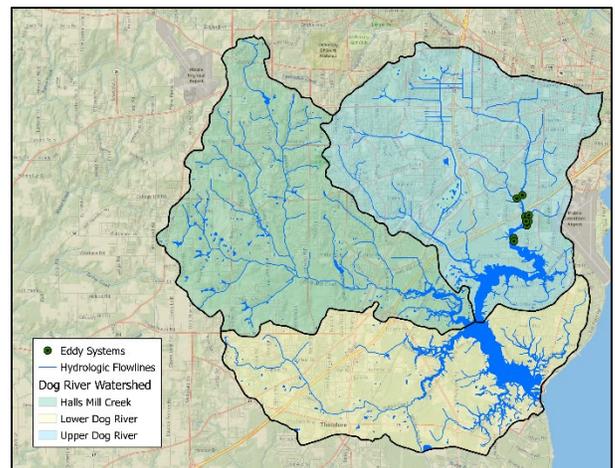


Figure 5. Eddy locations identified in hydrologic model locations.

dataset was used to identify areas of low, medium, and high-intensity development. Low-intensity development includes areas with a mixture of constructed material and vegetation with impervious surfaces accounting for 20 to 49 percent of total cover, most commonly including single family housing units. Medium intensity development is also a mixture of constructed material and vegetation but with 50 to 79 percent impervious cover. High intensity development is characterized by highly developed areas with 80 to 100 percent impervious cover. Although both medium and high intensity areas of development include apartment complexes and row houses, they are where people reside or work in high numbers and include commercial and industrial units. Therefore, this analysis interpreted low intensity development as a proxy for Residential concentrations and medium and high intensity development as the proxies for Commercial concentrations. These data were incorporated into the analysis to better understand sources of trash; i.e., did litter emanate from commercial establishments indicating a need for better grounds maintenance, or did it emanate from residential areas indicating a need for community education, engagement, and involvement?

Refinement of Geospatial Analysis: Low-Income Areas

The American Community Survey Dataset was overlaid to identify catchments intersecting census tracts with greater than 50% low-to-moderate-income households, since these areas meet eligibility criteria for U.S Department of Housing and Urban Development Community Development Block Grant (CDBG) funding. These data were calculated using U.S. Census blocks in which 51% of households earn less than 80% of the area median income. By identifying where correlations exist between these neighborhoods and high volumes of litter, the potential exists for use of CDBG funds to support interim assistance measures such as neighborhood clean-up campaigns.

Results: Overview of Target Catchments

Prioritization Criteria

Since Schueler et. al. (1994) and others have described the well-established relationship between impervious cover and increased pollutant loads, including litter, the analysis identified all catchments with urbanization of 25% or greater, the threshold at which Schueler’s work characterized receiving waters as “degraded.”

Criteria used for designation as a *target catchment* included:

- 1) The catchment area is at least 25% urbanized, and
- 2) Hydrologic model output for the catchment indicates it includes areas of pooling or accumulation of at least two inches of water during a six-inch rain event, or
- 3) The catchment includes waters or streams draining an adjacent catchment meeting the first two criteria.
- 4) The catchment falls below the 25% urbanization threshold but includes areas of concentrated urbanization near water pooling.

Table 1: Area of target catchments

Catchment	Name	Acres
1	Airport/Milkhouse Creek	1,074
2	Creekwood/2 nd Creek	1,201
3	Grelot/UT-Milkhouse Creek	355
4	Eslava Creek	2,187
5	Michael/Montlimar Creek	712
6	Mertz/Bolton Branch	772
7	Morningside/Bolton Branch	486
8	Halls Mill/Moore Creek	1,263
9	Hwy 90/Rattlesnake Bayou	2,805
10	Carol Plantation/Rabbit Creek	6,406
11	Providence Hospital	278
12	Springhill Hospital	687

Based on these criteria, 12 catchments, with numbers retained from the NHDPlus dataset (see Table 1), were designated as *target catchments*, and are shown in Figure 6. One of the twelve catchments, #10, located in the Lower Dog River Watershed, fell below the 25% impervious threshold but was selected and validated through field survey, due to the intensity of urbanization along Highway 90 including areas near Hamilton Boulevard and in Tillman’s corner.

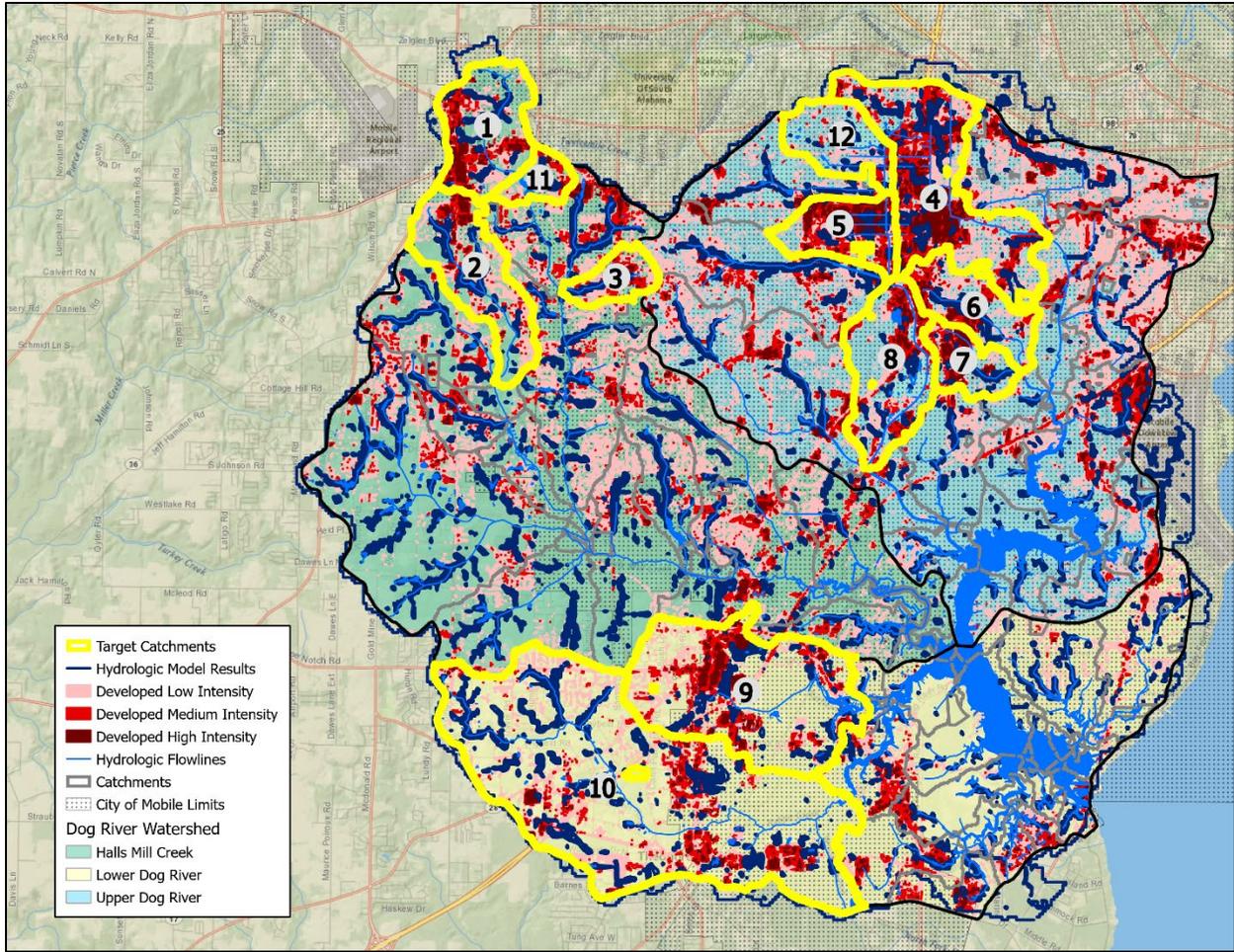


Figure 6. Map of Dog River Watershed Complex showing the 12 catchments meeting criteria for designation as target catchments. These target catchments retain the numbers designated in the NHDPlus dataset.

Table 2 provides data about the 12 target catchments (percent imperviousness, percent of catchment area within Mobile City Limits, and whether a Litter Gitter is installed there). Target catchments range between 20 to 81 percent impervious cover.

Table 2. Target Catchments with percent imperviousness, percent area within Mobile City Limits, and whether a Litter Gitter is installed.

Catchment	Name	Percent Imperviousness	Percent of area within Mobile City Limits	Litter Gitter Installed
1	Airport/Milkhouse Creek	42	72	No
2	Creekwood/2nd Creek	41	20	No
3	Grelot/UT-Milkhouse Creek	62	100	No
4	Eslava Creek	67	100	Yes
5	Michael/Montlimar Creek	81	100	Yes
6	Mertz/Bolton Branch	52	100	Yes
7	Morningside/Bolton Branch	48	100	Yes
8	Halls Mill/Moore Creek	43	100	Yes
9	Hwy 90/Rattlesnake Bayou	34	78	No
10	Carol Plantation/Rabbit Creek	20	37	No
11	Providence Hospital	41	54	No
12	Springhill Hospital	25	100	No

Of the 12 target catchments, five in the Upper Dog River Watershed were already equipped with a total of six Litter Gitters with maintenance and ETAP assessments already providing data. Figure 5 shows the location of these devices, numbered one through six clockwise from the northernmost device.

Based on ETAP data, an average of 16.9 lbs. of litter per device per cleaning event was collected during the period of April through October 2020, along with data characterizing the type and condition of the litter collected.

With maintenance schedules varying for the devices complicating comparisons, litter amounts were quantified in average mass (lbs.) captured per device per maintenance event. With these devices already providing data about these five target catchments, site assessments/ground truthing were not undertaken there. However, their status as target catchments remains. The location of the City of Mobile’s Bandalong Boom System, located downstream of the target catchments, is also indicated in Figure 7.

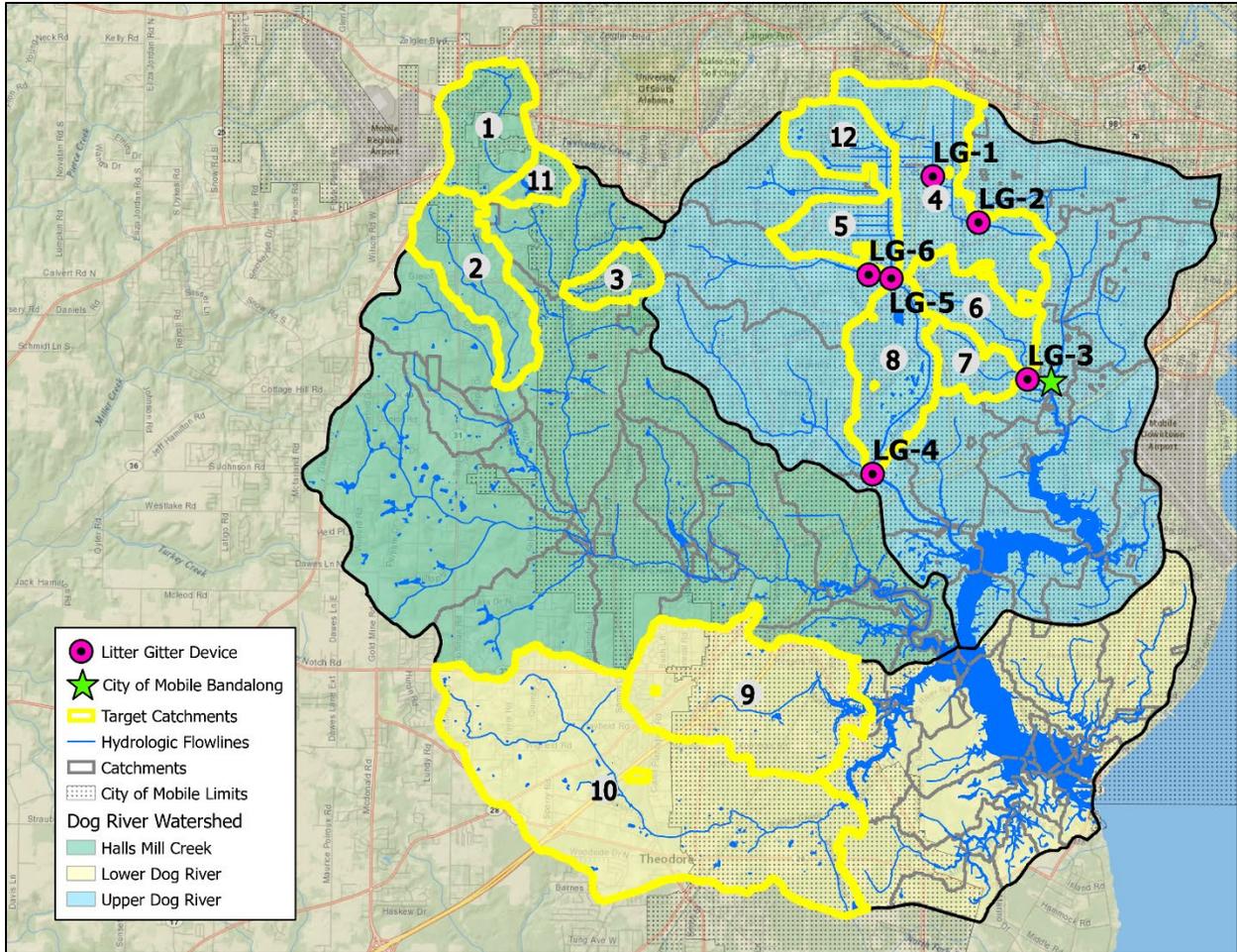


Figure 7. Locations of Litter Gitter instream litter capture devices. The location of the City of Mobile's Bandalong Boom System (not within a target catchment) is also indicated.

Field Surveys

Field surveys were conducted at the seven remaining target catchments at a total of 11 sites shown in Figure 8. Each site surveyed was assigned a Site ID that included an abbreviation for the receiving water body (i.e., EC-Eslava Creek, MC-Milkhouse Creek, SC-Second Creek, RB-Rattlesnake Bayou, RC-Rabbit Creek, and UT-unnamed tributary), numbered to differentiate between sites draining to the same receiving water.

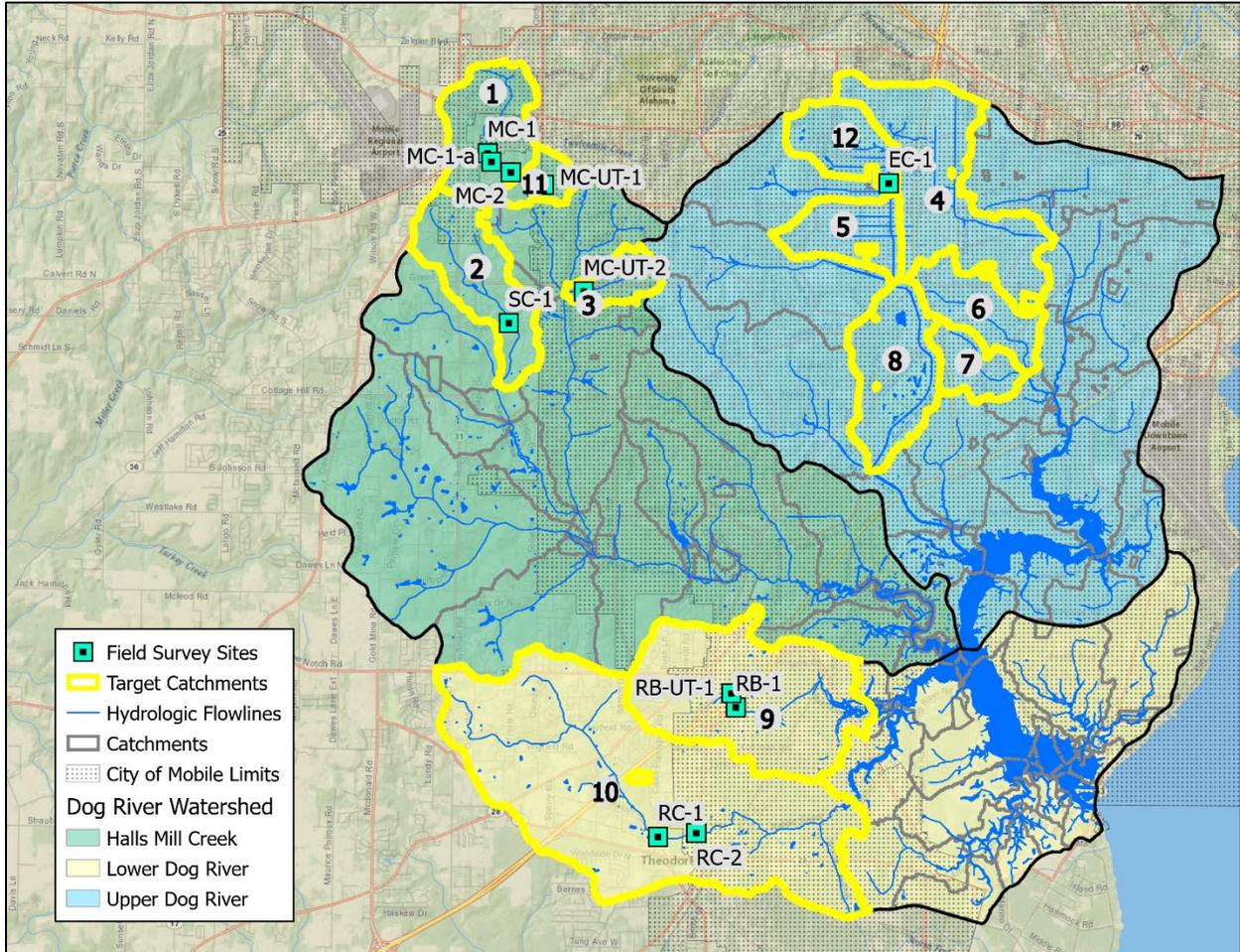


Figure 8. Locations of the 11 sites ground-truthed through field surveys within the seven target catchments without Litter Gitters collection devices.

Appendix A summarizes field survey data for the ground-truthed sites within the seven target catchments without Litter Gitters, including a highway-referenced location, target catchment number, Site ID, waterbody type, litter characterizations, impacted land use, adjacent land use, impairment rating (1 to 5 from least to most impaired), and whether the site was suitable for installation of a Litter Gitter.

Excluded Catchments

Despite meeting target catchment criteria and based upon these site assessments, two target catchments, shown in Figure 9, were excluded from the initial list of 12. Catchment 12, with assessment Site ID EC-1, was excluded from the list because the primary land use within this catchment is the Spring Hill Golf Course. The other, Catchment 11, with assessment Site ID MC-UT-1 near the Providence Hospital, was removed because it contained an accumulation/pooling area (a drainage basin/lake) with no connecting streams. Despite both having been significantly urbanized, site assessments confirmed that golf courses and hospitals represent land uses where poor trash management and litter accumulation are less likely.

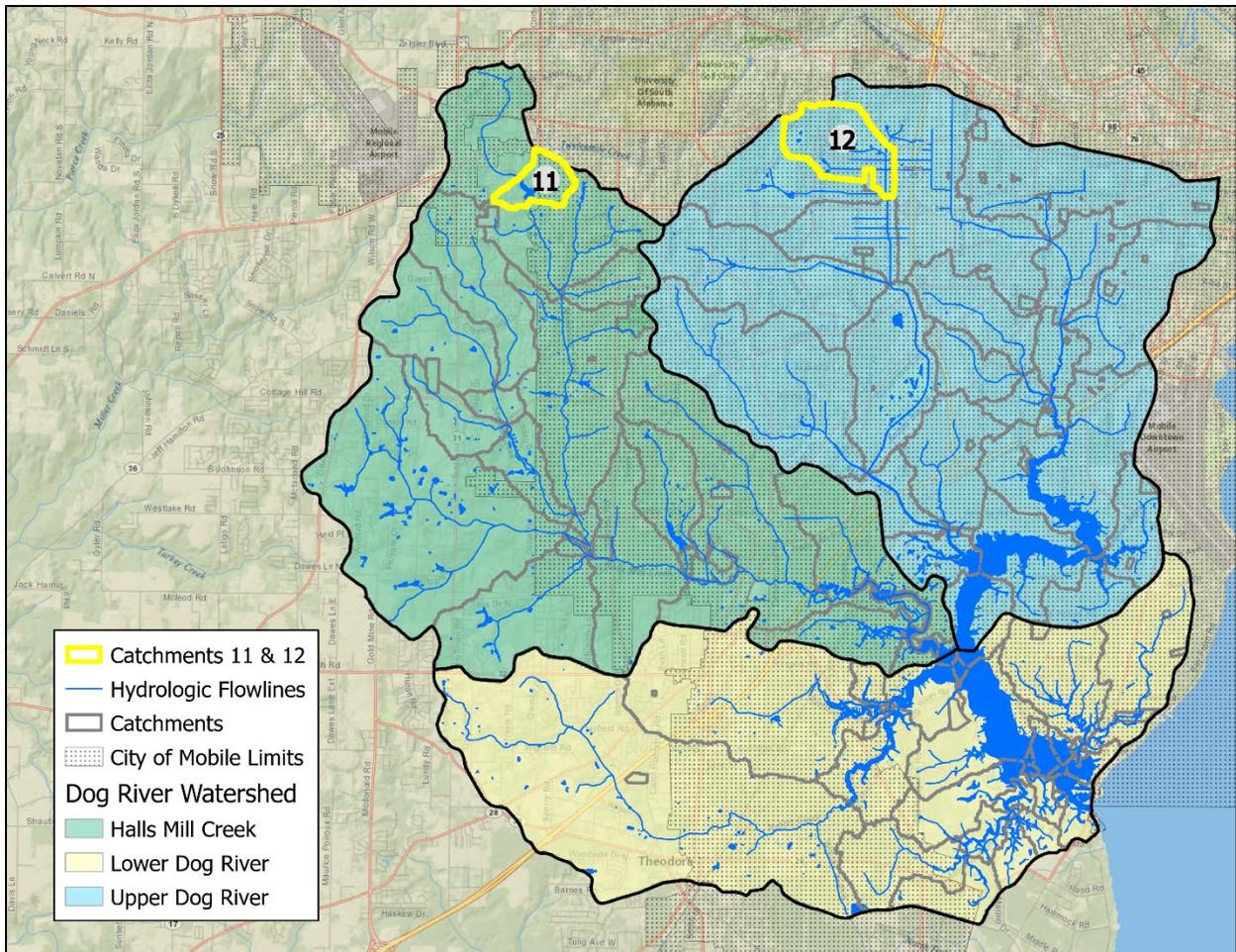


Figure 9. Catchments 11 and 12, which were excluded from further analysis.

Residential vs. Commercial Areas

Table 3 Target catchments with percent Residential and percent Commercial.

Target Catchment	Name	Percent Residential	Percent Commercial
1	Airport/Milkhouse Creek	17	25
2	Creekwood/2nd Creek	27	13
3	Grelot/UT-Milkhouse Creek	30	31
4	Eslava Creek	23	44
5	Michael/Montlimar Creek	23	57
6	Mertz/Bolton Branch	22	29
7	Morningside/Bolton Branch	20	28
8	Halls Mill/Moore Creek	19	24
9	Hwy 90/Rattlesnake Bayou	16	18
10	Carol Plantation/Rabbit Creek	12	8

Table 3 shows the percentage of the urbanized areas within target catchments designated as Residential and Commercial land uses. With only individual points from City of Mobile Land Cover data available to designate single units as Residential or

Commercial, percent imperviousness was used as a proxy for this characterization. Since low intensity development, ranging from 20 to 49 percent imperviousness, is found most specifically in single family residential developments, this category was designated Residential. While both medium and high intensity development, ranging in imperviousness from 50 to 100 percent, include some single family residential, apartment complexes, and row houses, this level of imperviousness is more indicative of commercial and industrial land uses. For the purpose of this analysis, both medium and high intensity development were designated as Commercial. Overlying the NLCD polygons based on imperviousness with the City of Mobile Land Cover points designating single units to validate the designations based on imperviousness provided a level of confidence about this analysis strategy. Concentrations of Residential and Commercial land uses are shown in Figure 10, respectively.

