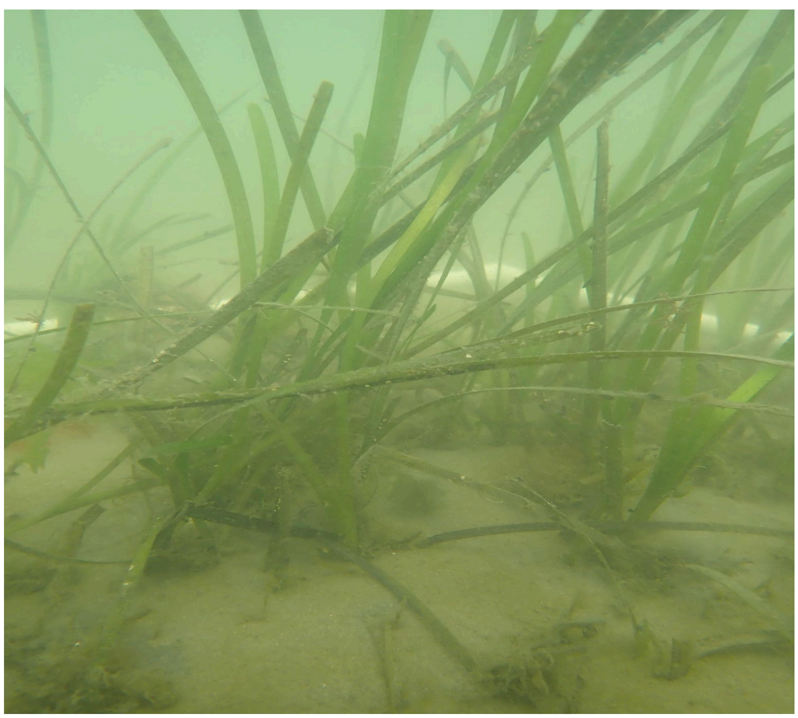
Peconic Estuary Partnership

PROTECTING AND RESTORING LONG ISLAND'S PECONIC BAYS

Peconic Estuary Partnership

Citizen Science Seagrass

Monitoring Program



Volunteer Safety

General Precautions

First, thank you for your interest in participating in the Peconic Estuary Partnership's Citizen Seagrass Monitoring Program! Your safety is of the utmost importance to us, so please carefully read all instructions in this manual **before** you begin to familiarize yourself with the parameters and test procedures. PEP will also provide multiple presentations, reference sheets and descriptions to make sampling more efficient and effective while you are in the field.

Seagrasses are a species of special concern not only to the State of New York, but to the Peconic Estuary as well. **Seagrasses should not be uprooted, dug up, or physically disturbed. All seagrass monitoring is observational (visual) only.** This is for the safety and protection of both the resource and our volunteers.

Please make sure to:

- Wear proper clothing and close-toed shoes while conducting seagrass surveys.
- Long-sleeve shirts and pants are recommended to provide additional protection while working in the water. Additional protection may be necessary when working in the sun.
- Wash down all your equipment with freshwater after each use to help keep the gear in good working condition.
- Store your kit in a dark, cool and secure place. Avoid leaving your kit out in the sun.

Please contact the PEP Program Office if you have any questions or problems with data entry or equipment.

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Seagrass in the Peconic Estuary

In the Peconic Estuary, the dominant seagrass is currently eelgrass (*Zostera marina*). It is estimated that there were around 8,700 acres of eelgrass in the Peconic Estuary in the 1930s. Recent aerial mapping from 2024 has revealed that this value has dropped to just 785.5 acres, a 7.6% reduction from the last survey in 2014, which mapped approximately 850 acres. The historical loss of eelgrass has generally been attributed to declining visibility, which limits the amount of light available for the plant to photosynthesize. Poor water quality has previously been linked to algal blooms (brown tide in the 1980-90s) and to nutrient and sediment pollution. Despite recent improvements in sewage treatment and watershed management, the resource has continued to decline. Rising water temperatures have been identified as a key driver of eelgrass losses across the East Coast and now in the Peconic Estuary. As a result, most meadows are now restricted to areas that are influenced by cooler ocean waters (the eastern part of the Estuary) or in areas that experience groundwater upwelling.

