A Trash Monitoring Protocol for Urban Streets

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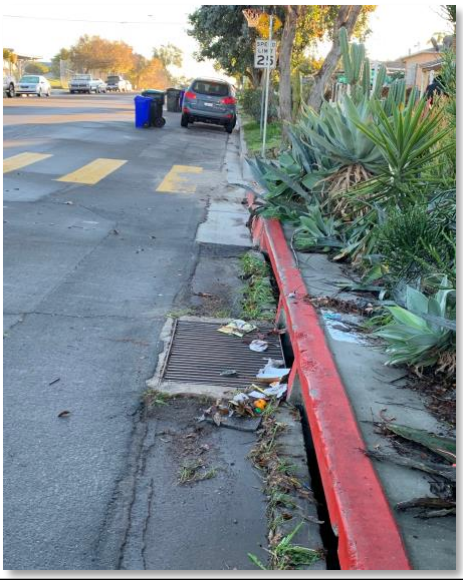
INTRODUCTION

Solutions to coastal trash pollution lie, in part, in a better understanding of the types, amounts, distributions, and sources of trash items that travel from consumers, to city streets, and into waterways. While several widely-accepted trash monitoring protocols exist for receiving waters (e.g., Lippiatt et al. 2013, SFBRWQCB 2004, Miller-Cassman et al. 2016), less attention has been paid, overall, to surveys of urban neighborhood streets. Looking further up the litter "supply chain," at trash on city streets, can help us better understand sources of litter, and therefore address the problem of marine debris more efficiently with a focus on source reduction rather than clean-up.

Urban trash accumulating at the mouth of estuarine Chollas Creek near San Diego Bay, California, USA. June 2017. Photo: T.S. Talley

The urban trash monitoring protocol herein provides a framework through which community scientists can investigate the presence of trash in their neighborhoods, and help identify solutions to trash leakage, by collecting data on types, amounts, distributions, and sources of trash for comparison across location and time (e.g., across seasons, rain events, land use types, and/or trash management strategies or events). This protocol is made up of seven steps, starting with question definition and ending with field-based trash assessment, and is informed by (and comparable to) a number of trash protocols, and data collection and standardization efforts (see SFBRWQCB 2004, EOA 2017, Clean Water Fund 2011, BASMAA 2017, Lippiatt et al. 2013, Moore et al. 2016, Moore and Hale 2018, Schuyler et al. 2018, State Water Board 2017, and Wheeler and Knight 2017). Importantly, the protocol offers a flexible, tiered approach to trash monitoring, allowing community scientists to choose what data they collect based on their interests, goals, and abilities. This protocol is generally designed for groups working with late middle school or early high school students, but can easily be adapted to suit older or younger audiences, such as K-5 classes or adults working with NGOs or local governments. Suggestions on how to do so are included within this document. The protocol can be used on its own, simply to collect data, or be paired with the accompanying curriculum, developed by California Sea Grant and Ocean Discovery Institute to introduce the



Accumulations of trash on a storm drain on an urban street in San Diego, where stormwater is untreated and conveys debris into receiving waters. 10 January 2020. Photo: T.S. Talley.

protocol itself, as well as the scientific process, and key concepts related to marine debris and consumer waste.

URBAN TRASH MONITORING PROTOCOL

Step 1: Define your question(s) or objective(s).

There are many different reasons why you and your group might want to collect data on the trash that ends up in urban neighborhoods. For instance, you may be interested in tracking the total amounts of trash that litter nearby streets, identifying "hot spots" for trash accumulation, determining the most commonly found litter items in your area, understanding the dominant sources of trash in your neighborhood/the activities that contribute most to litter accumulation in your neighborhood, or examining the best ways to clean up or prevent litter.

Because motivations for monitoring trash can vary greatly from group to group and community to community, this protocol is flexible, allowing you and your group to define your own question(s) according to your interests, goals, and abilities. Defining your question(s) first, before you begin data collection, will help you plan your monitoring efforts going forward, including when, where, and how you should conduct your surveys.

This protocol can help you collect data on the WHAT, WHERE, and HOW/WHY of trash in urban neighborhoods – WHAT types and/or amounts of trash end up on streets (types, amounts), WHERE this trash occurs (distributions), and HOW/WHY this trash gets there (sources) – and compare these data across location and time to answer larger questions about the impacts of season, weather, land use type, trash management/cleanup strategy, or other factors on trash accumulation. Examples of questions that can be addressed with help from this protocol include:

- How much trash was on my block during an average summer month vs. an average winter month?
- Where does the most trash accumulate in my neighborhood?
- What are the most commonly littered items on the streets surrounding my school?
- Do city blocks with bus stops have more trash than city blocks without bus stops?
- How thoroughly do street sweepers remove trash from city streets?
- How effective are plastic bag or straw bans at reducing abundance of those items on my city streets?
- What land use types are associated with the highest quantities of trash in my region?