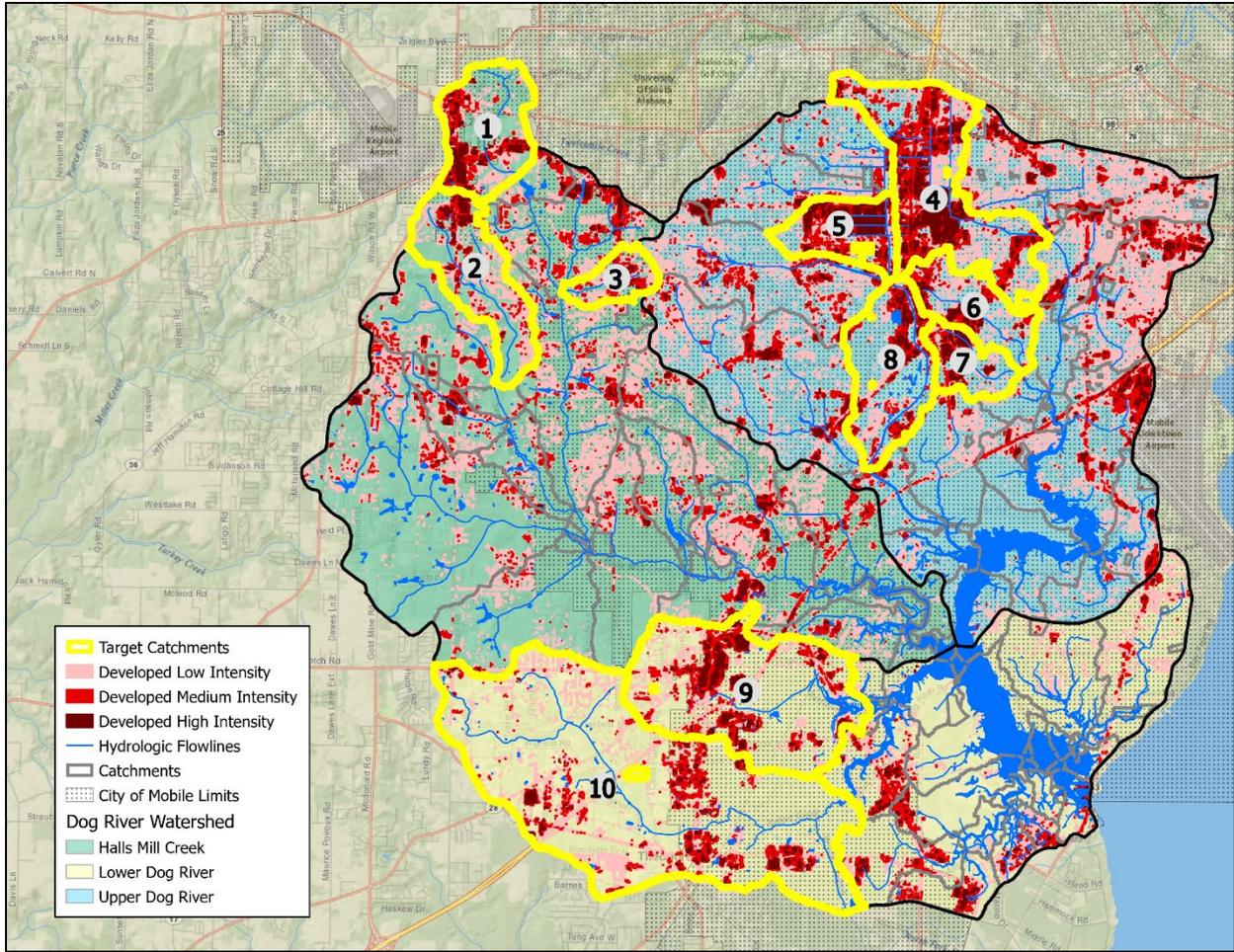


Figure 10. Residential and commercial areas represented by low, medium, and high intensity developed.

Low-to-Moderate-Income Areas

Figure 11 shows five of the 10 target catchments intersected census blocks with greater than 50% of the households earning less than 80% of the median income. Four low-to-moderate-income census blocks lie entirely within City of Mobile geopolitical boundaries. A fifth block in target catchment #10 lies in unincorporated Mobile County.

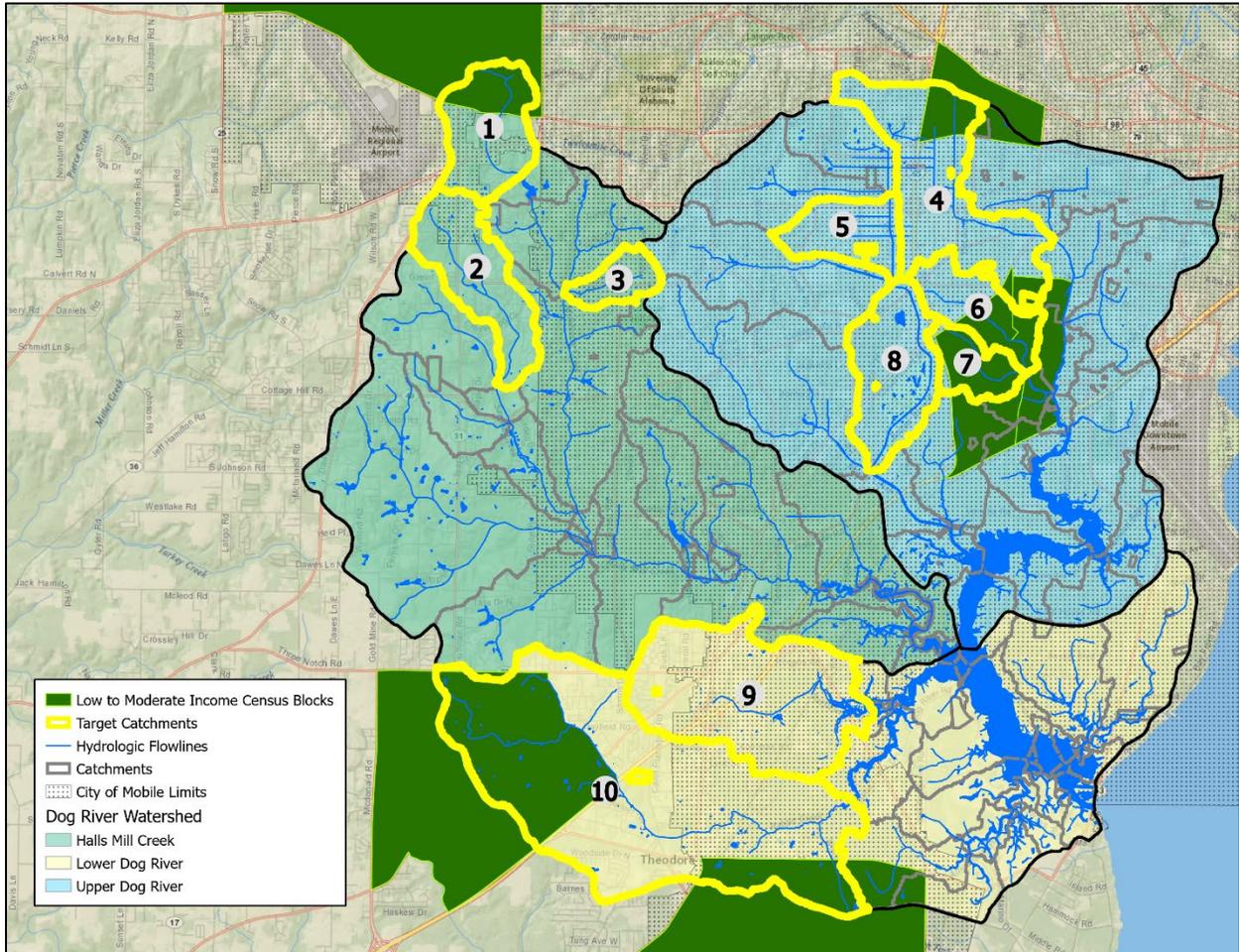


Figure 11. Catchments intersecting census blocks with greater than 50% of the households earning less than 80% of the area's medium income.

Results: The 10 Target Catchment Descriptions

The following maps will provide specific information on each of the 10 target catchments. Information on each of the five field-surveyed catchments will be presented first, with map, catchment descriptions, and site-specific field survey data, including:

- Site IDs with location of survey sites with GPS coordinates and major highway intersections for reference,
- specific data related to waterbody type, site condition, predominant litter type and condition, land use and adjacent land use impacted, impairment rating for each site, and
- and potential strategy for management. Appendix B summarizes assessments and potential strategies for each surveyed site.

The remaining five catchments were not field surveyed, and data from those catchments and material collected from Litter Gitters and ETAP assessments will be presented subsequently.

Figure 12 shows complete outputs of the hydrologic model with geospatial analysis of the Dog River Watershed Complex. Data layers include watershed boundaries, NHDPlus catchments (with designated target catchments numbers), hydrologic data indicating areas of water accumulation/pooling, areas of urbanization, Mobile City Limits, locations of Litter Gitter instream trash capture devices and the City's Bandalong Boom System, and locations of field survey sites.

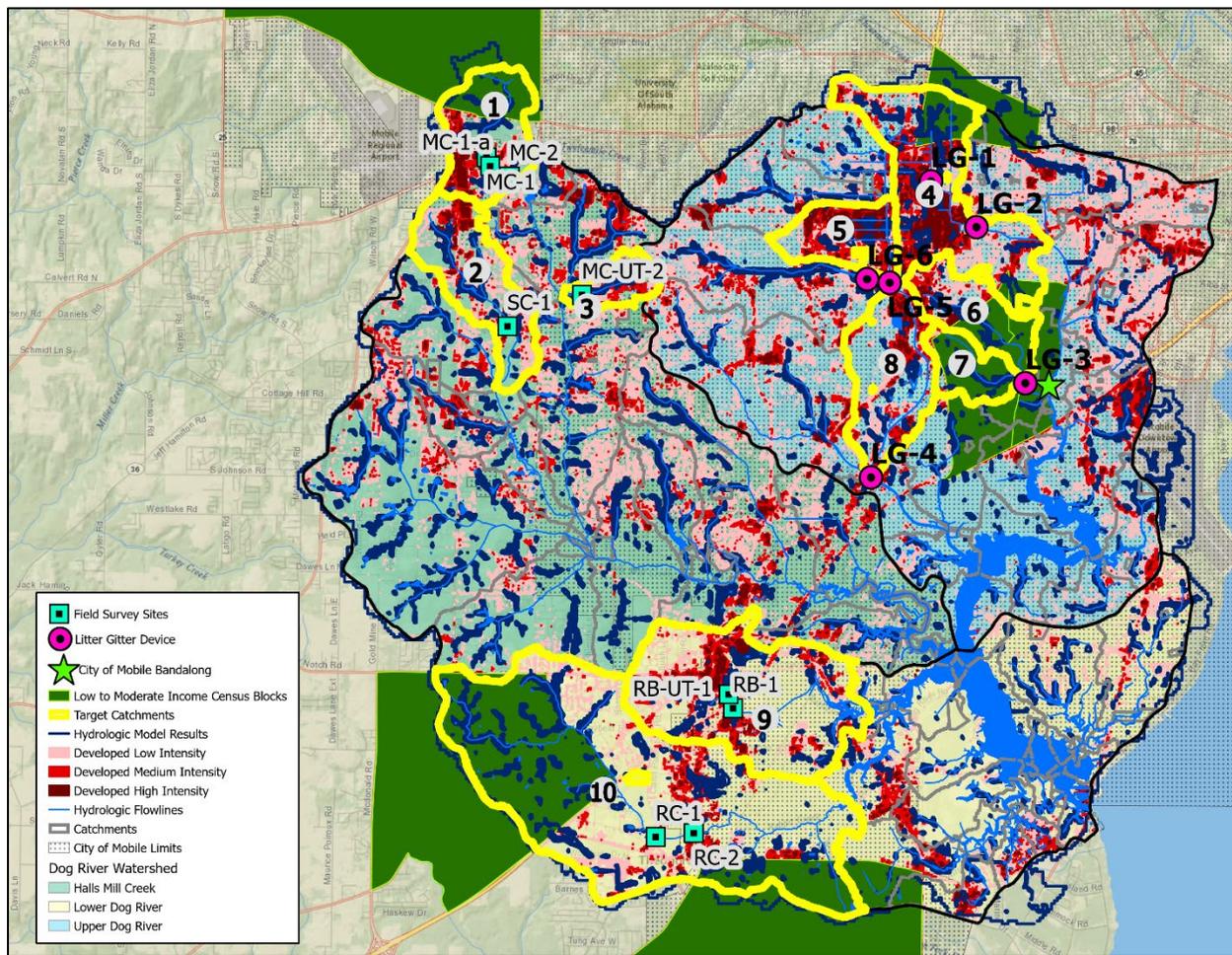


Figure 12. The Dog River Watershed Complex geospatial analysis.

Field Surveyed Target Catchments

Results of target catchment analyses will be presented first for the five target catchments surveyed in the field. Results from sites surveyed in target catchments 2, 1, 10, 3 and 9, follow.

Target Catchment 2 – Site SC-1: Creekwood Drive

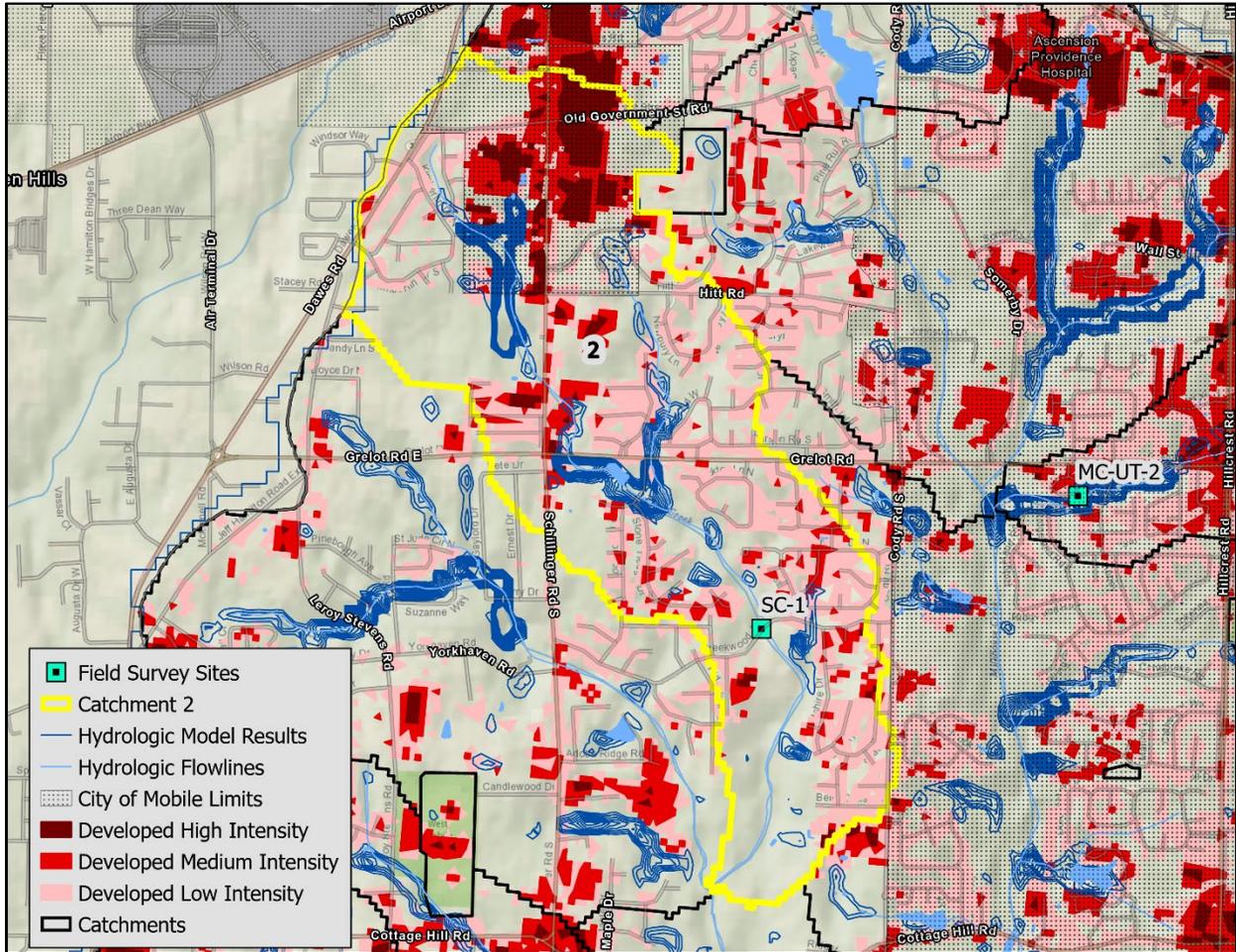


Figure 13. Target catchment 2 with field survey site SC-1.

Data from Site SC-1 within Target Catchment 2, shown in Figure 13 and located near Creekwood Drive between Schillinger Road and Cody Road is summarized below. Twenty percent of this catchment lies within Mobile City Limits with the remaining 80% in unincorporated Mobile County.

Site ID: SC-1

Latitude: 30° 39' 13.68" N

Longitude: -88° 12' 51.4794" W

Near road/intersection: Creekwood Drive between Schillinger Road and Cody Road

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 3

Predominant litter type: Styrofoam, plastic

Predominant litter condition: Intact

Land use impacted: Wetlands, roadside

Adjacent land use: Residential

Site Assessment: This site is located along a cut-through road between Schillinger Road and Cody Road. It is heavily littered with obvious areas of illegal dumping. The stream is mostly clean and in good condition.

Potential Strategy: Site is easily accessible for volunteer or tactical cleanups. Installation of watershed signage is recommended. Installation of an instream Litter Gitter is not recommended.

Target Catchment 1 – Sites MC-1, MC-1a, and MC-2: Schillinger Road/Airport Boulevard

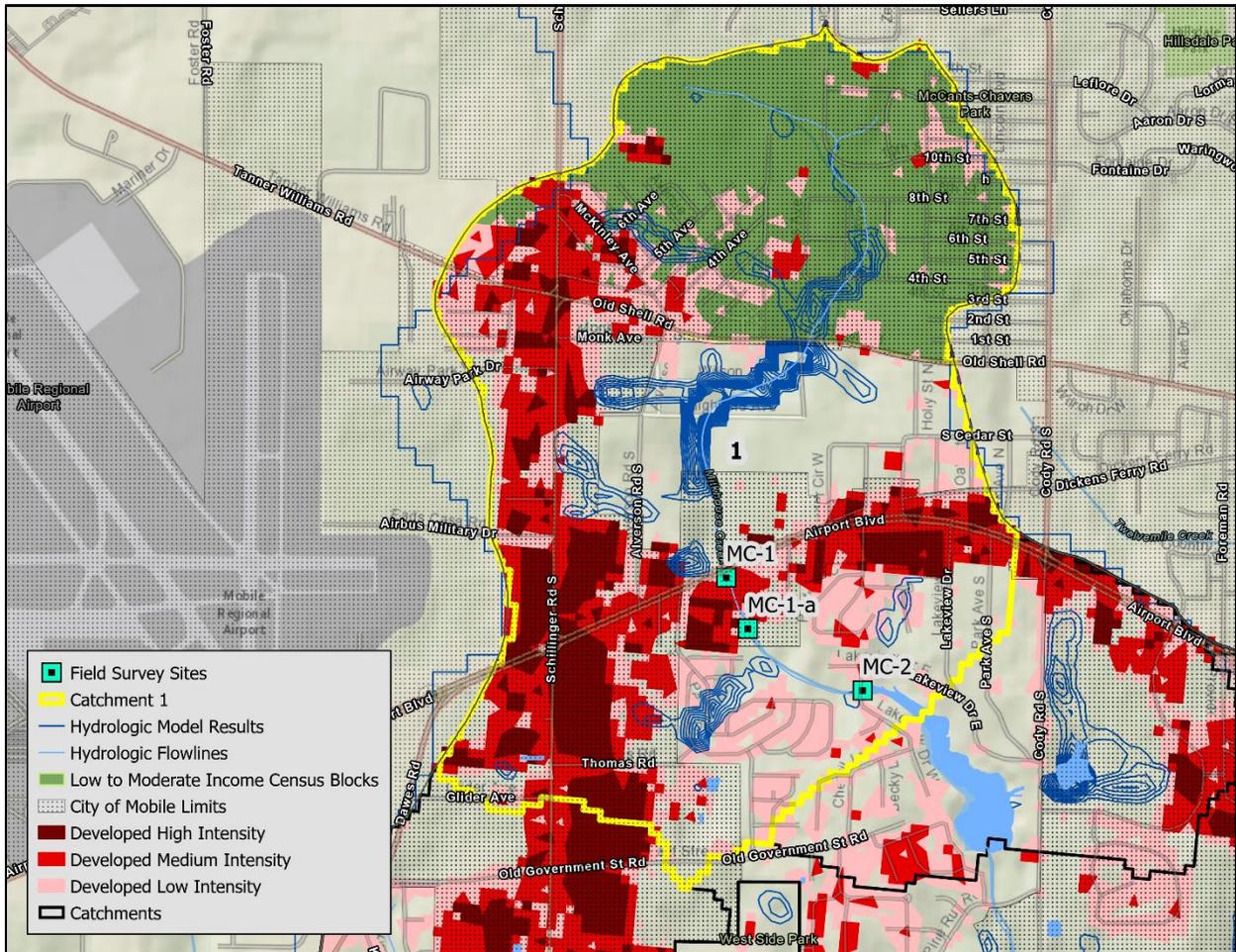


Figure 14. Target catchment 1 with field survey sites MC-1, MC-1a, MC-2.

Data from Sites MC-1, MC-1a, and MC-2 within Target Catchment 1, shown in Figure 14 and located near Schillinger Road and Airport Boulevard, are summarized below. Seventy-two percent of this catchment lies within Mobile City Limits with the remaining 28% within unincorporated Mobile County.

Site ID: MC-1

Latitude: 30° 41' 7.08" N

Longitude: -88° 13' 9.12" W

Near road/intersection: Airport Blvd.

Water body type: Ephemeral stream

Site condition (1 clean – 5 heavily impacted): 3

Predominant litter type: Styrofoam

Predominant litter condition: Intact

Land use impacted: Roadside

Adjacent land use: Commercial

Site Assessment: Site has roadside, lined ditches, and trash discarded from vehicles drains down Airport Boulevard into these ditches. Types of litter observed were mainly fast food and beverage containers. Rich's Car Wash is located next to the site, and discolored water (purple) was observed in the ditch.

Potential Strategy: Site is accessible for volunteer or tactical cleanups. The site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

Site ID: MC-1a

Latitude: 30° 41' 1.32" N

Longitude: -88° 13' 6.24" W

Near road/intersection: Airport Boulevard

Water body type: Stream, ditch

Site condition (1 clean – 5 heavily impacted): 4

Predominant litter type: Styrofoam

Predominant litter condition: Partially degraded

Land use impacted: Wetlands

Adjacent land use: Commercial

Site Assessment: Site is easily accessible through an adjacent church property. Volunteer cleanups here would be difficult, due to uneven terrain and heavy vegetation. The end of a concrete-lined ditch (and a culvert crossing Airport Boulevard flows into a degraded channel. The site has a head cut and is failing due to stormwater drainage. It appears to be holding litter from upstream MC-1 and prevents the majority of litter from flowing downstream into Optimist Lake.

Potential Strategy: Tactical/professional cleanups with routine inspections. Installation of an instream Litter Gitter is not recommended.

Site ID: MC-2

Latitude: 30° 40' 54.4794" N

Longitude: -88° 12' 51.12" W

Near road/intersection: Lakeview Drive West

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 1

Predominant litter type: Aluminum

Predominant litter condition: Partially degraded

Land use impacted: Roadside

Adjacent land use: Residential

Site Assessment: Site was sparsely littered, mostly on the roadside and not in the stream. The site has sediment accumulating from the degraded MC-1a channel. Instream litter appears to have escaped from Site MC-1a upstream.

Potential Strategy: Installation and maintenance of an instream Litter Gitter should be considered at this site or upstream, and the site should be routinely inspected.

