RAPID TRASH ASSESSMENT
Surface Water Ambient Monitoring Program
California Regional Water Quality Control Board, San Francisco Bay Region

Monitoring Design. The rapid trash assessment can be used for a number of purposes, such as ambient monitoring, evaluation of management actions, or comparing sites with and without public access. Ambient monitoring efforts should provide information at sites distributed throughout a waterbody, and several times a year to characterize spatial and temporal variability. Additionally, the ambient sampling design should document the effects of episodes that affect trash levels such as storms or community cleanup events. Pre- and post-project assessments can assist in evaluating the effectiveness of management practices ranging from public outreach to structural controls, or to document the effects of public access on trash levels in waterbodies (e.g., upstream/downstream). Such evaluations should consider trash levels over time and under different seasonal conditions. The methodology was developed for sections of wadeable streams, but can be adapted to shorelines of lakes, beaches, or estuaries. Ultimately, the monitoring design will strongly affect the usefulness of any rapid trash assessment information.

Site Definition. Upon arrival at a designated monitoring site, a team of two people or more defines or verifies a 100-foot section of the stream or shoreline to analyze, associated with a sampling location (station). When a site is first established, it is recommended that the 100-foot distance be accurately measured with a tape (or rope of predetermined length). The length should be measured not as a straight line, but as 100 feet of the actual stream or shore length, including sinuous curves. The starting and ending points of the survey should be easily identified landmarks, such as an oak tree or boulder, and noted on the worksheet ("Upper/Lower Boundaries of Reach"), or documented using global positioning system (GPS), so that future assessments are made at the same location. The team should confer and document the upper boundary of the banks or shore to be surveyed, based on evaluation of whether trash can be carried to the water body by wind or water (e.g., an upper terrace in the stream bank). The team should also document the location of the high water line based on site-specific physical indicators such as location of the low flow channel. Defining these characteristics of the site will facilitate comparing assessments conducted at the same site at different times of the year.

Survey. The survey should not take more than 20 minutes, and with practice, 15 minutes or less. The team begins the survey at one end of the selected reach. One team member (the "bank person") begins walking along the bank (where possible), looking for any trash on the stream (or shore) bank, or above the high water line, and tallies any trash items found on the trash assessment sheet. The other person (the "bed person") walks along the stream bed (or in the water at shorelines) and shouts out any trash items found in the water body for the person on land to tally on the trash assessment sheet. The person tallying the trash notes on the sheet whether the trash was found in the stream and below the high water line, or above the high water line (i.e., tally lines for below high water line (|), and tally dots or circles (•) for above the high water line). This will help for assigning scores for the worksheet. A pole or similar tool should be used to help look under bushes, logs, and other plant growth to see if trash has accumulated underneath. The ground or substrate should be carefully inspected to ensure that small items such as cigarette butts and pieces of broken glass or Styrofoam are being included. Because this is a rapid assessment, the tally is not exact, but it is important not to miss items that can affect human health, because such items can strongly affect the total score. Optional: The person in the stream can carry a garbage bag and collect trash as it is located, making sure to avoid injuries by using gloves. Avoid touching trash with unprotected hands!

At stream sites, when the team has finished the survey of the stream bed and one bank, the "bank person" crosses to the other bank. Continuing the assessment, the team works their way back along the reach, with the bank person surveying the opposite bank and the "bed person" re-examining the stream bed or collecting trash, making sure not to count items twice. When the surveyors are finished with the tallying, they should fill out the worksheet before leaving the site, while everything is still fresh in the memory. They should discuss each number so that they agree on every score. They should discuss and document the factors affecting trash levels at the site, such as a park, school, or nearby residences or businesses. The system provides a range of 5 numbers

within a given condition category, allowing for the range of conditions expected in the field. For instance, trash located in the water leads to lower scores than trash above the stream bank. Under each of the six trash assessment parameters, the narrative language is provided to assist with choosing a score within the range. Not all specific trash conditions mentioned in the narratives need to be present to fit in a specific condition category (e.g., "site frequently used by people"), nor do the narratives describe all possible conditions. The "Poor" condition category has a range of 6 numbers (0-6), unlike the other 3 condition categories. Scores of "0" should be reserved for the most extreme conditions. Once the scores are assigned for the 6 categories, they should be totaled up and any specific notes on the site should be written in the designated space at the end of the sheet. A given site should be assessed several times in a given year, during different seasons, to characterize the variability and persistence of trash occurrence for water quality assessment purposes.