This protocol can also be used to collect baseline data on trash loads on city streets, and/or build a long-term dataset for later analysis, if you and your group do not yet have a specific question in mind.

This protocol is focused on meso-trash, which are items between 0.5 cm to about 25 cm in size. Trash of this size is conveyable via stormwater thereby getting into urban stormwater systems. The protocol could, however, be adapted for more of a focus on large item trash, if that is where the users' interests lie. This protocol excludes micro-trash (<0.5 cm in size), which requires different survey approaches.

Step 2: Select your survey site(s)

This protocol uses each side of a city block as a survey unit, meaning that coverage of a city block (a segment of street that stretches between two cross streets) consists of two surveys—one for each side of the street. It is important to note, however, that this protocol can easily be adapted for use outside of urban areas. If you and your group are interested in surveying sections of road in a more rural setting, simply define a standard length of road as your survey unit (e.g., 30 m) and proceed with the protocol from there.

The question(s) you defined in Step 1 of the protocol will help you select your survey site(s) according to your needs. Site selection can be done by (1) targeting specific city blocks, or (2) randomly selecting city blocks.

Targeted selection of city blocks for sampling might be appropriate if:

a. You and your group are interested in monitoring trash in specific areas or areas that are particularly relevant to you (e.g., if you are interested in surveying streets directly surrounding your residence, school, work place, or a nearby park or waterway, or if you are interested in monitoring changes in trash loads over time at a particular trash hot spot).
b. You and your group are restricted in your ability to travel far or survey many different sites (e.g., if you are working with a school or neighborhood group and want to stay close to your home base, or if you are interested in conducting frequent surveys of the same few sites and thus would prefer to concentrate your efforts on those sites alone).
c. You and your group are interested in specific questions about the impacts of particular activities or site characteristics on trash loads in a small region or neighborhood (e.g., if you are interested in questions about the effects of dumpsters, street sweeping, trash collection, common modes of transportation, or particular land uses on trash quantities in your neighborhood). If this is the case for you, you may choose to select survey sites in close proximity to one another, based on the presence or absence of the activity or characteristic of interest (e.g., presence/absence of bus stops, presence/absence of street sweeping activity), for comparison purposes. It is important to note, however, that many factors contribute to the amounts and types of trash that make their way onto city streets, and all of these factors should be considered if you are interested in pinpointing the effects of specific activities or site characteristics on trash loads. Choosing survey sites in close proximity to one another (within the same neighborhood), with similar land use types, population densities, and traffic loads, that differ in only one or two ways, can help reduce the likelihood of conflating the effects of

the activity or site characteristic you are interested in with those of other contributing factors.

*CALL OUT BOX: Tip: if you are working with grade school kids, consider a targeted selection of study sites, such as a block with and without their school, so that simple yet meaningful messages can be crafted. (*include a map with a school and survey sites highlighted)

Random (stratified) selection of city blocks for sampling might be appropriate if:

a. You and your group are interested in identifying the effects of specific activities and/or site characteristics on urban street trash loads in a statistically relevant manner, perhaps over a larger-scale region (i.e., larger than a single neighborhood, though stratified random sampling can be used to monitor trash in a single neighborhood as well) (e.g., if you are interested in understanding which land use types are correlated with the greatest amounts of trash on streets citywide).
b. You and your group are interested in gaining a comprehensive understanding of, or collecting baseline data on, the amounts, types, and/or distributions of trash in your region.

Note that if your goal is to use your trash monitoring data to draw statistically meaningful conclusions about the trash that litters streets in your region, you should employ stratified random sampling to select your survey sites, randomly choosing city blocks from strata relevant to your area, which may include land use type, traffic type (pedestrian, automobile) and level, population density, median income, and storm drain outfalls, among other things. Sampling in this way is likely too complicated and time intensive for a group of community scientists or students to do on their own, and may only be appropriate for large-scale trash monitoring projects organized and/or conducted by governmental agencies or scientific organizations.

Regardless of the manner in which you select your survey sites, assign each site an identification code that can be used for recordkeeping purposes throughout the monitoring process (e.g., “Main St. block 1” could be shortened to “MAIN1”).