Target Catchment 10 – Sites RC-1 and RC-2: Highway 90/Carol Plantation Road

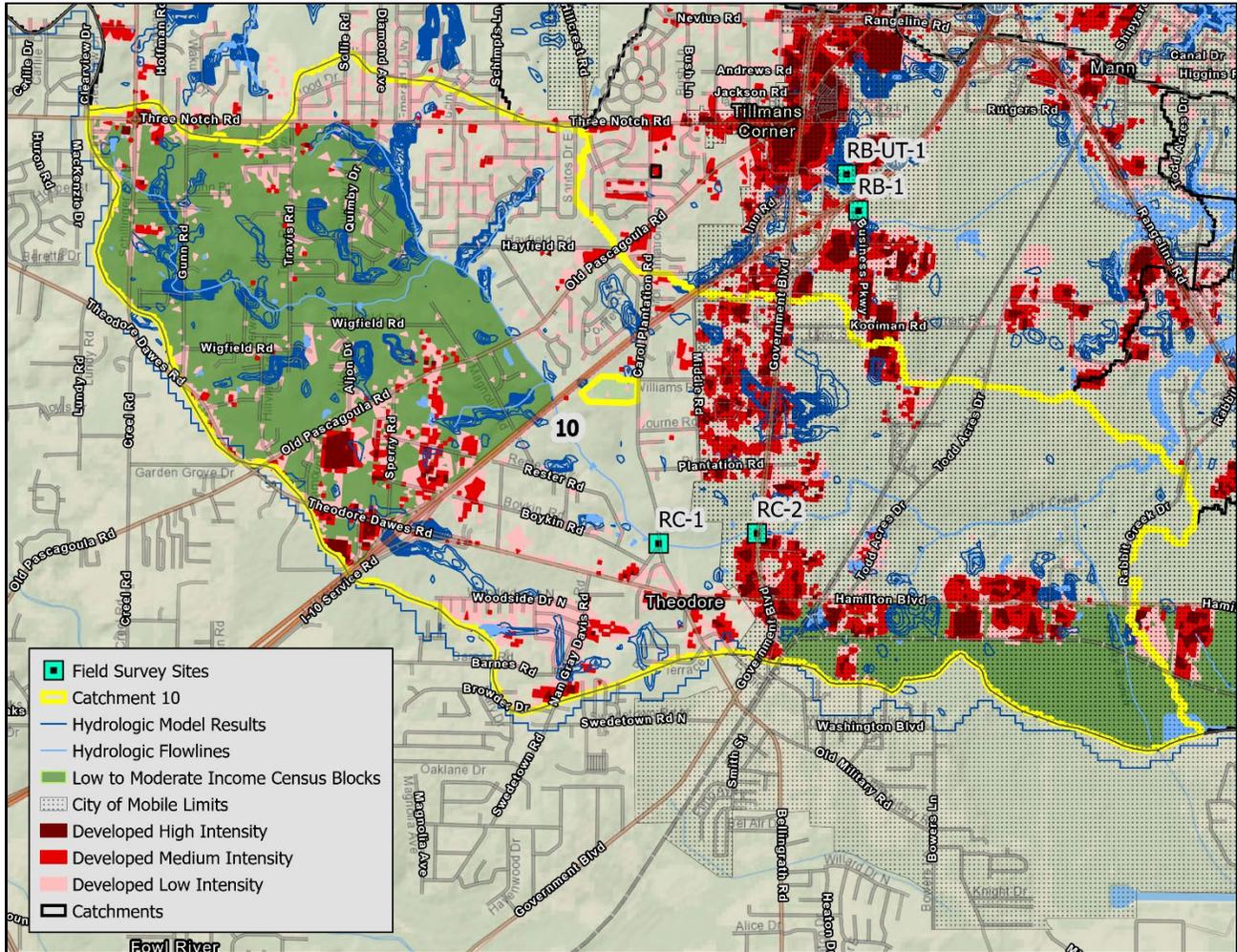


Figure 15. Target catchment 10 with two field survey sites, RC-1, and RC-2.

Data from Sites RC-1 and RC-2 within Target Catchment 10, shown in Figure 15 and located near Highway 90 in Tillman’s Corner, AL, are summarized below. Only 37% of this catchment lies within Mobile City Limits with the remaining 63% within unincorporated Mobile County.

Site ID: RC-1

Latitude: 30° 33' 31.32" N

Longitude: -88° 10' 51.96" W

Nearby road/Intersection: Carol Plantation Road

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 2

Predominant litter type: Styrofoam, plastic

Predominant litter condition: Intact

Land use impacted: Wetlands, roadside

Adjacent land use: Residential

Site Assessment: Trash instream is minimal. Stream appears in good condition. Roadside litter was observed.

Potential Strategy: Site is accessible for volunteer or tactical cleanups. It is currently an Adopt-A-Stream location. The adopter is the Theodore High School Science Club. Installation of watershed signage is recommended. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

Site ID: RC-2

Latitude: 30° 33' 34.1994" N

Longitude: -88° 10' 22.4394" W

Nearby road/Intersection: Highway 90/Government Blvd.

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 1

Predominant litter type: Styrofoam, plastic

Predominant litter condition: Intact

Land use impacted: Wetlands, roadside

Adjacent land use: Commercial

Site Assessment: Litter is concentrated in a roadside ditch that drains the Theodore Oaks Shopping Center and Highway 90. The site is easily accessible. Litter also observed in wooded area east side of road deposited from highwater events.

Potential Strategy: Site is accessible for volunteer or tactical cleanups. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

Target Catchment 3 – Site MC-UT-2: Hillcrest Road/Grelot Road

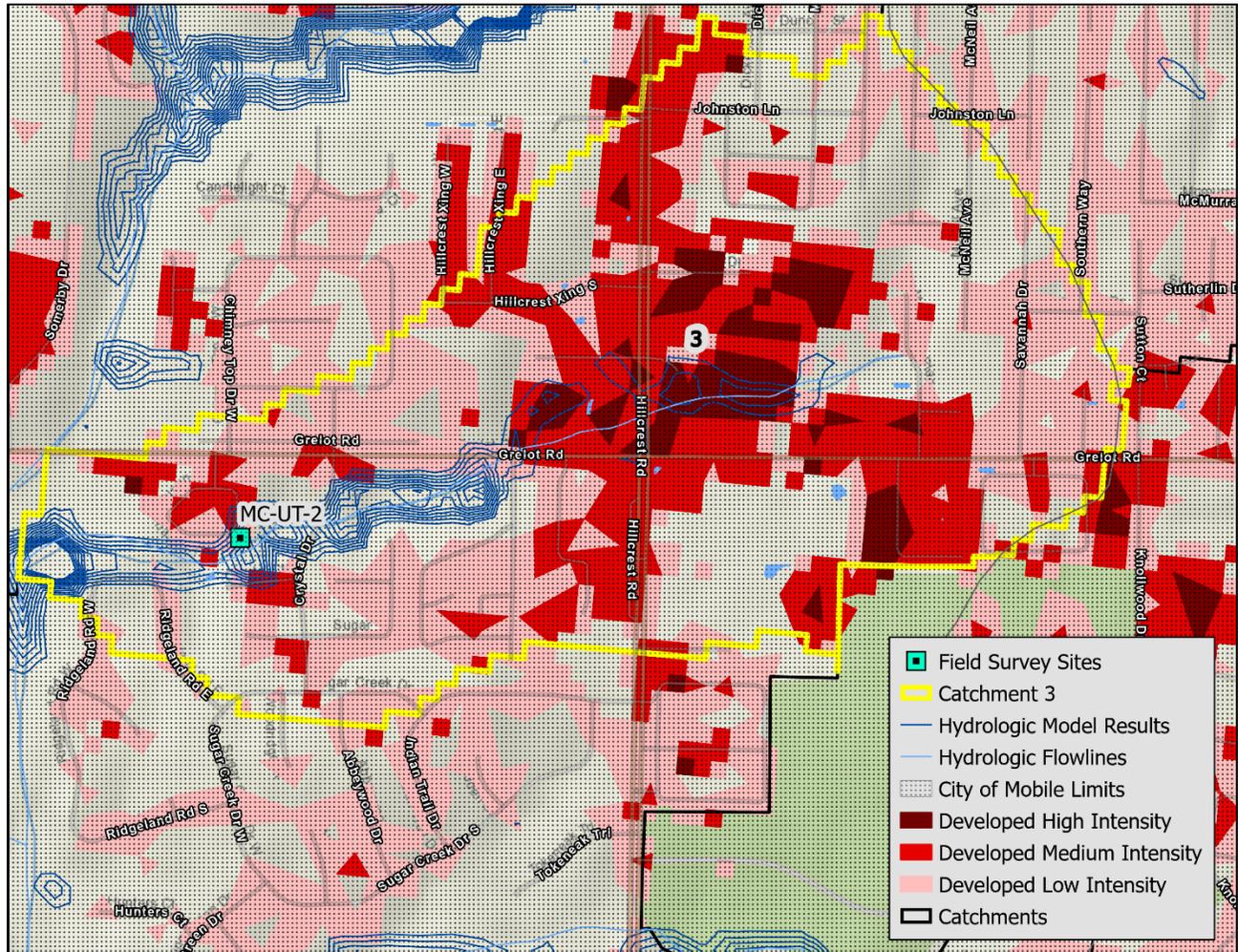


Figure 16. Target catchment 3 with field survey sites MC-UT-2.

Data from Site MC-UT-2 within Target Catchment 3, shown in Figure 16 and located near the intersection of Hillcrest Road and Grelot Road, is summarized below. The entirety of this catchment lies within the Mobile City Limits.

Site MC-UT-2

Latitude: 30° 39' 35.64" N

Longitude: -88° 11' 54.5994" W

Near road/intersection: Hillcrest Road/Grelot Road near the Autumn Chase Apartments

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 4

Predominant litter type: Styrofoam, plastic, glass, aluminum

Predominant litter condition: Intact, partially degraded, and degraded

Land use impacted: Parking lot

Adjacent land use: Commercial and residential

Site Assessment: Site was observed with heavy litter.

Potential Strategy: This site is accessible and suitable for volunteer or tactical cleanups. It should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

Target Catchment 9 – Sites RB-1 and RB-UT-1: Highway 90/Tillman’s Corner

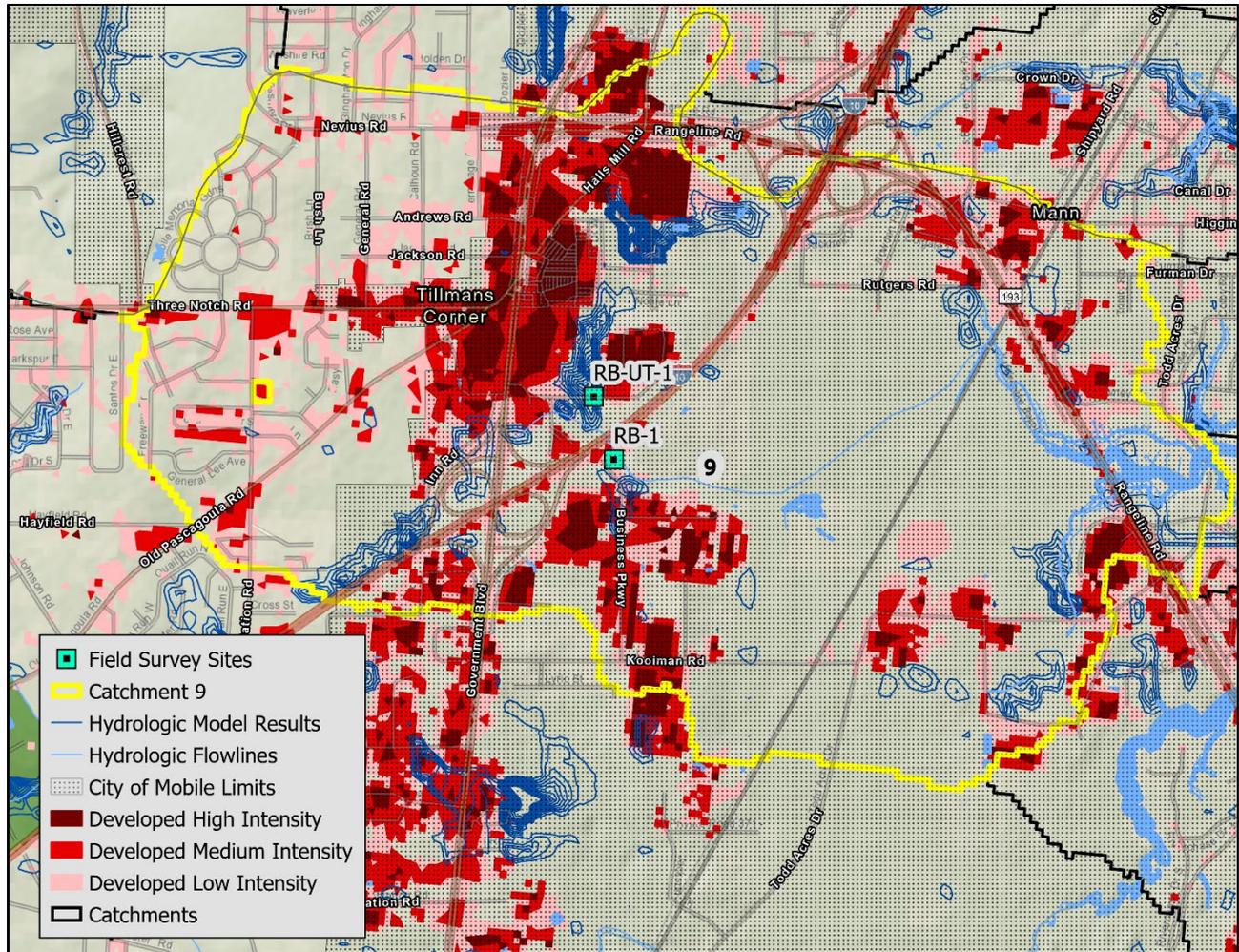


Figure 17. Target catchment 9 with two field survey sites, RB-1, and RB-UT-1.

Data from Sites RB-1 and RB-UT-1 within Target Catchment 9 of the Lower Dog River Watershed, shown in Figure 17 and located near Highway 90 in Tillman’s Corner, AL, are summarized below. Seventy-eight percent of this catchment lies within Mobile City Limits with the remaining 22% within unincorporated Mobile County.

Site ID: RB-1

Latitude: 30° 34' 58.4394" N

Longitude: -88° 9' 52.9194" W

Nearby road/intersection: Business Parkway, Kooiman Road

Water body type: Stream

Site condition (1 clean – 5 heavily impacted): 3

Predominant litter type: Styrofoam, plastic

Predominant litter condition: Partially degraded

Land use impacted: Instream

Adjacent land use: Commercial

Site Assessment: Site is downstream of two smaller drainages in Tillman's Corner and is easily accessible. Litter accumulates in a small lagoon on the east side of the bridge.

Potential strategy: Installation, maintenance, and routine inspection of an instream Litter Gitter is recommended for this site.

Site ID: RB-UT-1

Latitude: 30° 35' 7.7994" N

Longitude: -88° 9' 56.52" W

Nearby road/intersection: Coca Cola Road, Highway 90/Government Boulevard

Water body type: Ephemeral stream

Site condition (1 clean – 5 heavily impacted): 2

Predominant litter type: Plastics

Predominant litter condition: Partially degraded

Land use impacted: Roadside

Adjacent land use: Commercial

Site Assessment: Site drains a mixture of undeveloped, shopping centers, and residential areas and is easily accessible.

Potential strategy: Site is accessible for volunteer or tactical cleanups and should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

Target Catchments with Installed Litter Gitters

The following results capture data on the five target catchments with six Litter Gitters installed in their receiving waters. Information on these catchments includes a map, catchment descriptions, Litter Gitter locations, and data secured through application of ETAP to collected material. Results from target catchments 8, 4, 7, 6, and 5 follow.

Target Catchment 8 –Litter Gitter 4 on Moore Creek

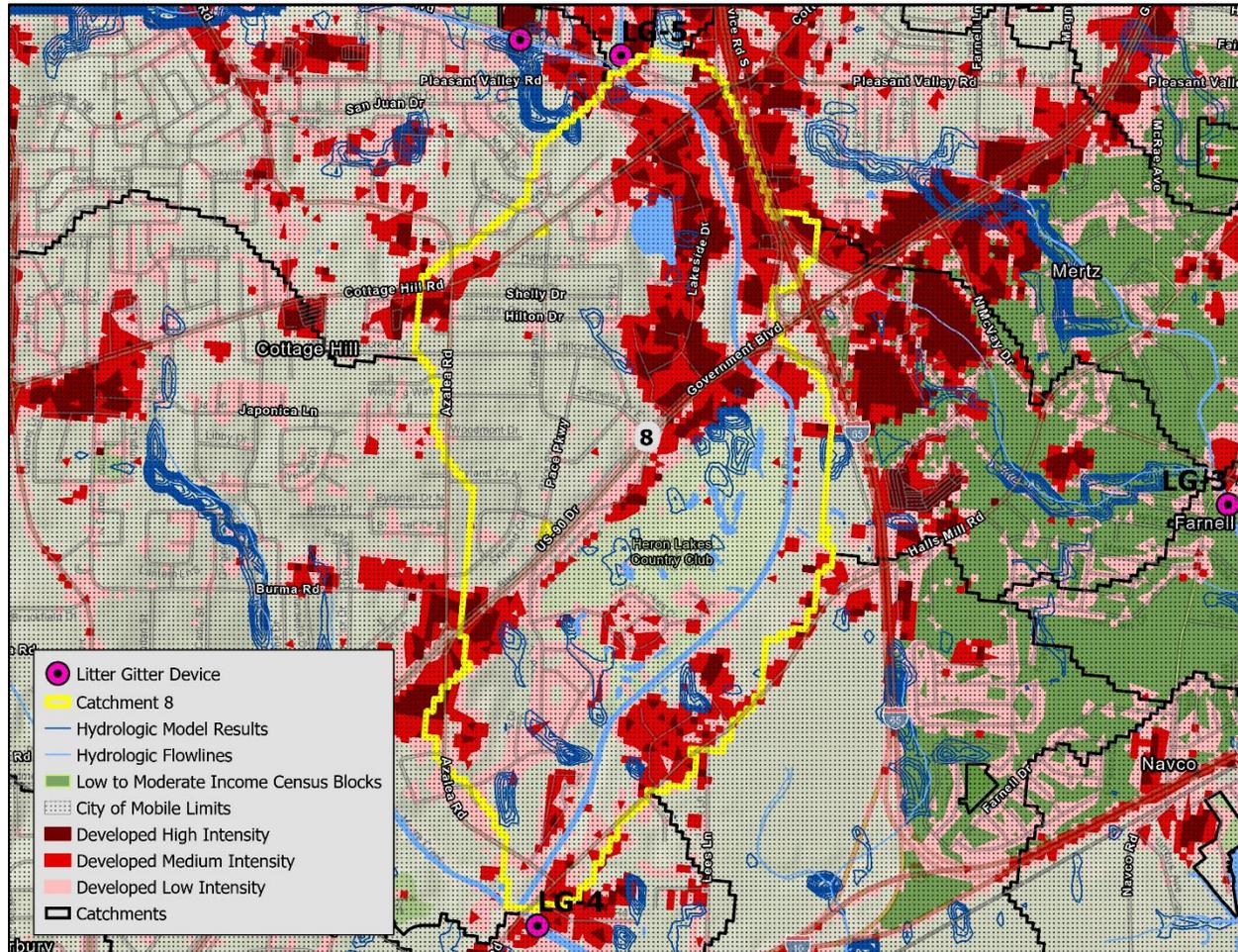


Figure 18. Target catchment 8 with Litter Gitter downstream of confluence of Moore Creek and Montlimar Canal indicated.

Target Catchment 8, shown in Figure 18, located on Moore Creek downstream of its confluence with the Montlimar Canal, drains an area running north to south along and west of I-65 past the Government Boulevard interchange before turning southwest between Heron Lakes Country Club and Halls Mill Road to a southern point near the confluence of Montlimar Creek (to which it drains) and Moore Creek, before turning north along Azalea Road, then northeast along Cottage Hill Road. The entirety of target catchment 6, which is 43.8% impervious, lies within Mobile City Limits.

Litter Gitter 4 location (waterbody and road/intersection): Moore Creek south of the intersection of Azalea Road and Halls Mill Road

Litter Gitter 4 Latitude/Longitude: 30° 37' 34.5792" N, -88° 7' 54.4866" W

Number of maintenance events: 24

Total mass of material collected: 358.4 lbs.

Average mass of material collected per maintenance event: 14.9 lbs.

Primary litter types collected: Plastic (81.9%) Other (including Styrofoam) (11.8%) Metal (3.7%) Glass (1.3%) Paper (1.3%)

Condition of material collected: Intact (54.0%) Partially degraded (42.0%) Degraded (4.0%)

Brands collected: Coke (28.9%) Swisher (11.7%) Gatorade (10.2%)

Primary upstream land use: Mixture of Commercial (24.7%) and Residential (19.1%)

Target Catchment 4 – Two Litter Gitters (1 and 2) installed in Eslava Creek

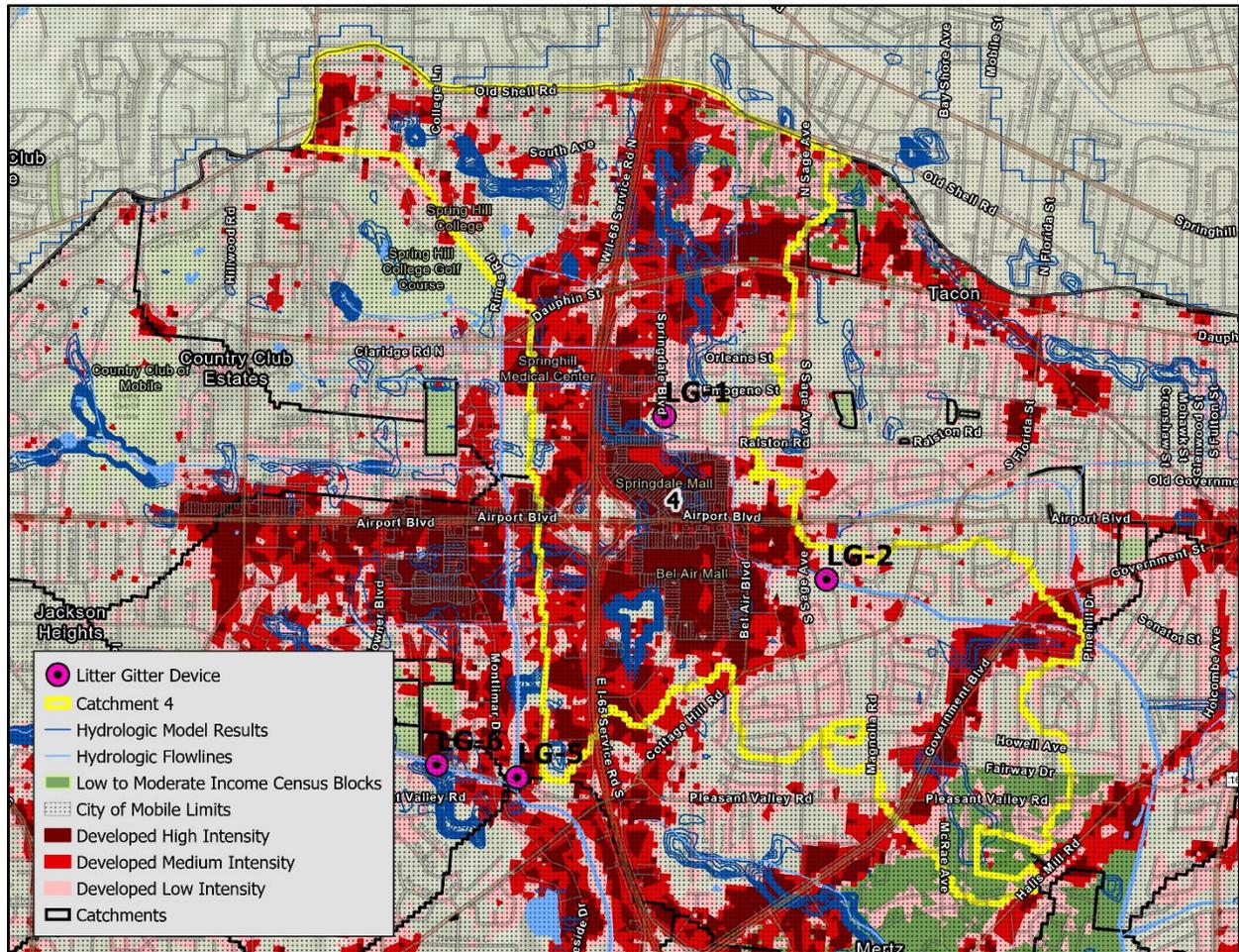


Figure 19. Target catchment 4 with two Litter Gitters installed in Eslava Creek.

Figure 19 show target catchment 4, which includes two Litter Gitters, 1, downstream of Emogene Street, and 2, downstream off Sage Avenue. This catchment is a large, roughly-L-shaped catchment with a western border along the I-65 corridor from Key Street north to Old Shell Road with narrower northern portions extending eastward to Sage Avenue and broader southern portions extending eastward across Government Street/Highway 90 to Pinehill Drive. This highly urbanized catchment includes several car dealerships along the South Beltline Highway, the Bel Air and Springdale malls, and the commercial portion of Dauphin Street between Spring Hill Hospital and Sage Avenue. The entirety of this catchment, which is 67.9% impervious, lies within Mobile City Limits.

Litter Gitter 1 location (waterbody and road/intersection): Eslava Creek downstream of Emogene Street

Litter Gitter 1 Latitude/Longitude: 30° 40' 54.0834" N, -88° 7' 23.1342" W

Number of maintenance events: 21

Total mass of material collected: 176.4 lbs.

Average mass of material collected per maintenance event: 8.3 lbs.

Primary litter types collected: Plastics (74.3%) Other (including Styrofoam) (8.2%) Metal (5.9%) Paper (1.5%) Glass (1.5%)

Condition of material collected: Intact (62.1%) Partially degraded (33.8%) Degraded (4.1%)

Brands collected: Coke (20.9%) Walmart (16.3%) Swisher (12.0%)

Primary upstream land use: Commercial

Litter Gitter 2 location (waterbody and road/intersection): Eslava Creek downstream of Sage Avenue

Litter Gitter 2 Latitude/Longitude: 30° 40' 23.5842" N, -88° 6' 47.3796" W

Number of maintenance events: 26

Total mass of material collected: 486.3 lbs.

Average mass of material collected per maintenance event: 18.7 lbs.

