Waller Creek Rapid Visual Litter Assessment Method and Baseline Results
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Abstract

The Watershed Protection Department has developed a method to assess litter in creeks and provide a way to evaluate the success of litter management efforts in the lower Waller Creek watershed over time. A rapid visual litter assessment method was applied at ten sites on Waller Creek in downtown Austin, Texas, to describe the abundance and type of litter present at each site in addition to identification of possible sources of litter. Surveys were timed to provide an estimate of staff time necessary to conduct future litter surveys using this method. On average, to complete the survey at one site took between 6.7 and 7.5 minutes. Surveys concluded that there was a significant presence of litter in lower Waller Creek. Beverage containers were identified to be the most prevalent type of litter. Surveys identified a few point sources of litter. Additional data points at each site may be needed to more accurately describe baseline conditions in Waller Creek.

Introduction

The Waller Creek Flood Control Tunnel Project will construct a stormwater bypass tunnel to address problems of flooding and erosion along lower Waller Creek. The mile-long tunnel will capture and redirect flood waters south of 12th Street and safely carry them to an outlet lagoon on the shores of Lady Bird Lake. In doing so, the tunnel will take nearly 28 acres of downtown land out of the 100-year floodplain and create an environment suitable for redevelopment. The project will also include amenities such as a new public boathouse and stream bank restoration. The project is scheduled for completion in 2015. For more information, see:
http://www.austintexas.gov/department/waller-creek

The City of Austin Watershed Protection Department (WPD) is evaluating a set of programmatic and structural best management practices to address litter concerns that may negatively impact aesthetic conditions of the redeveloped lower Waller stream corridor. The Waller Creek Litter Assessment, Project 551, was conducted to establish a baseline condition of litter by visual assessment in Waller Creek prior to the initiation of the Waller Creek Tunnel operations, and to provide an estimate of labor time required to repeat this assessment in the future for planning

purposes. The revised visual litter assessment form utilized in this project is included in this report and can be used in the future by staff, volunteers and interested citizens.

Methods

Site visits at 10 locations (Table 1) were conducted by visually inspecting Waller Creek upstream and downstream of bridge crossings. If vegetation or structures obstructed the view of the creek, then investigators walked into the channel and conducted a visual inspection on both sides of the bridge. Staff completed the litter index field sheet shown in Figure 1 which included the start and stop time for each site visit. The litter assessment was led by Todd Jackson of the WPD Environmental Resource Management Division and supported by Ramesh Swaminathan and John Beachy of the WPD Field Operations Division.

Table 1. Sites Surveyed.

Site #	Site Name	State83x	State83y
5656	Waller Creek at pedestrian bridge upstream of 15th Street	3116801.3	10073911.1
5655	Waller Creek at 14th Street Foot Bridge	3116565.9	10073237.2
1328	Waller Creek Upstream of 12th Street	3116563.9	10072477.9
5654	Waller Creek @ 11th Street	3116735.1	10071898.3
4475	Waller Creek downstream of 9th St	3116750.0	10071086.4
5653	Waller Creek @ 7th Street	3116560.4	10070453.0
1041	Waller Creek @ 5th Street	3116465.0	10069661.0
4206	Waller Creek 20 ft Upstream of Third st	3116168.9	10069106.0
5652	Waller Creek @ Cesar Chavez	3115454.7	10068551.9
5651	Waller Creek @ Pedestrian Bridge near Rowing Center	3114910.9	10067723.4

Both overall site score and litter category scores on the field sheet were used to describe one of five conditions for a survey site: 0 (No litter present), 1-5 (Present, but not significant), 6-10 (Significant Presence), 11-15 (Abundant) and 16-20 (Extremely Abundant). High scores, therefore indicate poor conditions due to abundant and continuously distributed litter at a site (see Figure 1). In addition to evaluating litter abundance, WPD staff also used the field sheet to evaluate possible non-point and point sources of litter entering Waller Creek. Site scores and litter sources for each site were recorded in the WPD Field Sampling Database and are summarized in maps and tables in the results section. The method used to score sites is outlined below.

Figure 1. Litter Index Scoring Sheet.

Litter Index Field Sheet

Date:_____ Watershed Name:_____ Start & End Times:_____

# of Observers & Contact Info:_____

_____

Location (nearest cross streets, GPS, address, etc.):_____

Score each category of litter below using the following scoring numbers:

Not Present	Present, Not Significant	Significant Presence	Abundant	Extremely Abundant
0	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20

For descriptions of typical items found in each category, see the reverse side of this page.

