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Shoreline Plastic Monitoring Field Guide

A guide for shoreline debris surveying in the field.

In accordance with Clean Oceans International (COI) protocol

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Introduction:

Debris, or what is known by most simply as trash, has become a problem for marine and freshwater systems worldwide. Now, it is critical that we collectively understand how and why this debris has gotten to where it is. Through using this debris monitoring protocol, the trash on a beach or coastline embodies a deeper understanding of the global debris problem. The process described in this guidebook is the first step in understanding where the debris on a given coastline may have come from and subsequently prevent further accumulation of debris. There are collection sites under this protocol that occur throughout the world, in areas such as Santa Cruz, CA, Lake Tahoe CA, and Cuba. Through scientifically collecting data on the debris from various locations, and publicly displaying the data, there creates the substrate for potential scientific studies, policy change, and a deeper understanding of the global marine debris issue. All leading towards a cleaner ocean. As a scientific training tool, the process explained in this guidebook creates a platform for students, instructors, and citizen scientists to enhance their scientific data collection techniques. COI maintains an online database(https://marineplastics.herokuapp.com/) for all debris collection surveys performed around the globe. More information regarding COI's mission can be found at https://cleanoceansinternational.org.

Choosing an area to study

There are a few characteristics that may make one shoreline a better place to monitor than another. We will here try and assist in choosing the most reasonable site that fits with your resources. One important consideration is how accessible is the beach to you and your surveyors. We recommend that when first choosing an area to survey, you start by considering a larger area and narrowing down from there. If you hope to perform the survey more than once, which we hope you do, you may want to choose a site that is closer even though it may not have as much debris as other places. Data collected from *any* site is useful, not just sites that have the most debris. Another important consideration is the level of other beachgoers, where carrying out a survey would be more difficult on a very popular beach, especially on a nice summer day. Deciding what shoreline area is most reasonable based off accessibility and level of other users, you can then decide where specifically you want your survey area to be.

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Types of Surveys *What survey is best for you?*

1. Basic Survey - The most simple procedure that only requires recording the pounds of trash collected and the number of people at the cleanup.
2. Rib Surface Scan - A good survey method for beaches with a large amount of debris or for a smaller data collection team. The rib surface scan is the most ideal survey if only 1 or 2 surveyors, though can be performed with larger groups as well. This is a sampling method to gather representative data for the 100 m beach segment. This 100 m segment is measured using a 100 m tape measure and is known as the *spine.*
3. Accumulation Sweep Survey - This survey is good for beaches that an amount of trash that is feasible to remove the debris from a 100m beach segment from the change in the substrate to the water's edge. This is a good survey for a larger group that wishes to do a larger cleanup effort as well as gather a depth of scientific data. Using a 100 m *spine,* just as in the rib surface scan.

*All data collected from each survey can be entered into the COI database at:

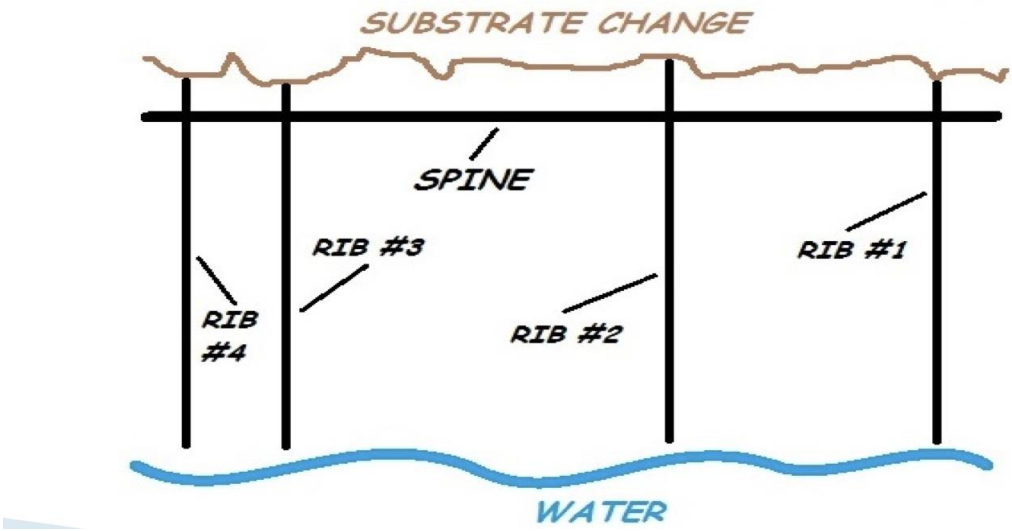
https://marineplastics.herokuapp.com/

*The data collection sheet for this survey can be found at:

https://www.scribd.com/document/380752641/COIDataSheet

Choosing where to set the *Spine*

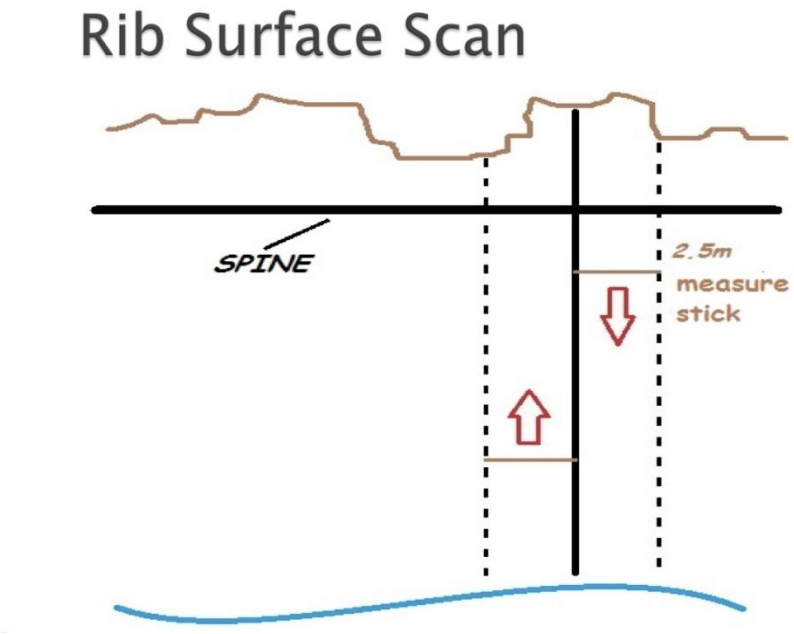
Once the beach or shoreline area is chosen, you can then go about deciding where to lay your survey line (the *spine*) in the Survey section. The *spine*, which is a 100 meter transect line that runs parallel to the shoreline is where your survey begins. The closer to the change in the substrate, such as a cliff, parking lot, or vegetation the better (see figure below). Choosing where to lay this 100 meter line is an important step. Of course, safety is the first goal, where you wouldn't want to place the spine over any potentially dangerous terrain. Also, the question of accessibility comes when choosing a good spine location. A spine set closer to your vehicle or beach access point may be useful. It is highly recommended that you or somebody from your survey team does some reconnaissance prior to your surveying. This reconnaissance would help you to formulate where you will place your spine once it comes to performing your survey. The goal of any continual survey collection, or one that is done more than once, is consistency. Once a place for the spine is set, it would be best if that is the spot where the spine is placed for any following data collections.