Primary litter types collected: Plastics (85.5%) Other (including Styrofoam) (7.9%) Metal (4.0%) Paper (1.6%) Glass (1.0%)

Condition of material collected: Intact (62.0%) Partially degraded (32.0%) Degraded (6.0%)

Brands collected: Coke (30.8%) Dasani (13.6%) Polar Pop (13.3%)

Primary upstream land use: Commercial

Target Catchment 7 –Litter Gitter 3 on Bolton Branch

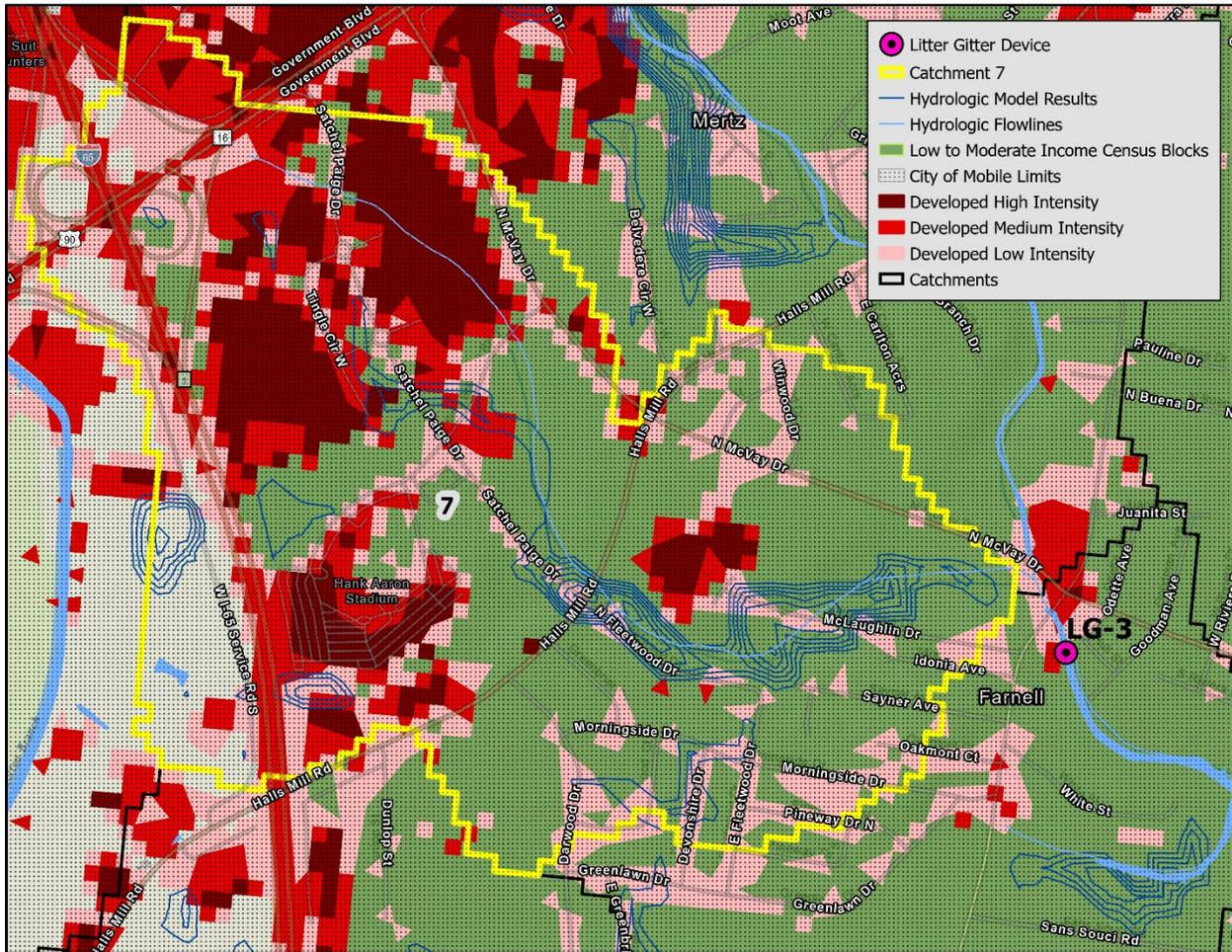


Figure 20. Target catchment 7 with location of Litter Gitter (the same one catching target catchment 6 drainage) indicated.

Target Catchment 7, shown in Figure 20, downstream of the confluence of an unnamed tributary (target catchment 7) and Bolton Branch (target catchment 6), drains an area running diagonally from the I-65/Government Boulevard interchange (in the northwest portion) southeast along McVay Drive N., almost to confluence of an unnamed tributary draining this catchment and Bolton Branch (which drains target catchment 6). Halls Mill Road bisects this catchment, which includes the McGowan Park Shopping Center, Satchel Paige Drive, and Hank Aaron Stadium. The entirety of target catchment 6, which is 52.3% impervious, lies within Mobile City Limits.

Litter Gitter 3 location (waterbody and road/intersection): Bolton Branch downstream of the McVay Dr. N./Navco Rd. intersection

Litter Gitter 3 Latitude/Longitude: 30° 38' 38.9718", N 30° 38' 38.9718" W

Number of maintenance events: 25

Total mass of material collected: 646.0 lbs.

Average mass of material collected per maintenance event: 25.8 lbs.

Primary litter types collected: Plastics (73.2%) Other (including Styrofoam) (12.7%) Metal (9.2%) Glass (3.5%) Paper (1.4%)

Condition of material collected: Intact (66.4%) Partially degraded (32.7%) Degraded (0.9%)

Brands collected: Coke (29.4%) Busch (12.6%) Swisher (11.9%)

Primary upstream land use: Mixture of Commercial (28.2%) and Residential (20.6%).

Target Catchment 6 –Litter Gitter, 3, on Bolton Branch downstream of Navco Road/McVay Drive

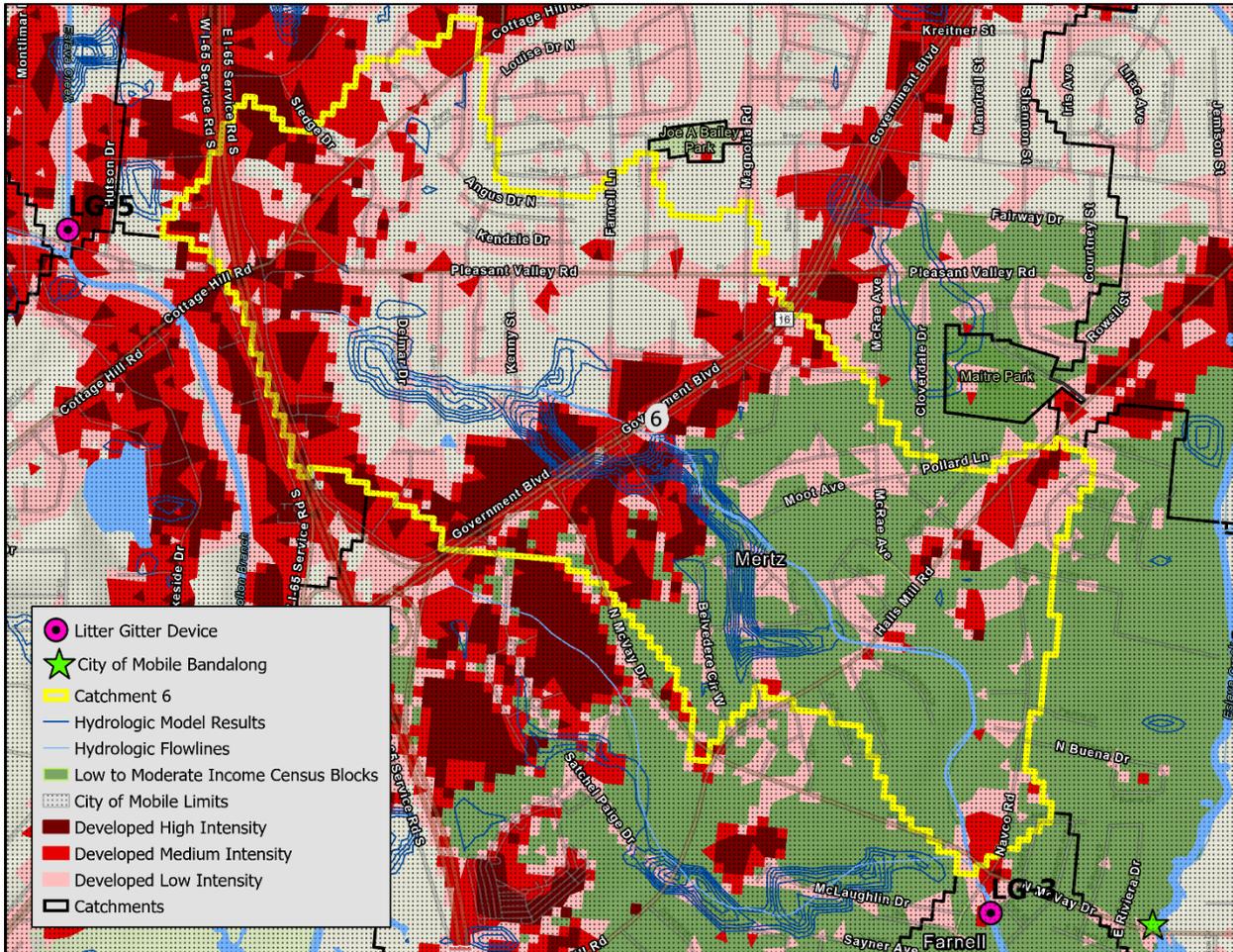


Figure 21. Target catchment 6 with location of Litter Gitter 3, downstream of the southeastern catchment boundary, (and City of Mobile Bandalong System) indicated.

Target catchment 6, shown in Figure 21, stretches diagonally from northwest along the I-65 corridor, directly south of catchment 4, southeast to the intersection of Navco Road and McVay Drive N. Litter Gitter 3 is positioned outside of the catchment boundaries on Bolton Branch, which drains this catchment as well as an unnamed tributary (draining target catchment 7), whose confluence with Bolton Branch lies within this catchment. The entirety of target catchment 6, which is 52.3% impervious, lies within Mobile City Limits.

Litter Gitter 3 location (waterbody and road/intersection): Bolton Branch downstream of the McVay Dr. N./Navco Rd. intersection

Litter Gitter 3 Latitude/Longitude: 30° 38' 38.9718", N 30° 38' 38.9718" W

Number of maintenance events: 25

Total mass of material collected: 646.0 lbs.

Average mass of material collected per maintenance event: 25.8 lbs.

Primary litter types collected: Plastics (73.2%) Other (including Styrofoam) (12.7%) Metal (9.2%) Glass (3.5%) Paper (1.4%)

Condition of material collected: Intact (66.4%) Partially degraded (32.7%) Degraded (0.9%)

Brands collected: Coke (29.4%) Busch (12.6%) Swisher (11.9%)

Primary upstream land use: Mixture of Commercial (28.2%) and Residential (20.6%).

Target Catchment 5 –Litter Gitters: 5 on the Montlimar Canal and 6 on the Michael Boulevard Canal

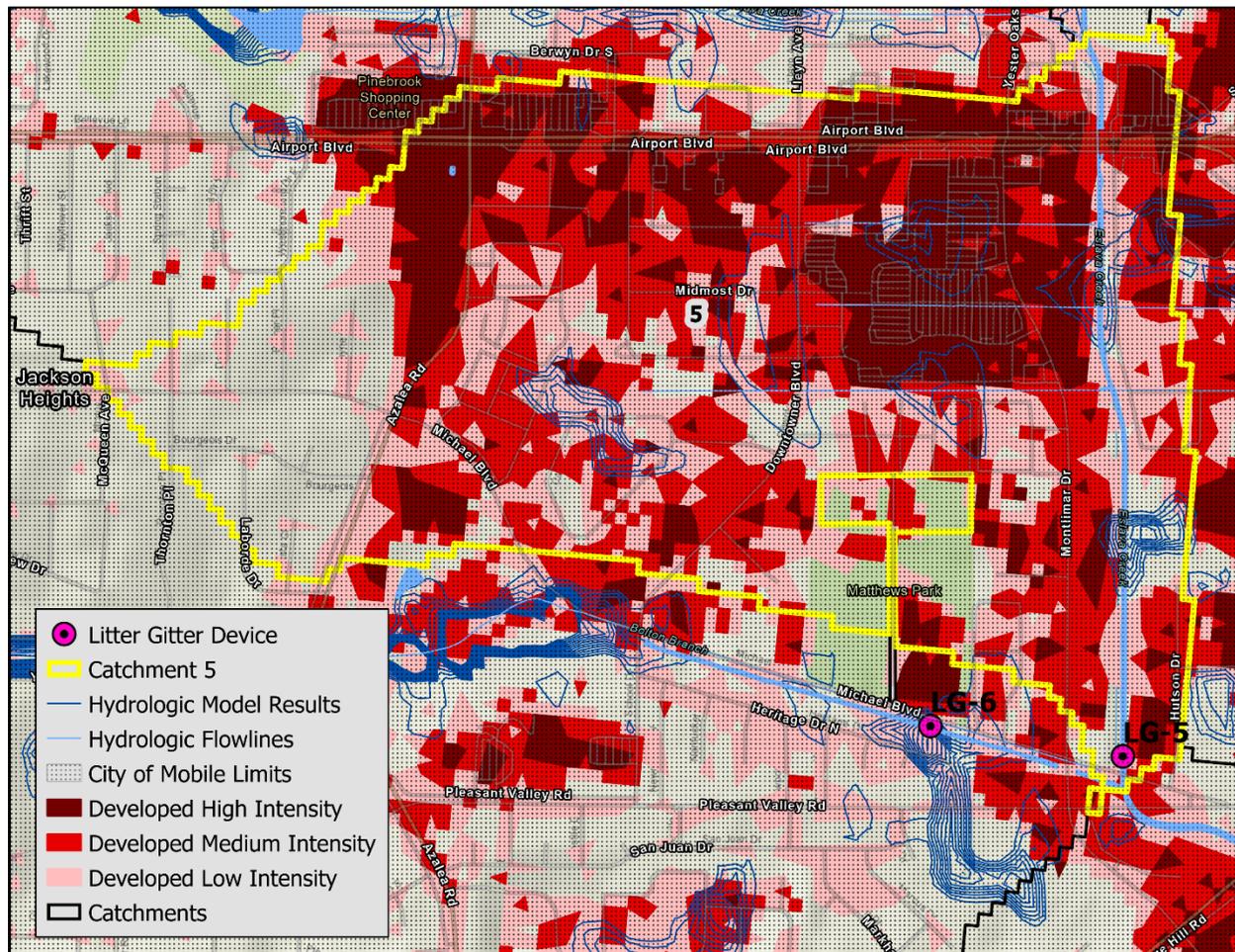


Figure 22. Target catchment 5 with Litter Gitter 5 on the channelized Montlimar Canal just upstream of its confluence with the Michael Blvd. Canal and Litter Gitter 6 on the Michael Blvd. Canal indicated.

Target catchment 5, shown in Figure 22, lies west of the I-65 corridor abutting the southern portion of target catchment 10. Its northern boundary extends west along Airport Boulevard to the Pinebrook Shopping center before turning to the southwest to McQueen Avenue before turning back to the east along Michael Boulevard just north of the Davidson High School campus. The entirety of target catchment 5, which is 81% impervious, lies within Mobile City Limits.

Litter Gitter 5 location (waterbody and road/intersection): Montlimar Canal upstream of confluence of the Montlimar and Michael Blvd. Canals near Michael Blvd within catchment boundaries

Litter Gitter Latitude/Longitude: 30° 39' 47.8692" N, -88° 8' 12.084" W

Number of maintenance events: 19

Total mass of material collected: 282.8 lbs.

Average mass of material collected per maintenance event: 15.7 lbs.

Primary litter types collected: Plastics (82.0%) Other (including Styrofoam) (10.9%) Metal (4.4%) Paper (1.7%) Glass (1.0%)

Condition of material collected: Intact (68.8%) Partially degraded (29.1%) Degraded (2.1%)

Brands collected: Coke (26.3%) Great Value (14.7%) Dasani (11.5%)

Primary upstream land use: Commercial (57.7%)

Litter Gitter 6 location (waterbody and road/intersection): On the Michael Blvd. Canal south of catchment boundaries and ~0.2 mi west of its Montlimar Drive crossing.

Litter Gitter Latitude/Longitude: 30° 39' 45.63" N, -88.131802 W

Number of maintenance events: 24

Total mass of material collected: 403.6 lbs.

Average mass of material collected per maintenance event: 16.8 lbs.

Primary litter types collected: Plastics (81.7%) Other (including Styrofoam) (9.6%) Metal (6.0%) Paper (2.2%) Glass (0.5%)

Condition of material collected: Intact (68.3%) Partially degraded (29.9%) Degraded (1.8%)

Brands collected: Coke (36.59%) Swisher (8.7%) Dasani (8.7%)

Primary upstream land use: Commercial (57.7%)

Average mass of material collected per maintenance event: 16.8 lbs.

Primary upstream land use: Commercial (57.7%)

Since Litter Gitters depend upon stream flow to capture waterborne litter, as evidenced from the information above, most of the recovered material was plastic, (ranging from 73.2 to 85.5 percent), with other (including Styrofoam) second (ranging from 7.9 to 12.7 percent). Osprey routinely performed single-pass tactical shoreline cleanups along upstream and downstream shorelines before Litter Gitters were installed to remove legacy litter and establish a clean baseline condition. Therefore, the condition of collected material trended from 54.0 to 68.8 percent intact and 29.1 to 33.8 percent partially degraded. In each of these Litter Gitters, very little degraded, or legacy, trash was captured.

Discussion

This study was undertaken to promote the wise stewardship of the Dog River Watershed with the goal of guiding reductions in waterborne trash/litter. It is intended to use hydrologic models and GIS datasets to identify and inform:

- Likely pathways by which improperly discarded litter is conveyed into receiving waters/tributaries to Dog River,
- Strategic locations for installation of Litter Gitter instream litter capture devices,
- Opportunities to engage communities to voluntarily clean up residential areas contributing to or impacted by waterborne trash, and
- Strategies for City of Mobile to deploy resources related to litter reduction near or related to commercial uses.

Litter Gitters are relatively low-cost, highly portable, and easily maintained instream capture devices supported by floating booms which direct flowing waterborne trash into collection baskets. They were developed and initially piloted in 2016 by Osprey Initiative LLC (Osprey) in the quarter-mile-long Maple Street tributary to One Mile Creek in the Three Mile Creek Watershed. Osprey was initially contracted by the Mobile Bay National Estuary Program to install and maintain these devices in the Three Mile Creek Watershed, where collected litter was characterized using and refining the EPA's ETAP before material was either recycled or appropriately discarded. This Protocol was designed to be applied to a broad range of site types – e.g., parks, streets, parking lots, etc. – and environmental conditions across various hydrological and climatic regimes. This universally accessible and applicable method for trash monitoring provides practitioners and citizen scientists with a comprehensive and rigorous method for quantifying and characterizing trash loadings. ETAP can be used to assess item age and level of fouling and to analyze and compare across specific material types and categories of trash collected to guide upstream source reduction decisions.

The Dog River Clearwater Revival secured funding from the EPA's Gulf of Mexico Program for the Dog River Watershed Comprehensive Trash Abatement Program in 2019 to strategically install and maintain six Litter Gitters in Dog River tributaries and to conduct this hydrologic and geospatial study. The six devices were installed prior to this study, based upon Osprey litter management observations and anecdotal knowledge of highly urbanized Watershed areas with the potential for pooling. Litter Gitters function in instream locations with flowing water. Accessibility for routine maintenance and ETAP analysis according to a prescribed schedule or after rain events is a necessary requirement for Litter Gitter installation.

With only a seven-month, somewhat-irregular maintenance schedule, ETAP's use in this assessment was limited to informing average mass of litter collected per maintenance event per device across five target catchments. This value ranged from 25.8 lbs. in Litter Gitter 3, servicing Catchments 7 and 6, both with mixed land uses and together draining 1,258 acres, to 8.3 lbs. in Litter Gitter 1, one of two devices draining heavily commercial catchment 4, covering an area of 2,188 acres.

Cleanups/Community Engagement. In non-stream locations where stormwater runoff conveys accumulations of litter or along streambanks where access for routine Litter Gitter maintenance is challenging or not feasible, volunteer or professional/tactical cleanups provide useful, but temporary, means of eliminating litter along its path to marine waters. In relatively safe areas, like those serving as annual Alabama Coastal Cleanup zones (without uneven terrain, heavy vegetation, or dangerous fauna), volunteer cleanups effectively remove the litter from the environment, raise awareness among

participating volunteers and their communities about the problem, and provide data to guide resource management strategies related to abating litter.

Neighborhoods with significant populations of low-to-moderate-income residents impacted by high volumes of litter may benefit from the use of CDBG funds to support interim assistance measures such as clean-up campaigns including educational signage.

In areas with conditions unsafe or too challenging for volunteer cleanups (and routinely before Litter Gitter installations), Osprey and other professional firms can be contracted to undertake tactical cleanups, often with application of ETAP to characterize material and collect data related to source determination. Tactical cleanups are more effective than volunteer cleanups in removing litter from the environment and provide data to guide trash management, but they are not as effective in raising community awareness.

Deployment of Municipal Resources to Address Litter Near or Related to Commercial Uses. Several City of Mobile departments, including, but not limited to, Engineering, Environmental Enforcement, Environmental Services, Neighborhood Development, Public Works, and Stormwater Management, allocate resources towards litter abatement and the City's "War on Litter." In 2014, John Smart reported that the City of Mobile, in an effort to reduce litter entering its waterways, focused on several changes within its litter ordinance (Smart, 2014). These changes include:

- Requiring litter receptacles, including cigarette receptacles, to be placed at entrances to commercial businesses, employee smoking areas, and common pedestrian transition points.
- All dumpsters must be enclosed.
- Prohibition of "junk" vehicles kept by owners, tenants, or occupants.
- Multi-family residential premises (apartments) must be free of litter.
- Cigarette butts are prohibited from being deposited in City streets, alleys, stormwater structures, ditches, or waterways.
- Signs on trees or utility poles in the City's rights-of-ways are not allowed without exception.
- All responsible parties – both owners and occupants – will be held responsible for a property in question.

A common recommendation to reduce illegally generated litter entering waterways from commercial roadways and parking lots is increased enforcement of existing regulations. With City staffs and budgets already stretched and environmental infractions related to illegal littering and dumping difficult to track and enforce, lack of implementation and enforcement results in these regulations frequently falling short of what is required to address environmental challenges and reduce volumes of stormwater-borne trash.

Apart from regulatory "sticks" related to enforcement to discourage bad behavior, providing "carrots" or incentives to encourage positive changes from businesses may be a more effective approach. Desired changes include increased availability of trash and cigarette receptacles near business entrances/exits and around parking areas, enhanced maintenance of dumpster or parking lot areas, and decreased use of plastic and Styrofoam single use packaging.

Potential incentives include public recognition touting the accomplishments of businesses or establishments for "doing the right thing, just because...". The Create A Clean Water Future website, Facebook, and Instagram are examples of social media platforms which could be used to advertise good trash management behavior. Public/private partnerships could secure and utilize grant funding to improve management (e.g., to purchase additional trash receptacles for businesses or establishments willing to install and maintain them or materials to construct fencing or wooden enclosures around dumpsters).

Operation of the City's fleet of street sweepers could prioritize areas within target catchments or use data related to areas of stormwater pooling around areas of urban development to eliminate trash before it is carried into storm drains by stormwater runoff.

The City's Litter Patrol, utilizing residents performing court-ordered community service for infractions, responds to complaints around the City by removing litter from hot spots and City rights-of-way. Supervisors could prioritize target catchments, including Interstate interchanges and major traffic intersections serviced by traffic signals as hotspots to service between complaint responses.

Data Gaps. This hydrologic/geospatial analysis of drainage areas was not exhaustive and could be improved. Across the Dog River Watershed Complex, certain areas are used by concentrations of homeless people who lack services necessary to properly manage their output of trash and litter. Some encampments have been shut down, but displaced populations quickly relocate to another location, frequently along creeks, streams, or other tributaries, where impacts are shifted. These areas were not the focus of this study, but the impacts associated with them are significant.

Use of data generated from application of ETAP to collected material was limited in this study by an irregular maintenance schedule of relatively short duration (six months) to mass of material collected per device per maintenance event and broad classification of predominant types of litter collected (i.e., plastics, other [including Styrofoam], and aluminum). Outputs from ETAP include data related to identification of brands and sources. Analysis of this brand data may be useful in establishing partnerships with businesses whose products are frequently recovered from Litter Gitters as a mechanism for targeting awareness campaigns or effecting changes in business practices.

Monitoring of success downstream should be a consistent part of any strategy to truly track the effectiveness of best management practice implementation like Litter Gitters. While this study informed development of strategies, its scope could be expanded to determine post-implementation trends and measure success.

