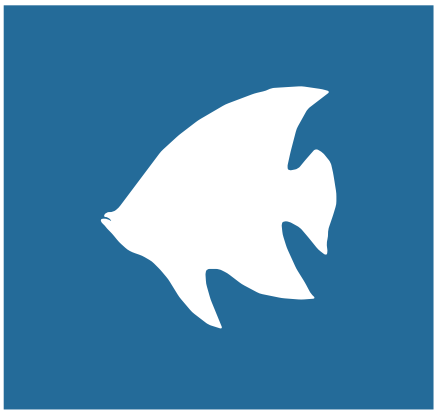
MARINE DEBRIS PREVENTION

MAKE A DIFFERENCE!



COMPLIMENTARY ACTIVITIES:

Activity #1: Trash Timeline

Activity #2: Do Science! - Data Collection

Activity #3: The Story of Trash

Activity #4: Reduce, Reuse, Recycle

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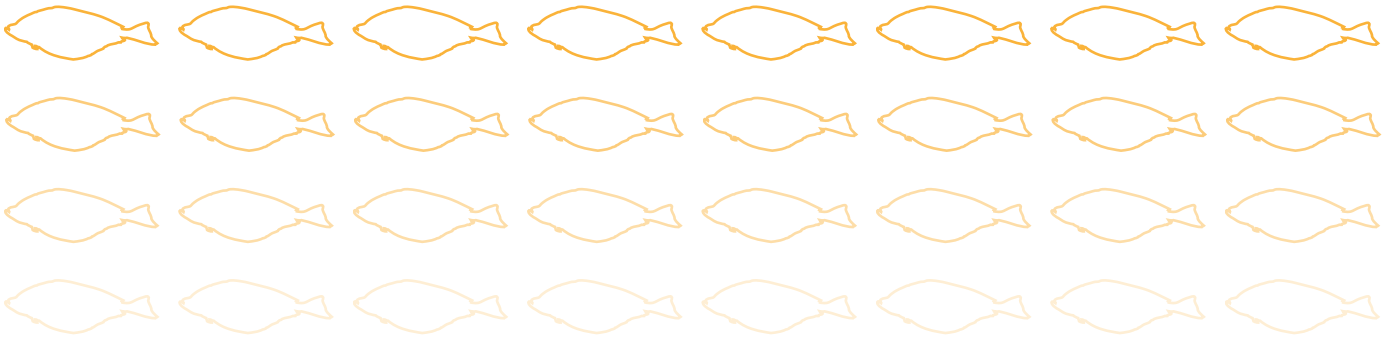


Preparation & Materials:

•Plastic trash bags (reused shopping bags are best)
• Rubber or work gloves (recommended)
•Cleanup data sheets (if completing the Data Collection activity)
• Scratch paper and pencils (if completing the Story of Trash activity)

ACTIVITY SUMMARY:

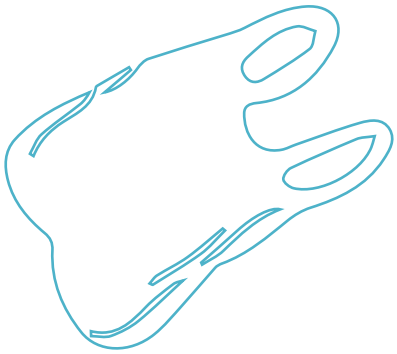
Marine debris is one of the major critical issues threatening animals living in San Francisco Bay and all of the world's oceans, estuaries, lakes, and rivers. From the world's largest animal, the blue whale, to small schooling fish, trash in our oceans endangers all marine life via ingestion and entanglement. Luckily, this is a problem we can help solve. All of us, including your students, can control what we do with our trash and the trash we encounter in our everyday lives. By having your students do a trash cleanup in the park by PIER 39 (or in your own school yard), they can take an active role in preventing the creation of more marine debris. No matter how far from the ocean, litter in any environment eventually finds its way to the sea or to other bodies of water. Your students will learn how important and easy it is to prevent trash from becoming marine debris.

For this trash cleanup, you can decide if you would like your students to work in small groups, pairs, or individually to collect litter around the park east of the Aquarium. The goal of the activity can simply be to help our environment, or you can add a competitive component and make it a litter race. Be sure to go over boundaries for the cleanup and some safety guidelines before beginning your trash pick-up. For example, teach your kids about no-touch items: broken glass, sharp or rusty metal, needles, and anything that comes from a human or animal body. If they find anything questionable, they should not touch it and get an adult's help.