Trash Assessment Parameters. The rapid trash assessment includes a range of parameters that capture the breadth of issues associated with trash and water quality. The first two parameters focus on qualitative and quantitative levels of trash, the second two parameters estimate actual threat to water quality, and the last two parameters represent how trash enters the water body at a site, through direct dumping or accumulation.

1. **Level of Trash.** This assessment parameter is intended to reflect a qualitative "first impression" of the site, after observing the entire length of the reach. Sites scoring in the "poor" range are those where trash is one of the first things that is noticeable about the waterbody. No trash should be obviously visible at sites that score in the "optimal" range.

2. **Actual Number of Trash Items Found.** Based on the tally of trash along the 100-foot stream reach, total the number of items both above and below the high water mark, and choose a score within the appropriate condition category based on the range of items provided. Choose a score among the 5 numbers that is adjusted based on where the tally lies in the provided range. Where more than 50 items have been tallied, assign the following scores: 5: 51-75 items; 4: 76-100 items; 3: 101-150 items; 2: 151-200 items; 1: 201-250 items; 0: over 250 items. Since these tallies do not significantly affect the overall score, it is ok to estimate the tally at sites with more than 100 items, making sure to identify trash items that can affect human health like diapers, pet or human waste, or medical waste.

   Sometimes items are broken into many pieces. Fragments with higher threat to aquatic life such as plastics should be enumerated, while ripped paper and broken glass, with lower threat and/or mobility, should be counted based on the parent item(s). The judgment whether to count all fragments or just one item depends on the potential exposure to downstream fish and wildlife, and waders and swimmers at a given site. Concrete is trash when it is dumped, but not when it is placed. Consider tallying only those items that would be removed in a restoration or cleanup effort.

3. **Threat to Aquatic Life.** As indicated in the technical notes, below, certain characteristics of trash makes it more harmful to aquatic life. If the trash items are persistent in the environment, buoyant (floatable), and relatively small, they can be transported long distances and be mistaken by wildlife as food items. Larger items can cause entanglement. Some discarded debris may contain toxic substances. All of these factors are considered in the narrative descriptions in this assessment parameter.

4. **Threat to Human Health.** Items that are more dangerous to people that wade or swim in the water weight this category of trash assessment. The worst conditions are associated with the potential for presence of dangerous bacteria or viruses, such as medical waste, diapers, and human or pet waste. Also included in this category are sources of pollutants that could accumulate in fish in the downstream environment, such as mercury.

5. **Illegal Dumping and Littering.** This assessment category relates to direct placement of trash items at the site, and the "poor" conditions are ascribed to sites that are obviously chronic dumping locations or "trash hotspots."

6. **Accumulation of Trash.** This assessment category relates to accumulation of trash items from upstream locations. Accumulated trash is distinguished from dumped trash by indications of age and transport. For instance, faded colors, silt marks, trash wrapped around roots, and signs of decay indicate accumulated trash. Trash accumulation is an indicator that the local drainage system facilitates conveyance of trash to water bodies, in violation of clean water laws and policies.

Technical Notes on Trash and Water Quality

Trash is a water pollutant that has a large range of characteristics of concern. Not all litter and debris delivered to streams are of equal concern to water quality. Besides the obvious negative aesthetic effects, most of the harm of trash in surface waters is imparted to aquatic life in the form of ingestion or entanglement. Some elements of trash exhibit significant threats to human health, such as discarded medical waste, human or pet waste, or even broken glass. Also, some household and industrial wastes may contain toxic substances of concern to human health and wildlife, such as batteries, pesticide containers, and fluorescent light bulbs that contain mercury. Larger trash such as discarded appliances can present physical barriers to natural stream flow, causing physical impacts such as bank erosion. From a management perspective, persistence and accumulation of trash in a waterbody are of particular concern, and signify a priority area for prevention of trash discharges. Also of concern are trash "hotspots" where illegal dumping, littering, or accumulation of trash occurs.