Categories	Score	Categories	Score	Categories	Score
Automotive Debris		Bikes, Toys & Sports Items		Beverage Containers	
Construction & Demolition Debris		Miscellaneous Large Items		Take-Out & Fast Food	
Appliances & Machinery		Clothing & Fabrics		Non-Take-Out Snack Containers	
Furniture & Furnishings		Plastic Bags		Personal Hygiene Products	
Electronic Waste		Packaging Materials		Tobacco Products	
Yard & Landscaping Waste		Printed Paper Items		Miscellaneous Small Items	

Please rank the overall condition of this site based on total litter present (circle a number):

None	Present, Not Significant	Significant Presence	Abundant	Extremely Abundant
0	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20
No litter is present	An occasional item or two throughout, but not readily observed *AND* - there are no pockets of accumulated litter.	Litter is not continuous, but is fairly evident throughout *OR* – very little litter throughout but with a few small pockets of accumulation.	Almost continuous litter throughout with a few gaps *OR* – litter is not continuous but with some large pockets of accumulation.	Litter is totally continuous throughout *AND* – several large pockets of accumulation

Can you identify any sources contributing to the litter problem at this site?

☐ A recent illegal dump site   ☐ An older illegal dump site   ☐ Storm or Flood debris

☐ Overflowing trash cans or dumpsters   ☐ Homeless camp site   ☐ Wind

☐ Roadside littering   ☐ Recreational activities   ☐ I am not sure

☐ Other (please explain):

Litter Survey Method

I. Instructions for scoring litter categories

A. **The objective** is to determine what types and what quantities of litter items are present at a specific location so that appropriate resources can be made available for clean-up efforts, and so that potential sources of this type of pollution can be located, mitigated and prevented. It is important to score categories appropriately so that areas where a particular type of litter is more abundant can be properly identified.

B. **How to score a category**: When selecting a numeric score for a litter category it is important to compare what you are seeing at the site to the definitions for each of the five major classifications defined in section "C" below. If what you see matches the definition exactly, then your score should fall right within the center of the scoring criteria (these numbers are 0, 3, 8, 13 and 18 respectively). If you feel that you see something that is a little different (slightly higher or slightly lower), then adjust your score within the litter class either higher or lower than the middle number.

C. **Litter category score definitions**: Scoring criteria range from "Not Present" to "Extremely Abundant," and include a numeric scoring system ranging from 0 to 20 (Table 2).

Table 2. Categorical Litter Scores.

None	Present, Not Significant	Significant	Abundant	Extremely Abundant
0	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20
Item is not present.	One or two items within this category, but items are not readily observed, *AND* - there are no pockets of items in this category accumulated anywhere.	Items in this category are not observed continuously, but they are fairly evident throughout, *OR* –there are a few small pockets where items in this category have significant accumulation.	Items in this category are almost continuously visible but with a few gaps, *OR* – items in this category are not continuously visible, but there are some large pockets of accumulation.	Items in this category are continuously visible from anywhere within the survey area, *AND* – there are several large pockets of accumulation of items in this category.

D. **Typical items at a site**: Typical items that are found in a particular category are summarized on the reverse side of the litter index sheet (Table 3). If you cannot place items at a site within any of the listed categories, then use the Miscellaneous Large or Miscellaneous Small categories instead. Make a brief note of what some of those miscellaneous items are, on the reverse side of the sheet, if possible.

Table 3. Categorical Litter Scores.