CALL OUT BOX: Monitoring within a “storm drainage-shed”
If you and your group have been involved in monitoring trash flow into receiving waters, or onto shorelines, for some time, and are interested in looking further up the litter “supply chain” to identify the sources of the trash polluting these areas, you may consider conducting your street monitoring efforts within the appropriate “storm drainage-shed.” You can do this by looking up a map of the City’s stormwater conveyance system, and tracing backward from the stormwater outfall closest to the receiving water or shoreline site of concern, to see which storm drains on which streets flow into that final stormwater outfall; all of the streets that connect to that final stormwater outfall make up the “storm drainage-shed.” From there, you can select your city block survey sites within the relevant storm drainage-shed through targeted or randomized sampling. Note that the storm drainage-shed sampling scheme only works in regions that manage their stormwater through MS4s (municipal separate storm sewer systems), as opposed

to combined sewer systems. This sampling scheme may be particularly useful for groups interested in identifying locally-relevant source reduction solutions to trash pollution in waterways (such as those involved in planning for and implementing the State of California's Trash Amendments (see State Water Board 2015 for more information)).

Step 3: Determine the timing of your survey(s)

Determining the timing of your survey(s) is just as important to pay attention to as the many different spatial, temporal, and managerial factors that can impact trash loads on city streets. Once again, the question(s) you defined in Step 1 of the protocol can guide you here. Factors that may be particularly important to consider in planning when to conduct your survey(s) include:

- **Season –** The trash found on city streets may vary from season to season, depending on weather, human activity, or other relevant factors. If you and your group are interested in comparing trash loads and/or characteristics across seasons, or are interested in drawing general conclusions about the trash that litters urban neighborhoods throughout the year, for example, it may be important to consider season when planning your sampling times.

- **Weather –** Weather, particularly rain, wind, or storm events, may impact trash loads and/or characteristics on city streets. If you and your group are interested in collecting data on the trash that typically litters your survey site(s), it may be important to postpone surveying in light of a significant rain, wind, or storm event. Alternatively, if you are interested in studying the impacts of weather events on trash loads (e.g., trash transfer via runoff created by rainfall), you may choose to survey your site(s) directly before and after such events. Note that the definition of a "significant" weather event may vary from location to location, based on local weather norms. For instance, EOA 2017 (originally written for the San Francisco Bay Area) suggests postponing any survey that is scheduled to occur within 48 hours of a rain event involving >0.5" of rain within a 24 hour period, while Wood Environment 2018 (written for the San Diego region) uses >0.1" of rain within a 24 hour period as its benchmark.

- **Management actions –** Trash control or management actions, such as street sweeping, community cleanups, or trash collection, may also affect trash loads and/or characteristics in urban neighborhoods. If you and your group are interested in collecting data on the trash typically found in your survey site(s), you may consider scheduling your sampling times around management events, in such a way that allows you to get the most accurate picture of the types and amounts of trash usually found in the area. This could mean sampling right before (or at least after the midpoint between) street sweeping or cleanup events (as suggested by EOA 2017). Alternatively, if you and your group are interested in studying the effectiveness of particular trash management

strategies (e.g., how thoroughly street sweeping removes trash from city streets, or how much trash is leaked during trash collection services), you may choose to sample directly before and after such events.

- **Unusual site use or human activity –** The occurrence of a largescale event or other activity near your survey site(s) (e.g., street fair, market, concert, or sports game) may also impact the litter found in your site(s). Once again, if you and your group are interested in collecting data on trash loads and/or characteristics typical of your site(s), you may consider postponing survey(s) that are scheduled to follow largescale, out-of-the ordinary events. Alternatively, you may want to understand how events like this impact trash in your neighborhood, in which case you may choose to survey before and after such events.

Step 4: Prepare for fieldwork

Now that you have identified your study site(s) and survey schedule, it is time to get ready to go into the field to collect the bulk of your data in person. First, you will need to assemble the following materials:

CALL OUT BOX: Tip: If you are working with younger kids, expect high quantities of trash, and/or are have time limitations for being out on the streets (e.g., early sunset), consider bringing collected trash back to the lab or classroom to sort (sorting requires the Quantitative Trash Data sheet).