Setting the *Ribs* and the Rib Scan Survey

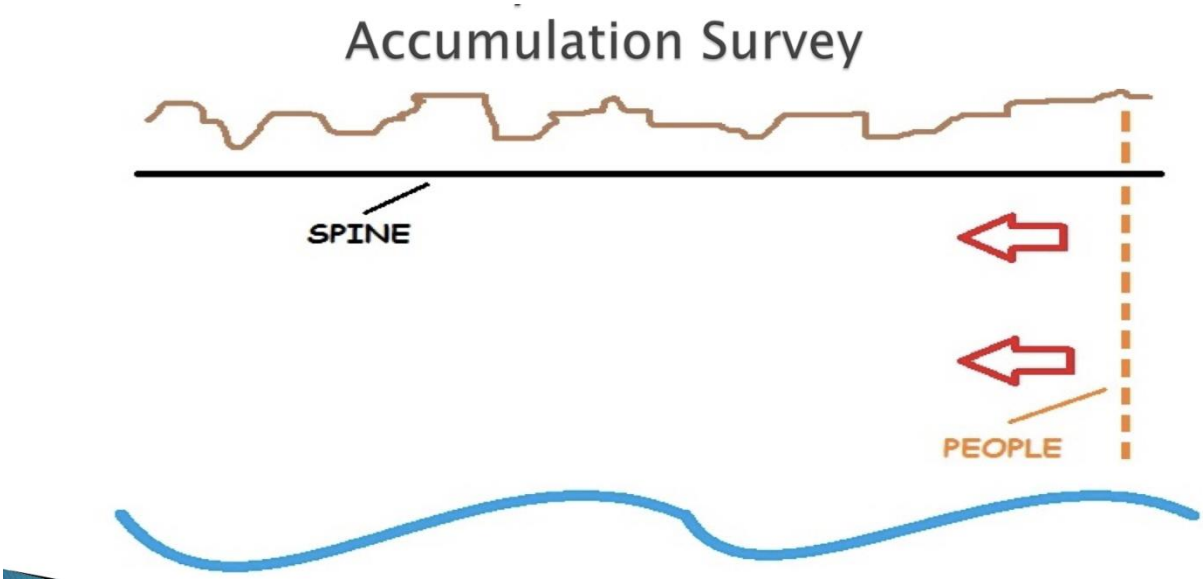
Now That you have the spine set, you now are ready to set in the ribs. The ribs run perpendicular to the shoreline and the direction of the *spine*. Note, each rib will be formed with a 100m tape measure. The *ribs* are created by obtaining a random number, ideally from a random number generator which can be easily downloaded as an app for apple or android. Each random number will represent where each *rib* will cross the *spine*. Once you have 4 random numbers between 1 and 100 and make sure each number is at least 3 units from each other, you place a marker, such as a flag or a stick, next to the corresponding meter number on the *spine*. The rib runs from the change in the substrate, such as the end of the beach that may end at a cliff parking lot or vegetation, across the spine perpendicularly over the *spine* and down to the edge of the water.

If you choose to survey a beach that is wider than 100m, you can choose to only survey 50m of beach. What's important is to be consistent; each time out you repeat exactly what you did last time. As seen on the shoreline debris data sheet, only debris that is 2.5 cm or larger is recorded. Recording whether debris is fresh or weathered is somewhat subjective to the surveyor (fresh debris may be something dropped on the beach recently, while something weathered would show physical signs of being in the environment for some time)