Categories	Typical Items in Each Category
Automotive Debris	Motorized vehicles and/or parts, hubcaps, tires, light covers, windows, air filters, oil/solvent cans, etc. **If car/boat batteries or any hazardous waste fluid spills are present, please call the Spills Response Team at (512) 974-2550 and note your observation somewhere on this sheet.**
Construction & Demolition Debris	Anything found in the demolition of a building (house or commercial) or at a construction site; Silt/debris fences, piles of sand/fill material, lumber, concrete, asphalt, bricks, cinder blocks, insulation, rebar, shingles, tiles, drywall, pipes, nails, doors, windows, siding or fixtures (kitchen, etc.)
Appliances & Machinery	Washing machines, dryers, dishwashers, stoves, refrigerators, air conditioners, vacuums, fans, lawn equipment, or any other home or business appliances.
Furniture & Furnishings	Bed frames, mattresses, couches, chairs, dressers, carpets, rugs, lamps, or other furnishings.
Electronic Waste	Computers, monitors, televisions, radios, phones, compact fluorescent light bulbs (CFL), copiers, scanners, batteries, etc. *Note: Car/boat batteries DO NOT go here and should be listed under Automotive Debris.
Yard & Landscaping	Grass cuttings, raked leaves, clearly cut tree or shrub branches, landscaping or potting soil, etc. *Note: Lawn equipment DOES NOT go here and should be listed under Appliances and Machinery.
Bikes, Toys or Sports Items	Bicycles, tricycles, big wheels, children's or pet's toys, and any type of ball or sports item. *Note: Electronic games or batteries DO NOT go here and should be listed under Electronic Waste.
Miscellaneous Large Items	Any item too big to fit into a large trash bag that does not appear to fit into any other categories on this sheet; shopping carts, wooden pallets, tents, etc. Please list items found here:
Clothing & Fabrics	Clothing or clothing accessories, purses, scarves, shoes, hats, belts, blankets, sheets, linens, etc.
Plastic Bags	Any type of plastic bag, grocery, retail, garbage bags, etc. *Note: Plastic material **not** from a bag DOES NOT go here. Also contents of a plastic bag should be recorded elsewhere.
Packaging Materials	Corrugated boxes, paperboard, packing cases, plastic bubble wrap, styrofoam packing peanuts, etc.
Printed Paper Items	Newspapers, magazines, phone books, junk mail, flyers, business or school papers, bills, etc.
Beverage Containers	Cans, bottles, boxes, cartons or pouches used for any beverage including alcohol. Caps, six-pack rings, beverage cases or drink packaging. *Note: Styrofoam/paper cups DO NOT go here and should be listed with Take-Out & Fast Food.
Take-Out and Fast Food	Disposable cups, plates, trays, utensils, condiment packaging, napkins, straws.
Non-Take Out Food Containers	Food packaging, candy or gum wrappers, energy bars, potato chip bags, etc.
Personal Hygiene & Toiletries	Toilet paper, feminine hygiene, Q-tips, condoms, diapers, make up containers, toothpaste, etc.
Tobacco Products	Cigarettes, cigars, smokeless tobacco products, tobacco product packaging, lighters and matches.
Miscellaneous Small Items	Any item small enough to fit in a large trash bag that does not appear to fit into any other categories on this sheet; fishing tackle, string, rope, etc. Please list items found here:

II. Instructions for overall site scoring

A. **The objective** is to provide a score for total litter at a specific location so that sites can be compared to one another to determine whether or not litter is increasing or decreasing in a particular area, and so that the worst litter sites can be prioritized for clean-up efforts.

B. It is important to note that the overall litter score is **NOT** an average of the individual scores for litter categories. The overall site score is an independent assessment of the general condition of the site. The overall site score can be higher than any individual category, but it cannot be lower than the highest score for an individual category.

1) It is possible that one location could have a very high overall score even if each individual category received low scores for each litter category. For example, a site where no individual category received a score above 5, but where total litter (all categories) is scattered in such a way that litter is totally continuous, could end up with a score of 18 or higher.

2) It is **NOT** possible to have an overall site score that is lower than any single category. For example, if a site received zeros or ones for each category, except for plastic bags, which received a score of 18 because they were totally continuous and piled up in several areas, then the overall site score would have to be at least 18.

C. **Overall site score definitions**: Scoring criteria range from "None" to "Extremely Abundant," and include a numeric scoring system ranging from 0 to 20. Use the definitions in Table 4 to determine the overall site score. If what you see matches the definition the table exactly, then your score should fall right within the center of the scoring criteria (these numbers are 0, 3, 8, 13 and 18 respectively). If you feel that you see something that is a little different (slightly higher or slightly lower), then adjust your score within the scoring class either higher or lower than the middle number.

Table 4. Overall Site Scores.

None	Present, Not Significant					Significant Presence					Abundant					Extremely Abundant				
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No litter is present	An occasional item or two throughout, but not readily observed *AND* - there are no pockets of accumulated litter.					Litter is not continuous, but is fairly evident throughout *OR* – very little litter throughout but with a few small pockets of accumulation.					Almost continuous litter throughout with a few gaps *OR* – litter is not continuous but with some large pockets of accumulation.					Litter is totally continuous throughout *AND* – several large pockets of accumulation				

III. Instructions for identification of litter sources

A. **The objective** is to identify any potential litter sources at a site that may be prevented from occurring in the future.