Supply list

- First aid kit
- 1 pair of gloves for every team member
- A few pet waste bags (if pet waste and other hazardous waste will be picked up)
- 1 trash picker for every team member (or pair of members)
- 1 colorful safety vest for every team member
- 1 clipboard for every survey team (if your group will be splitting into smaller teams)
- Copies of both the “Field-based Site Assessment” datasheet and the “Quantitative Trash Data” datasheet
- Pencils with erasers
- 1-2 measuring tapes for every survey team (for measuring 1 m into the road; the survey area width at start, middle and end; confirming size of trash vs. large items)
- 1 hanging scale for every survey team
- 1 bucket for every team member (or every pair of team members) (5-gallon buckets work well, but you can use any bucket as long as you know its total volume)
- Roll of large, heavy duty trash bags, any size as long as you know each bag’s total volume; the number of trash bags you will need per site (one side of a block) will vary

depending on the amounts of trash and the types of data you plan to collect. Based on the Tiers described in Step 7 below, you will need:
    - Tier 1 level: At least 1-2 trash bags per site
    - Tier 2 level: At least 7-8 trash bags per site
    - Tier 3 or Tier 4 levels: At least 7-8 trash bags per site, plus at least 5-6 buckets for further sorting.
- Roll of masking or painter's tape to label buckets and bags, as needed
- Sharpies/markers to label buckets and bags, as needed
- Tarp (if sorting trash in a clean space)
- 1 smartphone or camera for every survey team (to take photographs of each site)
- *Optional: Copies of a map of the area, with your survey sites labelled (if needed to locate your site(s))*
- *Optional: 1 long transect tape (~100 m long) (if you are conducting your surveys outside of an urban area and need to measure out a standard site length)*

In terms of personnel, you will need at least two people per site to conduct your fieldwork, though a few more (4-5 total) may be ideal, depending on participant experience level and the level of trash present at your site. Before going into the field, take time to review Steps 5 and 6 below with your group, so that everyone is comfortable with the field-based assessment protocols. In particular, it may be useful to review the protocols for visually assessing a site's trash levels and associated example photographs (see Step 5), and conducting a trial run, so as to reduce the amount of variation in how all of the members of your team might visually score trash levels at your site(s).

CALL OUT BOX: For larger groups, divide and conquer! The field-based assessment requires multiple trips up and down the block to assess different variables—assign different pairs or groups for each set of variables.

Note that working on city streets can be hazardous, and you and your group should pay attention to traffic and other potential risks present at your survey site(s). It is suggested that each member of your team wears a bright-colored vest so you are easily visible from the road, and that each team includes at least one adult. When conducting your surveys, stay within the public right of way (i.e., avoid private property), and do not stray too far into the street. If you ever feel unsafe at a survey site, you should leave the site immediately.

Step 5: Conduct a field-based site assessment

The field-based site assessment includes a visual qualitative assessment of trash levels at your site, using the Field-based Site Assessment datasheet. Complete the following sections of the datasheet together. Depending upon the size of your team, consider dividing up the team into smaller groups to complete the various tasks. If one group finishes before the others,

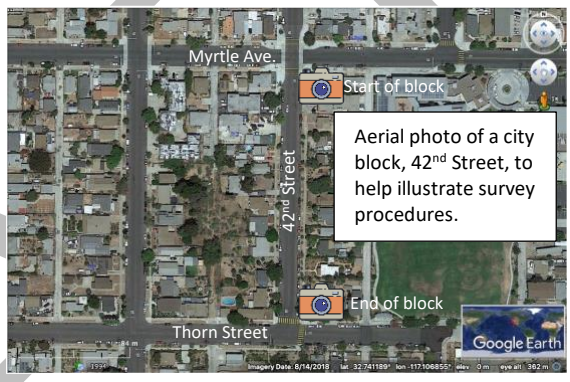
encourage them to help other groups finish their tasks, and rotate duties across sites so that all team members get to conduct each type of task.

1. **WHO & WHERE?** Fill out the appropriate spaces on the datasheet with your organization's name, the date, your team members' names, the street name, the side of the street (choose the most appropriate of north, east, south, west), city, and state of your survey block, your site's name, and the names of the cross streets at the start and the end of the block (which bookend your city block survey site). State how your site was selected, either random or targeted.

WHO & WHERE!? Complete this section and you are on your way!
Organization name: The Stormdrain Troopers — Date: 19 August 2019
Team members: Elda Berry & Rosa Californica
Street name: 42nd St — City, State: San Diego, CA
Side of street (circle one): N (E) S W — Site name: Head of Manzanita Canyon drainage-shed
Cross street at start of block: Myrtle Ave. — at end of block: Thorn St.
Site selection method (circle one): (Random) Targeted

First section of the field-based site assessment datasheet illustrating entered data.

