APPPENDICES

Day 1: What's Up with Microplastics? (Sink or Float Lab)

What's Up with Microplastics? (Sink or Float Lab)

(This activity is adapted from Maia McGuire, PhD, UF/IFAS Extension Agent IV.from the University of Florida: http://sfyl.ifas.ufl.edu/flagler/marine-and-coastal/)

Objective: Students will explore which plastics sink/float in water. They will write a story about what they did and learned in this activity.

Grades: 5-12

Anticipatory Set: 5 minutes: Engage students in listing anything they see, know or use that is plastic. Introduce to the students that today they will practice CER (claim, evidence, reasoning) using samples of plastic from different sources. First, they will make a **claim** of whether or not each sample of plastic they receive will either float or sink in water. They will collect **evidence** by placing each piece of plastic in water, as a mini experiment. Finally they will revisit their claim and **reason** as to the correctness of their claim based on their mini experiment.

Materials List:

- Items made from different plastic resins (at least 3 per group)
    - Plastic water bottle (PET, recycling code 1)
    - Milk jug (HDPE, recycling code 2)
    - ½" PVC pipe or cotton swab packaging (PVC, recycling code 3)
    - Lids from oatmeal containers (LDPE, recycling code 4)
    - Yogurt tub (PP, recycling code 5)
    - Solo cup (PS, recycling code 6)
    - Egg carton (EPS, recycling code 6)
    - Nylon cable ties (recycling code 7)

- Paper envelopes to store plastic pieces
- Very fine permanent markers (different colors are helpful)
- Small containers of water (clear cups or bowls are good)
- Paper towels or small towels

- Students will need:
    - Tweezers
    - Data sheets
    - Pencils
    - Plastic samples

Preparation by Teacher Before Activity:

1. Use scissors or a sharp craft knife to cut one plastic samples into 3 squares small: (approx.. ¼" x ¼"), medium (approx.. ½ " x ½ ") and large (1" x 1"). Exceptions: cut the cable ties into pieces that are approximately ¼" in length. If using PVC pipe, use a chop saw to cut it into approximately 1/8" rings.

2. Wherever possible, write the recycling number on the envelope of the pieces and pieces themselves . I used different colors for the different numbers—that way if the number becomes hard to read, the color still identifies the item. Otherwise it can be difficult to tell one clear or white square from another.

3. Put the pieces of each type of plastic in separate labeled envelopes. Label the envelopes with the plastic type and recycling code. (PET=polyethylene terephthalate; LDPE=low density polyethylene; PVC=polyvinyl chloride; PP=polypropylene; PS=polystyrene; EPS=expanded polystyrene—this may simply be labeled PS on the product; Nylon is grouped with "other" plastics.)

4. Print student instructions and datasheets

EXTENSION - if you want students to measure the density of each sample, then they will need a small electronic balance (that will record 0.01 gram—these can be purchased for less than $15) Add a question about density for them to answer in their final summary.

Student Instructions:

1. Collect 2 different types of envelopes. Each envelope has a different type of plastic in it.

2. Record the plastic type and recycle number on your datasheet.

3. Fill a clear plastic cup ½ with tap water.

Experiment 1: 15 minutes

1. Observe the plastic pieces in ONE of the envelopes. **Write a claim** as to whether or not you think the plastic from the envelope will sink or float. Write your claim on your datasheet.

2. Take out one plastic piece inside the envelope, one at a time, using tweezers and submerge the plastic piece in water, then let go of the plastic and record if it sinks or floats.
In your own words, **write the evidence from your experiment** onto your datasheet.

3. Remove the plastic piece from the water and place on a paper towel to dry.

4. Complete your datasheet by determining if your claim was correct. Remember to include lots of details to **support your reason**.

Experiment 2: 10 minutes

1. Observe the plastic pieces in THE OTHER envelope. **Write a claim** as to whether or not you think the plastic from this envelope will sink or float. Write your claim on your datasheet.

2. Take out one plastic piece inside the envelope, one at a time, using tweezers and submerge the plastic piece in water, then let go of the plastic and record if it sinks or floats.
In your own words, **write the evidence from your experiment** onto your datasheet.

3. Remove the plastic piece from the water and place on a paper towel to dry.

4. Complete your datasheet by determining if your claim was correct. Remember to include lots of details to **support your reason**.

Final Summary: 10-15 minutes
Write 2-3 sentences explaining what you did and the results of your experiments.
Match the plastics that sunk and the ones that floated with the recycle number.
Why is it important to know what happens to plastic in water?

Closure:
What plastics sink and which float? *(These plastic types float: LDPE, PP, and EPS These plastic types sink: PET, PVC, PS and Nylon.)*

Why do you think this is important to our water environments like the ocean, lakes, streams and rivers?

The graphic at http://www.grida.no/resources/6930 might be interesting to use along with this activity. You could also ask students to look for/identify other common items that are made from different plastic resins (e.g. plastic bottle caps are usually made from PP).

Student Worksheet

Name _____ Date_____

Envelope 1:

Plastic Type: _____ Recycle Number: _____

Experiment 1:

1. Observe the plastic pieces in ONE of the envelopes. **Write a claim** as to whether or not you think the plastic from the envelope will sink or float. Write your claim on your datasheet.

2. Take out one plastic piece inside the envelope, one at a time, using tweezers and submerge the plastic piece in water, then let go of the plastic and record if it sinks or floats.
In your own words, **write the evidence from your experiment** onto your datasheet.

3. Remove the plastic piece from the water and place on a paper towel to dry.

4. Complete your datasheet by determining if your claim was correct. Remember to include lots of details to **support your reason**.

Experiment 1 CER Notes:

CLAIM	EVIDENCE	REASONING

Envelope 2:

Plastic Type: _____ Recycle Number: _____

Experiment 2:

1. Observe the plastic pieces in THE OTHER envelope. **Write a claim** as to whether or not you think a plastic from this envelope will sink or float. Write your claim on your datasheet.

2. Take out one plastic piece inside the envelope, one at a time, using tweezers and submerge the plastic piece in water, then let go of the plastic and record if it sinks or floats.
In your own words, **write the evidence from your experiment** onto your datasheet.

3. Remove the plastic piece from the water and place on a paper towel to dry.

4. Complete your datasheet by determining if your claim was correct. Remember to include lots of details to **support your reason**.