B. Check any of the commonly encountered litter sources listed on the field sheet that apply to this site. If the litter source is not certain, or if you are not sure that you see a specific litter source at this location, then check the box that states, "**I am not sure**." Do not guess if you are not sure of the source. If you see a significant litter source that is not listed on the field sheet, then check the "Other" box and be sure to describe the source you are seeing. If there is a very specific source, such as a business or residential address, or a particular event at a location, then give details that will help us to locate this source.

C. **How to identify some common litter sources**:

1) **Recent illegal dump site**: Look for obvious signs that a large amount of litter was placed here intentionally, and that this has occurred within the last year or two (or more recently). Some illegal dump sites may contain mail, such as bill statements, that can be used identify potentially responsible parties. If this is the case, then make a note of that at the bottom of the field sheet. Other illegal dump sites may only contain furniture, yard waste, or construction or remodeling debris, but it is usually obvious that the material was purposefully left at that location.

2) **Older illegal dump site**: Look for signs that a large amount of litter was placed here intentionally, but that a significant amount of time has passed since this area was used as a dump site. Some areas may have been used decades ago as dump sites, and these types of sites often have very old debris washing out from eroded banks.

3) **Storm water or flood debris**: Look for signs that this material was moved here by water. Items tangled around trees or vegetation, or items that are higher in trees, are often signs of storm water or flooding.

4) **Overflowing trash cans or dumpsters**: This is usually obvious. If the trash can is at a business or residence, then note that information on the field sheet. If the trash can is in a park or other public place, then provide enough information to track the location down.

5) **Homeless camp site**: Look for improvised bedding, fire pits, or collections of items such as clothes or toiletries.

6) **Wind**: This can be difficult to distinguish from storm water pollution, but is often observed along fence or tree lines, where wind-borne litter collects. Look for light items, like plastic bags, accumulating.

7) **Roadside littering**: This source must be clearly distinguished from storm water or illegal dumping. Roadside littering includes items typically tossed out of moving vehicles, or improperly secured items on trucks. It is most evident where roadways cross creeks, and the litter collects in the drainage areas along the roadside. Only select this source if it is clear that no other source is involved.

8) **Recreational activities**: This category can relate to a special event, such as a concert or sports game, but it can also refer to a site where people tend to congregate, such as a swimming hole. An abundance of beverage or snack containers can often be found at these sites.

9) **I am not sure**: It is equally important to note sites where the source of litter is not clear. If you cannot see a clear source of litter at a site, then do not guess at the cause. Mark this category any time the litter source is not certain.

Results

Litter survey site locations and overall total litter scores for surveys conducted on November 12, 2014, are shown in Figure 2. Overall litter site scores, potential litter sources and total time spent at each site are summarized in Table 5. The average time spent at a survey site was 7.5 minutes, and the total time spent to visit all 10 sites was approximately 4 hours. The average overall site litter score on November 12, 2014, was 6.2 indicating that there was a significant presence of litter in the lower Waller Creek watershed, but that the amount of litter present was not continuous and that it was not abundant at most sites. However, scores were lower (better) than normally expected for this area potentially due to two extensive cleanup events that had been conducted in Waller Creek prior to this survey. These antecedent cleanups should be considered when evaluating the litter scores for this event and when comparing scores to future events.

The only site with an overall score high enough to categorize litter as "Abundant" was site 5652 (Waller Creek at Caesar Chavez St). Sources of litter at site 5652 included transient camp sites, wind-distributed litter and roadside littering. The most commonly observed source of litter at the sites on November 12, 2014, was storm or flood debris, but other sources identified are listed in Table 2. At site 4475 (Waller Creek at 9th Street) two potential point sources were identified: 1) A full and open dumpster at Ecology Action of Texas and 2) maintenance crews using leaf blowers to disperse trash from a parking garage at the intersection of 9th Street and IH 35. In both instances WPD staff discussed the importance of identifying a method to prevent these sources from contributing litter to the creek. In addition, leaf blowers were also observed being used by individuals in the entertainment district along Waller Creek between 7th and 4th streets, and some of the litter in the stream channel in that area may have been due to improper disposal of litter present on private property.