Conclusions. This study employed an inexpensive protocol to focus limited resources on areas where management implementation will have the "best bang for the buck" in reducing stormwater-conveyed waterborne litter in the Dog River Watershed Complex and City of Mobile. While developed as a portion of the Dog River Clearwater Revival's Dog River Watershed Comprehensive Trash Abatement Program, the methods used involved only the use of the output of a GSSHA hydrologic model, secondary GIS datasets produced by federal and local agencies, and data collected in the field through the installation and maintenance of Litter Gitter instream trash capture devices. With hydrologic modeling envisioned for both the Three Mile Creek and Eight Mile Creek watersheds, this protocol will be useful to the City of Mobile in effectively directing its resources across its jurisdiction to reduce trash conveyed by runoff into its receiving waters.

This use of hydrologic models with GIS datasets is broadly transferable to geopolitical entities nationwide and beyond to address increasing problems related to trash and marine debris. This analysis model could potentially be useful in informing management of other nonpoint source pollution problems, including identification of areas particularly susceptible to sanitary sewer overflows.

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Appendices

Appendix A. Target catchment site assessments

Location/Waterbody	Catchment	Site ID	Latitude	Longitude	Waterbody Type	Impairment Rating (1 clean-5 impacted)	Predominate Litter Type	Predominate Condition	Land Use Impacted	Adjacent Land Use	Suitable for Capture Device	Site Assessment
Creekwood Dr.	2	SC-1	30° 39' 13.68" N	-88° 12' 51.4794" W	Stream	3	Styrofoam; Plastic	Intact	Wetlands; Roadside	Residential	Yes	This site is located along a cut-through road between Schillinger Road and Cody Road. It is heavily littered with obvious areas of illegal dumping. The stream is mostly clean and in good condition.
Schillinger's Rd./Airport Blvd.	1	MC-1	30° 41' 7.08" N	-88° 13' 9.12" W	Ephemeral	3	Styrofoam	Intact	Roadside	Commercial	No	Site has roadside, lined ditches, and trash discarded from vehicles drains down Airport Boulevard into these ditches. Types of litter observed were mainly fast food and beverage containers. Rich's Car Wash is located next to the site, and discolored water (purple) was observed in the ditch.
	1	MC-1-a	30° 41' 1.32" N	-88° 13' 6.24" W	Stream; Ditch	4	Styrofoam	Partially Degraded	Wetlands	Commercial	No	Site is easily accessible through an adjacent church property. Volunteer cleanups here would be difficult, due to uneven terrain and heavy vegetation. The end of a concrete-lined ditch (and a culvert crossing Airport Boulevard flows into a degraded channel. The site has a head cut and is failing due to stormwater drainage. It appears to be holding litter from upstream MC-1 and prevents the majority of litter from flowing downstream into Optimist Lake.
	1	MC-2	30° 40' 54.4794" N	-88° 12' 51.12" W	Stream	1	Aluminum	Partially Degraded	Roadside	Residential	Yes	Site was sparsely littered, mostly on the roadside and not in the stream. The site has sediment accumulating from the degraded MC-1a channel. Instream litter appears to have escaped from Site MC-1a upstream.
Hwy. 90 Theodore/ Carol Plantation Rd.	10	RC-1	30° 33' 31.32" N	-88° 10' 51.96" W	Stream	1	Styrofoam; Plastic	Intact	Wetlands; Roadside	Residential	Yes	Site is accessible for volunteer or tactical cleanups. It is currently an Adopt-A-Stream location. The adopter is the Theodore High School Science Club. Installation of watershed signage is recommended. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
	10	RC-2	30° 33' 34.1994" N	-88° 10' 22.4394" W	Stream	2	Styrofoam	Intact	Wetlands; Roadside	Commercial	Yes	Site is accessible for volunteer or tactical cleanups. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
Hillcrest Rd./ Grelot Rd.	3	MC-UT-2	30° 39' 35.64" N	-88° 11' 54.5994" W	Stream	4	Styrofoam; Plastic; Glass; Aluminum	Intact; Partially Degraded; Degraded	Parking Lot	Commercial; Residential	No	Site was observed with heavy litter.
Hwy. 90/ Tillman's Corner	9	RB-1	30° 34' 58.4394" N	-88° 9' 52.9194" W	Stream	2	Styrofoam; Plastic	Partially Degraded	Instream	Commercial	Yes	Site is downstream of two smaller drainages in Tillman's Corner and is easily accessible. Litter accumulates in a small lagoon on the east side of the bridge.
	9	RB-UT-1	30° 35' 7.7994" N	-88° 9' 56.52" W	Ephemeral	2	Plastic	Partially Degraded	Roadside	Commercial	No	Site drains a mixture of undeveloped, shopping centers, and residential areas and is easily accessible.

Appendix B. Potential strategies for management of each field surveyed site.

SC-1	2	Site is easily accessible for volunteer or tactical cleanups. Installation of watershed signage is recommended. Installation of an instream Litter Gitter is not recommended.
MC-1	1	Site is accessible for volunteer or tactical cleanups. The site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
MC-1a	1	Tactical/professional cleanups with routine inspections. Installation of an instream Litter Gitter is not recommended.
MC-2	1	Installation and maintenance of an instream Litter Gitter should be considered at this site or upstream, and the site should be routinely inspected.
RC-1	10	Site is accessible for volunteer or tactical cleanups. It is currently an Adopt-A-Stream location. The Adopter is the Theodore High School Science Club. Installation of watershed signage is recommended. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
RC-2	10	Site is accessible for volunteer or tactical cleanups. Site should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
MC-UT-2	3	This site is accessible and suitable for volunteer or tactical cleanups. It should be routinely inspected. Installation of an instream Litter Gitter is not recommended.
RB-1	9	Installation, maintenance, and routine inspection of an instream Litter Gitter is recommended for this site.
RB-UT-1	9	Site is accessible for volunteer or tactical cleanups and should be routinely inspected. Installation of an instream Litter Gitter is not recommended.

EPA/GAP Grant Team Report
Dog River Watershed Trash Abatement Program
Number: MX00D87119
Year of Project: 7/1/2019 – 5/30/2021

PEP Summary Report for Trash Free Waterways Grant
Revised 06/02/2021

Truck Bed Trash Education Program

One of the most significant environmental issues we face along the Gulf Coast is litter and its effects on our local waterways. Through the [Dog River Clearwater Revival](#) (DRCR)'s EPA/GAP grant, Partners for Environmental Progress (PEP) was tasked with sponsoring an outreach campaign targeting businesses throughout the Dog River watershed. The campaign would build on Mobile Bay National Estuary Program's (MBNEP) original ***Trash Blows! Stow It!*** campaign developed in 2018 for the Alabama Fishing Rodeo on Dauphin Island.

There are two challenges associated with reducing trash in our waterways:

1. How to remove litter from our streams.
2. How to stop the generation of waterborne litter in the first place.

PEP's focus was on the latter issue - stopping waterborne litter in the first place. PEP sponsored the ***Trash Blows! Stow It!*** campaign, a truck trash outreach education program focused on pick-up truck-bed trash, a significant contributor to the litter problem throughout the watershed.

Our target audience was PEP member companies because many have fleets of trucks, have a substantial number of employees that drive pick-up trucks, and 40% of PEP's member businesses are in the Dog River Watershed. PEP also targeted other local businesses in the Dog River Watershed that attract pick-up truck owners and drivers, such as truck dealerships, transportation companies, and businesses where truck owners or drivers shop for auto services and supplies.

The campaign's primary goal was to educate PEP's member businesses and, subsequently, the employees who were pick-up truck drivers and owners. The campaign focused on the environmental and economic impacts of truck bed trash blowing onto our roads and waterways, specifically the Dog River and Mobile Bay watersheds. PEP hoped to increase awareness of pick-up truck owners and drivers about the litter problems by engaging the businesses within the watershed and providing them with the tools they needed to educate their employees about truck bed trash.

A secondary goal was to promote the Create a Clean Water Future (CCWF) brand and encourage businesses to join as a partner. CCWF offers free resources and tips easily achieved in the workplace.

During the outreach campaign, PEP developed:

1. Billboards to educate the overall population in the Dog River Watershed and the Highway 43/Theodore Industrial Canal corridors where many PEP member large businesses are located.
2. Website landing pages that included litter statistics, calls to action for business and individual truck owners, and a pledge page for business and individual truck owners.
3. Social media and digital advertising campaigns.
4. Education materials in digital and print formats for businesses to use to educate their employees. Including:
 - a. Talking points with litter statistics.
 - b. Campaign action timeline.
 - c. Yard signs to place at their locations, particularly entrances/exits.
 - d. Large posters for employee gathering places (i.e., time clock, breakroom, etc.)
 - e. Digital graphics and messaging for newsletters, emails, and intranet communications to employees.
5. Create a Clean Water Future: PEP branded all materials with the CCWF logo, and our outreach materials included a call to action for businesses to join.

PEP's *Trash Blows! Stow It!* campaign faced several challenges.

Our final campaign objective was to assess the campaign upon completion to determine its effectiveness. The outreach campaign began in August 2020 and ended in May 2021. During this time, PEP faced multiple challenges reaching members during the campaign. The pandemic had the most impact because it prevented PEP from hosting in-person meetings; therefore, we missed face-to-face education and opportunities for direct feedback. All of PEP's 2020 and 2021 events to date have been virtual.



PEP Hosts March 2021 Virtual Membership Breakfast

Mar 30, 2021 | PEP News | 0 Comments
 March 2021 Virtual Membership Breakfast PEP hosted our Virtual Membership Breakfast on March 18, 2021. Pete Riehm, USN (REL) and Captain William "Bill" Pfiser, USN (Ret.) were our featured speakers. Commander Riehm, and Captain Pfiser discussed the future USS MOBILE...

[read more](#)



PEP Member Companies Work to Preserve Wildlife Habitat and Natural Resources in their own 'Backyards'

Jan 30, 2021 | PEP News | 0 Comments
 PEP's 200+ members are concerned businesses, non-profits and organizations – both large and small – who share the common purpose of promoting economic prosperity and environmental sustainability in the area. Recently three of PEP's member companies worked to preserve...

[read more](#)



PEP Hosts January 2021 Virtual Membership Breakfast

Jan 29, 2021 | PEP News | 0 Comments
 January 2021 Virtual Membership Breakfast PEP hosted our Virtual Membership Breakfast on January 21, 2021. Shayla Beaco, Executive Director at Build Mobile, was our featured speaker. Shayla discussed the final draft of the City of Mobile's Unified Development Code...

[read more](#)



Were You Ready for a Global Pandemic? PEP Seminar Summary & Highlights

Dec 10, 2020 | PEP News | 0 Comments
 "Were You Ready for a Global Pandemic?" Seminar Summary & Highlights As part of PEP's 2020 Virtual Industrial Reverse Trade Show, PEP hosted an interactive panel discussion that was free and open to the public on December 3, 2020. During the seminar, local...

[read more](#)

Another challenge PEP faced was multiple hurricanes and tropical storms landfall on the Gulf Coast in August, September, and October 2020. The impacts of Hurricane Sally were incredibly disruptive, with extensive power outages to homes and businesses, which caused many of PEP's member businesses to close for several days.



Power lines in the streets in Gulf Shores. Hurricane Sally damage in Baldwin County on September 17, 2020. Photo courtesy of John Sharp, Alabama Media Group.

In addition to the pandemic and weather challenges, many of our member businesses were slow to distribute our educational materials and struggled with “being too busy.” Since many employees were working at home, many companies had skeletal crews at their offices. Many businesses did not need the print materials such as posters and yard signs with few employees in the office.

As PEP began developing the campaign, it was apparent they could not effectively deploy too many calls to action. PEP wanted to engage businesses and individuals to pledge to the **Trash Blows! Stow It!** campaign, ask companies to educate their employees, and join the Create a Clean Water Future (CCWF) partner. PEP felt the messages would get diluted to provide effective campaign messaging for all these calls to action. PEP chose to focus on obtaining **Trash Blows! Stow It!** pledges and provide resources to businesses to educate their employees. The campaign materials, including social media posts, billboards, and print materials, were branded with the CCWF logo. When appropriate, PEP included messaging to businesses and individuals about joining CCWF.

While this was a short, low-budget campaign beset by challenges, PEP did learn a few lessons that could be deployed to enhance any future expansion of the campaign. Even though PEP received a limited number of survey responses, they discovered many local pick-up truck owners *were already aware* of the effects of putting trash in the back of pick-up trucks. The majority stated they were already in the habit of placing trash directly in a receptacle or inside the cab of their truck until they could find a trash receptacle. PEP believes any reminder of the connection between truck bed trash, litter, and the impact on our local watershed will create awareness and change.

Creating behavioral change is a massive undertaking. Advertising on billboards and social media can be challenging, expensive, and difficult to measure its impact. PEP confirmed its member companies were the ideal target audience needed for the campaign (truck owners and truck fleets). When the company was able to engage in the campaign, it was a cost-effective and efficient outreach method. With an investment in more one-on-one outreach to member businesses, this project could be more effective and expanded even further into the community. PEP has included a list of recommendations at the end of this report.

The Campaign Outreach Plan and Results

1. Tasks: Graphic Design

- a. Develop a logo, campaign tagline, social media templates, educational outreach materials, and other graphics.



2. Tasks: Talking Points with litter statistics for businesses to use in written materials for their employees.



3. Tasks: Digital Education Materials

- a. Businesses who signed the **Trash Blows! Stow It! pledge** were offered digital education materials:

- Digital flyer (8.5" x 11") to print and distribute to employees.
- Four (4) full-color posters (18" x 24") to display at their business.
- Two (2) full-color yard signs (24" x 18") to display at their business.
- For the cost of printing, businesses were able to place an order for additional posters and yard signs.

- b. Businesses were encouraged to make the following changes to reduce truck bed trash in their fleet of vehicles:

- Create a company-wide sustainability plan.
- Increase parking lot trash receptacles so they are convenient and accessible to employees. Our campaign research showed littering significantly decreases when people are within 25 – 30 feet of a trash can receptacle.



- Encourage employees to stow all trash in a can before hitting the road.
 - Install truck bed trash receptacles in their fleet of vehicles.
 - Encourage employees to create “Green Teams” and participate in community cleanups. A “Green Team” consists of a small group of employees tasked to identify and initiate new green practices at the business location. Including, but not limited to, recycling, reducing paper use, improving energy efficiency, and more. Their “Green Team” can also educate colleagues about the benefits of participation and serve as cheerleaders for clean-up initiatives.
 - Reduce pollution and trash in our waterways by replacing Styrofoam and plastics in their breakroom with reusable cups, plates, and utensils.
- c. Businesses were encouraged to become a [Create a Clean Water Future Campaign \(CCWF\) partner](#). CCWF offers free resources and tips easily achieved in the workplace.
- d. Results:
30 businesses pledged to engage in the education campaign. Here are examples of the actions taken by a few of the most involved companies:

- PEP member business #1: AM/NS Calvert
 1. Since December 18, 2020, around 95,000 people have come through the inbound gate plus an additional 5,000 TiSlots and Truck Drivers, totaling 100,000 people entering the worksite where the **Trash Blows! Stow It!** campaign signs were posted.
 2. AM/NS educated their employees about truck bed trash and then completed litter removal from their Adopt-A-Mile roadway in December 2020.

Post Details

Partners for Environmental Progress (PEP)
Published by Loomly [?] · December 29, 2020 at 10:01 AM · [⚙]

Businesses in our area are taking the Trash Blows! Stow It! pledge and putting it into action! Member business AM/NS Calvert recently discussed the issue of truckbed trash with their employees before removing litter from their Adopt-A-Mile this month. Much of the trash found on the side of busy roadways flies out of truckbeds - but with your help, we can reduce it! Learn more about how your business can get involved at <https://loom.ly/Ze3nBds>
#trashblows #stowit #truckbedtrash #dontbetrashy #cleanwaterfuture #truckbedtrashcampaign



Performance for Your Post

309 People Reached

12 Reactions, Comments & Shares

5 Like	1 On Post	4 On Shares
3 Love	0 On Post	3 On Shares
0 Comments	0 On Post	0 On Shares
4 Shares	4 On Post	0 On Shares

9 Post Clicks

2 Photo Views	0 Link Clicks	7 Other Clicks
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NEGATIVE FEEDBACK

0 Hide Post	0 Hide All Posts
0 Report as Spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

- PEP member business #2: Alabama State Port Authority
 1. Featured the **Trash Blows! Stow It!** campaign in their January newsletter, which reached approximately 700 readers.
 2. From October 2020 to January 2021, approximately 100,000 people entered the gate, where the yard signs were posted. The port averaged 51,000 people coming in and out of the seven public terminal gates on the Mobile River and at their Theodore

location.

- PEP member business #3: Thompson Engineering created an 8-week timeline for their employees, and PEP shared the timeline as a template for other member companies. All Thompson employees were working remotely at home or out in the field during the campaign; therefore, posters and yard signs were not viewed by a significant number of employees. Thompson relied heavily on email and intranet communication to employees and did not provide audience size or results.
 1. Week 1
 - **Educate your leadership team and/or fleet management supervisor:** Before you communicate with all your staff, clue in your leadership team on the campaign. Let this group know why you'd like to participate in the ***Trash Blows! Stow It!*** campaign. Explain that the campaign will include distributing a survey and education materials before you send them out to a larger group.
 - **Talk to your fleet management supervisor about steps your company can take to make truck bed trash easier to dispose of properly.** Can you make parking lot trash cans more visible or communicate expectations when company truck drivers learn about fleet rules?
 - **Give your supervisors a heads up:** Using some of the talking points PEP has provided, give your supervisors a heads up and let them know that you'll be asking company truck drivers as well as personal truck drivers to take a survey. If they are in the know, they can help support the campaign.
 2. Week 2
 - **Send the PEP Pre-campaign survey to your staff and ask all truck drivers to take it with a reasonable amount of time (give them a week or two to complete it).** Use your company intranet, email or other communication tactics to get the word out. The survey is only 8 questions and should take less than 5 minutes to complete. Encourage them to answer all questions.
 - Continue to promote the survey at weekly meetings and in company announcements.
 3. Week 3
 - Send a final survey reminder to your staff.
 4. Week 4
 - Launch the campaign in earnest! Post an article on your intranet or send an email explaining the issue. Include FAQs from the information PEP provided. Let your staff know that your company has signed the ***Trash Blows! Stow It!*** pledge and encourage your employees to sign it individually.
 - Post yard signs at facility/company entrance and other high visibility areas and posters in employee gathering places,

entrances and any other appropriate areas to support the campaign.

5. Week 5

- Follow up on your initial email or intranet post with more information. Include any new things you're doing as a company to make disposing of trash easier.
- Suggest that supervisors use one of the talking points for their weekly safety or quality messages.
- Create a social media post to share from your company page. Please share PEP social media on this topic on your own social media pages.

6. Week 6

- Host a litter pickup event at your office or "on your street" if many of your employees are working from home.

7. Week 7

- Remind your fleet to stow trash properly by distributing targeted messages to this group.
- Post a final intranet or email message to your staff.
- Distribute vehicle air fresheners with campaign messages. (Ask PEP for details).

8. Week 8

- For the campaign's final week, distribute PEP's post-campaign survey to your employees and let's measure how attitudes about truck bed trash have changed!

■ PEP member business #4: Mitsubishi Polysilicon

1. This company joined the campaign late, so they had fewer employees complete the pre & post-campaign surveys. The Mitsubishi Polysilicon staff relied heavily on email and intranet communication to employees and did not provide audience size or results.
2. A summary of what Mitsubishi did during the **Trash Blows! Stow It!** campaign:
 - Week 1 – Introduction to the program. Introduction Email, posters and yard signs around the plant.
 - The email list included approximately 150 local employees and contractors.
 - Posters were placed in control rooms and administration buildings, which were seen by approximately 100 employees and contractors per day. They also posted signs on the dock on Dauphin Island, which were seen by anyone utilizing the Mobile Bay Ferry.
 - Over the eight weeks, they had 188 employees/contractors see the signs and posters plus an additional 250 visitors (deliveries, truck drivers, visitors, and vendors) at both facilities in Mobile County and the dock on Dauphin Island.
 - The campaign was discussed during morning meetings at all facilities (approx 30 people in attendance x 4 meetings).
 - Week 2 – Emailed the survey to all MIPSAs employees.

- Week 3 – Added trash cans at the plant entrance for employees/contractors to put loose trash blowing around in truck beds. Purchased a divider for one truck bed to keep smaller items more contained.
- Week 4 – Shared news article from Dog River Clearwater Revival and PEP partners when they implemented The Comprehensive Trash Abatement Program.
- Week 5 – Awareness of trash in local waterways (pics from kayaking Dog River Watershed).
- Week 6 – Pics from truck beds in the parking lot with loose trash
- Week 7 – More awareness stories with pictures and the amount of trash that ends up in drainage ditches, spillways, and creeks.
- Week 8 – Post survey went out to employees.

4. Tasks: Website

a. **Trash Blows! Stow It!** landing page (pepmobile.org/trashblows), which provided all the campaign resources and links.

- **Results:** Google Analytics 9/20/2020 - 3/12/2021: 54 pageviews 45 were unique), average time spent on page = 1:16

b. **Trash Blows! Stow It!** pledge for businesses landing page

(pepmobile.org/trashblows/pledge) as a way for businesses to commit to reducing truck bed trash blowing out of their fleet of vehicles and to educate their employees. This web form allowed us to track who was interested and which companies wanted our digital campaign materials.

■ **Results:**

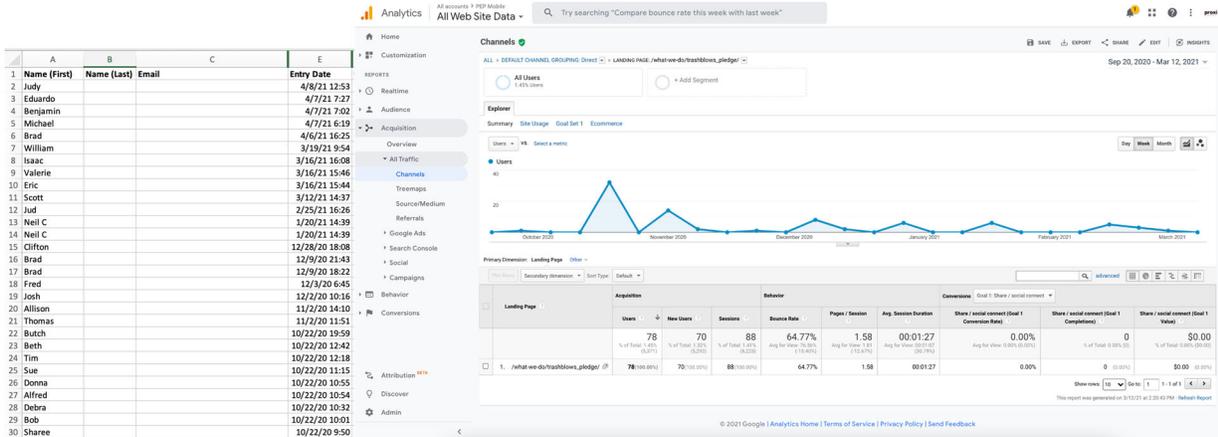
1. Pledges from PEP member businesses = 30 as of 5/21/2021 (Contact info to remain anonymous.)
2. Pledges from member businesses in the Dog River Watershed = 4 as of 5/21/2021
3. Google Analytics for pepmobile.org/trashblows landing page as of 5/18/2021: 87 pageviews (74 were unique), average time spent on page = 1:00.

The screenshot displays the Google Analytics interface for the website 'pepmobile.org/trashblows'. On the left, a table lists various companies and their entry dates. The main area shows a line chart of users over time and a detailed table of acquisition and behavior metrics.

Company	Entry Date
Alabama Shipyard	11/2/20 11:50
Alabama State Port Authority	4/8/21 12:52
BASF	11/2/20 14:09
City of Mobile	2/9/21 15:07
Dewberry	11/2/20 14:09
Eko Clean	10/22/20 11:03
Evonik	11/2/20 11:49
Keep Mobile Beautiful, Inc.	10/22/20 9:52
Long's Human Resource Service	2/25/21 16:26
McFadden Engineering	12/9/20 18:21
OEC, Inc.	11/3/20 14:11
Olds Filtration	1/19/21 13:36
Omega Properties Inc	10/22/20 10:32
Outokumpu Stainless USA	3/22/21 14:28
Outokumpu Stainless USA	3/17/21 19:32
Outokumpu Stainless USA	1/19/21 16:18
PPM Consultants	3/16/21 16:07
Shell Chemical LP	3/19/21 9:54
Star Service	11/3/20 12:13
TC Boiler	10/15/20 8:17
Thompson Engineering	3/16/21 11:19
USA	10/22/20 10:01
Valent Group	10/22/20 13:49
W&T Offshore, Inc	4/8/21 6:59
W&T Offshore, Inc	4/7/21 7:21
W&T Offshore, Inc	4/6/21 16:24
W&T Offshore, Inc	3/16/21 15:46
W&T Offshore, Inc	4/7/21 7:01
W&T Offshore, Inc	4/7/21 7:27
W&T Offshore, Inc	4/7/21 6:19

Landing Page	Acquisition			Behavior			Conversions		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Share / social connect (Goal 1 Conversion Rate)	Share / social connect (Goal 1 Completion)	Share / social connect (Goal 1 Value)
Landing Page	87	74	95	84.21%	1.23	00:01:00	0.00%	0	\$0.00
1. /what-we-do/trashblows/	87 (100.00%)	74 (100.00%)	95 (100.00%)	84.21%	1.23	00:01:00	0.00%	0	\$0.00

4. Pledges from individual truck owners = 29 as of 5/21/2021 (Contact info to remain anonymous.)
5. Google Analytics for pepmobile.org/trashblows/pledge landing page as of 5/18/2021: 78 pageviews (70 were unique), average time spent on page = 1:27



5. Tasks: Social Media

a. Social Media posts to FB, LI, TW

The first screenshot shows a Facebook post titled 'Partners for Environmental Progress (PEP)' published by Loosly on November 18, 2020. The post text asks how users can be part of the 'Trash Blows! Stow It!' campaign by placing trash canisters near their employees. The image shows a hand holding a white trash canister. The post has 50 people reached and 0 likes, comments, or shares.