Experiment 2 CER Notes:

CLAIM	EVIDENCE	REASONING

Name: _____ Date:_____

Homework - Final Story**:**
Write a STORY (4-5 sentences) write down

- what you did,
- why you did it,
- and your conclusions

In your story, tell your reader which plastics sunk/floated based on their recycle number.

In your story tell what you learned by doing this activity.

End your story with the answer to this question: *Why do you think it is important to know what happens to plastic in water?*

Day 2: Lesson and sample instructional slides from teachers 5th/7th/HS

Why Should We Care?

Objective: Students will be able to identify the hazards of microplastics in the environment. Students will be able to identify the types of microplastics from provided images.

Grades: 5-12

Anticipatory Set: 10 minutes
Revisit the activity from yesterday. Students investigated which plastics float and which sank. Have students identify which plastics floated and ask for examples of types of materials made from those types of plastics. Have students identify which plastics sink and ask for examples of types of materials made from those types of plastics. Then visit the final story that was done for homework. Ask for student volunteers to read their story to the rest of the class.

The question at the end of the assignment was "*...why do you think it is important to know what happens to plastic in water?"* Today we are going to understand the hazards of plastics, and specifically microplastics, in waterways.

Introduction: 10 minutes
Show the recent ABC news story (2:50 min)
https://drive.google.com/drive/u/0/folders/1em9E0gWFVU9mCh5yi_8K5EGmSd8LG2in

Brainstorm - think-share-pair - with a partner of any points brought out in the news story.

Ask the class to share out and list the points on the board.

Based on these points, create a list of "I wonder" statements about microplastics.

Examples:

- I wonder what happens to salmon when there are microplastics in the water.
- I wonder what microplastics look like. I wonder how big microplastics are.
- I wonder how long microplastics stay in the water.
- I wonder how much microplastics come from the atmosphere?

Instruction: (*Source:San Francisco Estuary Institute)*

- Microplastics are particles less than 5 mm
- Microplastics are found everywhere in the ocean and generally never disappear
- Microplastics are a pervasive and preventable threat to the health of marine ecosystems.
- Microplastics come in a wide variety of shapes, sizes, and plastic types, each with unique physical and chemical properties and toxicological impacts.
- Microplastics have been found in all 12 stormwater drainages into the San Francisco Bay (Bay).

- Annual amounts of microplastics via stormwater is estimated to be 7 trillion
- Microplastics are found in sediments all around the Bay.
- Wastewater treatment plants do not remove microplastics

Images for Instruction from *Understanding Microplastic Levels, Pathways, and Transport in the San Francisco Bay Region* (Sutton, et al., 2019). The full report can be downloaded from our project website: https://www.sfei.org/projects/ microplastics.

Identifying Microplastics:

So now that we know a little bit more about microplastics. Let's see what they actually look like. Tomorrow we will look at microplastics that have been filtered out of bay area water. Students will receive four known photos of microplastics collected from the environment and a worksheet with a mystery photo (Photo 5). (There are multiple mystery photos, this lesson has 1 example) Students are asked to try to identify what they see in the photo. (This example is a piece of a plastic water bottle.)

Closure:
Tomorrow we will filter and view our own Bay water and try to find microplastics. Let's discuss some challenges we may face in our lab tomorrow.

- Can not see anything in the water
- Too blurry
- Maybe animal and not man-made material
- May mess up filtration procedure
- Others…

5th Grade Sample Presentation

Microplastics

What role can we play in preventing and cleaning up plastic pollution in the water?

Microplastics - Day 1

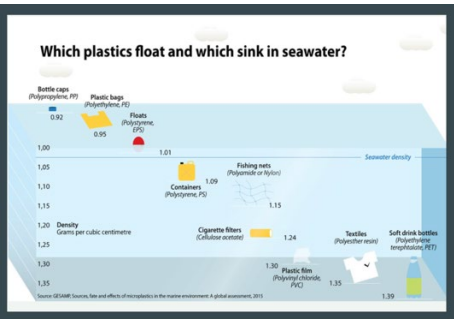
What are microplastics?

Plastic Exploration

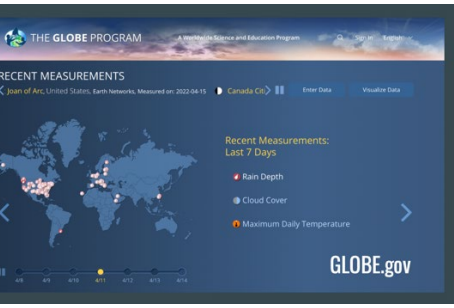
What do you notice about the plastic pieces? Discuss with your group.

Plastic Exploration

1. Which plastic pieces do you think will float? Which ones will sink? Why? Sort them into two piles and take a photo of the piles.
2. Test your guess. Be careful to submerge one piece at a time and to submerge each piece of plastic to the same depth before letting it go.
3. As you take a plastic pieces out, sort them into a pile for ones that float and ones that sink.
4. On blank paper, write a claim that states which types of plastic float and why. Put this claim on the table next to your piles.
5. When you are done, take another photo that includes your piles and your claim. Leave your piles on the table for a gallery walk.



National Geographic Video:
Tracking Plastics From Sea to the Source



Microplastics - Day 2

What does it mean to monitor microplastics?

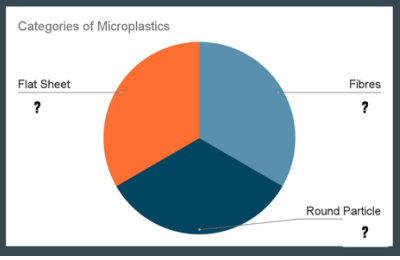
GLOBE.gov Pilot Microplastic Monitoring Protocol

Step 1: Collect water

Step 2: Filter water, save the filter

Step 3: Identify and count plastics caught on filter

GLOBE.gov Pilot Categories for Microplastics



GLOBE.gov Pilot Categories for Microplastics

1. With your desk partner, sort the photographs into round particles, flat sheets, and fibres

1. Then, subdivide each category into natural and plastic

Microplastic Contamination in San Francisco Bay

1. Read and annotate the text and images.
2. What did you learn that might help us answer the chapter question:

   What role can we play in preventing and cleaning up plastic pollution in the water?