The most prevalent type of litter observed during site surveys was beverage containers, which were observed at every site (Table 6). Other categories generally had low scores, with slightly elevated scores observed for snack containers, plastic bags, clothing and construction debris. Construction debris showed a slight increase from upstream to downstream, and it was abundant at site 5652 (Waller Creek at Caesar Chavez St.). Most of this debris was not attributed to recent

construction, but rather was comprised of broken concrete which appeared to have been washed into this area over a considerable period of time.

Table 5. Summary Data for Litter Surveys Conducted in Waller Creek on 11/12/2014.

Site number (Site name)	Overall Site Litter Score	Potential Litter Source(s)	Total Time Spent (min.)
5656 (Ped. Bridge nr. 15th Street)	6	Storm or Flood Debris	10
5655 (14th Street Foot Bridge)	7	Storm or Flood Debris, Homess Camp Site	7
1328 (12th Street)	4	Storm or Flood Debris	6
5654 (11th Street)	2	Not Certain	5
4475 (9th Street)	8	Possible point sources - open dumpster or possibly wind distributed trash from nearby recycling center	6
5653 (7th Street)	6	Roadside Litter	7
1041 (5th Street)	8	Not Certain	9
4206 (3rd Street)	6	Storm or Flood Debris	10
5652 (Ceasar Chavez)	12	Homeless Camp Site, Wind, Roadside Litter	11
5651 (Ped. Bridge nr. Rowing Center)	3	Not Certain	4
Average	**6.2**		**7.5**

Figure 2. Waller Creek Litter Survey Sites and Scores for November 12, 2014.
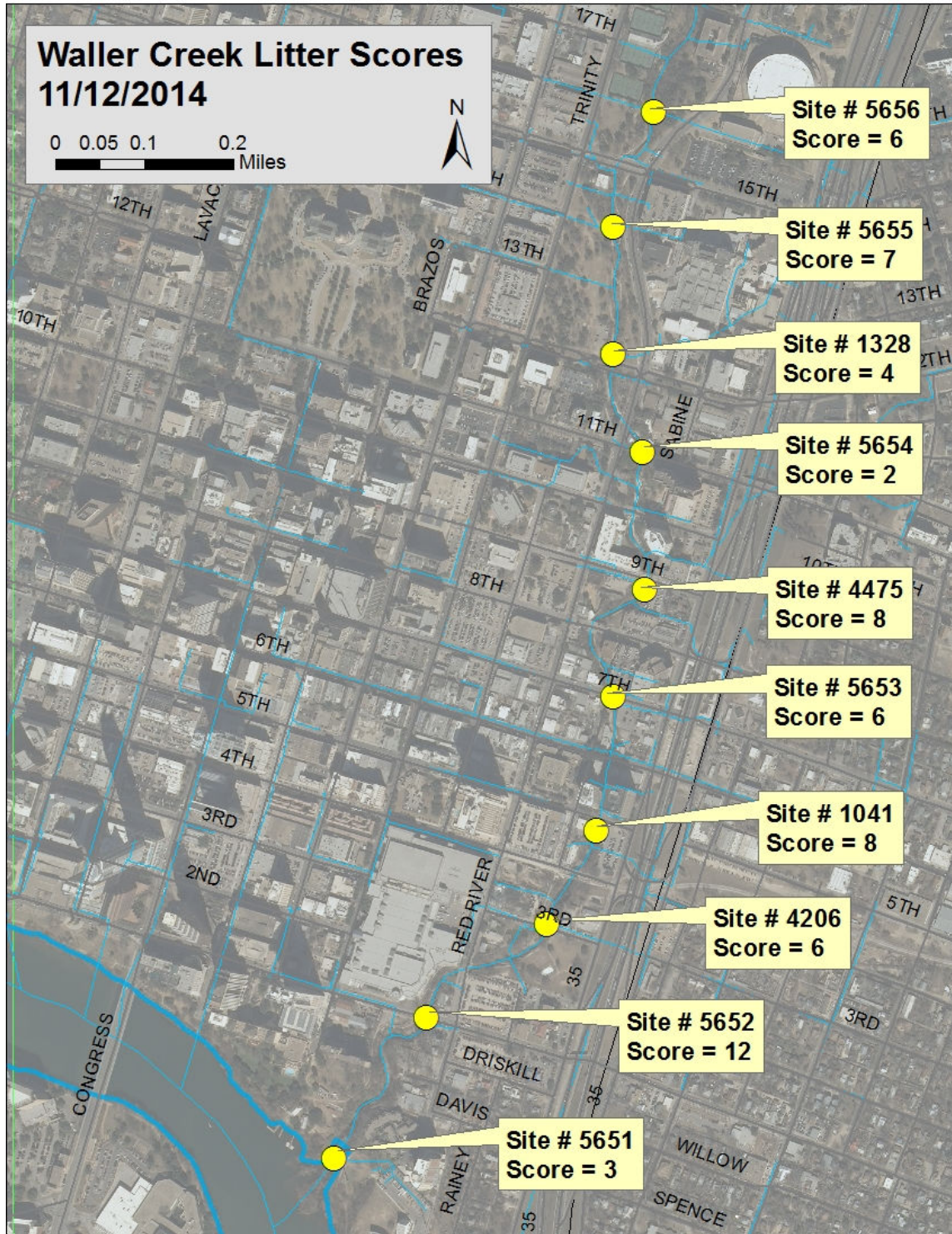
Table 6. Categorical Scores for Litter Surveys Conducted in Waller Creek on November 12, 2014.