2. **SAY CHEESE!** Fill out the appropriate sections of the datasheet as you take photos of your block. Have one team member use a smartphone or camera to take photographs from both the start and end of the block before trash is removed. Make sure that when these pictures are taken, the camera is pointed toward the middle of the site and positioned parallel to the road. Record the name of the person who took the photographs, if photos were taken on that individual's smartphone or camera, and the time each photo was taken (use am/pm or military time), to help you keep track of them later. If a camera is used, record the photo number.



Aerial photo of a city block, 42nd Street, to help illustrate survey procedures.

SAY CHEESE! Take photos of your block and document the following:
Initial photographs of block taken? (circle one) (yes) no
Number or time of photo: Start of block: 9:02 am ; End of block: 9:28 am (used to identify photos)
Name of photographer (if pictures taken on individual smartphone/camera): Ann Chovee

Second section of the field-based site assessment datasheet illustrating entered data.

Once you are done in the field, you should upload these photographs onto a computer and label them with the street name X cross street from which photo was taken, side of the street, location on block (start or end), and date (day-month-year). For example, if you are surveying a block on the east side of 42nd St. between Myrtle Ave. and Thorn St., as in the aerial photo, your two photos would be labeled as follows:

Photo at start of the block facing south down 42nd St, at intersection with Myrtle Ave on 13 December 2019. Photo name: 42ndStXMyrtleAv-E-start-13.12.2019

Photo at end of the block facing north up 42nd St, at intersection with Thorn St. on 13 December 2019. Photo name: 42ndStXThornSt-E-end-13.12.2019

3. **ROAD DEETS.** Describe the road and slope characteristics of your survey site**.** If you are performing repeated assessments of the same site, then you only need to assess these characteristics the first time since they will not change; put an "X" on the datasheet where this information is requested. Select whether the road that runs parallel to your survey site is paved, dirt, gravel, or other (if other, describe the road type). Count and record the number of lanes that make up the road. Record the slope of your survey site, by assessing the change in elevation from the start to the end of the block according to the key included on the datasheet (and below).

   City block slope key:

   0 – Flat, no difference
   1 – 5-100 cm difference (elevation change ranges from ankle to hip height)
   2 – 100-180 cm difference (elevation change ranges from hip to head height)
   3 – >180 cm difference (elevation change is above head height)

4. **TRASH RECON!** Walk the length of the block and measure the width, in meters, of the public access survey area at the start, middle and end of the block so that the total area of the block surveyed can be calculated after the web-based site assessment is complete (average of the three widths X length of block). Then, assess levels of trash, large discarded and dumped items, and ground cover with your team members according to the keys included on the datasheet (and below). Be sure to discuss levels and jointly agree upon on trash scores to reduce sampler bias (EOA 2017). It is okay to use half

scores; for example, if the trash levels fit the descriptions of both level 2 and 3 after the whole block is assessed, a score of 2.5 can be recorded. The trash levels section is for items that are items equal to or greater than 0.5 cm (≥0.2 inches, or macrodebris) and less than about 25-30 cm (1 foot, or items that are capable of fitting down a stormdrain).

The large items and evidence of dumping section is for items that appear to be discarded, such as furniture, construction materials, and filled trash bags, and/or that pose risks of blocking stormwater flows or contributing to debris inputs, such as gear and items associated with homeless encampments (e.g., tents, blankets, shopping carts). Large items are those that are greater than 25-30 cm (1 foot), or those not easily conveyed through the city's stormwater system. If there is a significant change in trash load throughout the city block, you may make notes on the datasheet that trash wasn't evenly distributed and, if applicable, noting the location of sudden changes, such as at storm drains, in plants, or adjacent to particular land uses.

Ground cover may influence the types and amounts of trash on streets, therefore, assess the level of cover of each ground cover type (bare soil, cobble/gravel, vegetation) on the non-concrete portions of the public right of way using the key on the datasheet (and below). Discuss levels of cover of each ground cover type with your team and jointly agree upon on scores to reduce sampler bias (EOA 2017).

Trash level key:

1 - No trash seen at first glance; on average, 3 or fewer small pieces per two car lengths

2 - Little trash at first glance; on average, 3 - 15 small pieces per two car lengths after a close look

3 - Trash is obvious; on average, 16 to 30 small and/or large pieces per two car lengths

4 - Trash is distracting; on average, over 30 pieces per two car lengths

Large discarded items and evidence of dumping key:

0 - None; no large items along the length of block

1 - Present but not obvious from other end of block; One to a few large items found along the block

2 - Obvious; Can see large items scattered in a few areas along the block

3 - Predominant; large items are found fairly consistently along the entire length of block

Ground cover key:

1 - None or very little seen; on average, none to a few small patches (5-15 cm) per two car lengths or 1-2 large patches per block