*When you are called, please come practice using the microscope

Microplastics - Day 3

Monitoring Microplastics

Microplastics - Day 4

What role can we play in preventing and cleaning up plastic pollution in the water?

What went well about the protocol? What could be improved for 5th graders to complete the protocol?

Step 1: Collect water

Step 2: Filter water, save the filter

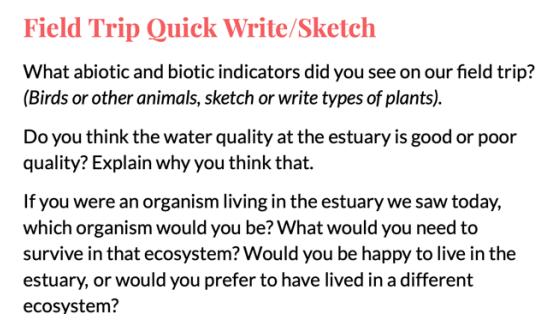
Step 3: Identify and count plastics caught on filter

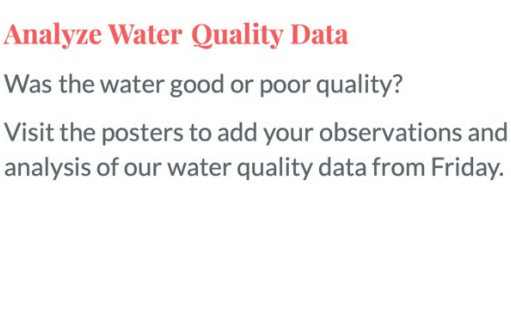
OLD MILL SCHOOL

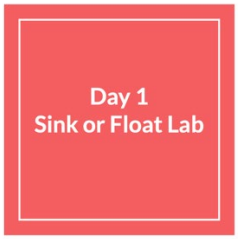
1. What role can we play in preventing microplastics?

1. What role can we play in cleaning them up?

7th Grade Sample Presentation







We have learned about many types of water quality indicators, and even visited the estuary to sample the water.
We are going to do a case study on a very important topic: **microplastics**

What do you think microplastics are?

How might plastic pollution affect the ecology of a healthy watershed?

Lab: Sink or Float

Read and annotate the procedure for today's lab

Experimental Procedure

1. Predict: Choose one of the plastic pieces. In your data table, write in the sample number, and write a prediction of whether you think that plastic sample will sink or float.

2. Observe: Take out one plastic piece, use forceps and submerge the plastic piece in water, then let go of the plastic and record if it sinks or floats. See the data card to write in the recycle # and plastic type in your data table.

3. Remove the plastic piece from the water and place on a paper towel to dry.

4. Repeat with your next sample. Must-do: Steps 1-3 with at least two types of plastic. May-do: Test out 3 different types of plastic.

Clean Up

Make sure plastic pieces go back into the correct bin

Carefully carry your group's water container back to the side table

Dry off your table

Building from the Lab:

Why is it important to know what happens to plastic in water?

Recent news story about microplastics in SF Bay watersheds

Partner Talk: What were your take-aways from the news story?

What questions do we still have about microplastics, or plastics getting into our watershed?

Questions - what do we wonder?

What questions do we still have about microplastics, or plastics getting into our watershed?

I wonder...

Homework

Due Wednesday

Plastics lab - Sink or float?

Finish Analyze Data and Conclusion questions

Optional: revise and turn back in pH lab

More on microplastics

Info about Microplastics

- Microplastics are particles less than 5 mm *(micro = small)*
- Microplastics are found everywhere in the ocean and don't disappear
- Microplastics are a pervasive and preventable threat to the health of aquatic ecosystems.
- Microplastics come in a wide variety of shapes, sizes, and plastic types, each with unique physical and chemical properties and toxic impacts.

(Source:San Francisco Estuary Institute)

Microplastics in the SF Bay Area



What do you think some of the sources of microplastics might be in the Bay Area?

More Info about Microplastics

- Microplastics have been found in all 12 stormwater drainages into the San Francisco Bay.
- Annual amounts of microplastics via stormwater is estimated to be 7 trillion pieces
- Microplastics are found in sediments (dirt, sand, etc.) all around the Bay.
- Wastewater treatment plants do not remove microplastics

What do they look like? Identifying Microplastics

So now we know a little bit more about microplastics. Let's see what they actually look like. On Thursday, we will have some guest visitors and look at microplastics that have been filtered out of bay area water.
You will receive four known photos of microplastics collected from the environment and a mystery photo (Photo 5).

Work with your group to discuss Photo 5 - what do you think Photo 5 is showing?

Identifying Microplastics

You will receive four known photos of microplastics collected from the environment and a mystery photo (Photo 5).

Work with your group to discuss Photo 5 - what do you think Photo 5 is showing?

→ Choose a scribe, complete your group's "What's in the Photo?" paper

Tomorrow: Filtering Water, Analyzing Microplastics

Tomorrow we will filter and view our own Bay water and try to find microplastics.

Partner Talk: What are some challenges we may face in our lab tomorrow?

Tomorrow: Filtering Water, Analyzing Microplastics

Tomorrow we will filter and view our own Bay water and try to find microplastics. Let's discuss some challenges we may face in our lab tomorrow.

- Can not see anything in the water
- Too blurry
- Maybe animal and not man made material
- May mess up filtration procedure
- Others…

Microplastics Lab Activity

Yesterday we looked at photos of different types of microplastics found in water.

Today we are going to take a look at water collected from the Bay Area. We will gain experience in filtering the water with a hand pump and filter paper then we will look at the filter paper for microplastics in our water samples.

Microplastics Lab Activity

Today we are going to take a look at water collected from the Bay Area. We will filter the water with a hand pump and filter paper then we will look at the filter paper for microplastics in our water samples.

Partner Talk: Would we expect to see microplastics if we look directly at our water samples without a microscope? Why or Why not?

