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Repeated Pass Removal Survey for Estimating Land-Based Trash Abundance

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We use this protocol and it's working.

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Abstract

Land-based litter negatively impacts human and ecosystem health, tourism and recreation, and the economy.[1] Most terrestrial, aquatic, and marine litter consists of plastic items, and a majority of aquatic and marine litter comes from terrestrial sources.[2, 3, 4] Yet, plastic litter in terrestrial systems remains understudied relative to litter in aquatic and marine environments.[3, 5] Surveying is a common method for determining litter abundance in terrestrial systems. Single-pass litter surveys, in which a surveyor passes through a transect once by foot, bicycle, or car, serve as the established method for assessing the qualitative or quantitative abundance of land-based litter. Established single-pass survey methods include but are not limited to the Bay Area Stormwater Management Association On-Land Visual Trash Assessment, various Surfrider and Channel Keeper "Beach Clean Up" methods, the Southern California Coastal Water Research Program Southern California Bight Regional Monitoring Program Trash Surveys, the Keep America Beautiful National Visible Litter Survey, the National Oceanic and Atmospheric Administration Marine Debris Monitoring and Assessment Project, the Ocean Conservancy International Coastal Cleanup, 5 Gyres Plastic Beach and Plastic Ocean methods, the University of Washington Coastal Observation and Seabird Survey Team Marine Debris Survey, the State of California Surface Water Ambient Monitoring Program Rapid Trash Assessment, the Alliance for the Great Lakes Adopt-A-Beach Litter Monitoring method, and some United States Environmental Protection Agency Trash Free Waters Projects.[6] Single-pass litter survey methods are useful given the time and cost constraints often associated with boots-on-the-ground surveying. However, there is a tradeoff: single-pass surveys underestimate litter abundance relative to multiple-pass surveys, and single-pass surveys lack measures of the variance in litter abundance. This is primarily because single-pass surveys involve variable levels of surveying effort, and do not always result in quantitative measures. Underestimation of litter abundance and knowledge gaps regarding the variation in litter abundance will result in inaccurate results when it comes to monitoring and predicting litter source, transport, and fate. Additionally, due to unmeasured variation in litter abundance, data acquired through single-pass trash assessment methods or clean-up events are difficult to compare without measures of effort. To address these issues, the Repeated Pass Removal Survey for Estimating Land-Based Trash Abundance aims to better estimate the number of visible and removable plastic litter items in the environment, with a quantification of the uncertainty around that estimate suitable for comparison between sites.

Attachments

PDF

Figure 1. Survey loc...

706KB

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Figure 2. Trash coun...

538KB

Materials

One team of three surveyors will need the following materials to survey one transect:

- 1 timer (watch or smartphone with timer)
- 1 camera (or smartphone with camera)
- 1 GPS unit (or smartphone with GPS capability enabled)
- 1 permanent marker
- 3 pairs disposable gloves
- 3 resealable bags or buckets of a minimum size of 1 gallon
- 2 flags, cones, or one piece of sidewalk chalk

Troubleshooting

Safety warnings

Safety Precautions:

- Wear gloves to protect skin while removing and counting trash. Avoid direct contact with trash at all times.
- Avoid any contact with dangerous litter items including but not limited to weapons and sharps. Note that the item was observed but not removed during your survey.

Before start

1. Use a random number generator to assign each surveyor to their respective pass number depending on how many passes are planned. At a minimum, three passes should be conducted at each transect. Therefore, a team of three surveyors is needed per transect.

2. Using a permanent marker, clearly label one resealable bag or bucket for each planned survey pass. Include the following information: survey date, survey site, transect ID, surveyor name, and pass number.

Surveying Land-Based Trash

1 Identify the transect's starting location, and note the latitude and longitude on the first-pass bag or bucket.

2 Take a picture facing down the transect from the transect's starting location.

3 Use existing visual boundaries to communicate the width of the transect to all surveyors (i.e. the edges of a walking path, or one-arms-length from the centerline of a walking path).

4 The first surveyor should set a timer for 15 minutes, and mark the starting location of the transect using a cone, flag, or chalk.

5 The first surveyor should then don gloves, start the 15 minute timer, and walk down the transect collecting all observed and removable litter as safely as possible.

5.1 The first surveyor should stop immediately when the 15 minute timer sounds, and seal the bag or bucket containing the litter they removed.

5.2 The first surveyor should remove their gloves, then record the longitude and latitude of the ending location of the transect on the first-pass bag or bucket. The first pass surveyor should mark the end location of the survey transect using a second cone or flag, or chalk.

6 Subsequent surveyors may begin once there is approximately five to ten feet of space between them and the preceding surveyor.

7 All surveyors should make the same effort while surveying the transect.

7.1 Subsequent surveyors should maintain a distance of approximately five to ten feet from the surveyor ahead of them to help ensure a consistent pace across all survey passes.

7.2 Place all litter inside the appropriately labeled resealable bag or bucket.

7.3 Only collect litter that is observed within the boundaries of the transect.

7.4 Note any litter that was observed but not collected due to safety concerns or size. Communicate this to subsequent surveyors.

7.5 Treat the transect as a closed transect, meaning any litter that enters the transect after the survey has begun cannot be included in the dataset of counts. However, this litter can be removed and disposed of after the survey is complete.

7.6 With the exception of the first pass surveyor, all surveyors should be able to see and follow the path set by the surveyor ahead of them.

7.7 No surveyor should ever pass the surveyor(s) ahead of them.

7.8 All subsequent passes should cover the entire transect distance and width covered in the first survey pass.

Counting Land-Based Trash

8 Count the litter in a safe location. If sorting takes place indoors, perform sorting in a well-ventilated space.

9 Once counted, either sort and appropriately dispose of the litter, or store the litter in sealed bags or buckets in a dark, 4°C room if further study of the collected litter is desired.

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