Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

Instruction Packet

Stanford Beach Water Quality Monitoring Project

LINDA MAR / PACIFICA STATE BEACH, PACIFICA

North side of San Pedro Creek

Please complete the online Pre-project Survey if you have not already completed it.

Contents of Instruction Packet:

Contents of Sampling Kit:

- 1-liter clear sampling bottle, white bottom (x1)
- Brown sample storage tubes (13 pairs of tubes: 1 pair per week for 12 weeks, + 1 extra pair if necessary)
- Color comparator (x1)
- Refractometer in gray box (x1)
- White dropper bottle of salinity calibration solution (x1)
- Water resistant data sheets (x14: one per week for 12 weeks, + 2 extra if necessary)
- Pencils (x2: pencil is best for writing on water resistant data sheets)
- Plastic zip-top bag to protect phone from water
- Mesh carrying bag

Issues or questions, please contact:
beachproject@stanford.edu
https://beach.stanford.edu

THANK YOU FOR PARTICIPATING!

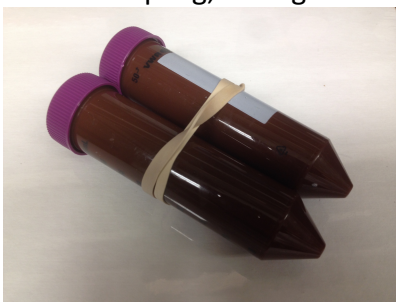
GENERAL INSTRUCTIONS

1. Please conduct 12 sampling trips: one sampling trip each week for 12 weeks. On each sampling trip, please take at least 5 samples using the white-bottomed, clear bottle. You will make color and salinity measurements on each sample. Also record the GPS coordinates of each sample location.

2. You may pick any day and time of the week to sample. *Please try to space out your sampling days so that you sample about once per week, and not on consecutive days.*

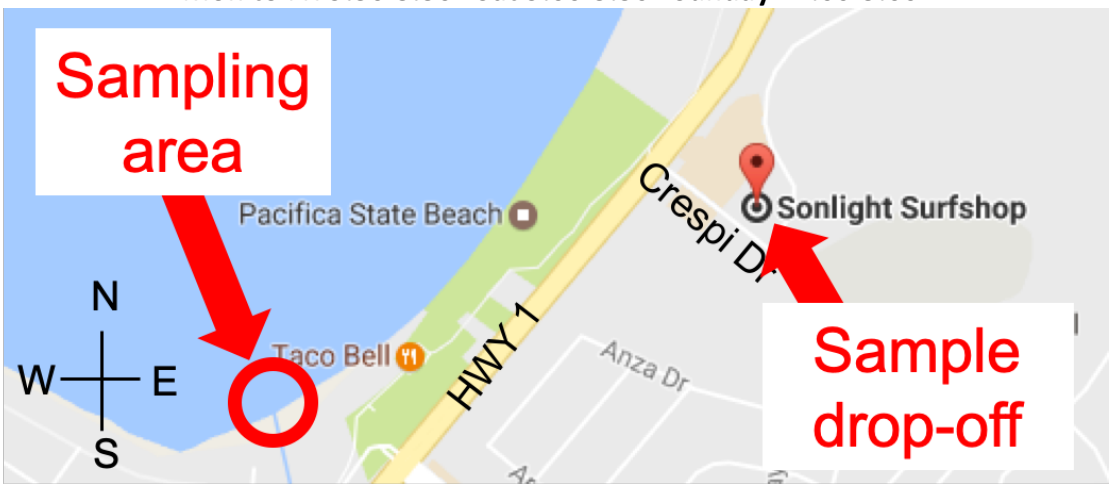
3. Each sampling trip, you will also fill 2 brown tubes with water from the near-Creek sample, after making your color and salinity measurements on that sample.

4. Each sampling trip, please drop off the 2 brown tubes and data sheet at the DROP-OFF LOCATION as soon as possible after sampling, during the business hours listed below.