To complement your trash cleanup, here are a few fun activities you can do with your students to think more about marine debris and how we can prevent it.

TRASH TIMELINE

For this activity, have each student choose one item from the trash that they collected. Look around and try to encourage students to choose pieces made out of a variety of materials. Ask your students to think about how long it would take for their item to break down or decompose in the marine environment. Once they've had a moment to think to themselves, they can pair up to share or discuss their thoughts with a small group. Next, challenge your students to work together and arrange themselves in a timeline from shortest to longest decomposition time. Using the Decomposition Time Key on the following page, you can then move through their timeline to see if they have ordered themselves correctly.



As you go through the timeline and rearrange when needed, start a discussion about what the students may have expected and what surprised them. Ask them to imagine what the Bay or ocean would be like if all these different types of trash continued to end up there, taking many years to biodegrade, or in some cases never completely disappearing.

- Why might it be bad for these items or things made of similar materials to be out in the environment for so long?
- How would it impact the environment and its wildlife? How would it impact your students and their community?
- How could you change the types of products you use and buy to reduce the possibility of the items with longer decomposition times from ending up in the environment?

Please Note: It is important to remember that scientists are not certain whether materials like plastic, Styrofoam, and metal ever completely decompose or if they merely break down into smaller pieces. Decomposition and biodegradation depend heavily on environmental conditions, and there is still much research to be done on this topic and these materials. So far, research has shown that plastic marine debris does become microplastics (pieces smaller than 5 millimeters), which may remain in the ocean forever, posing a serious threat to wildlife. Therefore, the times in the key below are strictly estimates based on various scientific resources.

DECOMPOSITION TIME KEY:

ITEM/MATERIAL	ESTIMATED DECOMPOSITION TIME*
Paper towels	2-4 weeks
Paper bag	1 month
Orange peel	2-5 weeks
Banana peel	2-5 weeks
Newspaper	6 weeks
Loose leaf paper	1-2 months
Gum wrappers	1-3 months
Apple core	2 months
Cardboard box	2-3 months
Waxed milk carton	3 months
Cotton sock	1-5 months
Rope	3-14 months
Biodegradable/compostable diapers	1 year
Wood	1-3 years
Cigarette butt	1-5 years
Wool sock	1-5 years
Paper plate	5 years
Soft plastic (plastic bag)	10-20 years
Pencil	13 years
Plastic film canister	20-30 years
Nylon fabric	30-40 years
Leather (of a boot)	40-50 years
Foamed plastic cup	50 years
Rubber sole (of a boot)	50-80 years
Tin can	50-100 years
Foamed plastic buoy	80 years
Aluminum can	200-350 years
Plastic 6-pack holders	300-450 years
Disposable diapers	450 years
Monofilament line (fishing line)	600 years
Aluminum foil	1,000-2,000 years
Glass bottles	1 million years/indefinitely
Nurdles	indefinitely
Plastic bottles	indefinitely
Styrofoam cup	indefinitely

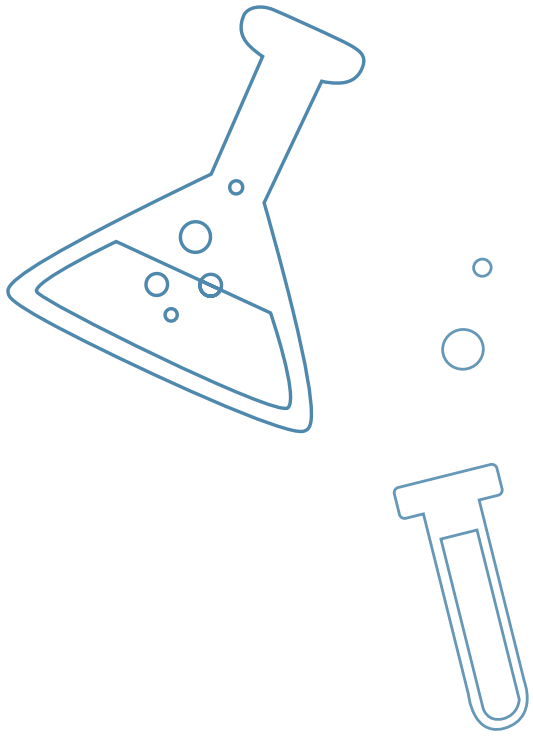
DO SCIENCE!
–DATA COLLECTION

Data collection is a great way to kick your trash cleanup up a notch. Give your students more experience with scientific practices by having them keep a running tally of the different kinds of trash items they collect. You can categorize trash by material or be more specific and count the number of particular items, such as straws, balloons, plastic utensils, cigarette butts, plastic bags, etc. You can collect data as a learning opportunity or you can collect data as part of a larger Citizen Science project. Citizen Science is scientific research conducted, in whole or in part, by nonprofessional scientists—which can include your students.