Site number (Site name)	Automotive Debris	Construction / Demolition Debris	Appliances / Machinery	Furniture / Furnishings	Electroinc Waste	Yard / Landscaping Waste	Bikes, Toys, Sports Items	Miscellaneous Large Items	Clothing / Fabrics	Plastic Bags	Packaging Materials	Priinted Paper Items	Beverage Containers	Take-Out Food / Fast Food	Non-Take-Out Snack Containers or Wrappers	Personal Hygiene Products	Tobacco Products	Miscellaneous Small Items
5656 (Ped. Bridge u/s 15th Street)	0	1	0	0	0	0	1	3	4	0	0	1	0	1	0	0	5	5
5655 (14th Street Foot Bridge)	0	0	0	0	0	0	0	4	1	0	2	5	1	5	5	3	2	2
1328 (12th Street)	0	2	0	0	0	0	0	1	3	0	1	3	1	2	0	1	2	1
5654 (11th Street)	0	2	0	0	0	0	0	0	1	0	0	2	1	2	1	0	1	0
4475 (9th Street)	0	5	0	0	0	0	2	6	4	1	0	7	0	1	0	3	2	2
5653 (7th Street)	0	0	0	0	5	0	2	1	6	2	6	6	0	0	0	4	0	3
1041 (5th Street)	0	8	0	0	0	0	0	2	2	3	2	7	5	6	0	8	0	0
4206 (3rd Street)	0	2	0	0	0	0	1	4	3	0	0	4	0	0	0	0	6	0
5652 (Ceasar Chavez)	0	12	1	0	0	0	0	4	1	3	6	10	3	6	0	2	3	3
5651 (Ped. Bridge u/s Rowing Center)	1	1	0	0	0	0	0	2	3	0	0	3	3	2	0	0	2	2
Average	0	3	0	0	1	0	1	3	3	1	2	5	1	3	1	2	2	2

Categorical Litter Score (0 = not present, 20 = Extremely Abundant)

Subsequent to the initial baseline sampling, WPD staff conducted a second set of litter surveys on February 13, 2015 (Figure 3). Overall litter site scores, potential litter sources and total time spent at each site during surveys on February 13, 2015, are summarized in Table 7. The average time spent at a survey site was 6.7 minutes, and the total time spent to visit all 10 sites was approximately 3 hours. The average overall site litter score on February 13, 2015, was 8.9, and four sites had litter scores high enough to indicate that litter was "abundant".

The entertainment district extending along Waller Creek from 9th Street to 3rd Street had a concentration of "abundant" litter values, and sources in that area included overflowing trash cans or dumpsters, transient camp sites, roadside littering and storm or flood debris. The most commonly observed source of litter throughout the lower Waller Creek watershed on February 13, 2015, was attributed to storm or flood debris. Litter was also reported to be "abundant" at the most downstream site, site 5651 (Waller Creek at the pedestrian bridge near the rowing center). Sources at that location included storm or flood debris and roadside littering.

Table 7. Summary Data for Litter Surveys Conducted in Waller Creek on February 13, 2015.