The second screenshot shows another Facebook post from PEP published on November 23, 2020. The post text asks how businesses can get involved by replacing styrofoam and plastics with reusable items. The image shows a stack of white styrofoam cups. The post has 51 people reached and 0 likes, comments, or shares.

b. Social Media Ads - LinkedIn

- Near the end of the campaign, PEP had \$100 available to run LinkedIn ads for ten days from 3/2 - 3/12/2021. PEP uploaded its member business contact list of 861 people as a custom audience and targeted a "look-alike" audience.

c. PEP decided to set up a lead form within LinkedIn because LinkedIn prefills the lead form to make it as easy as possible. Another reason is

The screenshot shows a LinkedIn lead form for Partners for Environmental Progress. The form title is 'Slow your trash to reduce litter in our roads and waterways.' It includes a 'Send Address' field with a dropdown menu, a 'First Name' field, and a 'Last Name' field. There is a checkbox for 'I agree to be contacted by Partners for Environmental Progress...' and a 'Submit' button at the bottom.

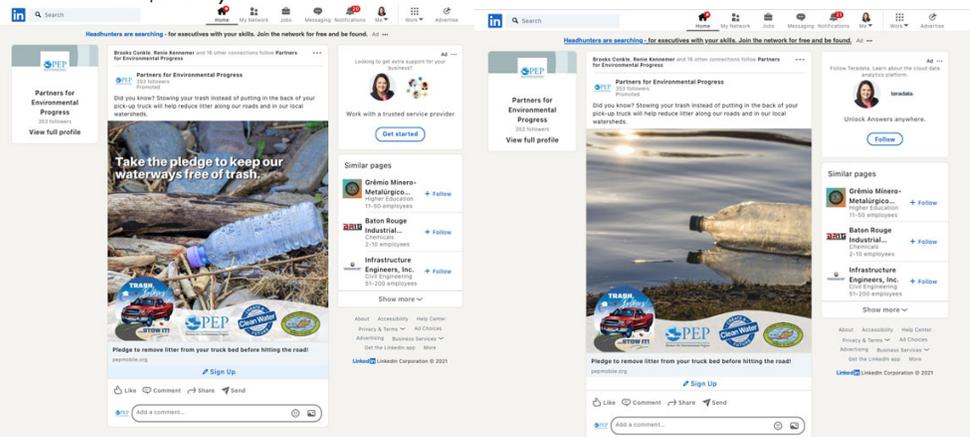
PEP was concerned that sending the lead to the landing page would not guarantee the lead would take the extra step to click on the pledge page.

- PEP ran six different ads, received 17 clicks but only received one lead. While one lead is disappointing, other stats for this campaign indicate decent results considering the ad spend (\$100), the timing (10 days), and PEP was targeting a very specific list.

Ad Name	Status	Spend	Key Results	Cost Per Result	Impressions	Clicks	Average CTR	Bid	Average CPM	Average CPC	Conversions	Cost Per Conversion	Leads	Cost Per Lead	Event Registrations
Ad 1	Active	\$93.95			1,736	17	0.98%	\$27.66	\$5.68	\$5.68	0	\$56.80	0	\$56.80	0
Ad 2	Active	\$19.51			319	3	0.94%	\$59.04	\$19.51	\$19.51	0	\$19.51	0	\$19.51	0
Ad 3	Active	\$38.62			450	7	1.56%	\$55.80	\$38.62	\$38.62	0	\$38.62	0	\$38.62	0
Ad 4	Active	\$10.48			174	3	1.72%	\$60.11	\$10.48	\$10.48	0	\$10.48	0	\$10.48	0
Ad 5	Active	\$10.72			118	1	0.84%	\$54.16	\$10.72	\$10.72	0	\$10.72	0	\$10.72	0
Ad 6	Active	\$14.28			276	2	0.72%	\$51.72	\$14.28	\$14.28	0	\$14.28	0	\$14.28	0
Ad 7	Active	\$17.36		\$17.36	383	3	1.00%	\$45.33	\$17.36	\$17.36	0	\$17.36	0	\$17.36	0

■ **Results:**

1. LinkedIn: Impressions = 1730, Reach = 954, Average Frequency = 1.813, Clicks = 17
2. Average Clickthrough Rate = 0.98% (benchmark average across all LinkedIn sponsored content ads is about 0.5%—so that means our content was compelling. The ads with the cleaner images with text, like the one below, performed the best)
3. Cost-Per-Click = \$5.86 (a benchmark for this on LinkedIn globally is \$5.58)



d. **Social Media Ads - Facebook**

- DRCR helped PEP identify 20 non-PEP member companies located in Dog River Watershed to target that fit the following criteria:
 1. The company owned a fleet of pick-up trucks.
 2. The company sells trucks or supplies/services to truck owners.
- Setting up the Facebook ads was challenging because Facebook considered PEP’s ads to fall into the “social issues” category, similar to political ads. PEP had to set up a “disclaimer” for the page, which Facebook finally approved so PEP could relaunch the ads on 3/12/2021.

PEP ran a 10-day campaign with a \$100 budget to compare to the LinkedIn campaign.

1. Results:

- Initial Campaign (Lead Generation Objective) *Note the no cost per result because no leads were achieved, and that's the result they were buying against.*

Ad Name	Reach	Impressions	Frequency	Link Clicks	Cost per Result	Amount Spent
PEP Trash Blows Ad #1 (Water Bot...	478	581	1.22	2	—	\$20.04
PEP Trash Blows Ad #2 (Coffee C...	445	609	1.37	7	—	\$13.04
PEP Trash Blows Ad #3 (Bottle in Wa...	394	494	1.25	6	—	\$12.95
PEP Trash Blows Ad #4 (Trash in Wa...	349	426	1.22	2	—	\$9.36
PEP Trash Blows Ad #5 (Misc. Imag...	117	124	1.06	—	—	\$4.51
PEP Trash Blows Ad #6 (Misc. Image...	80	95	1.19	—	—	\$2.69
Total Res... 6 / 6 rows displayed	1,279 People	2,329 Total	1.82 Per Person	17 Total	— On-Facebook Lead	\$62.59 Total Spent

- Round #2 Campaign (Reach Objective): PEP received the same number of link clicks here for a little more than half of the ad spend.

Ad Name	Reach	Impressions	Frequency	Link Clicks	Cost per Result	Amount Spent
PEP Trash Blows Ad #1 (Water Bottle) - C...	1,9...	2,1...	1,14	2	\$2.91 Reach	\$5.56
PEP Trash Blows Ad #2 (Coffee Cup) - C...	2,7...	3,3...	1,22	3	\$3.11 Reach	\$8.66
PEP Trash Blows Ad #3 (Bottle in Water) - C...	1,9...	2,2...	1,20	1	\$3.02 Reach	\$5.76
PEP Trash Blows Ad #4 (Trash in Water) - C...	2,3...	3,0...	1,31	4	\$3.33 Reach	\$7.69
PEP Trash Blows Ad #5 (Misc. Images) - C...	650	691	1,06	—	\$2.54 Reach	\$1.65
PEP Trash Blows Ad #6 (Misc. Images 2) - C...	2,5...	3,1...	1,26	7	\$3.25 Reach	\$8.16
Total Res... 6 / 6 rows displayed	8,872 People	14,736 Total	1.66 Per Person	17 Total	\$4.22 Reach	\$37.48 Total Spent

6. Billboards

- a. PEP negotiated four (4) billboards with Lamar Advertising, three in the DRCR watershed and one on Highway 43 in Chickasaw.

b. Results:

- PEP paid \$150 per billboard, totaling \$600. Lamar placed the value at \$850 per board, totaling \$3,400. PEP contracted the billboards to run for 28 days (10/5/2020 - 11/1/2020), but Lamar allowed them to stay in place through 11/19/2020 and some boards as late as 12/3/2020. Lamar placed an added value of \$2,884.20 for the bonus days.
- Total of 885,669 impressions and 409,037 bonus impressions.



CONTRACT: 3475170
CUSTOMER: 508171 - 1488 PUBLIC SERVICE - PARTNERS FOR ENVIRONMENTAL PROGRESS
REPORT DATE: 12/15/2020

POST BUY ANALYSIS SUMMARY						
	# OF UNITS CONTRD	TOTAL CONTRD PER PERIOD**	IMPRESSIONS CONTRD	IMPRESSIONS RECEIVED	BONUS IMPRESSIONS RECEIVED	ADDED VALUE
Poster	4	\$3,400.00	476,632	885,669	409,037	\$2,884.20
Totals	4	\$6,800.00**	476,632	885,669	409,037	\$2,884.20

MOBILE, AL													
512	Poster	\$850.00	\$30.36	10/5/2020	11/1/2020	28	128,216	9/28/2020	10/8/2020	54	11/30/2020	26	\$789.36
2361	Poster	\$850.00	\$30.36	10/5/2020	11/1/2020	28	106,000	9/28/2020	10/8/2020	56	12/2/2020	28	\$850.08
8712	Poster	\$850.00	\$30.36	10/5/2020	11/1/2020	28	137,744	9/28/2020	10/11/2020	54	12/3/2020	26	\$789.36
9502	Poster	\$850.00	\$30.36	10/5/2020	11/1/2020	28	104,672	9/28/2020	10/8/2020	43	11/19/2020	15	\$455.40
												Total:	\$2,884.20

7. Survey to employees - Pre-Campaign

a. The goal of the Pre-Campaign Survey was to determine the employee’s knowledge and habits regarding truck bed trash before starting our education campaign.

- **Results:** As of 5/18/2021, seven companies sent out the Pre-Campaign survey to employees, and PEP received 106 responses. [Pre-Campaign Survey Data is here](#)

Thompson Engineering x19
 Eiland & Ritchie, LLC x 1
 AM/NS Calvert x21
 Ditch Witch x1

Hand Arendall Harrison Sale LLC x1
 Mitsubishi Polysilicon x27
 W & T Offshore, Inc. x9
 Anonymous x27

b. In October 2020, PEP asked its member companies participating in the **Trash Blows! Stow It!** campaign to distribute a Pre-Campaign Survey to employees.

- **Results:** Overall, PEP found that 73% of respondents drive a pick-up truck personally or for work (the ideal campaign audience!) and do not put trash in their pick-up truck. The 24% who put trash in their truck bed said it is to avoid littering (don’t have a trash can nearby, etc.) And 12% do not feel the trash will fly out.

c. The Pre-Campaign Survey asked eight questions.

- **Q1 Do you personally own a pick-up truck or drive a company-owned pick-up truck?**

ANSWER CHOICES	RESPONSES	
Yes, I personally own a pick-up truck.	65.09%	69
Yes, I personally own a pick-up truck AND drive it for work.	0.00%	0
Yes, I drive a company-owned pick-up truck.	8.49%	9
Yes, I personally own a pick-up truck AND I drive a company-owned pick-up truck.	2.83%	3
No, I do not own or drive a pick-up truck.	23.58%	25
TOTAL		106

- **Q2 Do you put trash (fast food packaging, water bottles, plastic bags, etc.) into the back of your pick-up truck? Select all that apply.**

ANSWER CHOICES	RESPONSES	
No, I never put trash in the back of the pick-up truck.	73.75%	59
Yes, because I do not want the trash in the cab of my truck.	6.25%	5
Yes, because it's hard to find a trash can in the parking lot.	2.50%	2
Yes, because I plan to remove the trash when I get to work or home.	17.50%	14
Yes, because I believe putting trash in the truck bed is better than littering a parking lot.	5.00%	4
Other (please specify)	10.00%	8
Total Respondents: 80		

Other (please specify) = 8

I have a cover on the back of my truck so no risk of it blowing out
I place my trash into a plastic bag inside my pickup.
I put trash from my apartment in the bed of my truck to transport to the on-site trash compactor
In rare cases when there is no other option I put trash in the bed of my pick up truck however it has a bed cover so the trash cannot blow out while driving.
its just the easy place to throw stuff. And my buddies love it when I through stuff in their truck while they are watching....
Yes, because I have a trash can with a lid (Trash Stash) in the bed of my truck.

■ **Q3 Do you secure trash in a can or receptacle in your truck bed?**

ANSWER CHOICES	RESPONSES	
Yes	30.38%	24
No	69.62%	55
TOTAL		79

■ **Q4 If you do not secure trash in a can or receptacle in your truck bed, why not? Select all that apply.**

ANSWER CHOICES	RESPONSES	
I do not think the trash will blow out of my pick-up truck.	12.96%	7
There is not a trash can nearby.	1.85%	1
I do not know how to secure trash in my truck bed.	0.00%	0
I do not know where to find a truck bed trash receptacle.	7.41%	4
Other (please specify)	79.63%	43
Total Respondents: 54		

Other (please specify) = 31

Any trash in the bed is inside a trash bag or is a large enough box that I am not concerned with it flying out within the parking lot of my apartment
Bed has a cover
Do not put trash in the back of my truck.
Don't put trash back there.
don't put trash in the bed of my truck
I do not put trash in the back of my pickup truck
I do not put trash in the back. I have a toolbox if needed to place items.
I do not put trash in the bed of my pick-up, and if I did, it has a cover so it would be secured by the cover.
I do not put trash in the bed of my truck
I do not put trash in the bed of my truck. From what I see garbage trucks are the main ones littering as they drive down the road spilling waste.
I do not secure it in a can or receptacle but I do secure it.
I don't put it in the bed
I don't put trash in my truck bed.
I don't put trash in the bed
I don't put trash in the bed of mu truck
I don't put trash in the bed of my truck; I keep trash in the cab until I get to a trash can.
I don't put trash in the bed of the truck knowing it could blow out. Instead, I place it in the cab until I can put it in a trash can.
I dont push trash in the back of my truck
I dont put trash in the truck bed
I have a bed cover.
I have a cover on the back of my truck
I NEVER put trash in the bed of my truck! I ALWAYS secure anything else I haul in my truck to make sure nothing blows out! I am very much against littering in any form!
I place my trash into a bag inside my pickup.
I throw it under my toolbox to decrease the chances of blowing out.
I typically keep trash in the cab of my truck and throw it away as soon as possible. Also, I have a bed cover over my truck bed, which would contain any trash that I would store in the truck bed.
I usually collect my trash in a bag while in the cab and throw it away at one of my stops.
I usually do not put trash in the back of my truck.
my personal truck has a cover and I don't store trash in the bed
n/a
No I do not store trash in the bed of my truck!
Thats what the area under my tool box is for...

- **Q5 To your knowledge, does your company currently have a policy discouraging litter from blowing out of truck beds?**

ANSWER CHOICES	RESPONSES	
Yes, my company has a policy.	31.17%	24
No, I am not aware of my company having a policy.	68.83%	53
TOTAL		77

- **Q6 In the past year, have you noticed trash blowing out of a pick-up truck you were driving or were a passenger?**

ANSWER CHOICES	RESPONSES	
Yes, I have noticed trash blowing out of the truck.	37.66%	29
No, I have not noticed trash blowing out of the truck.	62.34%	48
TOTAL		77

- **Q7 Are you willing to commit to stowing the trash in your pick-up truck so that it will not blow out and become roadside litter?**

ANSWER CHOICES	RESPONSES	
Yes, I am willing to commit to stowing trash before it blows out of my pick-up truck.	94.81%	73
No, I have not noticed trash blowing out of the truck.	5.19%	4
TOTAL		77

- **Q8 Please include your contact information. (Contact info to remain anonymous.)**

8. Survey to employees - Post-Campaign to determine the impact of the education campaign. PEP's participating companies were asked to send out the Post-Campaign Survey by 4/20/2021 and then resend it one week later.
 - a. Results: As of 5/18/2021, only AM/NS had recorded responses. PEP received eight responses.
 - b. While the number of responses was small, the answers reflected a behavior change. 97% own or drive a pickup truck for work (62% personally). 71% stated they had changed their behavior while the remainder of responders said they did not need to change behavior as they never put trash in their beds.

- **Q1 Do you personally own a pick-up truck or drive a company-owned pick-up truck?**

ANSWER CHOICES	RESPONSES	
Yes, I personally own a pick-up truck.	62.50%	5
Yes, I personally own a pick-up truck AND drive it for work.	0.00%	0
Yes, I drive a company-owned pick-up truck.	25.00%	2
Yes, I personally own a pick-up truck AND I drive a company-owned pick-up truck.	0.00%	0
No, I do not own or drive a pick-up truck.	12.50%	1
TOTAL		8

- **Q2 Do you put trash (fast food packaging, water bottles, plastic bags, etc.) into the back of your pick-up truck? Select all that apply.**

ANSWER CHOICES	RESPONSES	
No, I never put trash in the back of the pick-up truck.	71.43%	5
Yes, because I do not want the trash in the cab of my truck.	14.29%	1
Yes, because it's hard to find a trash can in the parking lot.	0.00%	0
Yes, because I plan to remove the trash when I get to work or home.	14.29%	1
Yes, because I believe putting trash in the truck bed is better than littering a parking lot.	14.29%	1
Other (please specify)	0.00%	0
Total Respondents: 7		

■ **Q3 Do you secure trash in a can or receptacle in your truck bed?**

ANSWER CHOICES	RESPONSES	
Yes	28.57%	2
No	71.43%	5
TOTAL		7

■ **Q4 If you do not secure trash in a can or receptacle in your truck bed, why not? Select all that apply.**

ANSWER CHOICES	RESPONSES	
I do not think the trash will blow out of my pick-up truck.	40.00%	2
There is not a trash can nearby.	0.00%	0
I do not know how to secure trash in my truck bed.	0.00%	0
I do not know where to find a truck bed trash receptacle.	0.00%	0
Other (please specify)	60.00%	3
Total Respondents: 5		

■ **Q5 In the past year, have you noticed trash blowing out of a pick-up truck you were driving or were a passenger?**

ANSWER CHOICES	RESPONSES	
Yes, I have noticed trash blowing out of the truck.	71.43%	5
No, I have not noticed trash blowing out of the truck.	28.57%	2
TOTAL		7

■ **Q6 Have you seen anything about our *Trash Blows! Stow It!* marketing campaign in the past four months? Select all that apply.**

ANSWER CHOICES	RESPONSES	
No, I have not heard or seen any materials related to the Trash Blows! Stow It! marketing campaign.	28.57%	2
Yes, my employer has shared Trash Blows! Stow It! information.	71.43%	5
Yes, I have seen Trash Blows! Stow It! billboards.	0.00%	0
Yes, I have seen Trash Blows! Stow It! on social media.	14.29%	1
Yes, I have seen Trash Blows! Stow It! elsewhere. (please specify)	0.00%	0
Total Respondents: 7		

■ **Q7 In the past four months, have you changed your truck bed trash habits? Select all that apply.**

ANSWER CHOICES	RESPONSES	
Yes, I took the Trash Blows! Stow It! pledge and have been stowing my truck bed trash.	14.29%	1
Yes, I purchased a trash receptacle to store my truck bed trash.	14.29%	1
Yes, I no longer put loose trash in my truck bed.	71.43%	5
No, I am not interested in taking the Trash Blows! Stow It! pledge to help reduce roadside litter.	0.00%	0
Other (please specify)	28.57%	2
Total Respondents: 7		

- **Q8 Please include your contact information.** (Contact info to remain anonymous.)

9. Targeted Communication to PEP Members

- a. PEP highlighted the **Trash Blows! Stow It!** Campaign at all member events with PowerPoint presentations and live announcements
 - Monthly Newsletter to approximately 700 PEP member email addresses + 75 community contacts
 - Virtual Breakfasts attended by approximately 50 members (Sept, Nov, Jan, Mar & May)
 - Virtual Lunch and Learn Meetings
 - Annual Pheasant Shoot
 - Virtual Education Seminar approx 50
 - Sent the Campaign details to PEP members in seven specific emails
 - Virtual Annual Meeting
 1. PEP announced the **Trash Blows! Stow It!** campaign during a live broadcast of their annual meeting and environmental awards presentation on September 24, 2020.
 2. During the live broadcast, the number of viewers was 65 and has since gained 75 viewers on the PEP YouTube channel.

10. Direct Communication to Dog River business

- a. PEP sent a printed letter and materials to 20 companies identified by Dog River Clearwater Revival connected with truck owners inviting them to participate in the campaign. Followed by phone calls, this outreach did not result in any interested companies.
- b. PEP sent targeted emails to 81 member companies reminding them of their location in the Dog River Watershed and asking them to engage in the campaign along with the appropriate resources and links in November 2020 and January 2021. While several companies indicated interest, none engaged in the campaign.

11. Monthly e-newsletter

- a. **Trash Blows! Stow It!** campaign was mentioned in each of the monthly e-newsletters to members starting in August 2020.
- b. PEP launched the full **Trash Blows! Stow It!** campaign to members in a special email announcement on October 15, 2020. The email described the problems caused by truck bed trash, litter statistics, how businesses can get involved, free digital campaign resources, employee survey links, and links to project partners.
 - Results: Analytics for special launch email to members on 10/15/2020: Mailchimp open rate = 33.8% (25.9% is PEP's avg), 6.8% click rate (5.2%

is PEP's avg), 0 unsubscribes (.2% is PEP's avg) and 1 direct click to pledge.

Conclusion & Recommendations

The ***Trash Blows! Stow It!*** campaign (August 2020 to May 2021) set out to educate pick-up truck owners about the effects of truck-bed trash contributing to the litter problem in the Dog River Watershed. PEP developed and implemented a truck-bed trash outreach education program for PEP's member businesses.

PEP faced many challenges during this campaign: the 2020 pandemic, a forced shift to virtual events, businesses sent employees to work from home, etc. Therefore, PEP missed many face-to-face educational opportunities with pick-up truck owners and company drivers. The August - October hurricanes overloaded companies' and individuals' attention and resources. It was difficult to gain attention and traction for a campaign focused on outreach to pick-up truck owners.

PEP proved their member companies were the ideal target audience (truck owners and truck fleets) as confirmed by the pre-campaign survey results, which showed 73% of respondents drive a pick-up truck for personal or work purposes. Companies engaged in the program were able to affect some behavior change, as seen in the limited post-survey responses (97% stopped putting trash in the bed of their truck.) The surveys seem to be a valuable metric, but the quantity of post-campaign responses was disappointing. In future campaigns, it will be necessary to train the participating companies about the importance of completing both the pre- and post-campaign surveys.

At least one member company completed litter removal from their Adopt-A-Mile roadway, and more than 200,000 employees and facility visitors observed the campaign signs at member facilities (during a time when most were only open to essential visitors and employees). Most participating businesses relied heavily on email and intranet communication to educate employees due to most of their workforce working remotely during the pandemic.

PEP negotiated four (4) billboards with Lamar Advertising at an extreme discount. Although it is difficult to determine if the billboards could affect some behavior change, the low cost of \$600 for 885,669 traffic impressions and 409,037 bonus impressions was a great value.

The social media advertising did not generate substantial leads, although the clickthrough rate and costs-per-click performed better than average and demonstrated that the content was compelling. The ads with clear images and text performed the best. Reminders of the connection between truck-bed trash, litter, and the impact on our local watershed, create awareness and change; therefore, a social media/billboard mass marketing component is worthwhile.

PEP found the member company communication efforts to be more efficient and cost-effective than mass marketing to the public. However, it did require more PEP staff time to facilitate the one-to-one outreach necessary to engage more companies. With additional resources, this project could be more effective and expanded even further into the local community.

This report summarizes the campaign's plan, activities, and results. PEP also has a few recommendations should PEP, the grant team, the City of Mobile, or any other entity choose to continue promoting the campaign to business. Here are recommendations for future efforts:

1. Social media ads: Focus on driving followers to the website to drive awareness and not focus on obtaining pledges. PEP learned the pledges did not turn interest into action. When the social ad budget is low, PEP learned Facebook is a better ad choice than LinkedIn. Instagram should be tested as well. Use clear, compelling text on top of clear, compelling images of litter in watersheds and roadways.
2. In-person outreach and training: engaging businesses will require one-to-one outreach. Host an in-person training session for company representatives interested in facilitating the outreach campaign within their company. The training session should explain the campaign goals, tactics, and the value of the pre-and-post-campaign survey results and the need for the companies to report back on activities and metrics achieved. Distribute digital and print materials during this training.
3. Provide specific emphasis on recommendations for companies to improve their policies:
 - a. Add trash cans in parking lots and spaced appropriately to encourage employees to use trash cans instead of placing trash in trucks.
 - b. Develop truck bed trash policy for their fleet.
 - c. Implement a clean, on-site parking lot policy.

