What are the physical characteristics of a site?

The physical characteristics of a sampling site are the geographic features. This includes trees, shrubs, dunes, lagoon, buildings, parking lot, etc.

**Objective:**
1) Describe the shoreline of your sampling location
2) Create a site map
3) Work with the Documentation Team to take photos of your site from several angles

**Materials:** * Pencil
* Clipboards
* GPS unit/ Phone with capabilities

**Procedure:** Carefully read all directions before beginning the procedure!

**Shoreline Description:**
1. Walk down to the shoreline. This is going to be your sampling site.

   **Type**
   A. Identify the latitude and longitude of your sampling site

   B. Check all of the characteristics that apply.

<table>
<thead>
<tr>
<th>Sandy</th>
<th>Bulkhead</th>
<th>Vegetated (grasses, shrubs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Road Ending</td>
<td>Rocky</td>
<td>Pipe entering lagoon</td>
</tr>
<tr>
<td>Gentle beach slope</td>
<td>Steep slope</td>
<td>Pier Rock</td>
</tr>
<tr>
<td>Riprap (large amounts of rocks piled up)</td>
<td>Garbage</td>
<td>Oyster reef</td>
</tr>
</tbody>
</table>

* What are some other noteworthy features or characteristics of your sampling site (ex. muddy)

Dead Oyster Shells, Breakwaters, Sandy

C. Lagoon bottom is predominately (circle one)

<table>
<thead>
<tr>
<th>Sandy</th>
<th>Muddy</th>
<th>Rocky</th>
<th>Weedy</th>
<th>Muck</th>
<th>Unable to determine</th>
</tr>
</thead>
</table>

D. What percentage of the lagoon bottom is covered in vegetation?

- [ ] 0-25%
- [ ] 25-50%
- [ ] 50-75%
- [ ] 75-100%

E. What percentage of the lagoon surface is covered in vegetation?

- [ ] 0-25%
- [ ] 25-50%
- [ ] 50-75%
- [ ] 75-100%
Sketch a Site Map:

Locate your sampling site. Sketch a detailed map of your location. Include features found within 100 feet on either side of you. Be sure to identify any physical characteristics that may help others identify your sampling site and label them accordingly.
1. Carefully withdraw the sediment core from the water. Keep the core upright as you move it to collection tray or bin for observation. Position one hand on the bottom of the core and the other on the top (see photo above) to keep the sample steady.

2. If possible, slide the sediment core out of the tube onto the tray or bin.

A. Sketch a detailed picture of the sediment sample. 
*Remember: Be sure to include the different layers, plants, animals, and other items you see.

![Sketch of sediment sample](image)

B. Total length of your sediment core \( \frac{16.51}{\text{cm}} \)

C. Length of oxidized layer (if present) \( \text{cm} \)  
*Coloration was the same.

D. Length of anoxic layer (if present) \( \text{cm} \)  
*Interesting Fact: The anoxic layer may have a sulfur-like or 'rotten egg' smell. This is from bacteria that thrive in anoxic zones and produce hydrogen sulfide (H₂S) as a respiratory waste product.

F. Observe and dissect the sediment core. Fill out the chart below based on your findings.

<table>
<thead>
<tr>
<th></th>
<th>Absent</th>
<th>Rare</th>
<th>Common</th>
<th>Abundant</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>(feels thick &amp; dense)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mud</td>
<td>(smooth between fingers)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>(gritty; fine sand paper)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>(pea-sized granules)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pebbles</td>
<td>(larger than pea-sized)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bivalve Shells (Ex. clam, oyster)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Shells (single shell)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Macroalgae (Ex. seaweed, coral)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muck</td>
<td>(black in color; thick muck)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant Material (Ex. leaves, grass)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
What is an Aquatic Biological Survey?
During an aquatic biological survey, the investigator identifies and counts each species of fish or macro-invertebrate that is caught during collection. This gives the biologist a better idea as to species diversity and overall health of a given site along the lagoon.

What is a macro-invertebrate?
A macro-invertebrate is an organism that is easily visible without magnification and does not have a vertebrate or backbone! Examples of common, aquatic macro-invertebrates include crabs, horseshoe crabs, barnacles, clams, oysters, snails, shrimp, jellyfish, sand hoppers, worms, and much more!

Objective: 1) Conduct an aquatic biological survey to get a total number of each species caught, largest individual species, and overall total number of species
2) Calculate Catch Per Unit Effort (CPUE)

Materials: * Pencil
* Measuring tape
* Collection buckets
* Net(s) for collection (seine (Preferred), dip nets, plankton, cast, etc.)
* Binoculars
* Reference guide

Procedure: Carefully read all directions before beginning the procedure!