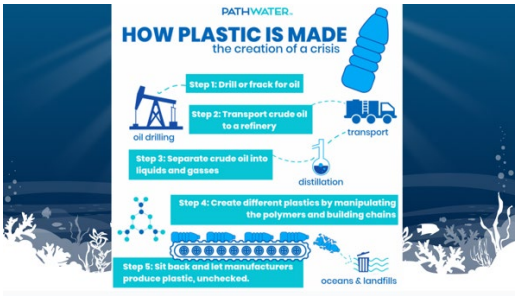
Microplastics Activity - in Sketchbook

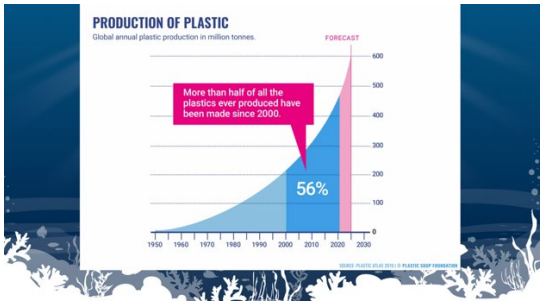
2 take-aways in your sketchbook

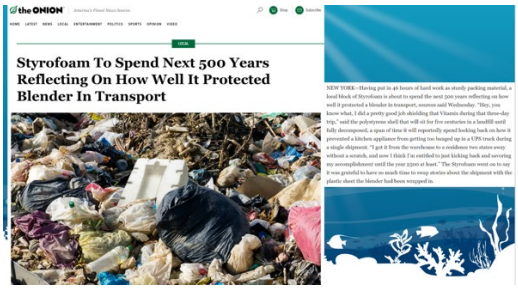
Filtering Analyzing

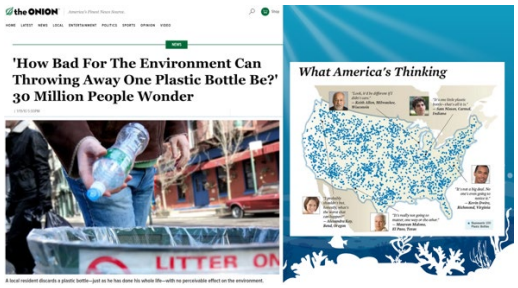
Take-aways can be:
Today I learned, what was challenging, something you observed, how was this experience for you

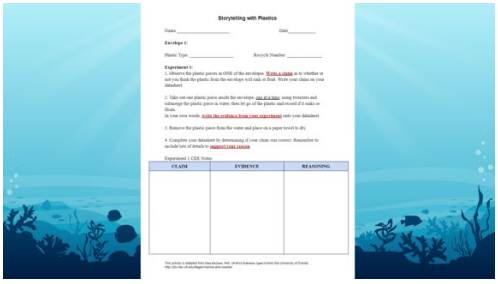
High School Sample Presentation (select slides)

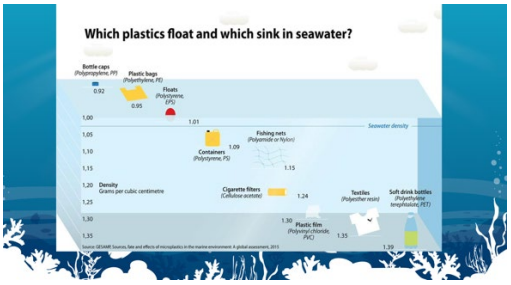


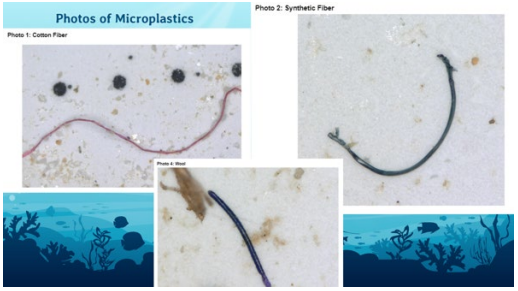


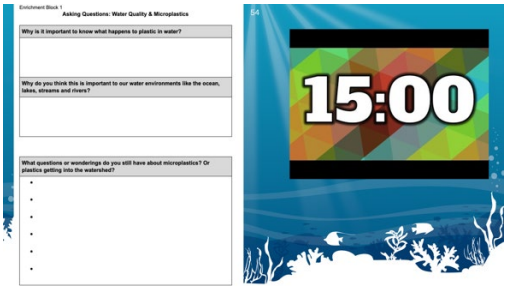


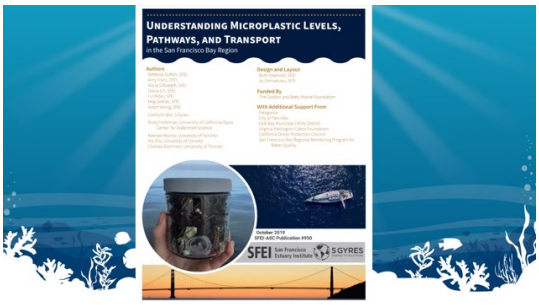












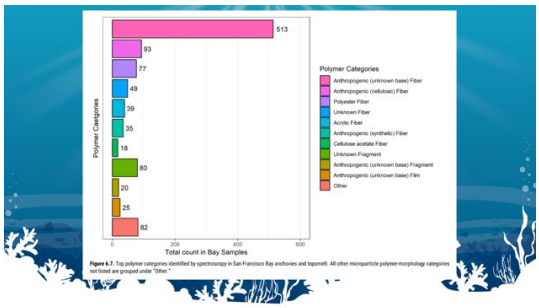


Figure 6.7. Top polymer categories identified by spectroscopy in San Francisco Bay anchovies and topsmelt. All other microparticle polymer-morphology categories not listed are grouped under "Other."

Asking Questions: Water Quality & Microplastics

What questions do you still have about microplastics? Or microplastics getting into our watershed?

- ? The information I have learned makes me wonder if...
- ? Based on what we have seen in class and what I know, I think...
- ? I could investigate this issue further by...

Day 3 – Investigating Microplastics

MMP
https://my.syncplicity.com/share/vmaulksthygtebh/MicroplasticsMonitoringProtoc_230601.zip
or
https://drive.google.com/drive/folders/1YBS5Q2Uho3Na4fPq3YLSsClYZ0gv-u7h?usp=sharing

Lesson

Microplastics Investigation

Objective: students will learn the protocol to filter water samples in order to find microplastics. Students will look for and identify microplastics from the filtered water.

Anticipatory Set: (5 minutes) Previously we looked at photos of different types of microplastics found in water. Today we are going to take a look at water collected from _____. We will gain experience in filtering the water with a hand pump; then we will look at the filter paper under a microscope for microplastics in our water samples. Would we expect to see microplastics if we look directly at our water samples or even the filter paper? Why or Why not?