2- Scattered; On average, a few to 10 small patches or a single large patch (30-60 cm) per two car lengths

3 - Obvious; on average, many small patches or a few large patches (30-60 cm) per two car lengths
4- Predominant; on average, multiple large patches or contiguous areas per two car lengths

5. **BLOCK PARTY COUNT DOWN!** Walk the length of the block and count the features and items that occur on the public right of way (from 1 meter (3 feet) in the road to the obvious edge of private property) that may influence trash accumulations, including number of parked cars, number of storm drains, and numbers of trash and recycling receptacles. Work together to count the number of parked cars and storm drains and record numbers on the datasheet. Finally, count the numbers of trash and recycling bins and dumpsters that occur in different states (e.g., lidded, no or broken lids, lids open); record values in the appropriate spaces on the datasheet. If you are performing repeated assessments of the same site, then you only need to assess ground cover characteristics and number of storm drains the first time since they will not change; put an "X" on the datasheet where this information is requested.

6. **THIS LAND IS WHOSE LAND?!** Walk the length of the block and record the numbers of each type of land use using the categories on the datasheet. For mobile vendors, such as carts, pop-ups or trucks, you can record their presence even if they are not there at the time of the survey if you or your team knows that they occur on that site with some regularity. As you walk, you can use tally marks on the datasheet to keep count of each land use and enter the total at the end of the block. If you encounter a landuse not on the list, use one of the "Other" spaces to record that landuse type and the total number. If there are multi-use lots, then use fractions. For example, if there is a hardware store on the ground floor and apartments on the 2nd floor then give "Multi-family small" and "Non-food Retail" each a count of ½ .

Step 6: Quantitative assessment of trash levels

Quantifying trash levels includes collection, identification and measurement of the abundance of collected trash (volume, weight, and/or number) using the Quantitative Trash datasheet.

1. Collect trash along the street block in the public right of way—from 1 meter (3 feet) in the road to the obvious edge of private property, including the gutter, the road verge (the strip of land between road and sidewalk, also called parking strip, planting strip or devil strip), the sidewalk, and any land between the sidewalk and property. Bring pet waste bags if your group will be picking up pet waste or other hazardous waste (e.g., dirty diapers, used medical supplies or personal care items); have an adult handle all hazardous waste.
    a. You can sort and record data on the trash you pick up right there in the field, or take it back to the classroom or lab to be sorted through later

b. Collect everything that is conveyable by stormwater and through storm drain system (between 0.5 cm – 25 to 30 cm). While items <0.5 cm are conveyable, they are not included in this protocol for practical purposes.

2. The type and extent of data that you and your group collect is dictated by the question you are interested in answering, as well as your group's capacities (e.g., grade level, number of people), your available time, etc. Once your research question is set, decide on which tier of data collection best suites your group's capacities. If you choose more in depth data collections (e.g., Tier 3), please make sure you also complete measures for the more basic lower number tiers (e.g., Tiers 1 and 2) to ensure that your data are comparable with all others following these protocols.

   If you and your group would like to also easily contribute to a global trash tracking effort, consider adding in the use of the **Marine Debris Tracker App**[1] to any of these Tiers. The app records location and accepts the numbers (counts) of items within a set menu of categories (e.g., plastic, rubber, cloth, glass). This would work well with Tiers 3 and 4 where counts of trash items may be completed, and may be added to Tiers 1 and 2 for items of interest that may be easily counted (e.g., drink bottles, straws).

   Tiered approach to quantitative data collection

   Tier 1 – measure the total weight and volume of all trash collected

   Tier 2 (optional) – sort trash into broad categories (metal, plastic, glass, paper, etc.) and take the total weight and volume of each category. Make sure the sum of all categories equals the total weight and volume measured in Tier 1.

   Tier 3 (optional) – sort plastics (or metal, glass, etc. if you're interested) into finer categories. Plastics are generally a focus because they dominate marine debris, are slow to break-down in the environment, and are associated with many health hazards to humans and wildlife. The categories can be adjusted according to your interests and goals; at a minimum, take the weight and volume of each category, and then count each item in each category, if you are interested.

   Tier 4 (optional) – identify plastics (or glass, etc.) even further by brand (or other metrics of interest to your group for example, plastic types). At a minimum, take the weight and volume of each category, and then count each item if that is of interest.

When measuring volume, do not compact the trash items; volume should reflect the state the trash was in while sitting in the environment.