Fish & Macro-invertebrate Inventory Using a Seine Net:
1. Students in Group #3 must have all of the Aquatic Biological Survey rules reviewed with them prior to starting this station. Below are a few of the most important rules:
   * Respect all animals and equipment
   * Do not stand on the seine net
   * When the seine net is hauled to the beach, students are to gather at its edge gently

2. Prior to seining, answer the following questions:
   A. Length of the seine net __ feet/meters Width of the seine net __ feet/meters
      Mesh size ___ mm
   B. Names of those using the seine net: Nicolette, Amanda, Rayssa, Melody, Samantha, nice
3. While the seine is being pulled;

**Remember:** Be sure to ask for assistance if you are unsure how to use a seine properly.

A. Record the distance the seine is pulled \[100 \text{ ft}\] (units)

B. Fill buckets with water

4. Haul seine to the shoreline.

A. First, collect all **fish** and gently place into buckets

B. Second, collect all **macro-invertebrates** and gently place into buckets

**Remember:** Work quickly to get all living organisms into buckets or bins of water.

5. Use the reference guides to help identify each organism to the best of your abilities. Fill out the data chart. Have your **Documentation Team** take pictures of each species that you observe, especially those that you are unsure about!

**Remember:** If you have trouble identifying organisms to the species level, list them in the most specific level of classification possible. Many killifish species also look similar to one another. If you are unsure, group them together as ‘killifish’.

6. Record the total number of each species counted during each seine pull in the data chart.

7. Measure the **largest individual** of each species. For most species it will not be possible to determine **gender**, but for those that you can (ex. crabs) it is useful to know the ratios of the sexes of the samples.
Collection Method #1

*Record length of collection net and mesh size of the equipment used

Seine net (preferred method) ☑

Optional Methods: Dip net Crab Trap Cast Net Other

<table>
<thead>
<tr>
<th>Length</th>
<th>(mm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Total # of individuals</th>
<th>Length of largest individual</th>
<th>Units (w/r bbl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. Blue Crab (2 males)</td>
<td>2</td>
<td>8.5 cm</td>
<td></td>
</tr>
<tr>
<td>1 Sargassum Crab</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Checkered Reef fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total fish in collection #1

Comments: ________________________________________________
Your responsibility is to record images and information about the field day. By taking digital pictures, short videos, asking questions and even interviewing the experts that are assisting your teams, you will gather information that may prove very valuable to the scientific data collected, and to questions that your classmates may ask later. You will also have handy images that can be used to demonstrate the groups' accomplishments.

**Objective:**
1) Take pictures of each group sampling in the field
2) Interview students, experts, and teachers during the sampling day
3) Take pictures of all the macro-invertebrates and fish observed in Group 3
4) Document the sampling site

*Note: Please review ‘Important Suggestions’ at the bottom of this section

**Materials:**
* Pencil
* Field notebook
* Digital cameras/ GoPro/ Documenting tools

**Procedure:**
1. Break students up into 4 different groups. Assign them one group to document during the length of the sampling day.

2. Write the name of each student assigned to document the various groups:
   - Group 1 (Physical Data): Sebastian, Ella, Jane, Isamar
   - Group 2 (Site Description): Eliass, Kimberly, Jacob
   - Group 3 (Biological Sampling): Aiden, Amanda, Samanthu
   - Group 4 (Chemical Data): Nicole, Francesca, Melyba

3. Students are journalists documenting the procedures and discoveries made throughout the day. Use your sense of artistry and creativity to get interesting angles, compositions and scenery.

   A. Ask your assigned group or team if they have any questions for the experts. When time permits, ask these questions. Record the answers you get in your field journal. If the experts are unable to answer, you will submit these questions after the trip to your teacher who will find someone who can answer them.
Water temperature, dissolved oxygen, and pH are important factors to study when learning about a specific study site. Organisms are adapted to survive in specific ranges of temperatures, pH, and dissolved oxygen (DO) before they become stressed.

**Objective:**
1) Record water temperature in BOTH Fahrenheit and Celsius
2) Measure dissolved oxygen
3) Measure pH

**Materials:**
* Pencil
* Clipboards
* Water thermometer
* LaMotte Water Quality Kit (DO & pH) [required method]
* pH reference guide (optional)

**Procedure:** Carefully read all directions before beginning the procedure!

1. **Water Temperature:**
   - Record in situ water temperature in BOTH Fahrenheit and Celsius every 15 or 30 minutes and then average the results (see chart below).