**Dog River Watershed Comprehensive Trash Abatement Program
Truck Bed Trash Can Competition Report**

**Prepared by: Mobile Bay National Estuary Program
Author: Henry Perkins**

**Prepared For: Dog River Clearwater Revival
March 31, 2021**

Introduction

In line with the overall purpose of reducing litter throughout the watershed Dog River Clearwater Revival charged the MBNEP with developing a public outreach campaign to target truck bed trash, a specific subset of roadside litter, throughout the Dog River Watershed. Truck-bed trash was targeted due to the high number of trucks in this area and the potential to reduce litter delivered from pickup truck beds. The EPA Gulf of Mexico Program grant included \$33,000 designated for this outreach portion.

It's estimated that as much as 5% of all trash along US roads and waterways results from this inadvertent "truck bed" littering. Thirty percent of respondents in a 2017 Don't Mess With Texas survey responded that they are aware of trash inadvertently leaving their truck, and 88% indicated that they would prefer having a method to dispose of litter in their vehicle as opposed to doing nothing.

Truck dealerships were targeted for engagement on this issue, to not only educate these private sector establishments but their customers as well. It was found that truck owners lacked any real options for securely storing trash in their truck beds, and that there was a need for a receptacle designed to specifically store trash in a truck bed.

Truck Bed Trash Can Competition

The Mobile Bay National Estuary Program, in association with local CBS affiliate WKRG, produced and televised a 30-minute competition called the "Truck Bed Trash Can Competition" to raise awareness of truck bed litter and to crowd source effective trash reduction technology for truck bed litter.

The competition was intended to facilitate the production marketing of a viable "truck bed trash can," i.e., a receptacle or other product designed to prevent trash and litter from inadvertently escaping truck beds, as well as to raise awareness about the general issue of truck bed litter.

The competition was advertised to the public primarily via social media, and special efforts were made to target environmental, entrepreneurial, engineering, and student groups. The importance of the issue of litter was highlighted with all competition promotion.

Volunteer judges for the competition were recruited based on their expertise in engineering, marketing, business development, and/or litter reduction. They included: a green technology CEO, an intellectual property attorney, a professor of entrepreneurship, a marketing expert, and a business owner and previous pitch competition winner.

The prizes for winning the competition were \$3,500 cash (raised through private sources) and 12+ hours of pro-bono professional services. The services included meetings with and advice from professionals with experience in litter reduction, business creation, product development, and intellectual property law. These prizes were designed to support the further development

and bringing to market of the winning trash can prototype. The cash award was secured through sponsorships, and the professional services were donated in-kind from competition judges.

Entrants were asked to design an original prototype for a truck bed trash can and create a brief video pitching it. Finalists in the video round were invited to pitch their prototype live.

The video submissions were judged with precise criteria measuring the designs' practicality, viability, cost, quality, and eco-friendliness. Judges were given one week to complete judging, after which three submissions were selected for live pitches. All contestants were notified of their status and were given notes on how to improve both their prototype and pitch. Most submissions were received from the Mobile area, although there was one submission from Auburn, AL.

The Results

The live pitch for the competition took place on November 12, 2020, from noon until 3:30PM. Pitches were hosted at WKRG-TV and filmed in a television studio. Contestants had 10 minutes to present and pitch their prototype, and judges were allotted 10 minutes to ask questions. WKRG personality Devon Walsh hosted the competition. The problem of litter and possible solutions to it were discussed throughout the show. The runtime of the show was approximately 30 minutes.

The competition aired digitally on December 10, 2020, at 7:00PM on WKRG's website, and a "Viewer's Choice" competition was held to further promote the show, awarding an additional \$500 prize to the most popular design as selected by the audience. The digital show and Viewer's Choice competition were advertised digitally through the MBNEP's social media platforms and mailing lists and through WKRG's social media platform.

In total, six video entries were submitted to the MBNEP and reviewed by judges. The entries and judges' reactions are briefly described below:

Entry 1

The Rake-Up Pack is a durable-plastic receptacle with locking latch. Adjustable prongs attach the device to the tailgate, and storage and ventilation are built into the side of the device. An extending rake for scraping trash out of the truck bed attaches to the side of the device.

Judges were impressed with the design and overall presentation but were concerned that the prototype was too complicated and would have high manufacturing costs as a result.

Entry 2

The Bubble Bucket is an insulated bucket with a hole in the top and a separated insulated layer serves as a cooler for beverage storage. The hole is blocked with a weighted, magnetic lid. Trash bags are sealed in place by the lid on the bucket. The insulation includes pockets for tool storage.

Judges responded positively to the concept's creativity and versatility but were concerned that component materials and a mounting method had not been discussed, were off put by the idea of drinks being stored with garbage, and disapproved of the profanity used in the presentation.

Entry 3

This entry is an unnamed wooden box with a plastic side cut into a "star shape" to allow trash to be pushed through. A latch is installed on the side to empty the trash can. Magnets on the bottom attach the device to the bed of the truck.

Judges felt the product was practical and had potential but were concerned that the cut-plastic side would scrape users' hands, and thought the product overall needed further development.

Entry 4

The Gator Bucket is a lidded bucket with a hole in the lid and vinyl covering the hole. It mounts magnetically to the truck bed. The device is completely recyclable, low cost, and customizable.

Judges were impressed with the simplicity of the design, referring to it as "elegant." They had concerns that such a low-cost trash can secured poorly to a truck bed may come loose and become litter itself.

Entry 5

The Model T-A is a detachable tarp that covers the entire bed of the truck. Extending rods on either end of the tarp hold it in place in the truck bed, and it was demonstrated to stay in place at highway speeds.

Judges were impressed with the research and effort that went into the presentation of this product but were concerned that realistically a driver might not take the time to install the cover.

Entry 6

Humpy Dumpy is a lightweight, rack-mounted, polyhedron metal box designed to sit over the wheel well in the cargo bed of a truck. It included an attached, hinged lid with latch and mounting-rack which attaches to the side of the truck cargo bed. The mounting rack screws into place, while the box is removable when lifted.

Judges were impressed with the design's simplicity, "sleek" look, and use of dead space. They had concerns about the cost of manufacturing and its application over the variety of wheel wells that exist in the market.



The winning design of the competition, Humpy Dumpy

The Gator Bucket, The Model T-A, and Humpy Dumpy were selected to move on to the live pitch. The winning design was Humpy Dumpy. The competition is available for streaming on WKRG's website at <https://www.wkrg.com/truck-bed-trash-can-design-competition>.

After the competition, the winner was introduced to professionals in business development, engineering, and intellectual property law to further develop the prototype and launch the product to market. Over a dozen hours of meetings between the winner and these professionals were arranged, clarifying the scope of what will be required to bring this product to market and outlining the next steps.

Due to the complexities of bringing the product to the market, the winner determined that they lacked the capacity to bring the trash can to market and agreed to sell the intellectual property to the MBNEP for one dollar.

Audience Reached:

Six truck dealerships were approached and educated on issues regarding truck bed trash.

Four college classes lectured on the issue of truck bed trash.

The digital platforms the competition was advertised on have a combined reach of approximately 500,000 individuals.

75 social media posts were created shared 126 times.

The livestream of the competition was viewed 11,000 times.

Next Steps:

With the intellectual property in hand, the MBNEP continues its commitment to bringing the product to market and is working with partners to finalize the product prototype, explore patent options, conduct market research, and identify manufacturers.



Review of Municipal Trash Abatement Programs and Best Management Practices
Prepared by: Meredith Diskin, Cade Kistler, & Kevin Pulliam

Table of Contents

Introduction	1
Funding for Litter Abatement Programs	1
Creating Collaborations at All Levels	3
Identifying Locations for Installation of Trash Capture Devices	5
Effective Trash Reduction Technologies	6
Improving Enactment and Enforcement of Laws	7
Trash Monitoring Data Collection	8
Innovative Programs to Engage the Public	9
Recommendations	10
Goal 1 – Educate Citizens about Harmful Effects of Litter and Engage them in Litter Abatement Programs	10
Goal 2 – Make It Easier to Recycle and Dispose of Trash Properly	11
Goal 3 – Improve Existing Programs and Policies	11
Closing Remarks	11
References	13



Figure 1 - Volunteers at a “Creekfest” litter cleanup on Three Mile Creek

Introduction

Mobile Baykeeper undertook the task of reviewing municipal trash abatement programs and Best Management Practices (BMPs), including non-structural, structural, and regulatory measures, in at least 10 cities throughout the United States. It is hoped that information gleaned from this literature review will be combined with the knowledge gained through undertaking the activities in this GOMP grant to continue to enhance and improve the litter management strategy for the City of Mobile. This review provides recommendations for:

- 1) Funding trash reduction programs.
- 2) Creating regional partnerships among businesses, environmental groups, individual citizens, and governments at all levels.
- 3) Developing a methodology for identifying locations for installation of trash capture devices and promoting the use of effective trash reduction technologies and approaches.
- 4) Improving the enactment and enforcement of laws to reduce trash.
- 5) Increasing trash monitoring-related data collection, generation and dissemination efforts.
- 6) And developing innovative ways of engaging the general public in trash reduction activities.

Funding for Litter Abatement Programs

Municipal/Local Led Funding Strategies

When local organizations and businesses are provided funding to assist in implementation of trash reduction programs this assists municipalities in achieving goals of their trash reduction programs. Grants provide money to localities for local litter prevention, recycling programs, litter enforcement and to purchase supplies for cleanups, trash reduction technologies and trash studies. Palmetto Pride, South Carolina’s anti-litter and beautification organization, offers a Litter Prevention Grant available to all litter control organizations, non-profits and government agencies.¹ The funding is used to develop successful anti-litter and enforcement programs. The organization specifically looks for programs that include community cleanups and educational programs, illegal dumpsite remediation and trash equipment purchasing. Not only does this reduce litter in the community but also helps municipalities comply with their Phase I MS4 program. The organization also offers a Litter Task Force Grant to assist county governments in hiring part-time litter enforcement officers dedicated to enforcing state and local litter laws.² Smaller litter grants are

offered in Philadelphia, Pennsylvania where microgrants are offered to local organizations who propose to develop or expand innovative and impactful litter abatement programs.³ Last year, the City gave seven organization microgrants in support of the City's bold Zero Waste goal. Funding programs like these helps to encourage and support successful litter abatement and prevention initiatives by local organizations and governmental agencies.

State & National Funding Sources

Numerous state and national funding sources are available to non-profits, NGOs, and municipalities working to reduce litter. These sources of funds are great ways to perform intensive work on litter abatement projects and jump-start long-term efforts. Because of the episodic nature of these grants, they should not be relied upon for long-term funding of litter abatement programs but should instead be prioritized for more costly purchases and tougher projects.

States that offer litter funding have encouraged municipalities to remove thousands of pounds. Some examples include (but are not limited to):

- Kentucky Department of Environmental Protection's [litter abatement grant program](#)
- Washington Department of Ecology's [community litter cleanup grant program](#)
- Ohio Environmental Protection Agency's [community and litter grants program](#)
- West Virginia's [litter control grant program](#)
- Virginia Department of Environmental Quality's [litter prevention grant program](#)
- Tennessee Department of Transportation's [litter grant program](#)
- Nebraska Department of Environmental Quality's [litter reduction and recycling grant program](#)

Many of these programs are funded by tire disposal fees and/or fees that come from litter enforcement fines. Currently proceeds from litter enforcement fines in Alabama are split between the general fund and the municipality or county where the fine was issued. Many states also have litter taxes and bottle deposit laws that fund litter abatement programs. While the Alabama Department of Environmental Management (ADEM) does offer a [grant program aimed at improving recycling efforts](#), we are currently unaware of any similar litter abatement grants offered by the State of Alabama.

Numerous national funding sources are available for litter abatement projects. Several organizations and municipalities in the area have recently been awardee funding from these sources and are familiar with many of the opportunities available. While it is not the within the scope of this review to attempt to list every opportunity available, some of the primary funders that award grants for litter prevention and removal are:

- NOAA's Marine Debris Program
- EPA's Trash Free Waters and Gulf of Mexico Programs
- The National Fish and Wildlife Five Star Program

Creative Funding Strategies

One strategy that has become more popular over the last few years is using funding generated from various single use plastic fees to fund litter programs. Because the use of single use plastics inherently increases the generation of litter and burdens municipalities with costs associated with removing that litter it makes sense that customers and/or establishments that choose to use these single use plastics would be charged an additional amount to cover this oft externalized cost. Currently hundreds of municipalities in the country have some sort of rulemaking on single use plastics⁴. Notable cities in the Southeast that have plastic bag legislation include Charleston, Sc (adopted)⁵, and Durham, Nc (pending)⁶. Several other cities in Texas and Florida had similar bans or fees that were removed after action was taken by state legislatures and/or state courts to preempt these ordinances.

Some cities, such as Fresno, Ca use a portion of the proceeds from sales taxes to fund litter abatement programs⁷. This is similar to the “penny sales tax” Mobile, Al has in place through 2023.

Whether from general funds, grant funding, or other creative means, it is vital that city leaders assess the cost litter is encumbering their city with, clearly calculate the cost it will take to begin to deal with the problem, consider all the funding mechanisms available to them, and then take action to ensure there is enough available funding to meet the pervasive problem of litter.

Creating Collaborations at All Levels

Establishing partnerships among public and private entities are an effective strategy for preventing and reducing litter within communities. Public private partnerships where municipalities and private businesses partner to secure sufficient funding to combat litter and move towards zero waste are being implemented successfully all over the U.S. These partnerships leverage the vested interests of local businesses in having clean communities to garner sufficient funding and other resources to tackle the problem of litter from a multitude of angles. Effective collaborations can combine knowledge, data and resources to greatly reduce litter. To establish an effective collaboration, partners must work together to form a common goal and then define a plan of action with roles and responsibilities for each partner to undertake. Philadelphia, Pennsylvania instituted a partnership program, Community Cans Program, where the city partners with local organizations to

Bans on Plastic, and Bans on Bans

Jurisdictions across the United States have instituted bans and fees on various types of plastics, like bags, carryout containers, polystyrene (Styrofoam), and straws. States have also enacted restrictions preventing future plastic bans. Nation-wide, there is currently a ban on the use of microbeads.

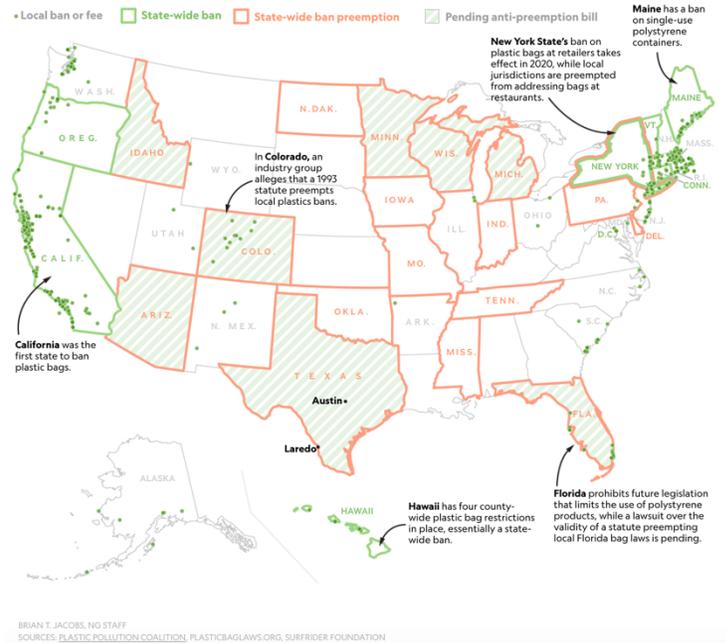


Figure 2 - Map depicting cities and states with litter ordinances or laws.

foster community responsibility for keeping their neighborhoods free of trash.⁸ The city works with community leaders to strategically place trash baskets in public right-of-way's along popular commercial corridors. Philadelphia also partners with local artists to decorate and paint the trash baskets to better engage citizens and foster a deeper sense of community pride. Since its inception in 2018, the Community Cans Program has expanded to eight neighborhoods and has consulted with 24 local organizations, eight of which have placed 65 community cans throughout Philadelphia.

A similar program has been offered in Huntsville, Alabama where their environmental Green Team, working through a Phillip Morris initiative, offered to give small businesses in the city free cigarette disposal receptacles to encourage proper disposal of cigarettes.⁹ A spokesperson for the program said it has been a very successful campaign with many small businesses taking up the offer and other small businesses are paying to install their own cigarette stands. The amount of cigarette butts littered on sidewalks and streets has decreased drastically since the program began and now the program is working to expand to the outskirts and suburbs of the city.

In addition to providing business with trash cans and other anti-litter equipment, some cities are also partnering with businesses to clean up a specific part of the city. Palmetto Prideways a program in South Carolina allows businesses to sponsor a two-mile section of a highway to be cleaned by SC Department of Corrections inmate services.¹⁰ Businesses can sponsor up to six sections which will include signage along the highway with the company's name. 33 businesses are sponsoring highway sections through the program leading to significantly reduced litter along highly trafficked highways.

While many cities are partnering with local businesses to offer equipment and clean ups, other cities are working to better educate and inform businesses on how they can work to reduce litter. Lexington, Kentucky's Bluegrass Greensource, an organization promoting sustainability and environmental stewardship in the city, performs outreach for both businesses and the community. They collaborate with businesses to host educational presentations and perform waste audits. A recycling waste audit will be performed on both municipal buildings and willing businesses to assess their recycling efforts and gain knowledge on how to improve.¹¹ The audit will identify what types of recyclable materials a business generates and how much of it goes towards recycling or is discarded. The audit identified nearly 93 lbs. of recycling waste but had a contamination rate of 14% (I.E. 14% of the recycling was contaminated with other trash or improperly cleaned in such a way that it could not be recycled). Bluegrass Greensource and Arlington Christian Church took steps to reduce this contamination rate, including passing out recycling flyers to educate citizens on what can and cannot be recycling. A follow up audit the next year revealed the church had reduced its contamination rate to under 2%. Philadelphia also implemented a Municipal Building Waste Audit and Digital



Figure 3 - Partners from several groups discuss litter abatement strategies in Mobile, Al near One Mile Creek.

Commercial Waste Report.¹² Any city-owned and operated facilities must submit an annual waste audit report detailing what materials or wastes the facility has generated that year and the names of the hauling companies servicing the facility. The audit and has led to exciting outcomes, including the development of new City contracts for recycling construction and demolition debris and waste cooking oil, standardized recycling signage and outreach materials provided across City departments, and tools to help City-owned facilities track and reduce their waste generation over time. Preventing and cleaning up litter require the resources and participation of multiple entities. Litter and waste impact a broad array of entities, thus it is vital that collaborations occur to enact anti-litter strategies and programs. These entities can share information, provide resources and equipment and improve the ability of all to achieve a common goal of reducing waste in the environment.

Identifying Locations for Installation of Trash Capture Devices

Placement of Litter Capture Devices - Marine Debris Interceptors, Litter Gitters, etc.

The Mobile Bay National Estuary Program has laid out a plan for how to locate Marine Debris Interceptors and Litter Gitters using GIS analysis of watersheds by land use and runoff potential. This methodology is attached as an appendix to the Dog River Clearwater Revival Report that this review was prepared for and should be referenced when locating trash capture devices.

Placement of Waste Receptacles/Recycling Bins

There is a debate in many cities on how best to utilize trash capture devices, including waste receptacles and recycling bins. Some city officials believe that by adding more trash cans in neighborhoods with major litter issues citizens will be more inclined to throw their trash away. Other officials believe that by removing trash cans citizens will force people to hold on to their trash or waste less. Data has consistently shown though that adding more trash cans reduces the amount of litter.¹³ Some cities in the U.S. have already begun conducting



Figure 5 - A marine debris interceptor installed by the City of Mobile stops litter from going into the stormwater system and subsequently surface waterbodies.



Figure 4 - An Osprey Initiative Litter Gitter in One Mile Creek catches floatable litter.

comprehensive litter studies to collect data on how to best to utilize waste receptacles and recycling bins. Philadelphia partnered with the City's Behavioral Science Initiative to conduct two litter studies on litter reduction and recycling.¹⁴ The first study collected data on the effect of waste receptacle placement on litter and cleanup time. During the experiment, the number and location of trash cans in four parks and three commercial corridors was changed and the amount of trash and staff time spent collected litter was measured. The results revealed

that when fewer trash cans were available less trash was placed in the cans and more staff time was spent cleaning litter. The second study researched the effect of distributing lidded recycling bins around the city on recycling volume and litter. Lidded recycling bins were placed at four separate recycling centers and then data was collected on recycling volume and litter rates. The results revealed the bins increased the volume of recycling but did not affect litter rates. The results are now being used to make data-based decisions on the placement and total number of waste containment devices and recycling bins. It is also helping to justify the expenditure of city funds, and craft policy and regulation on increasing bin distribution locations through a collaboration between the Streets Department and the Parks and Recreation Department. A third study is currently being performed to test the effects of positive versus negative message on litter and illegal dumping. After researching how public trash can placement affects litter rates and surveying litter conditions throughout Philadelphia, the City is now identifying ways to strategically increase trash can coverage in Philadelphia's public right-of-way with the goal of reducing litter and illegal dumping. While scientific studies are very successful in determining location and number of trash capture devices, not all cities must go to this length in order to gather useful data.

Louisville, Kentucky's Neighborhood Cleanliness Project conducted a litter assessment to establish a baseline of litter, note where litter came from, the major types of litter and the locations where litter is most commonly found.¹⁵ Surveyors walked the streets within two neighborhoods and gave each street a score based on a previously set guideline. After the assessment, Louisville improved the current trash collection system by adding more decorative waste receptacles to the streets with the biggest litter issues, providing 77 households with overflowing trash bins and additional bin, providing four recycling bins to households that requested them and providing a appointment-based large item collection system. The City also added ten surveillance systems to areas with the highest rates of illegal dumping. Major improvements in reducing litter and improving neighborhood cleanliness were recorded a year after the initial assessment. Reports of solid waste issues and illegal dumping decreased by 50% and many streets improved their cleanliness scores. Additionally, nearly 100 citizens pledged to not litter, pick up any litter near their homes, and place a sign in their yards to raise awareness of the issue.

In Mobile, Alabama, an environmental company called Osprey Initiative designed and created a Litter Gitter, an in-stream trash collection device designed to trap litter which flows into the waterways as stormwater runoff. The Litter Gitter floats above the water and uses a boom to direct the flow of water and trash into a metal trap. The trap is cleaned regularly, where debris is sorted from recyclables to provide detailed data on what types and abundance of debris and recyclables are most commonly found in the waterway. Data is collected by the EPA for their Escaped Trash Assessment Protocol (ETAP), working to reduce the amount of trash in the nation's waterways. There are currently 31 Litter Gitters across five Southeastern states, with plans for more in the coming year.

Effective Trash Reduction Technologies

In order to overcome challenges with the increasing amount of litter within our communities and the negative impacts of waste on our environment, some cities and waste management

companies are rethinking strategies and using out of the box solutions to revamp waste disposal and handling. In Montgomery, Alabama a recycling company called RePower South (RPS) is developing new technology to make the recycling process more efficient and environmentally friendly.¹⁶ Recycling that is collected from Montgomery's residences is taken to the Montgomery Recycling and Recovery Facility where RPS's technology will sort the recycling and remove all non-recyclable products to be transformed into low-carbon, clean fuel. This fuel can be used to replace coal and is sold to industrial consumers and utilities. This helps reduce our dependence on coal and provides cleaner air at a lower cost than coal. The partnership between the City of Montgomery and RPS also provides a revenue-sharing provision, whereby the City receives funds from RPS if the sales of recovered materials exceed an agreed upon threshold. In Charleston, RPS uses similarly advanced technology to reduce the amount of waste that is sent to landfills.¹⁷ RPS takes landfill-bound municipal solid waste and processes it so it can be transformed into either a recyclable product, like cardboard, or recyclable fuel used as a substitute for coal. Waste that is not able to be transformed into a recyclable product is then sent to the landfill. As waste and litter becomes a bigger problem for municipalities, innovative technologies and public private partnerships will be critical in achieving cost-effective solutions to clean up waste.

Improving Enactment and Enforcement of Laws

Municipalities enact a multitude of laws and ordinances to curb litter-related crimes. There are state laws, administrative rules and local laws. Laws that work to reduce litter include both commercial and residential littering, sanitation and health, public nuisance and water protection. For instance, in Alabama a law was passed to make littering a Class B misdemeanor, which increased possible jail time to 6 months and fines up to \$3,000.¹⁸ However, in some states the fines increase for repeat offenders. In Jacksonville, Florida fines begin at \$55 for the first offense and increased up to \$350 for the fifth offense. These fines are then used to help pay for the salaries of litter enforcement officers.¹⁹ These state and local laws pertaining to litter are enforced through local law enforcement and enforcement officers.

