

INTERNATIONAL TRASH TRAP NETWORK

DETAILED WASTE CHARACTERIZATION PROTOCOL

Purpose: This protocol describes a harmonized procedure to characterize and quantify debris found in trash traps deployed across the globe. This protocol is intended for any group and allows a better understanding of the types of materials collected in a trash trap. The data collected using this protocol can inform local sources of debris and can be synthesized across locations to enable comparisons and better characterize our global impact.

Technical Notes:

- Please contact info@trashtrapnetwork.org with any questions regarding this protocol.
- This protocol has been tested and used with Seabins and LittaTraps. We hope this protocol can be used, and adapted if needed, for other types of trash traps. We would be happy to advise on how if relevant to your situation.
- Follow this protocol at least 5-10 times each year to obtain an accurate representation of the contents of your trash trap.
- Aim to capture at least 1–2 wet events per year (to be considered a wet event, the amount of rainfall must be >10 mm over 24h). When measuring a wet event, ensure that there are 5 days in-between each wet event to ensure enough debris has collected on the streets.
- We do not expect to see animals in a trash trap, but if you find any live animals in your trash trap place them back into the water safely. If you come across any that are dead, please note it down on the datasheet and keep a record of the species (if possible) and count. If you encounter this more than once, consider moving your device to another area to avoid an impact to aquatic organisms.
- If characterizing waste from different trash traps at different waterbodies, please ensure to thoroughly rinse and wash your materials to avoid introducing any non-native plants into your local waterbody or spreading invasive species from one location to another.
- Prior to carrying out this protocol, please refer to Appendices B and C for instructions on how to construct the '2 mm Sieve' and 'French Press Sieve' that will be used to separate small and large debris.

Safety Notes:

- Prior to retrieving your trash trap, put on your lifejacket if near a waterbody.
- If your device has an external energy source, check if the power needs to be OFF prior to collecting the debris from the device. If the power is left on, this may damage and clog the pump inside the device.
- When retrieving the debris from some devices you may need a tool to bring it ashore. This is dependent on the type and size of your device; we recommend an extension pole, pike pole or pool net.
- When sorting through debris DO NOT place your hand in and grab debris to put it on the tarpaulin, instead empty all the debris onto the tarpaulin to ensure you do not grab anything

unexpectedly.

- Wear gloves while sorting through the debris and be cautious when submerging arm into 5-gallon bucket (wear elbow-high gloves for this).
- If dangerous materials are found, dispose of these items with care; e.g., a used syringe should be placed in a labelled sharps container to safely store them for proper disposal.

Materials

Safety Equipment

Item	Recommended Materials	Notes
Life jacket	No specific type required	
Gloves	Gardening or dishwashing gloves	Strong and reusable. Enable protection from sharp debris.
Sharps Container	Yogurt container or butter tub	Any plastic container with a secure lid Must be clearly labelled as 'Sharps'
Extension pole	Extension pole or pike pole	Requirement dependent on type of trash trap Used to retrieve trash trap from waterway
Weather precautions	Sunscreen, water, hat, sunglasses	
First Aid Kit	No specific type required	

Waste Characterization

Item	Recommended Materials	Notes
Copy of detailed waste characterization protocol	Find a copy on https://oceanconservancy.org/ittn	
Clipboard	No specific type required	
Datasheets	Find a copy on https://oceanconservancy.org/ittn ; print on waterproof paper	
Trash scale	Luggage or fish scale i.e., https://www.walmart.com/ip/N1-Digital-Hanging-Luggage-Scale-Portable-Handheld-Baggage-Scale-88-Pounds-2-Pack-New/377710866	Requires a hook or clasp to hold the catch bag Allows for measurement in Kilograms
Digital Kitchen scale	No specific type required	Allows for measurement to 2 decimal places
≥1-gallon Ziploc bags or trash bag for large debris	No specific type required	Pre-weigh prior to waste characterization

≥1 clean small bag, container, or jar for small debris	No specific type required	Pre-weigh prior to waste characterization
Pencil/Pen	No specific type required	
Labelling tape	i.e., https://www.staples.ca/products/2858950-en-general-purpose-masking-tape-203-beige-12mm-x-55m	
Squirt bottle(s)	i.e., https://www.walmart.com/ip/250mL-Right-Angle-Bent-Tip-Plastic-Liquid-Storage-Squeeze-Bottle-Dispenser/52292754	
Digital camera or cell phone camera	No specific type required	
2 x Tweezers	No specific type required	Used for sorting and handling small debris
Metal spoon	No specific type required	
Tarpaulin	i.e., https://www.canadiantire.ca/en/pdp/light-duty-poly-tarp-9-x-12-ft-0405030p.html#srp	
Garbage bags	No specific type required	Large and strong enough to hold debris collected by the trash trap
Hose & Water Source	No specific type required	