Rapid Trash Assessment. Trash assessment includes a visual survey of the waterbody (e.g., stream bed and banks) and adjacent areas from which trash elements can be carried to the waterbody by wind, water, or gravity. The delineation of these adjacent areas is site-specific and requires some judgment and documentation. The rapid trash assessment worksheet is designed to represent the range of effects that trash has on the physical, biological, and chemical integrity of water bodies, in accordance with the goals of the Clean Water Act and the California Water Code. The worksheet also provides a record for evaluation of the management of trash discharges, by documenting sites that receive direct discharges (i.e., dumping or chronic littering) and those that accumulate trash from upstream locations.

Trash Characteristics of Concern. For aquatic life, buoyant (floatable) elements tend to be more harmful than settleable elements, due to their ability to be transported throughout the waterbody and ultimately to the marine environment. Persistent elements such as plastics, synthetic rubber and synthetic cloth tend to be more harmful than degradable elements such as paper, which can rip and biodegrade relatively quickly. Glass, foamed plastic and metal are less persistent, even though they are not biodegradable, because wave action and rusting can cause them to break into smaller pieces. Natural rubber and cloth can degrade but not as quickly as paper (U.S. EPA, 2002). Smaller elements such as plastic resin pellets (a by-product of plastic manufacturing) and cigarette butts are often more harmful to aquatic life than larger elements, since they can be ingested by a larger number of smaller organisms which can then suffer malnutrition or internal injuries. Larger plastic elements such as plastic grocery bags are also harmful to larger aquatic life such as sea turtles, which can mistake the trash for floating prey and ingest it, leading to starvation or suffocation. Floating debris that is not trapped and removed will eventually end up on the beaches or in the open ocean, repelling visitors and residents from the beaches and degrading coastal waters.

Trash in water bodies can threaten the health of people that use them for wading or swimming. Of particular concern are the bacteria and viruses associated with diapers, medical waste (e.g., used hypodermic needles and pipettes), and human or pet waste. Additionally, broken glass or sharp metal fragments in streams can cause puncture or laceration injuries. Such injuries can then expose a person's bloodstream to microbes in the stream's water that may cause illness. Additionally, some trash items such as containers or tires can pond water and support mosquito production and associated risks of diseases like encephalitis and the West Nile virus.

Leaf litter is trash when there is evidence of dumping. Leaves and pine needles in streams provide a natural source of food for organisms, but excessive levels of leaves, due to human influence, can cause nutrient imbalance and oxygen depletion in streams, to the detriment of the aquatic ecosystem. Clumps of leaf litter and yard waste from trash bags should be treated as trash in the water quality assessment, and not confused with

natural inputs of leaves to streams. If there is a question in the field, check the type of leaf to confirm it comes from a nearby riparian tree. In some instances, leaf litter may be trash if it originates from dense ornamental stands of nearby human planted trees that are overloading the stream's assimilative capacity for leaf inputs. Other biodegradable trash, such as food waste, also exerts a demand on dissolved oxygen, but aquatic life is unlikely to be adversely affected unless the dumping of food waste is substantial and persistent at a given location.

Wildlife impacts due to trash occur in creeks, lakes, estuaries, and ultimately the ocean. The two primary problems that trash poses to wildlife are entanglement and ingestion. Marine mammals, turtles, birds, fish, and crustaceans all have been affected by entanglement in or ingestion of floatable debris. Many of the species most vulnerable to the problems of floatable debris are endangered or threatened.

Entanglement results when an animal becomes encircled or ensnared by debris. It can occur accidentally or when the animal is attracted to the debris as part of its normal behavior or out of curiosity. Entanglement is harmful to wildlife for several reasons. Not only can it cause wounds that can lead to infections or loss of limbs, but it can also cause strangulation or suffocation. In addition, entanglement can impair an animal's ability to swim, which can result in drowning or difficulty in moving about, finding food, and escaping predators (U.S. EPA, 2001).

Ingestion occurs when an animal swallows floatable debris. It sometimes occurs accidentally, but usually animals feed on debris because it looks like food, for instance plastic bags appearing like jellyfish, a prey item of sea turtles. Ingestion can lead to starvation or malnutrition if the ingested items block the intestinal tract, preventing digestion, or accumulate in the digestive tract, making the animal feel "full" and lessening its desire to feed. Ingestion of sharp objects can damage the mouth, digestive tract and/or stomach lining and cause infection or pain. Ingested items can also block air passages and prevent breathing, thereby causing death (U.S. EPA, 2001).