Divide the class into teams of 3-4 students - Each group should have a filtration set up, 500 mL of sample water, and a microscope.

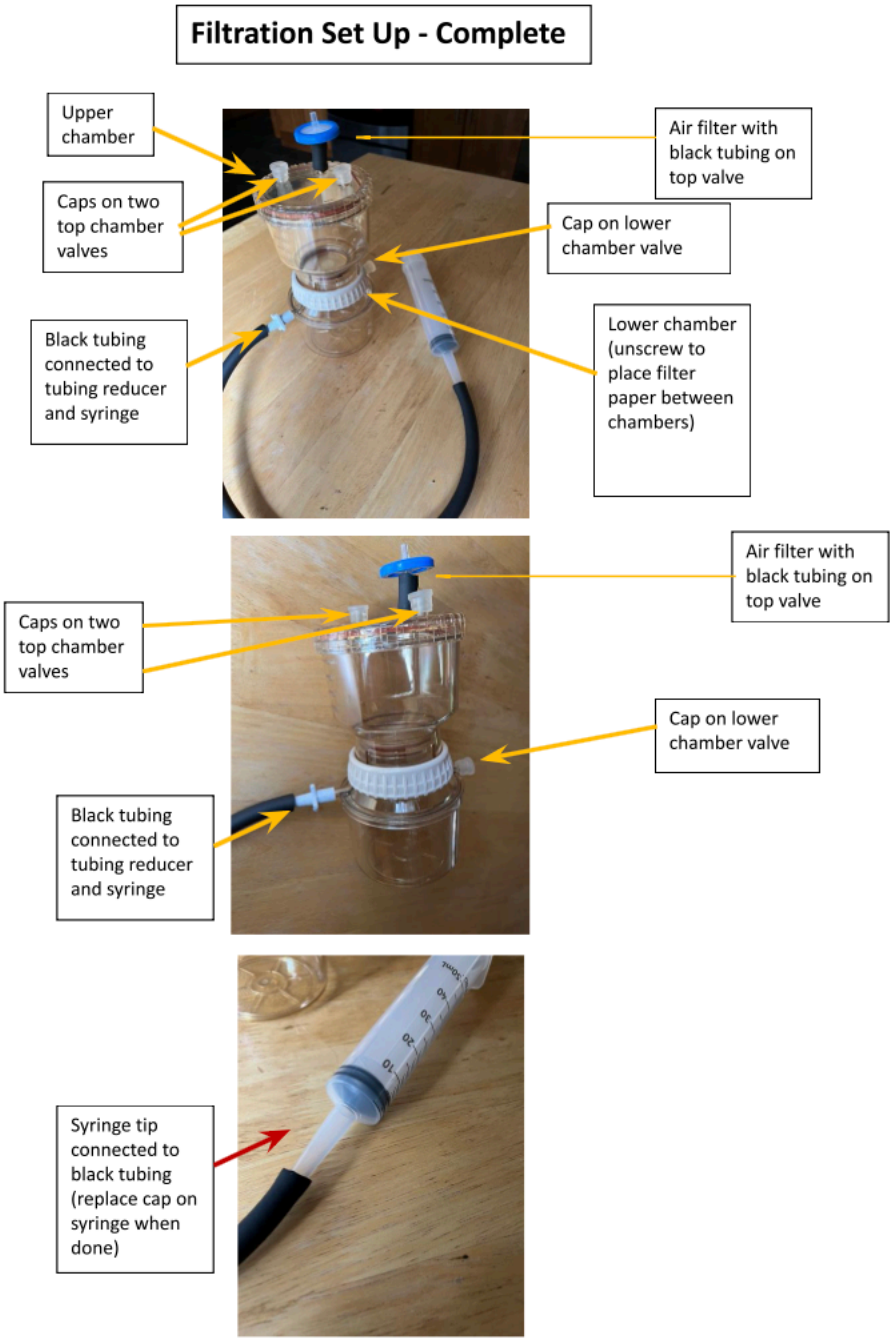
Instructions Filtration:
See the Microplastics Field Guide for filtration set up

- Assemble filtration set up using as shown in the field guide
  - Make sure all gaskets are in place
  - Label filter paper with x/y coordinates
  - Place 0.47 micron filter paper on tray between upper and lower chambers
  - Make sure system is sealed
- Place 500 mL of sample water in upper chamber (if you have a 250 mL filtration unit, place 250 mL in upper chamber and repeat)
- Use the 60 mL syringe to create a vacuum in the lower chamber to draw water from the upper chamber down to the lower chamber though the filter paper.
- When all water is drawn from upper chamber, remove chamber and carefully remove filter paper and put in petri dish for microscopy portion of lab

Instructions Microscopy:
- Team of 3-4
  - One person from the team will enter the data onto the excel spreadsheet. (or you can use your own data sheet)
  - Place the petri dish under the microscope lens
  - Take turns looking at the filter paper in the microscope

- When you see microplastics, first use the dichotomous key to determine the category
- Record the location of your observation using x/y coordinates
- Use the microplastics recognition guide to determine what you see
- Draw what you see of take a picture through the ocular lens

Filtration System Set-up



Filtration Field Guide

**MINIMIZE CONTAMINATION FROM THE AIR,
AND CONTACT WITH HANDS AND CLOTHING**

Objective: Filter 500 mL of sample water onto filter paper for analysis of microplastics
You'll Need

- Filter unit with rubber stoppers
- 60 mL syringe and rubber tubing
- Water sample (500 mL)
- Vinyl or latex gloves
- 0.47 micron Filter paper
- Tweezers
- Petri dish to store filter paper

PART 1 SET UP

1-Wear gloves.

2-Rinse the interior surface of the upper chamber of the filtration unit using deionized water.