   *Note:* It may help to have the thermometer securely tied to a string or lanyard for ease of use.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Location</th>
<th>Time</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fort Pierce Yacht Club</td>
<td>10:45</td>
<td>24.851</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fort Pierce Yacht Club</td>
<td>11:34</td>
<td>28.457</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fort Pierce Yacht Club</td>
<td>11:50</td>
<td>28.322</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If your thermometer is not able to read both Fahrenheit and Celsius, then you will need to use the conversion chart to assist you.

To calculate Celsius from Fahrenheit: \[ ^\circ C = \left( ^\circ F - 32 \right) \times 0.556 \]

To calculate Fahrenheit from Celsius: \[ ^\circ F = \left( 1.8 \times ^\circ C \right) + 32 \]
2. Dissolved Oxygen (DO):

The amount of DO in a lagoon is one of the most important indicators of its health. Many variables influence DO including temperature, time of day, abundance of vegetation, and wind conditions. DO measurements are read in units of mg/L, ppm and/or as percent saturation. Plants and wildlife will add oxygen to the water and animal respiration can subtract oxygen from the water. Therefore, all night plants do not produce oxygen, and the organisms in the water continue to respire.

A. Circle the DO measuring method(s)

Drop count test kit ampoules
Other
Digital Titrator
LaMotte Water Quality Kit (required)

*Note: Be sure to eliminate all air bubbles before testing!!!

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Temperature °C</th>
<th>DO mg/L or ppm</th>
<th>% Saturation (see chart below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>16:13</td>
<td>27.9</td>
<td>6.25</td>
<td>95.5</td>
</tr>
<tr>
<td>Trial 2</td>
<td>11:34</td>
<td>28.4</td>
<td>7.1</td>
<td>107.3</td>
</tr>
<tr>
<td>Trial 3</td>
<td>11:31</td>
<td>28.2</td>
<td>6.1</td>
<td>98.4</td>
</tr>
</tbody>
</table>

B. Determining percent saturation:
For a relatively quick and easy determination of the percent saturation value for dissolved oxygen at a given temperature, use the saturation chart below. Pair up the measured mg/l of DO with the temperature of the water (in °C). Draw a straight line (use a straight edge) between the two values. The % saturation is the value where your drawn line intercepts the angled saturation scale. Waterways with a saturation value of 90% or greater are generally considered healthy.
3. Water pH:
Most aquatic organisms are adapted to survive in a pH range between 6.8 - 8.0.

A. Circle the pH measuring method(s)

<table>
<thead>
<tr>
<th>Litmus paper</th>
<th>pH meter</th>
<th>LaMotte Water Quality Kit {required}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator solution</td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

B. Test water pH three times at three different locations within your site and average the results.
Record results below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Reading 1</th>
<th>Reading 2</th>
<th>Reading 3</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaMotte Water Quality Kit {required}</td>
<td>11:07</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Test Method (optional)</td>
<td>10:43</td>
<td>7.92</td>
<td>7.99</td>
<td></td>
<td>7.93</td>
</tr>
</tbody>
</table>
Salinity and turbidity are factors that scientists study to better understand a specific study site. Organisms are only adapted to survive if a specific range of salinity and increased turbidity can negatively influence the biodiversity of the lagoon.

Objective: 1) Measure salinity
               2) Determine turbidity

Materials: * Pencil
           * Clipboards
           * Salinity measurement Tool (Hydrometer, refractometer, test strip, etc.)
           * Turbidity measurement tool (Secchi disc, short sight tube, and/or long sight tube, etc)

Procedure: Carefully read all directions before beginning the procedure!

1. Salinity:

   Salinity is the measure of 'total salts', 'conductivity', or more specifically the concentration of Chloride ions (Cl⁻). In freshwater parts of the river, the unit of measurement may be parts per million (ppm) or milligrams per liter (mg/L). These two units are equivalent. In saltier parts of the bay, you may measure salinity in parts per thousand (ppt); one part per thousand equals 1000 mg/L.

   A. Circle the measuring method(s) used for salinity

      Hydrometer    Test strips  LaMotte Water Quality Kit (requires distilled or deionized water)

      Refractometer  Other_________________________

   B. Record salinity three times at three different locations within your site and average the results. Record results below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Reading 1</th>
<th>Reading 2</th>
<th>Reading 3</th>
<th>Average*</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaMotte Water Quality Kit</td>
<td>11.67</td>
<td>28</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Other Test Method</td>
<td>10.45</td>
<td>28.44</td>
<td>28.44</td>
<td>27.75</td>
</tr>
</tbody>
</table>
2. Turbidity:
Turbidity is a measure of water clarity, which is an important feature of an estuary. Different techniques for determining turbidity use different units of measurement.