5. DROP-OFF LOCATION:

Sonlight Surfshop, 575 Crespi Dr #1 · Pacifica, CA · 94044
Mon to Fri 9:30-5:30 · Sat 9:00-5:30 · Sunday 11:00-5:00



- Please drop your pair of brown tubes (caps tightly closed!) and datasheet in the large plastic tub located inside the store. If the store is closed at the day or time you collect your samples, please store in a dark, cool place and drop off as soon as possible when it is open.

SAMPLING DETAILS

SAFETY FIRST! Only take samples when and where you are comfortable. If you are not comfortable taking any sample, then skip it.

Where on the beach should I sample?

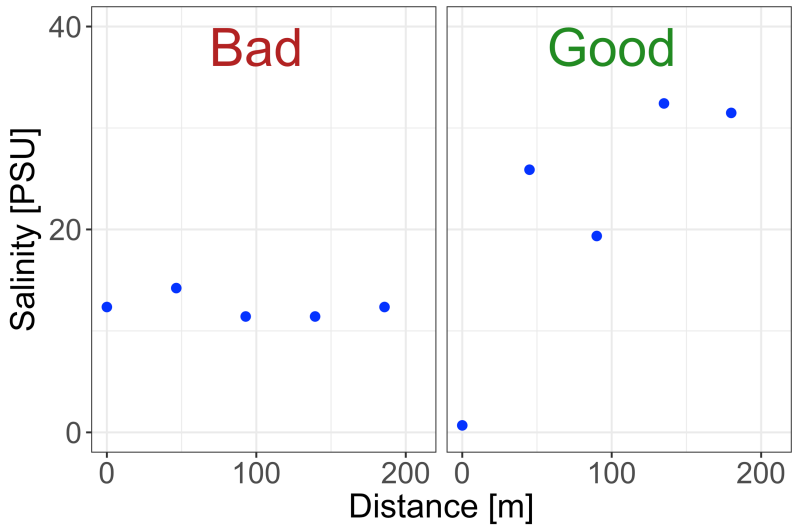
Please sample on the NORTH SIDE (toward Taco Bell) of the Creek.
Feel free to sample on the south side as well, but please make sure to complete the north side. Other people will sample on the south side.

Take at least **5 samples** for your measurements using the white-bottomed, clear plastic bottle, filling the bottle to the top. Record the GPS coordinates of your sample locations.

Sample 1. Near-Creek sample: ankle deep, facing the ocean, where the Creek meets the ocean (as close as possible to where the center of the Creek intersects the ocean). This will likely be your lowest salinity sample. After making color and salinity measurements, fill 2 brown tubes with this sample.

Other samples: Overall, the goal is to obtain a salinity profile that contains a full range of salinities, from the salinity of the near-Creek sample up to the salinity of local ocean water (about 34 Practical Salinity Units, PSU – labeled on your refractometer as "0/00"). The location of these samples may change each week, and will depend on the amount of flow coming from the Creek. If Creek flow is low, you might try taking 25 regular walking steps between each sample; if flow is high, you might try taking 50 steps. However, you will need to determine appropriate locations.

An example is shown by the "good" salinity profile below. In this plot, the salinity of the near-Creek sample is close to 0. However, depending on conditions, the near-Creek salinity may be much higher than 0 (for example, if Creek flow is low), so just do your best to record the range of salinities present.



How deep should samples be taken?

Ankle-deep: All samples should be taken in ankle-deep water.

Incoming wave: If waves are present, try to take samples on incoming waves as the water washes up the beach past you.

When should I use the solution in the small white dropper bottle?

The small white dropper bottle contains salinity calibration solution. The salinity of this solution is 17 PSU (Practical Salinity Units – yes, that is the scientific name!).

Measure the salinity of this solution 2 times each day you go out to sample.

1. Measure it once immediately *before measuring your first* water sample. Use the small screwdriver to adjust the calibration screw on top of the refractometer until the refractometer reads 17 PSU (0/00).
2. Measure it a second time immediately *after measuring your last sample*. Write this number down on your data sheet. Do not worry about adjusting the screw this time.