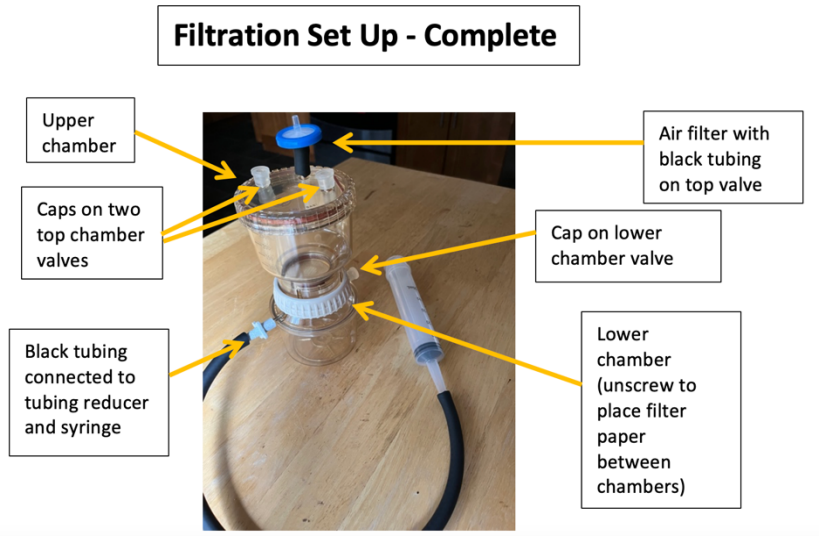
3-Assemble the filtration unit as shown in photo below.

4-Unscrew the upper chamber and carefully place the filter paper on the lower chamber tray with tweezers.

5-Take care to align upper chamber back on lower chamber and *gentle screw* upper chamber back on unit. Make sure orange o-ring is placed correctly.

6-Assemble the black tubing on the reducer valve on the lower chamber. Attach syringe to other end of tubing.

7-Remove the lid of the top chamber and fill chamber with sample water. (Total amount of water to be filtered: 500 mL)



PART 2 FILTRATION

8-Pull out the syringe piston to create vacuum on the lower chamber.

9-Remove the syringe from the black tube and eject the air mixture. Reconnect the syringe to the black tube.

10-Repeat the procedure to apply vacuum repeatedly, until all sample water in the upper chamber has passed through the filter paper to the lower chamber.

11-Lift the lid of the upper chamber and add deionized water using a spray bottle, to rinse the sides of the upper chamber, collecting particles that had become possibly adhered to the walls.

12-Re-apply vacuum until all deionized water passes through the filter paper to the lower chamber.

PART 3 SECURING FILTER PAPER

13-At the end of the filtration, unscrew the upper compartment.

14-Gently lift the filter paper using tweezers and place paper in open petri dish – CLOSE DISH IMMEDIATE to not contaminate the filter paper with air.

15-Place a label on the lid of the Petri dish, stating the sample code recorded on the sample bottle.

16-Rinse the filtering unit with deionized water and prepare it for the next sample.

Microscopy Field Guide

Microplastics in Surface Waters Sample Observation through Microscopy

Objective: Observe filtered water samples and analyze their content.

You'll Need

- Microplastics – Surface Waters Data Sheet
- Microplastics Recognition Guide
- Petri dishes containing the samples
- Latex or vinyl gloves
- Tweezers for handling membranes
- Microscopes

Instructions

PART 1 OBSERVATIONS

1- Put microscope on lowest magnification.

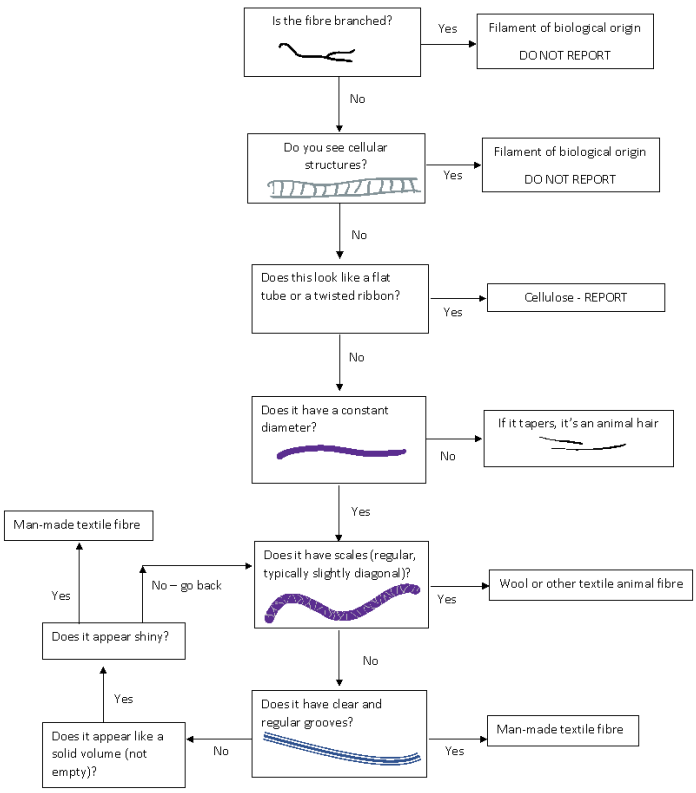
2- Using tweezers, take filter paper from its Petri dish and place it in the middle of the glass slide and place on stage.

3- Close the Petri dish to prevent contamination.

4- Quickly scan the sample to quickly gain an understanding of its contents

6- Start from the top-most point on the sample, and increase the magnification as you wish to help with item identification.

7- Take notes of your observations on the data sheet. Use the microplastics dichotomous key to help you identify what you see.



8- Draw your observations on your worksheet.

9- At the end of the observation, place the sample in its Petri dish and close the Petri dish.

PART 2 RECORDING YOUR OBSERVATIONS

10- Complete the summary datasheet and the Excel datasheet if you can.

11- On the Summary Datasheet that follows the table, you can calculate the TOTAL NUMBER OF PARTICLES FOUND PER CATEGORY

a. If you have used more than one membrane to filter 500 mL, sum the data collected for each membrane to obtain the total number of particles per category present in the 500 mL sample.

b. To obtain the total number of particles per category found in 1 m 3 of water, simply multiply by 2000 the particles you counted in every 500 ml sample.

12- Record the number obtained in the table in your Summary Datasheet.

Sample Student Worksheet (water testing and microplastics)

Water Analysis and Microplastics Student Worksheet

DATA MEASUREMENTS Name_____

PART I Fresh Water Sample from Sierra Snow Melt

A. pH, Temperature ° C, Electrical Conductivity µS, TDS ppm

From the sample water, use the electronic meter to measure the pH, temperature, electrical conductivity, and total dissolved solids of the sample water.