Step 7: Conduct a web-based site assessment

[1] NOAA Marine Debris Program: Marine Debris Tracker App
https://marinedebris.noaa.gov/partnerships/marine-debris-tracker

Once you have completed the field-based site assessment, you can use the web to collect information that may be too difficult and or time consuming in the field. If you do not have access to the internet, you can try to make some of the measures in the field and gather information from local authorities, or skip this step accepting that some of the information that could explain observed temporal and spatial patterns in trash accumulations may be missing. This may be an acceptable loss depending upon your research questions. Use the Web-based site assessment datasheet.

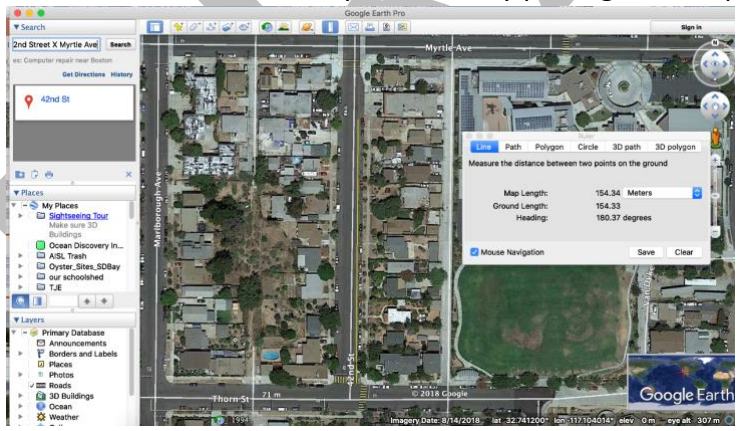
1. **Find your block in Google Earth:** Download Google Earth or Google Earth Pro on to your computer(s) or open using a web browser (https://earth.google.com/web) and locate your block using the search function and typing in the street name and one of the cross streets that intersects it, or by navigating through the map by hand.

2. **WHO & WHERE?!** On the Web-based Site Assessment datasheet, enter your organization's name, the date, your team members' names, the street name, side of the street surveyed, city and state of your block, the names of the cross streets at the start and end of the block (which bookend your city block survey site).

WHO & WHERE!? Complete this section and you are on your way!	
Organization name: The Stormdrain Troopers	Date: 19 August 2019
Team members: Elda Berry & Rosa Californica	
Street name: 42nd St	City, State: San Diego, CA
Side of street (circle one): N (E) S W	Site name: Head of Manzanita Canyon drainage-shed
Cross street at start of block: Myrtle Ave.	at end of block: Thorn St.
Site selection method (circle one): (Random) Targeted	

The first section of the web-based site assessment datasheet illustrating entered data.

3. **BLOCK PARTY!** Determine the location (latitude and longitude in decimal degrees) of both the start and end of your block by placing the the placemark tool (the yellow thumbtack) at the start and end locations in Google Earth; record the coordinates from the placement window on the datasheet. Measure the total length of your block using the ruler tool (the little ruler icon) in Google Earth. Record this distance (the length of your block) in meters in the on your datasheet. Next, measure the lengths of the various landuse types on your block using Google Earth. If you are unfamiliar with your block, you may need to refer to the information you recorded during the field-based site assessment**.** Based on what you can tell from the aerial view of your block, assess the types of land uses that are present



Screenshot showing use of Google Earth's ruler tool to measure the single family residences along this block of 42nd St. Note that the 2nd building from the north (top) is larger and has multiple parking spaces indicating that it is a multi-family residence. Notes from the previous field assessment will also provide land use information in order to make these measurements.

along your block, parcel by parcel. For example, on your block, are there single-family or multi-family residences? Commercial developments like stores or restaurants? Public buildings such as schools or libraries, or public parcels like parks or open spaces? Are there transit centers or bus stops on your block? If the boundary of the use is a bit ambiguous, like a bus stop or mobile vendor, make a best guess; measure the length of the bus stop covering or what seems like the obvious common waiting/gathering area. Google Earth can help you with this, as commercial and public buildings and open spaces are often labeled.

BLOCK PARTY!

Gather the following information from Google Earth using the field-based assessment data as a reference, and enter data in the appropriate spaces below.

Length of block (meters): 183

Land use types and lengths (Linear distances of adjacent land uses measured along the block; provide a length for all uses recorded in field). If there are multiuse plots, multiply length by fractions noted in the field (e.g., two uses on a 100 yard lot: 100 yd X 1/2 = 50 yds for each use)

	total length (meters)	use these rows to add lengths, if needed
Residential		
Single family homes	168	141, 154
Multi family - small (<10 units)	15	15
Mult family - large (≥10 units)		
Other (state): _____		
Transportation		
Bus stop (no bench or shelter)		
Bus stop (with bench or shelter)		
Transit center, station or depot		

Part of the landuse types and lengths section of the web-based site assessment datasheet illustrating entered data.