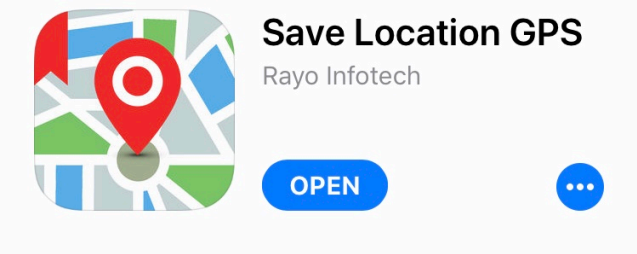
Making measurements: GPS COORDINATES

SUPPLIES:

1. Smart phone with GPS app named “Save Location GPS”
2. The zip-top bag can be used to protect your phone from water

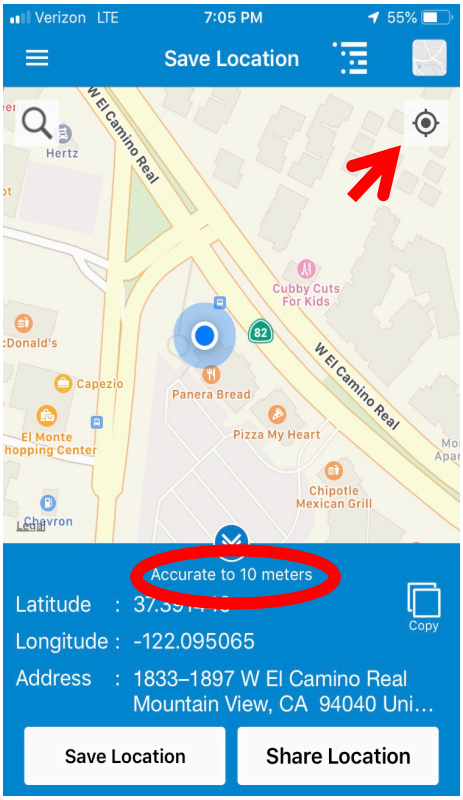
PROCEDURE:

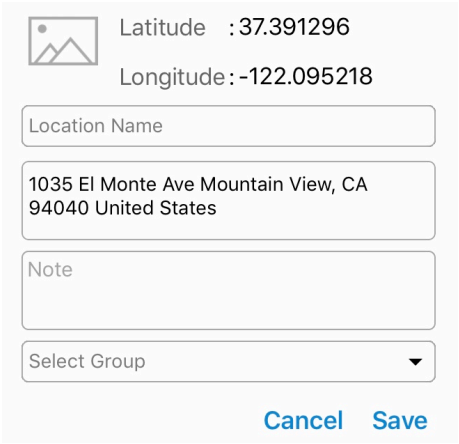
1. Download the free app called “Save Location GPS” developed by Rayo Infotech. If you do not have a smartphone or do not use Apple or Google app store, email beachproject@stanford.edu for help.



2. Open the app and allow app to access your location when the pop-up appears. Allow it to load until the accuracy says “Accurate to 10 meters”. This should only take a few seconds.

3. Standing in the same spot you collected your sample, click on the pinpoint location icon highlighted by the red arrow in the photo to the right. This will update your location. Next, click on “Save Location”. This box will appear:





4. Do **not** click “Save”. You can now leave the sampling location to record the latitude and longitude coordinates on your data sheet without the coordinates changing. These location coordinates will not disappear even if your phone screen goes into locked mode. After you record the GPS coordinates on your data sheet, click “Cancel”.

5. Repeat steps 3-4 for each sample. Make sure accuracy is at 10 m before you record the next sampling location.

Making measurements: WATER COLOR

SUPPLIES:

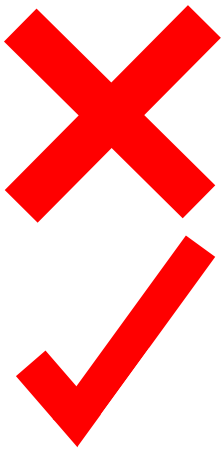
1. 1-liter clear bottle, bottom painted white
2. Color comparator

PROCEDURE:

1. Standing in water ankle deep, fill 1-liter bottle to the top from an incoming wave.

   !!! Avoid getting a lot of sand. You should be able to look from above and see the white bottom of the bottle through the water.