Sieve Construction (2mm and French-press style)

Item	Recommended Materials	Notes
Frame	Plastic tub, box sieve for soil, or wooden lumber, i.e., https://www.amazon.ca/gp/product/B000TAOYRQ?pf_rd_r=SVQXWDKT2KHXXZVRJ72GG&pf_rd_p=b84b7a33-3e6c-498a-8674-6a34958d31c1&pd_rd_r=27b66e37-509b-46bb-9c19-879f263afeba&pd_rd_w=K7KoW&pd_rd_wg=2F1Tv&ref_=pd_gw_unk	If using a plastic tub or box sieve, you will cut out the bottom and replace with 2mm mesh. If using wood, you will create a frame from four pieces of lumber.
Hardware Cloth	i.e. https://www.amazon.com/Woven-X60cm-Coarse-gauze-Stainless/dp/B01N4RCHFUF/ref=sr_1_2?keywords=2mm&qid=1638831821&s=industrial&sr=1-2	2mm mesh size

Painters Bucket	i.e., https://www.homedepot.ca/product/e-hofmann-plastics-19l-5-gallon-graduated-measuring-bucket/1000784935?rrec=true	Approx. 20L and/or 30cm diameter.
Wire mesh	i.e., https://www.homehardware.ca/en/1-x-1-x-24-x-15-16ga-galvanized-welded-fence/p/5422432?gclid=CjwKCAjw9LS SBhBsEiwAKtf0n_o0z7TGvO_aBxdj60UE_XoflCbZWkWvelXK0tQwhGCnoGaf_mMmORoC2NQQAvD_BwE&gclsrc=aw.ds	Approx. 3 cm mesh size
Cabinet Pull	i.e., https://www.homedepot.ca/product/richelieu-roosevelt-collection-3-in-76-2-mm-center-to-center-matte-black-contemporary-cabinet-pull/1001004650	3 inches long
Door Jamb	i.e., https://www.homedepot.ca/product/m-d-building-products-1-inch-x-81-inch-premium-door-jamb-replacement-seal-brown/1001120736	Alternatively, can use a window seal Must be flexible, approximately 100cm size.
Wood	No specific type required	Strip approximately 12 inches x 1 inch
Tin snips	No specific type required	Wire cutters or similar tools are also appropriate
Hacksaw	No specific type required	Miter saw or similar tools are also appropriate
Duct Tape	No specific type required	Any adhesive to join the mesh to the frame (e.g. staple gun, screws, tape, glue).
Drill	No specific type required	Screwdriver is also appropriate
Exacto Knife	No specific type required	

See Appendices B and C for additional instructions for constructing the 2 mm sieve and French press sieve.

Procedure:

Step 1: Before collecting any debris from your Trash Capture Device

- 1) On the paper datasheet, fill out details of your organization/affiliation, the date of trash trap retrieval, details of your trash trap and the most recent period of deployment.
- 2) Record the GPS coordinates of your site using decimal degrees (e.g., 43.642397, -79.324571). You can find this by dropping a pin using the map on your phone or google maps on your computer.
- 3) Record if the trash trap captured a “wet event” during the most recent period of deployment. To be considered a wet event, the amount of rainfall must be >10 mm over a 24-hour period. This information is usually available on government weather websites and/or weather apps.
- 4) Record the wind and weather conditions at the time of retrieval.
- 5) Pre-weigh the empty Ziploc or garbage bags (for large debris) and small jar/container without the lid (for small debris) using the kitchen scale and record the empty weights on the datasheet in **grams**. Label each container with the location, trash trap ID (if applicable), Time, Date, and your initials. Label the Ziplocs as “large debris” and the small container as “small debris”. Depending on how full your trash trap is, you may need multiple bags and containers. In this case, you label all the Ziplocs and containers with the same information, if they contain debris from the same device.
- 6) Ensure you are wearing gloves before handling debris.
- 7) Place the tarpaulin down on the area you will be sorting through debris.