Some municipalities partner with local law enforcement to help enforce and advise on litter enforcement activities. Charleston has its own enforcement committee which helps to develop and enact its own Palmetto Pride enforcement programs designed to help officers enforce litter laws.⁶ The committee includes law enforcement and code officers from around South Carolina, like the Police Departments, Sherriff's Departments and Highway Patrol. The committee advises Palmetto Pride on litter enforcement, legislative acts and education. Palmetto Pride has several anti-litter programs, all designed to confront different aspects of the bigger litter campaign. The Zero Tolerance Program is a collaboration between Palmetto Pride, South Carolina Litter Control Association and statewide law enforcement agencies to educate citizens on litter laws and their associated fines. The Camera Loan Program offers enforcement agencies the ability to borrow surveillance equipment to monitor "hotspots" in their jurisdictions. The agencies must then send Palmetto Pride a report on how the equipment was used and any findings or results. Philadelphia has a similar program to Palmetto Pride, but instead has its own formalized environmental crimes unit within the Philadelphia Police Department Neighborhood Services Unit to coordinate illegal

dumping surveillance.²⁰ The crimes unit works with the Police Department to impound vehicles involved in litter crimes and streamline litter cases in the courts. It is in the interest of the different enforcement agencies to work together to enforce litter laws and ordinances and help improve the quality of litter control activities in their city, however it is also imperative that enforcement agencies work with local citizens to help enforce litter laws around their neighborhood. Local citizens can act as crime watchers in their neighborhood to help identify and locate potential sources of littering.

Durham, North Carolina has a Swat-a-Litterbug Program that encourages citizens to report littering or any illegal dumping activities.²¹ Citizens can fill out a report form on North Carolina's Department of Transportation (NCDOT) website with the car make, model and tag number of the person suspected of littering. NCDOT will then send a formal notification to the suspect that educates them on the littering offense, the local litter laws and the penalties associated with litter. This program allows citizens to become more engaged in the city's anti-litter campaign and helps foster a sense of community pride.

Litter Monitoring Data Collection

The broader issue of litter and illegal dumping activities occurs on a global scale which necessitates the use of gathering data from multiple municipalities to understand how which management practices and anti-litter campaigns work best. Several cities participate in an Annual Litter Index Survey, including Philadelphia, Durham, Lexington and Shreveport, Louisiana.²² The Litter Index Survey is a data collection tool created by Keep America Beautiful to help its affiliates monitor and collect data on litter within their communities. Each city conducts a visual assessment of the litter conditions of the streets, parks, highways, recreation sites, public schools, waterways, stormwater infrastructure and vacant lots. Field surveyors given a rating based on metrics given to them by Keep America Beautiful, with a "1" being little to no litter and "4" indicating litter that requires a major clean up. This survey allows the city to gather data on where the major litter problems occur and what types of anti-litter strategies are needed. The data is then indexed onto a map to show neighborhood litter ratings. The map also provides resources each neighborhood has to help those citizens keep their neighborhoods clean. This survey has allowed Keep America Beautiful to identify seven major sources of litter: motorists/boaters, pedestrians, households, hauling uncovered loads, loading docks, dumpsters and construction sites.

The most intensive litter monitoring currently being used is the [EPA's Escaped Trash Assessment Protocol](#)²³. ETAP is being used by several organizations and municipalities, including in the Mobile Bay area, Osprey Initiative, Mobile Bay National Estuary Program, Mobile Baykeeper and others. ETAP provides a level of data beyond what typical volunteer cleanups collect and is extremely useful at more strategically attacking the specific sources of litter in an area by using concrete data about the amounts of each type litter collected. ETAP data can now be entered into the Water Rangers app thanks to funding from the Mobile Bay National Estuary Program.

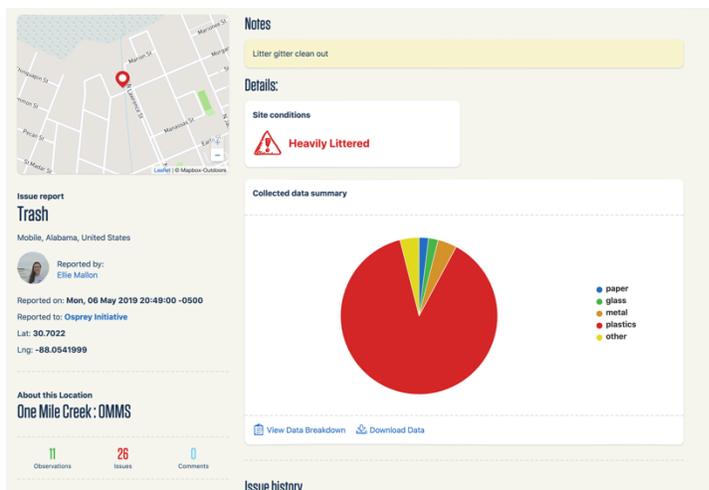


Figure 6 - A screengrab from an ETAP entry Osprey Initiative put into the Water Rangers web tool.

Innovative Programs to Engage the Public

Community outreach is one of best strategies for curbing litter and encouraging people to be better stewards for their environment and communities. When people develop a greater sense of community pride, they tend to not litter as well as pick up litter they see around their neighborhoods. Outreach programs are often one of the most heavily invested parts of a city's anti-litter campaigns. Many of these programs are geared towards promoting and organizing volunteerism and stewardship. In Chattanooga, Tennessee, the Chattanooga Park Stewards Volunteer Program aims to improve the environmental and aesthetic quality of the parks and greenways by organizing volunteers, hosting local cleanups and providing outreach at events.²⁴ The program offers multiple volunteer opportunities, including Parks Stewards who assist with maintenance opportunities and report park conditions, and Trail Stewards who help upkeep park trails by picking up litter and inform visitors of trail use guidelines. Similarly, Huntsville's Green Team has a Neighborhood Pride Program, which partners with individuals and neighborhoods to help them design a cleanup and landscape improvement program specific to their neighborhood.²⁵ Individuals can sponsor neighborhood cleanups and adopt and maintain specific locations in their neighborhood. Lastly, Durham offers an Adoption program which gives neighborhoods and individuals the opportunity to adopt different areas of their community, including streets, streams and parks.²⁶ Adoptees must clean up their area a specified number of times per month and report what types of litter was cleaned up and the amount. Volunteer programs offer citizens and communities a chance to take ownership of their neighborhoods, but these programs must also be paired with educational programs to empower and inform citizens about litter issues and how to prevent them.

Education is one of the cornerstones for many anti-litter campaigns. Educating and empowering communities to become environmental stewards is a vital step in eliminating illegal

dumping. It is also an extremely important step in changing the psychology behind littering. Individuals often imitate the actions of those around them and will likely do what is expected of them. If these expectations change then people's behavior will also change. Providing activities and tools to teach citizens about litter prevention and the negative impacts of litter prompts them to become more proactive in their efforts to curb littering. Many anti-littering programs provide educational presentations to schools and businesses to help them become more informed. Shreveport offers schools the option to request a presentation on a variety of environmental topics, including litter/solid waste and stormwater runoff/stormwater drains.²⁷ In addition, Shreveport will meet and present with neighborhood organizations to specifically discuss how neighborhoods organizations can work with its citizens to combat litter.²⁸ Similarly, an organization in Birmingham, Alabama called Litter Quitters gives presentations to participating schools, including all 30 public schools in Jefferson County.²⁹ The presentations discuss the local watersheds, how litter impacts these watersheds, and presents the schools with an opportunity to participate in a city-wide competition. Students compile a 60-second YouTube video discussing litter and why it's harmful and whichever video receives the most "likes" will win monetary prizes for their schools. Charleston also has several incentive-based education programs for schools. The Palmetto Pride Art Contest features artwork by students centered around litter.³⁰ The winning design will be featured on a Palmetto Pride t-shirt. The Children's Book Contest allows students to write a book describing how litter affects everyone. At the end of the contest one book is chosen to be published and will be sent to every school for their library collection of litter-themed books. Incentives for students to participate in anti-litter campaigns like these encourage students to become proactive members of their own neighborhoods in helping in the fight against litter.

Recommendations

We understand that many of the anti-litter programs and policies discussed above may not work for all cities, including Mobile. Therefore, the following is a list of recommendations for what the City of Mobile can do to reduce the amount of litter in our neighborhoods and increase the efficiency and amount of recycling within the city. Although this review was focused on gleaning innovative and effective ideas from other municipalities it should be noted that the City of Mobile and organizations working on reducing litter in the Mobile Bay area are already implementing many of these strategies at various scales throughout the region. If these groups and local municipalities keep the same momentum for stopping litter and gain fresh ideas from this review it is anticipated the substantial ongoing work of reducing litter in the Mobile Bay area will become even more successful.

Goal 1 – Educate Citizens about Harmful Effects of Litter and Engage them in Litter Abatement Programs

1.1 Create a Neighbor-to-Neighbor Network

The network will be led and managed by elected neighborhood leaders who will collaborate with Department of Public Works on proactive strategies to reduce litter

problems and provide input on the design and distribution of anti-litter education material.

1.2 Launch an Anti-Littering Social Media Campaign

The campaign will educate citizens about trash and litter issues in Mobile and what they can do to help combat the problems in their own neighborhoods. It will be launched across several social media platforms, including Facebook, Twitter, Instagram and YouTube. Citizens will hear about success stories from within their own neighborhoods and throughout the city. These messages will showcase public clean-ups, infographics and videos.

Goal 2 – Make It Easier to Recycle and Dispose of Trash Properly

1.1 Increase abundance of trash and recycling bins

Review feasibility and costs to increase the number of trash receptacles and recycling bins throughout the city at prime locations, municipal parks and shopping centers.

1.2 Reduce Single Use Plastics

Support statewide policies to reduce single-use plastic bags and provide resources to community organizations and businesses to distribute free reusable bags to residents. Additionally, partner with Plastic Free Gulf Coast to educate residents and businesses on moving towards a plastic free economy.

1.3 Improve Recycling Technology

Reach out to RePower South, an innovative recycling company, to discuss how they have improved Montgomery's recycling program and the opportunity for partnership between the City of Mobile and RPS.

Goal 3 – Improve Existing Programs and Policies

1.1 Update and Expand Operation Clean Sweep

Create a collaboration between the Mobile County Department of Environmental Enforcement and neighborhood groups to improve Operation Clean Sweep through an increase in the number of county-wide recycling days and an improvement in the communication and messaging surrounding the events.

1.2 Improve Anti-Litter Signage

Anti-littering messages and signs in highly littered areas to consistently remind residents not to litter and the penalties for littering.

1.3 Enforcing strict litter laws

Notify residents about litter laws and environmental offenses to reduce littering behavior and raise awareness about disposing of litter properly.

Closing Remarks

The majority of citizens share a common vision, a vision of their community as a clean, healthy and eye-catchingly beautiful place. Litter is a direct threat to this vision and is an increasing concern in communities where it is improperly discarded into roadways and waterways. Litter has

many negative impacts like polluting our vital waterways where we swim, play and fish and making an area less appealing to visitors and tourists, indirectly affecting the economy. To combat this challenge, cities across the country have developed and begun implementing numerous litter abatement strategies and programs. These programs are aimed at providing expertise, resources and education to help citizens end littering in their neighborhoods. This litter literature review was written to provide city officials and interested parties in Mobile, Alabama with the knowledge and tools to enhance ongoing litter abatement programs in the City and implement new initiatives where appropriate. Litter is a major issue in Coastal Alabama, costing the taxpayers hundreds of thousands of dollars to clean up each year. Successful litter abatement programs help reduce the amount of litter while also educating citizens on why it's harmful to the environment and what they can do to help reduce and prevent littering in their neighborhoods.

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Overall Summary of Reviewed Municipalities and Area(s) of Expertise

Municipality	Funding	Partnerships	Device Locale	Effective Technologies	Enforcement	Data	Public Engagement
Huntsville, AL	Litter enforcement fines, litter taxes, bottle deposit laws	Partners with small businesses	N/A	Free cigarette disposal receptacles offered to small businesses	Littering is a Class B misdemeanor	N/A	Neighborhood Pride Program partners with individuals and neighborhood associations to design a clean-up and landscape improvement program unique to their community
Shreveport, LA	N/A	Partners with small businesses, schools, civic associations and volunteer groups	Litter Index Survey	N/A	Fines range from \$150 for simple littering to \$10,000 for large items	Annual Litter Index Survey	Offers schools the option to request presentation on environmental topics, meet and present with neighborhoods
Durham, NC	Plastic bag legislation	Partners with municipalities, businesses and individuals	Litter Index Survey	N/A	Swat-a-Litterbug Program where citizens can report people who litter	Annual Litter Index Survey	Adoption program
Chattanooga, TN	N/A	Partners with state agencies, local municipalities and volunteer groups	N/A	N/A	Fines range from \$50 to \$3,000	N/A	Chattanooga Park Stewards Volunteer Program
Greenville, SC	Litter Prevention Grant	Palmetto Prideways partners with businesses and law enforcement agencies	N/A	N/A	Enforcement committee, Zero tolerance program, Camera Loan Program, Litter Busters Hotline	N/A	N/A
Philadelphia, PA	Litter Microgrants offered to local organizations	Community Cans program partners with local artists to paint trash baskets to foster community pride	Litter studies on litter reduction/recycling; Community Cans program collaborates with local organizations to strategically place trash baskets along popular commercial corridors	N/A	Formalized environmental crimes unit in PPD neighborhood services unit	Annual Litter Index Survey	N/A
Lexington, KY	N/A	Partners with businesses to to perform waste audits to assess recycling efforts and advice on improvements	N/A	N/A	N/A	Annual Litter Index Survey	N/A
Louisville, KY	Kentucky's Department of Environmental Protection offers a Litter Abatement Grant	N/A	Litter Assessment located streets with biggest litter issues and the city added more decorative waste receptacles and ten surveillance systems to these areas	N/A	N/A	Litter Assessment was performed to establish a litter baseline, including where litter originated, types of litter and locations where litter was commonly found	N/A
Montgomery, AL	N/A	N/A	N/A	The city has partnered with Repower South, who is developing new technology to make recycling more efficient/environmentally friendly	N/A	N/A	N/A
Charleston, SC	Litter Prevention Grant, plastic bag legislation	Palmetto Prideways partners with businesses and law enforcement agencies	N/A	The city has partnered with Repower South, who is developing new technology to make recycling more efficient/environmentally friendly	Enforcement committee, Zero tolerance program, Camera Loan Program, Litter Busters Hotline	N/A	Incentive based education programs for schools
Jacksonville, FL		N/A	N/A	N/A	Fines begin at \$55 and increase up to \$350 for 5th offense	N/A	N/A
Birmingham, AL	Alabama Department of Environmental Management's Recycling Fund Grant offered to local governments, public schools and authorities	N/A	N/A	N/A	Litter enforcement fines, litter taxes, bottle deposit laws, "penny sales tax"	N/A	Litter Quitters gives presentations to participating schools, including all 30 schools in Jefferson county
Fresno, CA	Sales tax	N/A	N/A	N/A	N/A	N/A	N/A

Funding for Litter Abatement Programs		
Program	Information	Benefits & Challenges
Municipal/Local Led Funding Strategies		
ADDEM - recycling	<u>grant program aimed at increasing recycling efforts.</u>	
Palmetto Pride	Litter Prevention Grant: All litter control organizations, non profits and government agencies eligible. Uses develop successful anti-litter and enforcement programs. Criteria: The organization specifically looks for community cleanups and educational programs, illegal dumpsite remediation and trash equipment maintenance. Litter Task Force Grant: Assists county governments in hiring part-time litter enforcement officers dedicated to enforcing state and local litter laws.	Assists with Phase 1MS4 program compliance
Palmetto Pride		
Philadelphia, Pa	Microgrants offered to local organizations who propose to develop or expand innovative and impactful litter abatement programs. Last year, the City gave seven organization microgrants in support of the City's bold Zero Waste goal.	Encourage and support successful litter abatement and prevention initiatives by local organizations and governmental agencies.
State Grants		
<u>Kentucky Department of Environmental Protection's litter abatement grant program</u>	These sources of funds are great ways to perform intensive work on litter abatement projects and jump-start long-term efforts. Because of the episodic nature of these grants, they should not be relied upon for long-term funding of litter abatement programs. Many funded by tire disposal fees and/or fees that come from litter enforcement fines. Currently proceeds from litter enforcement fines in Alabama are split between the general fund and the municipality or county where the fine was issued. Many states also have litter taxes and bottle deposit laws that fund litter abatement programs. While the Alabama Department of Environmental Management (ADEM) does offer a grant program aimed at improving recycling efforts, we are currently unaware of any similar litter abatement grants offered by the State of Alabama.	
<u>Washington Department of Ecology's community litter cleanup grant program</u>		
<u>Ohio Environmental Protection Agency's community and litter grants program</u>		
<u>West Virginia's litter control grant program</u>		
<u>Michigan Department of Environmental Quality's litter prevention grant program</u>		
<u>Tennessee Department of Transportation's litter grant program</u>		
<u>Nebraska Department of Environmental Quality's litter reduction and recycling grant program</u>		
Federal Grants (not an exhaustive list)		
NOAA	Marine Debris Removal	
EPA	Trash Free Waters	
HUD	CDBG qualified areas	
Non-Traditional Funding Strategies		
Single-use plastic bags fees	Currently hundreds of municipalities in the country have some sort of rulemaking on single use plastics. Notable cities in the Southeast that have plastic bag legislation include Charleston, Sc (adopted), and Durham, Nc (pending).	Benefits: can create sustainable funding for litter prevention effort while simultaneously reducing litter. Challenges: Several other cities in Texas and Florida had similar bans or fees that were removed after action was taken by state legislatures and/or state courts to preempt these ordinances.
Fresno	Fresno uses a portion of the proceeds from sales taxes to fund litter abatement programs. This is similar to the "penny sales tax" Mobile, Al has in place through 2023.	

Program	Information	Benefits & Challenges
Philadelphia, Pennsylvania Community Cans Program	The city partners with local organizations to foster community responsibility for keeping their neighborhoods free of trash. The city works with community leaders to strategically place trash baskets in public right-of-way's along popular commercial corridors	foster a deeper sense of community pride. Since its inception in 2018, the Community Cans Program has expanded to eight neighborhoods and has consulted with 24 local organizations, eight of which have placed 65 community cans throughout Philadelphia.
Philadelphia, Pennsylvania Community Cans Program	partners with local artists to decorate and paint the trash baskets	
Huntsville, Alabama	The city gave small businesses in the city free cigarette disposal receptacles to encourage proper disposal of cigarettes	
Palmetto Prideways	allows businesses to sponsor a two-mile section of a highway to be cleaned by SC Department of Corrections inmate services.	
Lexington, Kentucky's Bluegrass Greensource	They collaborate with businesses to host educational presentations and perform waste audits. A recycling waste audit will be performed on both municipal buildings and willing businesses to assess their recycling efforts and gain knowledge on how to improve.	

Identifying Locations for Installation of Trash Capture Devices		
Program	Information	Benefits & Challenges
Philadelphia & the City's Behavioral Science Initiative	Philadelphia partnered with the City's Behavioral Science Initiative to conduct two litter studies on litter reduction and recycling. ^{xiv} The first study collected data on the effect of waste receptacle placement on litter and cleanup time.	The results revealed that when fewer trash cans were available less trash was placed in the cans and more staff time was spent cleaning litter. It is also helping to justify the expenditure of city funds, and craft policy and regulation on increasing bin distribution location
Louisville, Kentucky Neighborhood Cleanliness Project	conducted a litter assessment to establish a baseline of litter, note where litter came from, the major types of litter and the locations where litter is most commonly found.	

Effective Trash Reduction Technologies

Program	Information	Benefits & Challenges
Montgomery, AL	<p>a recycling company called RePower South (RPS) is developing new technology to make the recycling process more efficient and environmentally friendly. Recycling collected from Montgomery's residences is taken to the Montgomery Recycling and Recovery Facility where RPS's technology will sort the recycling and remove all non-recyclable products to be transformed into low-carbon, clean fuel. This fuel can be used to replace coal and is sold to industrial consumers and utilities.</p>	<p>helps reduce our dependence on coal and provides cleaner air at a lower cost than coal. The partnership between the City of Montgomery and RPS also provides a revenue-sharing provision, whereby the City receives funds from RPS if the sales of recovered materials exceed an agreed upon threshold.</p>
Charleston, SC	<p>RPS takes landfill-bound municipal solid waste and processes it so it can be transformed into either a recyclable product, like cardboard, or recyclable fuel used as a substitute for coal. Waste that is not able to be transformed into a recyclable product is then sent to the landfill.</p>	

Program	Information	Benefits & Challenges
Alabama	Class B misdemeanor increased possible jail time to 6 months and fines up to \$3,000.	some states the fines increase for repeat offenders
Charleston, SC/Palmetto Pride	Has its own enforcement committee which helps to develop and enact its own Palmetto Pride enforcement programs designed to help officers enforce litter laws.	
	The Camera Loan Program offers enforcement agencies the ability to borrow surveillance equipment to monitor “hotspots” in their jurisdictions. The agencies must then send Palmetto Pride a report on how the equipment was used and any findings or results.	
Charleston, SC/Palmetto Pride	The Zero Tolerance Program is a collaboration between Palmetto Pride, South Carolina Litter Control Association and statewide law enforcement agencies to educate citizens on litter laws and their associated fines.	
Philadelphia, Pa	has its own formalized environmental crimes unit within the Philadelphia Police Department Neighborhood Services Unit to coordinate illegal dumping surveillance. The crimes unit works with the Police Department to impound vehicles involved in litter crimes and streamline litter cases in the courts. It is in the interest of the different enforcement agencies to work together to enforce litter laws and ordinances and help improve the quality of litter control activities in their city, however it is also imperative that enforcement agencies work with local citizens to help enforce litter laws around their neighborhood.	

Jacksonville, FL	finer begin at \$55 for the first offense and increased up to \$350 for the fifth offense	finer are used to help pay for the salaries of litter enforcement officers.
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Data			
Program	Where	Information	Benefits & Challenges
Annual Litter Index Survey Keep America Beautiful	Participating cities: Philadelphia, Durham, Lexington and Shreveport, Louisiana.	data collection tool where participating cities conduct a visual assessment of the litter conditions of the streets, parks, highways, recreation sites, public schools, waterways, stormwater infrastructure and vacant lots. Field surveyors give a rating based on metrics given to them by Keep America Beautiful, with a "1" being little to no litter and "4" indicating litter that requires a major clean up. This survey allows the city to gather data on where the major litter problems occur and what types of ant-litter strategies are needed. The data is then indexed onto a map to show neighborhood litter ratings. The map also provides resources each neighborhood has to help those citizens keep their neighborhoods clean.	use of gathering data from multiple municipalities to understand how which management practices and anti-litter campaigns work best. The data has allowed Keep America Beautiful to identify seven major sources of litter: motorists/boaters, pedestrians, households, hauling uncovered loads, loading docks, dumpsters and construction sites.
ETAP	EPA - program is national	Escaped Trash Assessment Protocol (ETAP) is a data intensive form that collects a plethora of data about litter collected.	Can be useful in making decisions about where to target litter reduction efforts but requires great deal of time and energy to use and track;

Public Engagement Programs

Program	Information	Benefits & Challenges
Huntsville's Green Team	<p>Neighborhood Pride Program - partners with individuals and neighborhoods to help them design a cleanup and landscape improvement program specific to their neighborhood. Individuals can sponsor neighborhood cleanups and adopt and maintain specific locations in their neighborhood.</p>	
Charleston	<p>The Palmetto Pride Art Contest features artwork by students centered around litter. The winning design will be featured on a Palmetto Pride t-shirt. The Children's Book Contest allows students to write a book describing how litter affects everyone. At the end of the contest one book is chosen to be published and will be sent to every school for their library collection of litter-themed books.</p>	<p>Incentives for students to participate in anti-litter campaigns like these encourage students to become proactive members of their own neighborhoods in helping in the fight against litter.</p>
Birmingham, AL Litter Quitters	<p>gives presentations to participating schools, including all 30 public schools in Jefferson County.xxix The presentations discuss the local watersheds, how litter impacts these watersheds, and presents the schools with an opportunity to participate in a city-wide competition. Students compile a 60-second YouTube video discussing litter and why it's harmful and whichever video receives the most "likes" will win monetary prizes for their schools.</p>	

Durham, NC	offers an Adoption program which gives neighborhoods and individuals the opportunity to adopt different areas of their community, including streets, streams and parks.	
Shreveport, La	Presentations available upon request	
Chattanooga, Tennessee Chattanooga Park Stewards Volunteer Program	aims to improve the environmental and aesthetic quality of the parks and greenways by organizing volunteers, hosting local cleanups and providing outreach at events.	