The data collected at trash cleanups is used to determine how we can take steps to prevent marine debris. It can also help us monitor litter-reducing measures already put in place. For example, this can provide information on whether or not the plastic bag ban in San Francisco is effective in reducing the number of plastic bags that end up in the Bay. The aggregate data can be used to target the corporations and create environmental policy that helps eliminate the source of the problem.

To provide a realistic learning experience, your class can use the data collection sheet below to enhance their trash cleanup. Then, you can input your data into the Bay Area Student Litter Project's database online at: http://mageere.wix.com/bayarealitter. This website allows you to explore what other schools in the Bay Area have been finding as it compiles the data from many different schoolyard trash cleanups.

Additionally, if your school has easy access to tablets, you and your students can contribute to an international database using the Litterati app. This program allows you to log pictures and information in real time as your students pick up litter. You can learn more about Litterati and check out all of the data already collected by citizen scientists at: http://www.litterati.org/index.php.



To wrap up this valuable experience, consider using what students learn from their data collection as a starting point for a discussion.

- Why are some types of trash more likely to be found than others?
- What could be done to make the most common items less common?
- Is there a brand or particular item that was found more frequently? Could the students take personal action to contact that brand or reduce personal use?
- Why is it important to collect data? What is citizen science? What are the benefits and limitations of citizen science?
- If you are doing the data collection at your school—what actions can your class take together to reduce the amount of the most common item found on your school grounds? For example, if plastic straw wrappers are very commonly found, your class could write a letter to the principal asking them to buy straws with paper wrappers, no wrappers, or no straws at all.

TOP 10 WHOLE ITEMS FOUND AT 2015 SAN FRANCISCO BEACH CLEANUPS

1. Cigarette butts – **18,880**
2. Food wrappers – **7,945**
3. Plastic bottle caps – **3,668**
4. Metal bottle caps – **3,009**
5. Paper bags – **2,310**
6. Plastic grocery bags – **2,138**
7. Other plastic bags – **1,909**
8. Plastic beverage bottles – **1,480**
9. Plastic take out containers – **1,460**
10. Straws and stirrers – **1,448**

Please Note: The most common item found at these beach cleanups was actually 29,395 small plastic, glass, or foam pieces that couldn't be classified. These are parts of larger items that have begun to break apart into smaller pieces rather than decomposing. Many of the pieces will eventually become microplastics, which can be very dangerous for wildlife to consume. Scientists are not sure if microplastics ever completely decompose.

Source: International Coastal Cleanup Data, Ocean Conservancy.

THE STORY OF TRASH

This activity will add a creative twist to your trash cleanup. Have pairs of students or small groups choose a trash item and think about the life history of that item.

- Where, how, and why was the item made? After it was created, where did it go next?
- Did someone purchase it?
- Was it then used again or was it discarded?
- In the end, how did it end up where you found it?

Once they have discussed the history of their item, the students will work with their partner or group to tell the story of their trash, from its creation to being found and kept from becoming marine debris. Encourage them to be creative! They can write a poem or song, they can act it out, or they can tell it like a story—whatever they'd like to do to share their item's story with the class. When they have finished preparing their Story of Trash, gather together and have each group present to the class.

After the groups have shared their Stories of Trash, ask them to think about what could have happened if they hadn't picked their item up today. Would it have had a negative impact on marine life? Finish by having the groups figure out what parts of their Story of Trash could have been changed to keep their item from ending up where they found it. Are these changes things the students could change about their own habits? We all have a role in preventing marine debris—from what we purchase and use to how we get rid of things we no longer need.

Below is an example of a trash life history, as well as how students could have responded to the follow-up questions.