Site number (Site name)	Overall Site Litter Score	Potential Litter Source(s)	Total Time Spent (min.)
5656 (Ped. Bridge nr. 15th Street)	7	Storm or Flood Debris	8
5655 (14th Street Foot Bridge)	5	Storm or Flood Debris	4
1328 (12th Street)	3	Storm or Flood Debris, Wind	4
5654 (11th Street)	5	Roadside Littering	5
4475 (9th Street)	14	Storm or Flood Debris, Overflowing Trash Cans or Dumpsters, Homeless Camp Site, Roadside Littering	11
5653 (7th Street)	15	Overflowing Trash Cans or Dumpsters	7
1041 (5th Street)	7	Storm of Flood Debris, Roadside Littering	9
4206 (3rd Street)	12	Storm or Flood Debris, Roadside Littering	8
5652 (Ceasar Chavez)	8	Storm or Flood Debris, Overflowing Trash Cans or Dumpsters, Roadside Littering	5
5651 (Ped. Bridge nr. Rowing Center)	13	Storm or Flood Debris, Roadside Littering	6
Average	**8.9**		**6.7**

The most prevalent types of litter observed during site surveys on February 13, /2015, were beverage containers, and take-out food/fast food containers–both of which scored as either

significant or as abundant at most of the survey sites (Table 8). These litter categories were most abundant in Waller Creek near the downtown entertainment district, where overall litter scores also indicated the most littered sites. Other significant categories of litter on this date included clothing/fabrics and construction/demolition debris. Construction debris was notably abundant at site # 5651 (Waller Creek at the pedestrian bridge near the rowing center).

Figure 3. Waller Creek Litter Survey Sites and Scores for February 13, 2015.
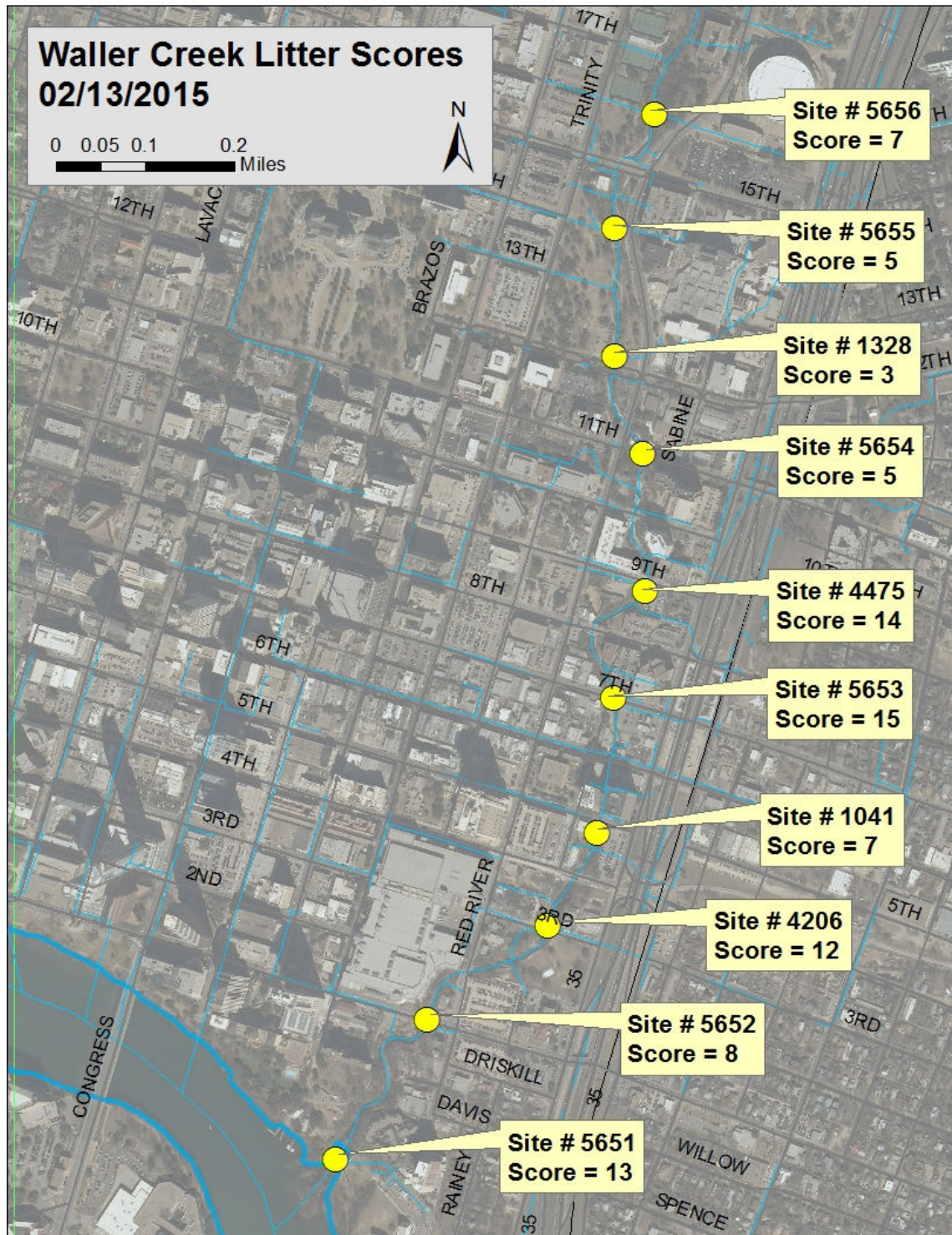
Table 8. Categorical Scores for Litter Surveys Conducted in Waller Creek on February 13, 2015.