A. *Circle* the measuring method(s) used for turbidity

<table>
<thead>
<tr>
<th>Secchi disc</th>
<th>Short sight tube/ LaMotte Water Quality Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long sight tube</td>
<td>Turbidimeter</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

B. Record turbidity **three times at three different locations within your site** and then average the results. Record results below. Be sure to enter data on the correct line for the technique you use.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Location</th>
<th>Time</th>
<th>Reading 1</th>
<th>Reading 2</th>
<th>Reading 3</th>
<th>Average</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secchi Disc</td>
<td></td>
<td>11:07</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>Feet or cm</td>
</tr>
<tr>
<td>Short Sight Tube</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JTUs</td>
</tr>
<tr>
<td>Long Sight Tube</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>cm/meter</td>
</tr>
<tr>
<td>Turbidimeter</td>
<td>10:43</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>NTUs</td>
</tr>
</tbody>
</table>
Objective: 1) Measure phosphates
2) Measure nitrates
3) Preparation for fecal coliform bacteria test (to be completed in classroom/ laboratory)

Materials: * Pencil  
* Timer  
* Clipboard  
* LaMotte Water Quality Kit

Procedure: Carefully read all directions before beginning the procedure!

1. Phosphate:
Phosphate is a nutrient required for plant and animal growth. High levels of phosphate can result in the overgrowth of plants, increased bacterial activity and decreased dissolved oxygen levels.

   A. Using the LaMotte Water Quality Kit, measure phosphate levels three times at three different locations within your site and average the results. Record results below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Reading 1</th>
<th>Reading 2</th>
<th>Reading 3</th>
<th>Average (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaMotte Water Quality Kit</td>
<td>11:07</td>
<td>2 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Nitrate:
The nutrient, nitrate, is necessary to build protein in all aquatic plants and animals. Excess levels of nitrate cause increased plant growth and decay, enhanced bacterial decomposition, and consequently a decrease in dissolved oxygen.

   A. Using the LaMotte Water Quality Kit, measure nitrate levels three times at three different locations within your site and average the results. Record results below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Reading 1</th>
<th>Reading 2</th>
<th>Reading 3</th>
<th>Average (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaMotte Water Quality Kit</td>
<td>11:07</td>
<td>5 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Fecal Coliform Bacteria:
Fecal coliform bacteria are present in the human digestive tract. When coliform bacteria is found in water, it reliably indicates the presence of fecal or sewage contamination. *This test requires a 24 hr*
What are Tides?
Tides are the 'up and down' motion or 'rising and falling' of water caused by the gravity of the Moon on our Earth. Some bodies of waters experience 2 high tides and 2 low tides each day which is not the case in some parts of the lagoon or even other parts of the world.

**Objective:** 1) Measure the change in tides for your sampling site, if any.

**Materials:**
* Pencil
* Clipboards
* Tape Measure
* Long, slender, strong sticks
* Timing device [Ex. stopwatch, watch, etc.]

**Procedure:** Carefully read all directions before beginning the procedure!

**Tide Measurement and Tidal Change:**
1. Insert one stick deep into the sediment at exactly the water’s edge. Pile stones at the base of the stick to give it extra support in order to hold it upright. Use your best judgement where the water’s edge is if there are waves.

   *Hint: Make sure the stick is not placed in a location that will interfere with other teams*

2. After 10 minutes, check your tide marker. If the water’s edge has moved in either direction, use the second stick (planting it the same way as the first one) to mark the new edge. Do not move the first stick!

3. Measure the distance between the first and second stick to get a change in tide.

4. Continue measuring the tides for approximately 30 minutes

<table>
<thead>
<tr>
<th>Time</th>
<th>Vertical Tidal Change (between stick #1 &amp; #2)</th>
<th>Rising, falling or unchanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td>10 inches</td>
</tr>
<tr>
<td>20 minutes</td>
<td></td>
<td>23 inches</td>
</tr>
<tr>
<td>30 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OVERALL VERTICAL TIDAL CHANGE =**
Cloud Cover

1. Estimate cloud cover

- Clear (0–25%)
- Partly cloudy (25–50%)
- Mostly cloudy (50–75%)
- Overcast (75–100%)

Wind Direction and Speed:

Wind levels can increase choppiness in the water while adding oxygen to it. This is important for many of the animals that live in the estuary. Wind can affect the movement of surface water, making it difficult to determine current direction and speed.

1. Record wind direction using either the "water on the face method" or "flag method":

   East

*Remember: Wind direction is determined by the direction the wind is blowing from.*

2. Circle the descriptive word that best describes the conditions of the water:

   - Virtually flat
   - Rippled
   - Choppy

3. Measure wind speed by using either an anemometer and the Beaufort Scale:

   A. Using the anemometer, record wind speed ______ knots or ______ mph

   B. Using the Beaufort Scale (please refer to the next page), figure out which Beaufort Force # best describes wind speed _______