Step 2: Weigh the debris within the Trash Capture Device

- 1) If your trash trap is externally powered, turn off the power to prevent damage to the device while removing it.
- 2) Retrieve your trash trap from its deployment location. Some devices may require a tool to bring it ashore (e.g., an extension pole). Beware while extracting the device that if it is full to the brim it can become very heavy, and lifting may require two people.
- 3) Once the device is retrieved, shake it to remove most of the water.
- 4) Record how full your device is (empty, quarter full, half full, full to the brim).
- 5) Take a picture of the contents caught in your device and ensure that the photograph clearly indicates how full the device is.
- 6) Weigh the catch bag full of debris using the luggage scale. Ensure to record the measurement in **kilograms**. If the compartment where the debris is stored in the device is non-detachable, empty the contents into a garbage bag and weigh the bag and debris together.

Step 3: Quantify and characterize the large anthropogenic debris (>3 cm)

- 1) Attach the hose to a water source.
- 2) After weighing the catch bag with debris inside, empty the contents onto the tarpaulin. Depending on how compact the debris is, you may have to help guide the material out using your hands (wear gloves). When the bulk of the material is removed, hold the catch bag upside down and shake it three times over the tarpaulin to remove any debris stuck to the insides.
- 3) Weigh the empty catch bag/garbage bag and record this in **kilograms** on the datasheet.
- 4) Once all the debris is laid out on the tarpaulin, take a photograph of the debris.
- 5) Quantify and characterize all large anthropogenic debris (Larger than approximately 3cm, Figure 1).
- 6) Work through the contents of the trash trap section by section to remove any large debris entangled inside. Look out for large debris that may be entrained in other organic material or other contents caught in your trash trap.
- 7) For each piece of large debris, record the material and item (e.g., plastic bottle cap, cigarette butt, plastic straw, paper receipt) on the datasheet and tally the count.
- 8) Sum the final count for all categories of large debris and record the total count on the datasheet.
- 9) After counting and characterization, rinse the large debris using the squirt bottle if it is dirty or has small debris attached to it and place all pieces of large debris in the pre-weighed Ziploc bag. If you have a lot of large debris, you may need multiple Ziploc bags.
- 10) Weigh the Ziploc bag full of large debris, and record this weight in **grams** on your datasheet.

Step 4: Separate the small anthropogenic debris from the natural debris

- 1) Once all large debris has been quantified, characterized, and removed, take two large handfuls of the left-over contents caught by your trash trap and place at the bottom of the 5-gallon bucket.
- 2) Place the hose inside the bucket with the contents inside and turn it on at a high pressure.
- 3) Begin filling up the 5-gallon bucket, spraying down the contents in a circular motion while doing so until the bucket is just over $\frac{3}{4}$ full. This will allow the contents to loosen up and release any small debris entangled inside the organic matter.

NOTE: *If sharp/dangerous materials are seen floating in the bucket, dispose of them immediately (and log it on your datasheet if anthropogenic). If there are any large*

natural debris that can be easily removed without removing any anthropogenic material, e.g., sticks or branches floating at the top of the bucket, remove them and rinse the surface of each piece into the bucket. Leave the rest of the plant material/natural debris such as algae in the bucket.

- 4) Let the water settle for about 1 minute to allow small debris to float to the surface.
- 5) If there are any large pieces of debris found floating that were missed in the initial removal, place them in your large debris Ziploc bag and add them to your counts on the datasheet.
- 6) Place the 28 cm diameter circular French-press style sieve into the bucket and slowly push it down toward the bottom of the bucket, to wherever it becomes stuck.
- 7) Wait for another minute or so to allow the small debris to resurface through the sieve while the remaining contents or materials are bound to the bottom of the bucket.
- 8) Place the 2 mm sieve on the ground and with the French-press style 28 cm diameter sieve still inside the bucket, slowly pour the contents of the bucket through the 2 mm sieve, avoid any splashing as this will cause small debris to be lost from the sample. Pour until the bucket is empty.
- 9) Once the bucket is empty and all that remains are the remaining contents stuck at the bottom, repeat steps 1 - 8 twice more. In total you will rinse the 2 handfuls of material 3 times. Once triple-rinsed, remove the remaining material from the bucket and place to the side where it can later be properly disposed of.
- 10) Repeat steps 1 – 9 until you have extracted small anthropogenic debris from all organic material.
- 11) Throw all extracted organic material into the garbage bin. **Do not dispose of this debris back into the water**, as some small pieces of debris will likely remain attached to the material even after 3 rinses.