2. Set the bottle down on flat ground. Use your body to cast a shadow over the bottle. Looking from directly above the bottle, match the color of the water to the most similar color on the comparator.

   !!! It helps to blur your vision (let your eyes go out of focus) when matching color.

3. Record that color's number (1, 2, 3, or 4) on the datasheet. This measurement is very coarse, but please record only one number, and do not record half numbers.

!!! Do not dump the water out yet. Use the same water to measure salinity.

Making measurements: WATER SALINITY

SUPPLIES:

1. Same water used to observe color in the white-bottomed bottle
2. Refractometer + screwdriver + plastic pipette + wipe cloth (all inside gray plastic case)

NOTE: CALIBRATION SOLUTION

- Don't forget to calibrate the refractometer! Please read the box titled "When should I use the solution in the small white dropper bottle?"
- You only need 3 drops of calibration solution to perform the calibration measurement.

PROCEDURE:

1. Using the same water you used for the color measurements, measure salinity with the refractometer.

2. First, fill the pipette with sample water and expel it onto the beach 3 times. This ensures you are not measuring any water left in the pipette from the previous sample.

3. Lift the hinged plastic lens cover and place 3 drops of water on the glass lens. Close the cover slowly and wait 30 seconds for the reading to stabilize.

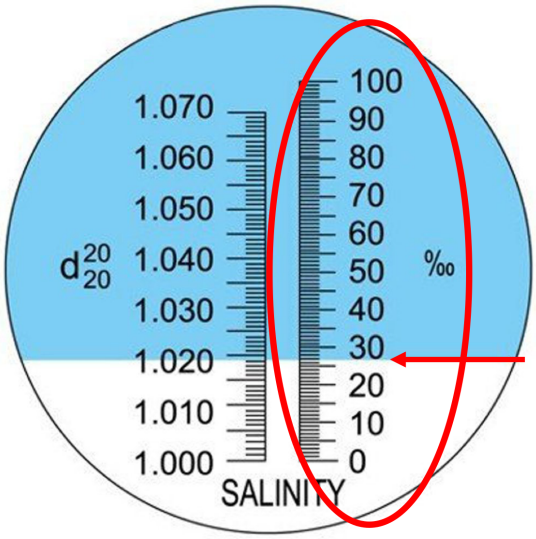
   !!! DO NOT SUBMERGE THE REFRACTOMETER. If the body of the refractometer gets wet, water may get inside. See the Troubleshooting page.

   !!! Make sure there are no bubbles on the lens. Closing the lens cover slowly helps avoid bubbles. If bubbles appear, try lifting and replacing the cover slowly.

4. Looking through the viewfinder, find the number where the blue and white shaded regions meet. Look at the number on the right side, labeled "0/00".

   !!! Directing the refractometer toward light makes the blue-white line easier to see.

   !!! The refractometer's focus can be adjusted by turning the eyepiece.



5. Record the salinity on the datasheet. In the diagram above, the salinity would be 27.

6. Using the refractometer's cloth (or other soft, lent-free cloth), dry the lens and lens cover completely before measuring another sample.

!!! If this water is the near-Creek sample, then do not dump the water out yet. Instead, use this water to fill two brown tubes.

If this is not the near-Creek sample, or after you have filled the 2 brown tubes with water from the near-Creek location, you may dump the water out and proceed to the next sample.

Datasheet – Linda Mar

Example datasheet

- Participant ID (from brown tube label): 219
- Sample ID (from brown tube label): 4429
- Primary Sampler** present for sampling? Yes / No
- Date [mm/dd/yy]: 2/25/19
- Waves present? Yes / No Side of Creek: North / South
- Start time: 8:35 AM X PM__

REMEMBER:

1. Store water from near-Creek sample.
2. Calibrate refractometer to 17 ppt before 1st measurement.
3. Measure calibration solution after last measurement.