The story of a piece of clear semi-hard plastic:

Created at a Lego factory to package a set of Star Wars Legos → Shipped across the Pacific on a large container ship with millions of other packaged Lego toys → Loaded onto a semi in the Port of Oakland to be driven to Target → unloaded and shelved in the Target toy aisle → Chosen and purchased by a mom shopping for birthday presents for her kids → Driven home in the back of a minivan → Wrapped up and tied with a bow → Torn to pieces by children trying to get to their new Legos to play with → Tossed into the trash can with the rest of the packaging and discarded wrapping paper and ribbons → Carried to the curb on garbage day → Dumped onto the sidewalk when a raccoon knocked over the trash can → Washed downhill with the next rain → Blown across city blocks until landing in the park

If we hadn't picked it up, what would have happened:

The plastic may have blown or washed into the Bay, eventually making its way out to the ocean. Since it wouldn't biodegrade for many, many years, the plastic would probably continue drifting until it was pulled into the North Pacific Gyre. As part of the Great North Pacific Garbage Patch, the plastic would pose a threat to many marine animals who might eat it or be trapped in it. Plastic debris often breaks down into tiny pieces (called microplastics) and becomes easy for filter-feeding animals, like anchovies or baleen whales, to mistake as food. These microplastics bioaccumulate and move up the food web, impacting larger predators as well, including human beings. Another way plastic debris endangers wildlife is by becoming entangled on animals' limbs, mouths, or other body parts, hindering movement, eating, breathing, and other natural behaviors. For more information, you can learn about marine debris and the five gyres here:

http://marinedebris.noaa.gov/movement/how-debris-accumulates http://education.nationalgeographic.org/encyclopedia/great-pacific-garbagepatch/

How we can change the story:

1) To prevent the creation of unnecessary plastics, we can support companies that try to limit the use of plastic for their products' packaging or alternatively use compostable or biodegradable materials.

2) Instead of disposing of the packaging in the trash can, we can recycle any hard plastics in a bin with a lid.

3) We can do our part to collect any litter that we find on the ground on a daily basis or organize a trash cleanup with our community to help prevent accidental trash from becoming marine debris.

For a humorous example of a creative Story of Trash, check out this short video of a mockumentary about the Majestic Plastic Bag: https://www.youtube.com/watch?v=GLgh9h2ePYw

REDUCE, REUSE, RECYCLE

Everyone has heard the 3R catchphrase—even your students—but unfortunately, most of us don't realize just how much of our trash we really can divert from landfills or prevent from becoming marine debris. This activity is designed to show your students how they can actively prevent marine debris by being more thoughtful about how to create less trash and what they do with the trash they do create. Once the students have completed their trash cleanup, have them split into small groups and lay out all of the trash items they found. Challenge them to sort their trash into different categories and see how little they can end up putting in their landfill pile. Here are some of the categories we suggest:

REDUCE:

Is this item something that people could have gone without in the first place or used a more eco-friendly alternative for? Single-use items like plastic silverware, straws, and water bottles frequently end up as marine debris, when we could be using long-lasting, reusable products instead.

REPURPOSE:

Could the item be used to create something new? Many things that end up going to landfill could actually be used to make arts and crafts. People are even using marine debris collected at beach cleanups to make things like skateboards, carpeting, shoes, and more!

REUSE

Is this an item that could have been reused instead of being thrown out? Some examples include plastic grocery bags, Ziplocs, ribbons, etc.

REDESIGN/REINVENT

Could you redesign the product so that it is more sustainable? For example, could you make straws out of paper or use different packaging? Could you make plastic bottles thinner so that they use less plastic? Could you design six pack rings with built in perforations so that something can't get stuck in it?

RECYCLE:

Is this item made of a recyclable material? Here in the Bay Area, we are lucky to have a recycling system that covers a wide range of materials including all hard plastic, paper, tin, aluminum, and glass products. You can also find special recycling programs that will take soft plastics, granola bar wrappers, batteries, E-waste, and other items.

COMPOST

Is this item organic—meaning was it once part of a living animal or plant? If so, it can be composted so that it properly and quickly biodegrades and even can be used for agriculture. This happens much more effectively and quickly in a commercial composting facility than in the ocean environment.

LANDFILL:

If the item doesn't fit into any of the categories above and you can't think of another way to get rid of it, then it can go to landfill. Unfortunately, even when we throw items away rather than litter them, they can still escape the system and end up as marine debris. Items escape when wind carries them away from a trash can, garbage truck, or landfill, allowing for them to be blown or washed into our waterways. This is why it's best for us to come up with other ways to deal with our trash.