A second species, widgeongrass (*Ruppia maritima*), is present but less widespread and constrained to a few small areas. In 2024, its total extent is estimated at 14.8 acres, while it was undetected in the 2014 mapping. Widgeongrass is considered "weedy" and can tolerate a wide range of conditions. It therefore tends to occupy areas less suitable for eelgrass growth, such as those of low salinity. Widgeongrass populations can be dynamic and their abundance can vary substantially from year-to-year. Thus, this species is less likely to appear reliably each year, interrupting the regular delivery of the key services described above. With this being said, it is of the utmost importance that this resource is continued to be monitored, managed, and restored to maintain what is left of seagrass habitat within the Peconic Estuary. (*Lefcheck, 2025*).

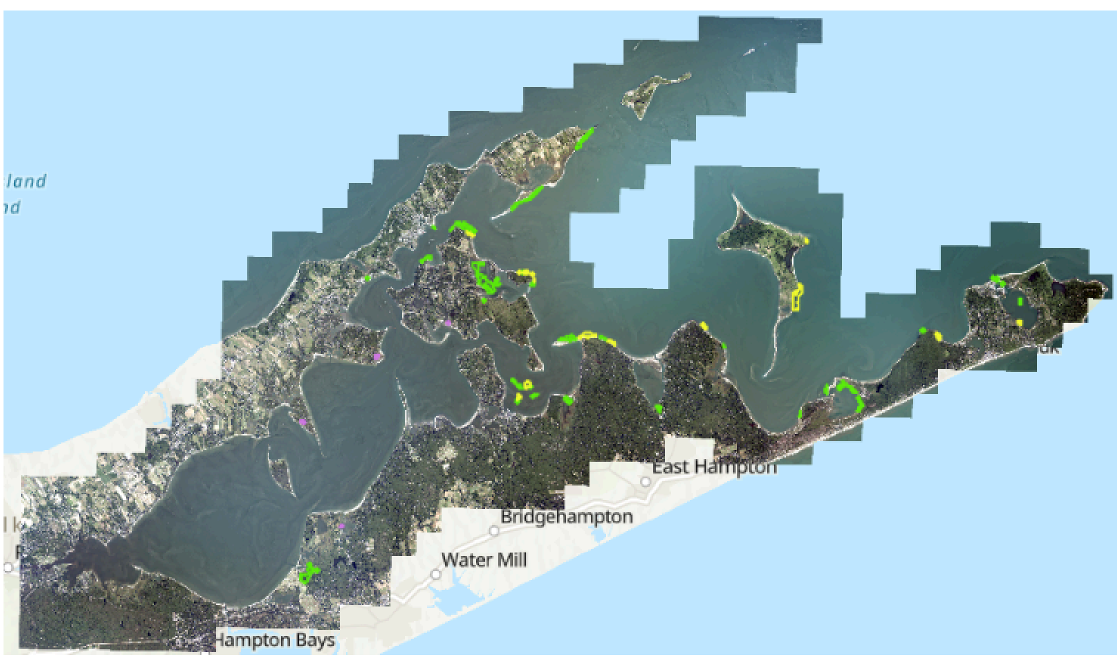


Figure 1: Map of the remaining seagrass meadows within the Peconic Estuary as of aerial flyovers and ground truthing conducted in 2024