Step 5: Quantify and characterize the small anthropogenic debris (2 mm – 3 cm)

- 1) Now all that should remain on the 2 mm sieve are small pieces of anthropogenic debris and some small pieces of plant material/non-organic material.
- 2) Decide whether counting all the small anthropogenic debris is possible. If there are too many pieces (e.g., more than 50-100), you can subsample. If so, check Yes under ‘Did you subsample?’ on your datasheet and skip to step 9. If not, check No and continue to step 3.
- 3) Gather all your small pieces of debris in a pile on the 2 mm sieve. Use the metal spoon to scrape the corners and sides of the sieve.
- 4) Remove the pile from the sieve and place all small debris onto the tarpaulin.

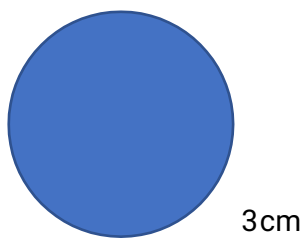
- 5) Begin to count all small pieces and tally as fragment, foam, pellet, film, or other. If tallied as other, please note what the other category is. See Table 1 and Figure 1 below to correctly identify the size and types of small pieces of debris.
- 6) Once counted and categorized, place all small anthropogenic debris in the clean pre-weighed container/jar.
- 7) Next, weigh the container/jar with the small debris inside without the lid on and record the weight **in grams** on your datasheet under “Weight of small debris in container”.
- 8) Fill in the rest of your datasheet, including “Final Count” of each category, and the “Total count of small debris” which is the sum of all your final counts. Skip to step 16.
- 9) If there are too many pieces in your sieve to count (more than 50-100), check Yes under “Did you subsample” on your datasheet.
- 10) To subsample, gather all the debris in the center of the sieve into a small pile. Use the metal spoon to scrape the corners and sides of the sieve. Once it’s all in a pile, divide this into four smaller equal piles.
- 11) To reduce bias, have another person pick which pile you will quantify and characterize, and this will be your subsample.
- 12) Place the subsample onto the tarpaulin and place the three remaining debris piles to the side for later disposal.
- 13) Count all small pieces and tally as a fragment, foam, pellet, film or other. If tallied as other, please note what the other category is. See Table 1 and Figure 1 below to correctly identify the size and types of small pieces of debris.
- 14) Once tallied, place all counted small anthropogenic debris into the pre-weighed container/jar. Weigh and record on your datasheet under “Weight of small debris in container”. Multiply this by 4 to represent the total weight of small debris collected. Record this extrapolated number under ‘Extrapolated weight of subsample’ on your datasheet.
- 15) Next, multiply the final count of each type of small debris by 4 to represent the total amount of small debris collected. Record each extrapolated count on the datasheet and record the sum of extrapolated numbers from all categories under “Extrapolated total count of subsample” on your datasheet.
- 16) Place the device back into the water/ground as per instructions for your trash trap type.

Step 6: Upload your data

After all anthropogenic debris (small and large) has been weighed, counted, and characterized, transfer the data from your paper datasheets into the excel spreadsheet template provided. Send the completed spreadsheet and photographs of the retrieved trash trap and debris contents to info@trashtrapnetwork.org.

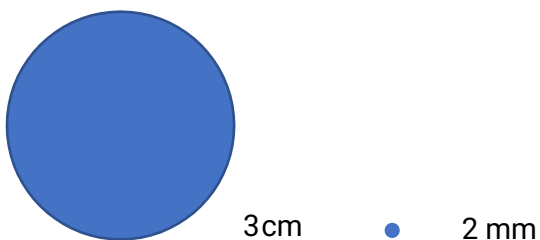
APPENDIX A: Categorization of large and small debris

Large debris



Items larger than the 3cm circle

Small debris



Items smaller than the 3cm circle
and larger than the 2mm circle

Figure 1: Markers to identify between large and small debris.