Categorical Litter Score (0 = not present, 20 = Extremely Abundant)

Site number (Site name)	Automotive Debris	Construction / Demolition Debris	Appliances / Machinery	Furniture / Furnishings	Electroinc Waste	Yard / Landscaping Waste	Bikes, Toys, Sports Items	Miscellaneous Large Items	Clothing / Fabrics	Plastic Bags	Packaging Materials	Priinted Paper Items	Beverage Containers	Take-Out Food / Fast Food	Non-Take-Out Snack Containers or Wrappers	Personal Hygiene Products	Tobacco Products	Miscellaneous Small Items
5656 (Ped. Bridge u/s 15th Street)	0	2	0	0	0	0	0	9	5	0	0	2	2	0	5	0	0	3
5655 (14th Street Foot Bridge)	0	1	0	0	0	0	0	2	2	1	1	0	6	5	4	1	1	3
1328 (12th Street)	0	1	0	0	0	0	1	1	1	2	2	1	3	1	1	2	1	2
5654 (11th Street)	0	3	0	0	0	0	1	4	2	0	1	1	5	2	1	0	1	2
4475 (9th Street)	0	9	0	0	0	0	0	10	5	12	1	1	14	4	1	0	1	3
5653 (7th Street)	1	0	0	0	0	0	2	1	4	0	3	3	16	15	6	2	8	0
1041 (5th Street)	0	7	0	0	0	4	3	2	2	1	2	2	6	6	4	0	11	5
4206 (3rd Street)	0	9	0	0	0	0	0	10	6	0	2	2	12	12	8	2	7	6
5652 (Ceasar Chavez)	0	2	1	1	0	0	2	4	4	4	4	8	8	7	2	0	8	2
5651 (Ped. Bridge u/s Rowing Center)	0	13	0	0	0	0	2	5	4	1	0	0	8	8	0	0	3	4
Average	0	5	0	0	0	1	1	5	4	2	2	2	8	6	4	1	4	3

Discussion and Recommendations

Comparison of the results from the two initial surveys indicates that a creek cleanup effort prior to the November 2014 assessment may have artificially lowered (i.e. improved) the November 2014 litter score. Data collected three months later (February 2015) indicated more prevalent litter, which supports this conjecture. In order to reduce the effects of this type of sporadic anomaly it would be prudent to conduct litter surveys on additional dates in order to develop a sufficient baseline for litter conditions in this area. It is recommended that staff complete litter surveys both before and after events that are likely to affect conditions in the creek channel, such as storms, cleanup efforts, special events or concerts, etc. This will provide data that can be used to assess the potential impact of different types of events with regard to litter in Waller Creek. It is also recommended that 12 or more (monthly) data points should be used to establish a baseline for litter conditions at each site in order to evaluate how this stream is affected by litter at different points during the year.

Two point sources of litter were identified during these surveys which could be directly addressed. Open and full dumpsters which contribute litter due to spill-over and wind-blown trash should be referred to 3-1-1 or Austin Code Compliance Department's (CCD) West District Investigator/Assistant Division Manager, John Hale, at 512-974-6087 or john.hale@austintexas.gov. Depending on the number of properties in violation, CCD public information office staff may assist with an outreach strategy. Otherwise, CCD staff educate individual violators on a case-by-case basis. Property owners should not use leaf blowers to push trash off of their property and into the stream channel. Other litter sources, such as storm and flood debris, may be mitigated in part by operation of the Waller Creek Tunnel.

Prior to utilizing this form for future visual litter assessment, it is recommended that new monitors contact the author to review the method prior to the first sampling event to ensure consistency in data collection.