PHYSICAL STATION: Tides/Depth, Currents

SUMMARY INTRODUCTION

At the end of the pier you will cover the following tests:
• Tides
• Depth at the end of the pier
• Currents

For your station you will have the following supplies:
• Weighted Rope (for depth)
• Measuring Tape (for both tides & currents)
• Oranges (for currents)
• Stopwatch (for currents) (use the one on your phones)
• Calculator

Things to discuss: Posing questions try and engage then in understanding the system: What is a tide? (The tide is the up and down flow in the estuary that is driven by the cycle of the moon – created because the Earth and the moon are attracted to each other, just like magnets are attracted to each other. The moon tries to pull at anything on the Earth to bring it closer. The Earth is able to hold onto everything except the water. Since the water is always moving, Earth cannot hold onto it, and the moon is able to pull at it.

*What is the amount of time for a tidal cycle. (*On the Hudson we have 2 high and 2 low tides each day – and they shift slightly each day in time since the two high and low tides happen every 12 ½ hrs. rather than 12 hrs. The height or the tide can vary based on the cycle of the moon – highest with new and full moon.)

Why is it important? It makes the system dynamic! It brings changes in salinity, makes the water move 2 ways unlike a traditional river that flows just one way our estuary flows 2 ways!

What is a current? (The Hudson has tidal currents, the directional flow inside the water column - In the Hudson the elevation difference between the high and low tide creates the currents as the water adjusts to being higher and lower it moves in and out of the estuary. If you stand in the main part of the river you will feel it pushing against your legs. If we seined off the end of the pier you would feel it but we seine in the protected embayment so we don't get that physical sense of the current.)

Discuss the terms

- *Flood* (flooding into the estuary from the ocean) *and*
- *Ebb (*moving out of the estuary) *tide.*

Note that the currents do not always run the same as the tide – because of a lag they can be in conflict. Also discuss what might be different in the main channel versus where we are over on the flats.

Currents – if there is a strong wind it can make it hard to predict the current.

It is possible for the Wind to overwhelm the tides and currents – just a month or so ago we had a blow out tide that overwhelmed the tides and currents and exposed large areas of mud from the bottom of the river.

What impact do tides and currents have on the other things we are testing? (In this section of the river it impacts salinity, can affect temperature, oxygen, even pH and it can impact the biology).

In the Hudson River it is the tides that define the area we refer to as the estuary – salt stops before the tides in this system – tides go all the way to the Troy Dam (153 miles) because the river is so flat. USGS has it listed as ~ 2 ft. elevation change in sea level between Manhattan and Troy – others have listed it as 5 ft.

1. TIDES:
Use your depth line to measure form the top of the pier down to the surface of the water from the end of the pier. Pull the rope up and use a tape to measure at the end of the pier distance from the top of the pier to the surface of the water and record.

2. DEPTH:
Use weighted rope to get depth – 3 steps for verification

1. Drop weight to bottom & measure the height of rope from the bottom to the waterline.
2. Next measure from top of pier to water
3. Measure full extent of the rope from bottom of river to top of pier - 1 plus 2 should equal 3

CURRENTS: - You will use an orange since it has the right density to stay buoyant but not be moved by the winds. You will be measuring the distance it travels in 30 or 60 secs (depending on how fast current is moving) and then calculating velocity per second
Engage multiple people for this.

- One student tosses the orange out as far as possible into the river
- One student times it with the stop watch as it travels for 30 to 60 secs.
- One person to line up with where the orange lands after the toss
- Another student walks with the orange and stops when the timer calls time.
- Two people then use a tape measure from the point of starting toss to where it ended up.
- Do the velocity calculation (V=D/T)
- Please record the current in cm (tape has cm and inches).