Common settled debris includes glass, cigarettes, rubber, construction debris and more. Settleables are a problem for bottom feeders and dwellers and can contribute to sediment contamination. Larger settleable items such as automobiles, shopping carts and furniture can redirect stream flow and destabilize the channel.

In conclusion, trash in water bodies can affect humans, fish, and wildlife in a number of adverse ways. Not all water quality effects of trash are the same in severity or duration, and the rapid assessment methodology was designed to reflect the range of trash impacts to aquatic life, public health, and aesthetic enjoyment. When evaluating the water quality effects of trash and conducting a rapid assessment, remember to evaluate individual items and their buoyancy, degradability, size, potential health hazard, and potential hazards to fish and wildlife, and select your scores accordingly.

References:

U.S. Environmental Protection Agency, 2001. Draft Assessing and Monitoring Floatable Debris.

U.S. Environmental Protection Agency, 2002. The Definition, Characterization and Sources of Marine Debris. Unit 1 of Turning the Tide on Trash, a Learning Guide on Marine Debris.

RAPID TRASH ASSESSMENT WORKSHEET

Surface Water Ambient Monitoring Program, San Francisco Bay Regional Water Quality Control Board

WATERSHED/STREAM: _____ DATE/TIME: _____
MONITORING GROUP, STAFF: _____ SAMPLE ID NO. _____
SITE DESCRIPTION (Station Name, No., etc.): _____

	CONDITION CATEGORY			
Trash Assessment Parameter	**Optimal**	**Sub optimal**	**Marginal**	**Poor**
1. Level of Trash	On first glance, no trash visible; little or no trash evident when streambed and streambanks are closely examined for litter and debris, for instance by looking under leaves.	On first glance, little or no trash visible; after close inspection small levels of trash evident in streambank and streambed.	Trash is evident in low to medium levels on first glance. Stream-bank surfaces and immediate riparian zone contain litter and debris. Evidence of site being used by people: scattered cans, bottles, blankets, and/or clothing.	Trash distracts the eye on first glance. Streambank surfaces and immediate riparian zone contain substantial levels of litter and debris. Evidence of site being used frequently by people: many cans & bottles, food wrappers, manmade shelters, blankets, and/or piles of clothing.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Actual Number of Trash Items Found	0 to 5 trash items based on a rapid survey of a 100-foot stream reach.	6 to 25 trash items based on a rapid survey of a 100-foot stream reach.	26 to 50 trash items based on a rapid survey of a 100-foot stream reach.	Over 50 trash items based on a rapid survey of a 100-foot stream reach.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Threat to Aquatic Life	Trash, if any, is mostly paper or wood products or other biodegradable materials. Note: A large amount of rapidly biodegradable material like food waste creates high oxygen demand, and should not be scored as optimal.	Little or no persistent, buoyant, and small litter or debris. Presence of settleable, degradable, and non-toxic debris such as wood, glass, metal, and degradable plastics such as foamed plastics.	Medium prevalence of persistent (plastic, synthetic rubber or cloth), toxic, buoyant, and small litter such as: plastic bags; pellets; cigarette butts; large deposits of settleable debris such as glass or metal; and any evidence of small clumps of deposited yard waste or leaf litter.	Large amount of persistent (plastic, synthetic rubber or cloth), toxic, buoyant, and small (transportable) trash such as: cigarette butts; plastic bags; plastic pellets; batteries or other toxic substances; and large clumps of yard waste or dumped leaf litter.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Threat to Human Health	Observable trash contains no evidence of bacteria or virus hazards such as medical waste, diapers, pet or human waste, no evidence of toxic substances such as pesticides or batteries, no ponded water for mosquito production & no evidence of puncture or laceration hazards associated with the observed litter or debris.	No medical waste or sources of toxic substances, but any presence of puncture or laceration hazards such as broken glass and metal debris. Or presence of ponded water in trash items such as tires or containers that could facilitate mosquito production.	Presence of **one** of the following: hypodermic needles, pipettes, or other medical waste ; any used diapers or pet waste within the stream channel or where runoff could carry materials to waterbody; any toxic substance such as pesticides, batteries, or fluorescent light bulbs (mercury).	Presence of **more than one** of the following: any hypodermic needles, pipettes, or other medical waste; used diapers or pet waste within the stream channel or where runoff could carry materials to waterbody; any toxic substances such as pesticides, batteries, or fluorescent light bulbs (mercury); ponded water in trash items.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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	CONDITION CATEGORY			
Trash Assessment Parameter	**Optimal**	**Sub optimal**	**Marginal**	**Poor**
5. Illegal Dumping and Littering	Any observed trash is incidental litter (less than 5 items) or carried downstream from another location. No evidence of illegal dumping.	Some evidence of in-stream or shoreline littering; and/or some evidence of illegal dumping, such as a sign prohibiting dumping along with observed garbage bags of material. Limited vehicular access limits the amount of potential dumping, or material dumped is diffuse paper-based debris (e.g., convenience stores or fast food).	Prevalent in-stream or shoreline littering; and/or the presence of **one** of the following: furniture, appliances, or bags of garbage or yard waste, coupled with vehicular access that facilitates in-and-out dumping of materials to avoid landfill costs.	Significant litter on shoreline or stream banks and streambed; and/or evidence of chronic dumping, with **more than one** of the following items: furniture, appliances, shopping carts, garbage bags, or yard waste. Easy vehicular access for in-and-out dumping of materials to avoid landfill costs.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Accum-ulation of Trash	There does not appear to be a problem with trash accumulation from downstream transport. Observable trash, if any, appears to have been directly deposited at the stream location.	Some evidence that litter and debris have been transported from upstream areas to the location. Less than 5 trash items have been transported from upstream locations, based on evidence such as silt marks, faded colors or location near high water marks.	5 to 20 items of observable trash are carried to the location from upstream, as evidenced by its location near high water marks and siltation marks on the debris.	Trash appears to have accumulated in substantial quantities at the location based on delivery from upstream areas, and is in various states of degradation based on its persistence in the waterbody. Over 20 items of observable trash have been carried to the location from upstream.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Total Score _____