- PRESS THE LEFT BUTTON TO TURN ON THE METER
- ADJUST THE RIGHT **MODE** BUTTION SO THAT THE UNIT YOU ARE LOOKING FOR US AT THE TOP pH, µS, ppm
- CHANGE THE MODE FOR EACH MEASUREMENT

pH:	Temperature: ° C:	Electrical Conductivity (µS):	TDS ppm:

PART II

B. Water Transparency

- FILL TRANSPARENCY TUBE TO 60 ML (CM) LINE OR UNTIL YOU CAN NO LONG SEE BLACK AND WHITE CROSS MARK AT THE BOTTOM OF THE TUBE
- SLOW RELEASE WATER FROM HOLE ON THE BOTTOM WHILE ONE PERSON LOOKS THROUGH TUBE
- STOP RELEASEING WATER WHEN LACK AND WHITE CROSS MARK AT THE BOTTOM OF THE TUBE CAN BE SEEN
- READ THE LEVEL OF WATER IN THE TUBE

Result: (in cm)

C. Dissolved Oxygen – include units

Using the LaMotte test kit, follow the procedures to measure the amount of Dissolved Oxygen in the water sample provided.

Result:

E. Alkalinity – include units

Using the LaMotte test kit, follow the procedures to measure the Alkalinity in the water sample provided.

Result:

F. Nitrates – include units

Using the LaMotte test kit, follow the procedures to measure the amount of Nitrates in the water sample provided.

Result:

G. Salinity – report as a %

Using hydrometer and graduated cylinder, follow the procedures to measure the amount of salinity in the water sample provided.

Result:

PART III

H. Microplastics

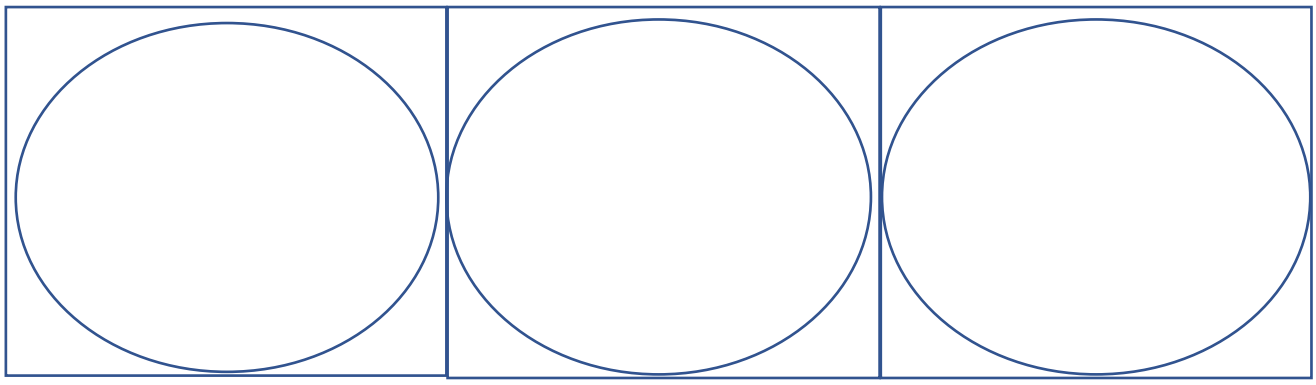
1. Do all plastics sink? _____ Explain your answer based on what you have learned so far.

2. Justify the statement: "Plastics are a global issue."

3. Who are the major exporters of plastics and who do they export to?

4. Can you name 3 habits you have that use plastic and in danger of getting into our water ways?

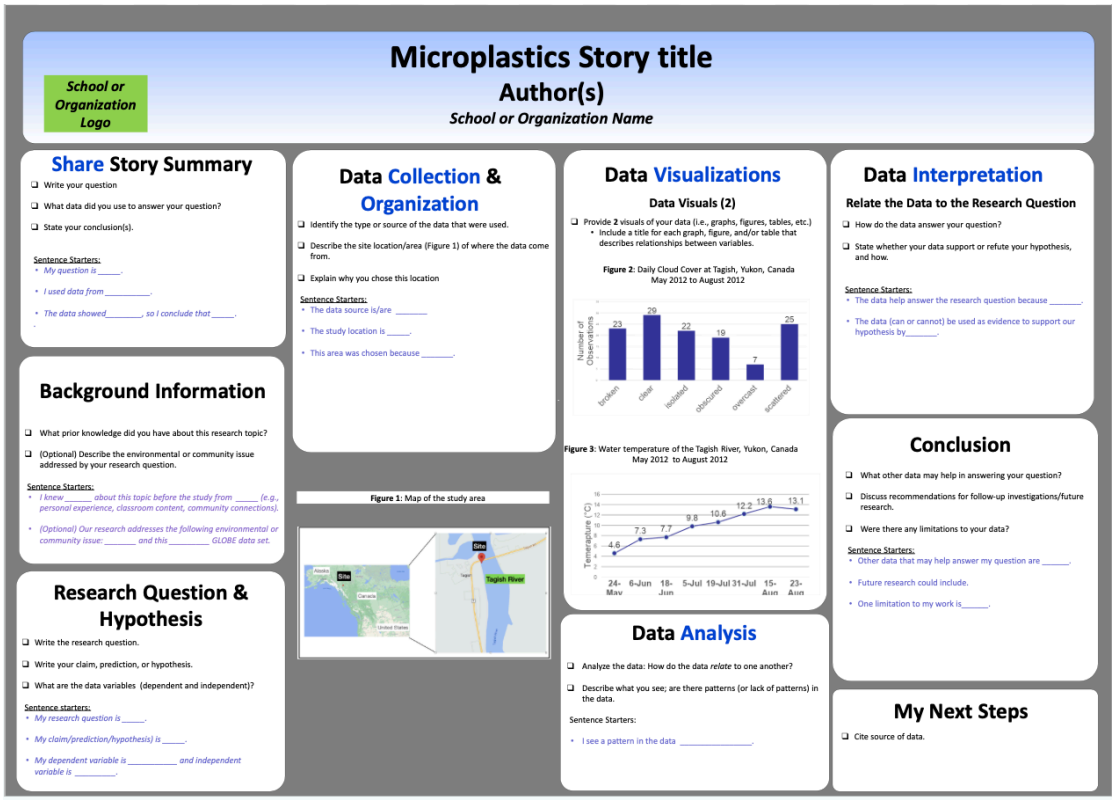
5. **Draw and label** 3 colorful images of three different things that you see in the microscope:



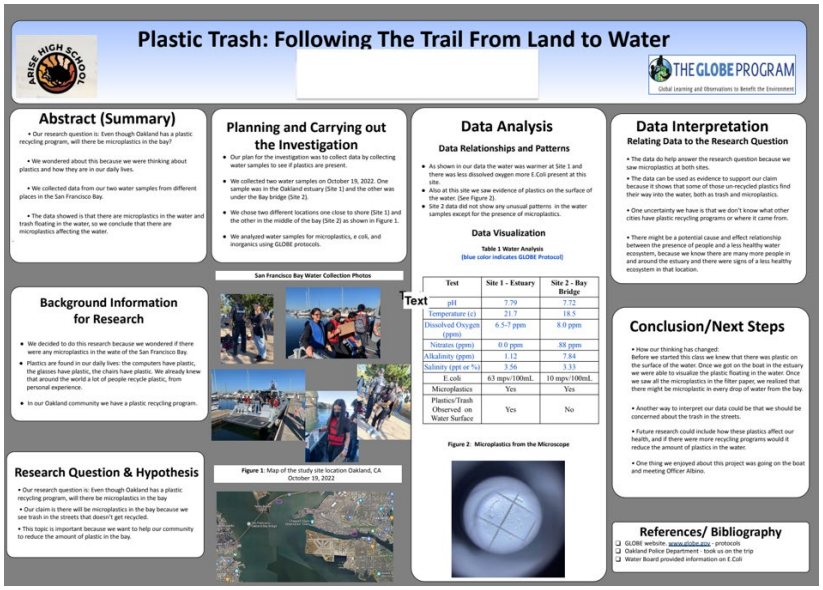
6. **Take Action:** Provide a non-plastic alternative to each habit you have that uses plastic. What might be the negative and positive consequences of these alternatives on the environment and global economy if *everyone* adopted these alternatives?

Day 4- Storytelling – Putting it all Together

Link to Slide:
https://docs.google.com/presentation/d/1VCFXxoKYWpVXnRwrxN5hXkoXAEMmGoko/edit#slide=id.p1



Sample Student Storytelling Poster



Optional and Recommended: Water Testing and Analysis through the GLOBE Program

Hydrosphere

Water is a crucial resource for life and a key player in many important chemical reactions. These reactions help shape the land and change the composition of water bodies, which in turn affect the wildlife that live in those bodies.

Altering any characteristic of the water cycle impacts many other natural processes. The valuable data provided by GLOBE students is helping us enhance our understanding of these connections and Earth's natural waters. To make sure this data is comparable from site to site, GLOBE students and scientists use GLOBE-approved instruments and follow rigorous protocols.

Site Definition

https://www.globe.gov/documents/11865/3464b426-6d54-4ba2-9cca-8d398fb38ef8

GLOBE Protocols

Alkalinity - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/alkalinity

Conductivity - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/conductivity

Dissolved Oxygen - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/dissolved-oxygen

Freshwater macroinvertebrates - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/freshwater-macroinvertebrates

Mosquitos - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/mosquitoes

Nitrates - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/nitrates

pH - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/ph

Salinity - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/salinity-including-titration

Temperature - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/water-temperature

Transparency - https://www.globe.gov/do-globe/globe-teachers-guide/hydrosphere/water-transparency

GLOBE Hydrosphere Learning Activities

Activities to help students learn more about the instruments and protocols

Hydrosphere Learning Activities (pdf)
Introduction document to the Hydrosphere Investigation Area Learning Activities.

Model a Catchment Basin (pdf)
Students will make a 3-dimensional model of a catchment basin to understand how water moves through the basin and explore how water is affected when there are changes in the basin.

Modeling Your Water Balance (pdf)
Students will model the changes in soil water storage over a year.

Practicing Your Protocols (pdf)
In the classroom, students practice using the instruments or kits for protocols, exploring the range of measurements and sources of variation and error.

The pH Game (pdf)
Students will create mixtures of water samples, soil samples, plants and other natural materials to better understand the importance of pH levels.

Water Detectives (pdf)
Students will investigate how they use their senses for observation and why we use instruments to collect data.

Water Walk (pdf)
Students become acquainted with their Hydrosphere Study Site.

Equipment List from Fisher Scientific for Microplastics Investigation

Catalog No. 09-740-23A
Filtration Unit: https://www.fishersci.com/shop/products/nalgene-reusable-filter-holders-receiver/0974023A
$863.00 per pack of 4 need 2 packs = $1,726

Catalog No. HAWG04700
Filter paper: https://www.fishersci.com/shop/products/mf-millipore-membrane-filter-0-45-m-gridded/HAWG04700
$270 per pack of 100 = $270

Catalog No. 09-928-167
Air Filter: https://www.fishersci.com/shop/products/whatman-uniflo-syringe-filters-with-gf-pre-filter-0-45-m/09928167?searchHijack=true&searchTerm=09-928-167&searchType=RAPID&matchedCatNo=09-928-167
$318 per pack of 100 = $318

Catalog No.14-823-44
Syringe: https://www.fishersci.com/shop/products/bd-syringes-luer-lok-tips-4/1482344
$70.20 per pack of 40 = $70.20

Catalog No.15-078-271
Tubing: https://www.fishersci.com/shop/products/traceable-silicone-pump-tubing/15078271
$75.70 for 1= $75.70

or

https://www.fishersci.com/shop/products/dehp-free-pvc-tubing-12/14387338#clear%20tubing

Catalog No.05-719-709
Sample Bottles: https://www.fishersci.com/shop/products/fisherbrand-pre-cleaned-wide-mouth-leakproof-bottles-4/05719709#500%20 ml%20past%20 sample%20 bottles
$239.64 per pack of 48= $239.64

Catalog No. S08184
Petri Dishes: https://www.fishersci.com/shop/products/united-scientific-disposable-petri-dishes-4/S08184#?keyword=
$3.95/pack of 10 for 3 packs= $11.85

Cell Phone Microscopes: https://a.co/f1qNIQz $7.99 each