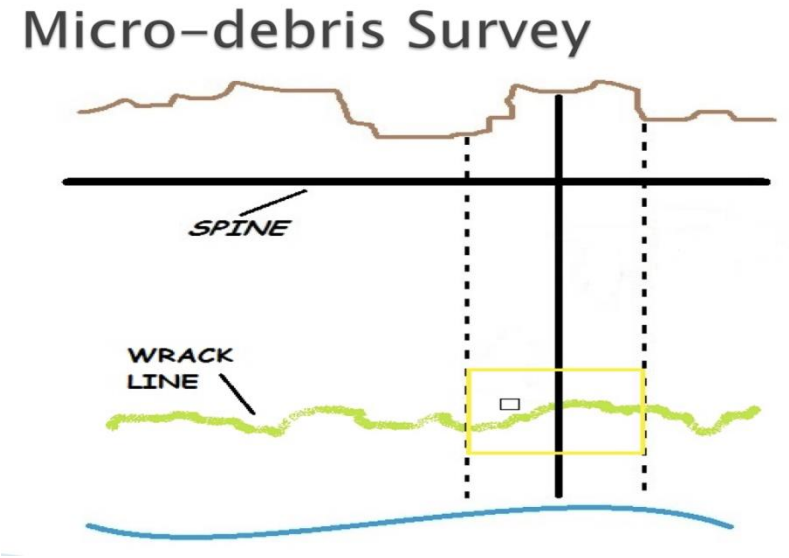
Accumulation Sweep Survey

This is another option of surveying a beach location of your choice. The accumulation sweep survey is ideal for shoreline areas that have an amount of trash that is feasible to pick up in a reasonable amount of time. Similar to the rib surface scan, this survey method uses a *spine* that is measured using a 100 m tape measure. This 100 m line is set parallel to the shoreline direction and a close to the change in the substrate (cliff, parking lot, vegetation, etc.) (see figure below). Once the 100 m *spine* is set begin at one end of the *spine* and line every member of your survey team spread out as equally as possible. All members of the survey collect all debris larger than 2.5 cm that is visible in the area within the 100 m and from the change in the substrate to the water's edge. It works well for one individual to hold the data collection sheet and record all of the debris that the other members collect. As seen on the shoreline debris data sheet, only debris that is 2.5 cm or larger is recorded. Recording whether debris is fresh or weathered is somewhat subjective to the surveyor (fresh debris may be something dropped on the beach recently, while something weathered would show physical signs of being in the environment for some time). The Accumulation Sweep Survey can only be done if you have enough people to cover the beach.



The Micro Debris Survey

As a part of the rib surface scan, you may choose to perform a micro debris survey. This survey method is collect data on items smaller than 2.5 cm. As each rib is still set from your rib surface scan, find the wrack line, or the line on the beach where a recent high wave has deposited debris. From where each rib crosses the wrack line and within 2.5 m of the rib, lay down a 1/16 m x 1/16 m constructed sieve with mesh that allows for sand to fall through. Collect and record all micro debris items from a 1/16 m x 1/16 m, 2.5 cm deep area.



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Itemized List of Survey Equipment

Personal Kit	*Teaching Kit*								
	item			**Make**		**Model #**	**internet #**	**price**	**location**
1x	**5x** 100m tape measure		Lufkin 328ft. Fiberglass Tape Measure			FM100CME	203927888	5x($36.59)	Home Depot
1x	**4x** 2.5m sticks	10m 1/2" pvc tube	4x(1/2" x10 ft. PVC 40 plain-end pipe)			530048	100113200	4x($2.03)	Home Depot
3x		12x 1/2" couplings	12x(Dura 1/2" Schedule 40 PVC Coupling			C429-005	100342935	12x($0.35)	Home Depot
2x		8x 1/2" caps	8x(1/2" Schedule 40 PVC Cap)			C447-005	100346039	8x($0.32)	Home Depot
	11m elastic chord		1/8" Black Polyester Shock Cord 50 ft.			SHC1850		$13.99	US Cargo Control
1x	**4x** 5 gallon bucket		5-gal. Homer Bucket			05GLHD2	100087613	$2.97	Home Depot
	1 pair work gloves		Size Large Suede Leather Leather Palm Gloves			55023-36	205598691	$3.98	Home Depot
	4x clipboards	2x(OIC 100% Recycled Hardboard Clipboards, Letter size pack of 2)					item # 470591	2x($3.29)	Office Depot
	5 pens	Paper Mate Inkjoy 100 Stick Pens, Medium Point. Pack of 10					item # 533722	$2.19	Office Depot
	disinfectant		CVS 91% Isopropyl Alcohol			sku: 216440		$2.49	CVS Pharmacy
	garbage bags		33 Gal.Large Trash Drawstring Trash Bags 50-c.			HDX-9600098	203378681	$12.97	Home Depot
	COI Burlap Bag	Reusable Burlap Trash Bags Provided by COI						$10.00	COI
1x	1x Sharps container		SharpSafety Phlebotomy Sharps Disposal Container					$1.95	healthykin.com
	box to hold kit (optional but recommended)		35 in. Mobile Job Box			222167	205053257	$54.00	Home Depot
1x	Pliers								Home Depot
	disposable gloves								Home Depot
1x	Paper towels								Home Depot
1x	8x Terry towels								Home Depot
Personal Kit Price:							***Teaching Kit Price***		
$138.14								$298.95	
The Personal Kit is designed for surveys perfomed by 1 or more surveyors							The Teaching Kit is designed for a group of 8 or more		

*Includes the options:

Personal kit (1-4 surveyors performing a Rib Surface Scan or for Accumulation Sweep Survey)

Teaching kit (more than 4 surveyors performing a Rib Surface Scan)