SITE DEFINITION:
UPPER/LOWER BOUNDARIES OF REACH: _____
HIGH WATER LINE: _____
UPPER EXTENT OF BANKS OR SHORE: _____
_____

NOTES:

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TRASH ITEM TALLY (Tally with (|) if found below high water line, and (•) if above)

PLASTIC	**METAL**
Plastic Bags	Aluminum Foil
Plastic Bottles	Aluminum or Steel Cans
Plastic Bottle Caps	Bottle Caps
Plastic Cup Lid/Straw	Metal Pipe Segments
Plastic Pipe Segments	Auto Parts (specify below)
Plastic Six-Pack Rings	Wire (barb, chicken wire etc.)
Plastic Wrapper	Metal Object
Soft Plastic Pieces	**LARGE (specify below)**
Hard Plastic Pieces	Appliances
Styrofoam cups pieces	Furniture
Styrofoam Pellets	Garbage Bags of Trash
Fishing Line	Tires
Tarp	Shopping Carts
Other (write-in)	Other (write-in)
BIOHAZARD	**TOXIC**
Human Waste/Diapers	Chemical Containers
Pet Waste	Oil/Surfactant on Water
Syringes or Pipettes	Spray Paint Cans
Dead Animals	Lighters
Other (write-in)	Small Batteries
CONSTRUCTION DEBRIS	Vehicle Batteries
Concrete (not placed)	Other (write-in)
Rebar	**BIODEGRADABLE**
Bricks	Paper
Wood Debris	Cardboard
Other (write-in)	Food Waste
MISCELLANEOUS	Yard Waste (incl. trees)
Synthetic Rubber	Leaf Litter Piles
Foam Rubber	Other (write-in)
Balloons	**GLASS**
Ceramic pots/shards	Glass bottles
Hose Pieces	Glass pieces
Cigarette Butts	**FABRIC AND CLOTH**
Golf Balls	Synthetic Fabric
Tennis Balls	Natural Fabric (cotton, wool)
Other (write-in)	Other (write-in)

SPECIFIC DESCRIPTION OF ITEMS FOUND (if any):