Table 1: Categorizing microplastics

MICROPLASTIC	DESCRIPTION	IMAGE
Hard Fragment	Fragments have a rigid structure and sometimes irregular shape. They are not always equally thick throughout and can appear twisted or curled. Shavings, droplets, and seams from plastic manufacturing fit within this category. Fragments can be any color or combination of colors ¹ .	 <p data-bbox="943 657 1312 688">Image: Kovač Viršek et al. 2016</p>
Foam	Foams are soft, compressible, and cloud-like. They are usually white and/or opaque but can be any color ¹ .	 <p data-bbox="927 1066 1260 1098">Image: Rochman et al. 2019</p>
Pellet	Pellets (sometimes called “nurdles”) are often rounded or cylindrical in shape. Pellets can be any color ¹ .	 <p data-bbox="943 1476 1235 1507">Image: Patricia Corcoran</p>
Film	Films are flat, thin, and malleable. Films can fold or crease but do not break apart easily. Films are typically partially or fully transparent and are found in a range of colors ¹ .	 <p data-bbox="943 1795 1312 1827">Image: Kovač Viršek et al. 2016</p>

1. Rochman et al. 2019

APPENDIX B: Constructing the 2 mm Sieve

Procedure:

- 1) Create the frame. If you are using a plastic tub or box sieve, cut out the bottom using the hacksaw (or similar equipment). If you are using wood to construct the frame, cut your wood to size with mitered ends, drill two long screws in each corner to connect the four pieces together.
- 2) Cut the hardware cloth to your desired size using the tin snips (or similar equipment).
- 3) Attach the hardware cloth to the tray, using your preferred method (e.g. duct tape, staple gun, etc).
- 4) Refer to Image 1 & Image 2 as examples of the finished product.

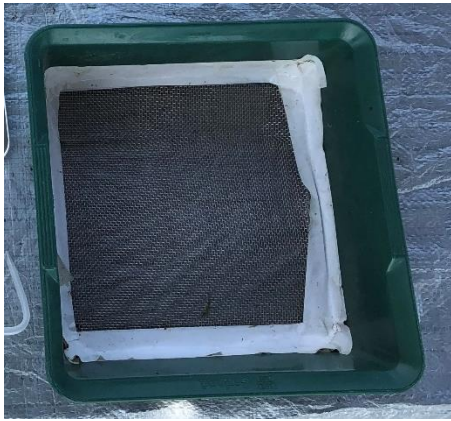


Image 1



Image 2

APPENDIX C: Constructing the French-press Sieve

Procedure:

- 1) Confirm internal diameter of bucket (A) measuring approximately 3" from the bottom. It is important that you measure 3" from the bottom as buckets taper slightly from top to bottom and leaving 3" will allow room to trap the plant material.
- 2) Cut a circle of wire mesh (B) at a diameter $\frac{1}{2}$ " less than the measurement (A) noted in step 1 – Refer Image 1.

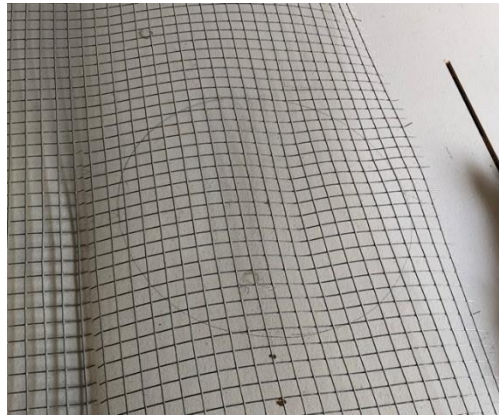


Image 1

- 3) Cut the wood strip (E) to the length (A) noted in step 1.
- 4) Mount the cabinet pull (C) to the center of the wood strip (E) – Refer Image 2 & 3.



Image 2

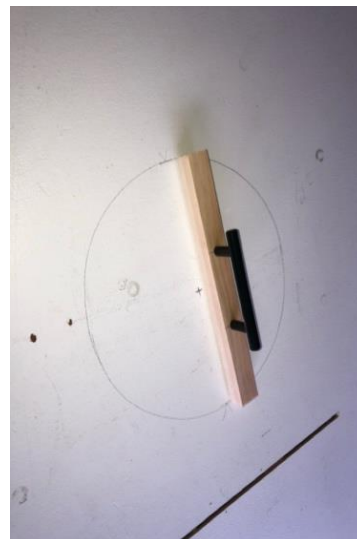


Image 3

- 5) Attach the bottom of the wood strip to the wire mesh, stapling on the bottom.

- 6) Attach one end of the flexible seal to one end of the wood strip and stretch the seal around the circumference of the wire mesh, staple it to the opposite end of the wood strip, and continue to stretch it around the wire mesh until back at the other end, trim the excess seal and staple in place. Refer to Image 4.



Image 4

- 7) Refer to Image 5 & Image 6 as an example of the finished product.



Image 5



Image 6