		GPS coordinates [Latitude | Longitude]	Color # [1-4]	Salinity [0-100]
Location (take at least 5)	Near-Creek	37.596283 | -122.505564	3	5
	2	37.596558 | -122.505863	1	15
	3	37.596527 | -122.505839	1	25
	4	37.596497 | -122.505578	1	31
	5	37.596832 | -122.505284	1	34
	6	|		
	7	|		
	8	|		
	9	|		
Calibration solution (after last measure.)		NA	NA	19

- End time: 9:05 AM X PM__

***The Primary Sampler is the person who signed up for this project and responds to electronic communication.*

TROUBLESHOOTING AND MAINTENANCE

Refractometer

- Avoid storing the refractometer in a hot environment or directly in the sun. The refractometer is quite sensitive to ambient temperature, which is why we measure the calibration solution before and after sampling.
- Let the refractometer, the wipe cloth, and the foam in the case dry out after use by leaving the gray box and lens cover open. This will reduce the chances of moisture entering the refractometer and mold growth.
- If the instrument becomes foggy and you cannot fix it by adjusting the focus, water may have entered the refractometer. If water enters the refractometer, please contact us.

Color comparator

- The color comparator is water resistant. However, try to avoid getting it wet as it may warp or the adhesive may fail. If it somehow becomes unusable, please contact us.

Stanford University

Research Information Sheet

STUDY TITLE:
Water quality monitoring with citizen scientists: Impacts of coastal discharges

RESEARCHERS & PROTOCOL DIRECTORS: Ali Boehm, Wiley Jennings
Institutional Review Board Protocol No. 37740. Approval Date: April 20, 2018; Expiration Date: March 31, 2019

DESCRIPTION: You are invited to participate in a research study on the movement and mixing of stream runoff in the surf zone at beaches in California. Our objectives for this research are to improve our understanding—and eventually our management—of coastal water quality. You will be asked to collect water quality data and samples and to answer online survey questions about the study. The data you collect will be confidential and you and your participation will not be known to anyone outside the Research Team.

TIME INVOLVEMENT: Your participation will take a maximum of 10-15 hours total this winter.

RISKS AND BENEFITS: Collecting water samples poses the normal risks of going to the beach. The benefits which may reasonably be expected to result from this study are more informed development of coastal water quality management practices. We cannot and do not guarantee or promise that you will receive any benefits from this study.

PAYMENTS: You will not receive any payment for your participation in this study.

SUBJECT'S RIGHTS: If you have read this form and have decided to participate in this project, please understand that your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. The alternative is to not participate. You have the right to refuse to answer particular questions. Your participation is confidential: your name and identity will not be known by anyone besides the Research Team, nor will they be made known in *any* materials resulting from the study without your explicit permission. By consenting to participate you acknowledge that you are 18 years old or older, that you are comfortable collecting data and water samples at your local beach, that you understand the normal risks of going to the beach, and that you will obey all posted signs and instructions when you visit the beach.

CONTACT INFORMATION:
Questions: If you have any questions, concerns or complaints about this research, its procedures, risks and benefits, contact the Protocol Director, Wiley Jennings at wileyjen@stanford.edu.

Independent Contact: If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the Stanford Institutional Review Board (IRB) to speak to someone independent of the research team at 01-650-723-2480 or toll free at 01-866-680-2906. You can also write to the Stanford IRB, Stanford University, Stanford, CA 94305-5401. Additionally, in the event of an injury or issue *while you are collecting water samples* for the Stanford Beach Water Quality Monitoring Project, please let us know. Contact the project team: beachproject@stanford.edu or Stanford University's Office of Risk Management: (650) 723-4554, 215 Panama Street Building D, Stanford, CA 94305

Please keep a copy of this information sheet for your reference.