Once you have assessed the types of land uses that are present along your block, use the ruler tool in Google Earth to measure the lengths, in meters, of each land use on your city block. Use the space provided on the datasheet to tally lengths as you measure them and then enter the sum in the "total length" column when done. If a land use you encounter is not on the list, add it to one of the "Other" spaces and specify the land use. If there are multiuse plots, multiply the length of the parcel by the appropriate fraction and note this in tally space (e.g., two uses on a 100 meter lot: 100 m X 1/2 = 50 m for each use). The sum of all landuse distances should equal the total length of the block.

4. **NEIGHBORHOOD SLEUTHING.** Note any recent relevant events that may have impacted trash on your site if the data are readily available for your city and/or if your research question requires this information. Look up the street sweeping schedule for your city or neighborhood, and make note of which days your city block is typically swept, as well as how many days will have passed between the most recent street sweeping day and the day you conducted your on-site field assessment. If your city or neighborhood does not conduct street sweeping, you can skip this step.

   Next, look up weather data for your area, and record the date of the last significant storm event that occurred near your site (e.g., the last time it rained >0.5" within a 24 hour period; as noted in Step 3 of the protocol, your definition of a "significant" storm event will vary depending on your local weather norms). Record the number of days that will have elapsed between the date of the last significant storm event and the date you have planned to conduct your on-site field assessment. Note that these numbers may change if you need to postpone your field assessment due to further weather events (as described in Step 3 of the protocol).

   If there has not been a significant storm event in many months, you may choose to skip this step and simply make note of the lack of relevant weather events.

If the information is available to you, record the date of the last cleanup that occurred on your site, and the number of days that will have passed between the date of the most recent cleanup and the date on which you have scheduled your on-site field assessment.

Finally, make note of the types and dates of (and the days elapsed since) any other relevant events that may have impacted trash loads and/or characteristics on your site (e.g., large-scale events like street fairs, and/or other management actions like trash pick-up). If your city has GIS information readily available, record the official designated land uses for your block. Look up your city or neighborhood's official zoning map(s) to find the land use designations for your site (e.g., type in "City of X zoning maps"). This will usually involve locating the correct map, either in your community's General Plan or on a separate zoning map website, finding your city block on the map, and using the map legend (and/or associated tables or documents) to understand the meaning of the relevant zoning codes. Once you have found the official land use designations for your site, record them on your datasheet.

DATA ENTRY & ANALYSES

Once the datasheets have been completed, you are ready to enter your data into the data entry sheets and perform calculations using the data calculation sheet all in the workbook provided. The workbooks provided are in Microsoft Excel but can be exported to other spreadsheet software. There is a data entry sheet for (1) the site assessment data, with both field and web based data combined in one sheet; and (2) the quantitative trash data. In these data entry sheets, each row is a site and each column is a factor or variable. It is important that the sites (rows) remain in the same order between sheets so that data can be easily combined for analyses.

Site assessment data entry sheet. Both field and web-based variables are entered on this sheet. The site information is entered in columns A-I, field-based site assessment data occur in the next set of columns (J-AZ), and the web-based site assessment data occur in the final set of columns to the right (BA-BU). The categories of some of the variables, such as landuse, can be expanded or collapsed as needed to answer your group's research questions and/or to accommodate the landuses in your study areas.

Quantitative trash data entry sheet. The site information is entered into columns A-I. Sets of columns to the right are different colors and correspond to the four different tiers of data collection (see Step 6: Quantitative assessment of trash levels).

On the data calculation page, the site information should autofill from the site assessment data entry sheet. A little sample data is provided on the data calculations page, which combines some of the site assessment and quantitative trash data on to one sheet using formulas that

are linked to the data entry sheets. This sheet can be used to calculate new variables of interest (e.g., % of block comprised of particular landuses) so that your group may perform statistical analyses (e.g., correlations between numbers of trash cans and total volume of trash), calculate summary statistics, and/or create charts and other visualizations of the data. Remember to standardize trash volume and weight by area sampled so that comparisons may be made using data across sites of different sizes; formulas are set up to calculate the total amount of trash (volume, weight) per m^2. Sample data are used to illustrate how to calculate total area sampled, total volume and weight of trash, and the volume and weight of trash per meter squared. The calculations you decide to make will depend upon your group's research questions of interest.

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