Testing Parameters

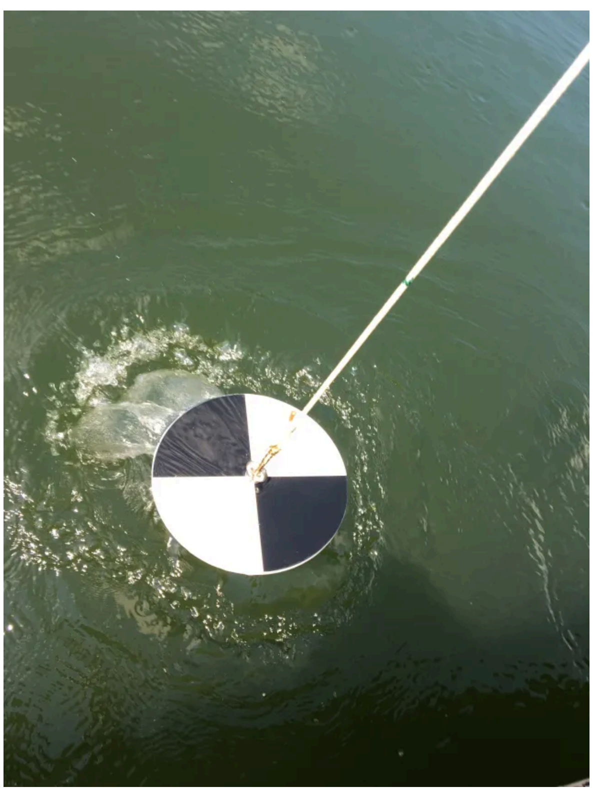
Salinity

Salinity is the concentration of dissolved salts within water. During a rainstorm event, or areas adjacent to a groundwater refugia, salinity can range throughout the Peconic Estuary. Salinity is a parameter that can affect species health and be a driver in the distribution of seagrass species within the Peconics.

Salinity is measured through the use of a refractometer (image on the right). The degree to which light is bent (refracted) as it passes through water is related to the chemical composition of the water sample. Salinity is expressed in ‘parts per thousand’ (ppt) or the grams of salt per 1000 grams of water sample.

Water Clarity

Particles and chemicals suspended or dissolved in water can reduce clarity. This has the ability to reduce the amount of sunlight capable of penetrating the water column. Many of these particles can come from sources such as stormwater runoff, algal blooms, and unstable bottom sediments. Seagrasses are particularly sensitive to water clarity, as they are photosynthesizing, aquatic plants. A reduction in light availability hinders photosynthesis, which is required for growth. If light levels become too low, photosynthesis may stop altogether causing the plants to die.



Water clarity is measured with the Secchi disk (image to the left). A Secchi disk is a weighted plastic disk that is marked in black and white sections. The disk is lowered into the water until the observer can no longer distinguish between the black and white sections. The depth of the disk is measured in meters (m), which is noted on the string with marks.

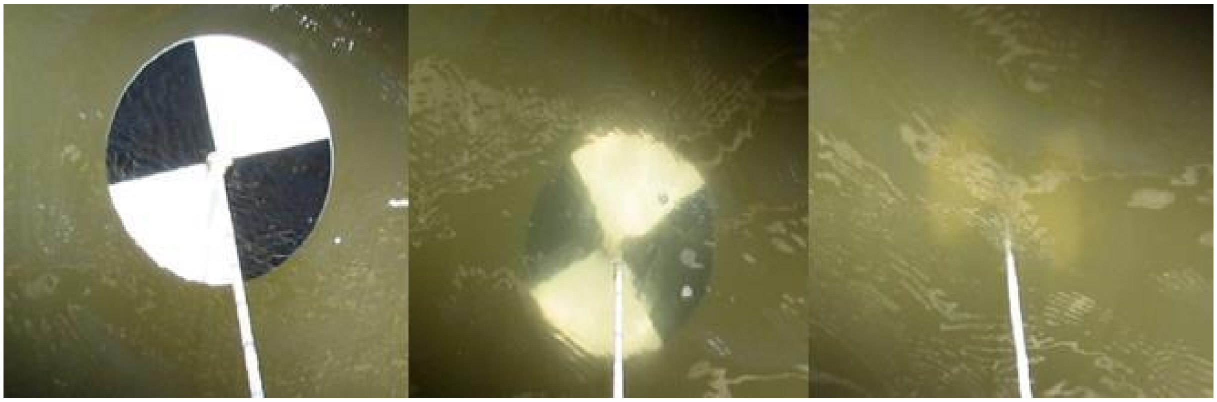


Figure 2*: An example of how to use a Secchi disk as it is lowered into the water column and visibility disappears*. (*FOS CSSN Protocol*).

Algae

Algae can grow on or within seagrass beds and can have major impacts on seagrass health. It can block light availability and use up oxygen in the water column leading to seagrass death. Drift algae can be pushed into seagrass beds through the movement of tides and currents and become trapped within the meadows. Volunteers will indicate potential algae biomass using a 0-3 scale system (figure below).

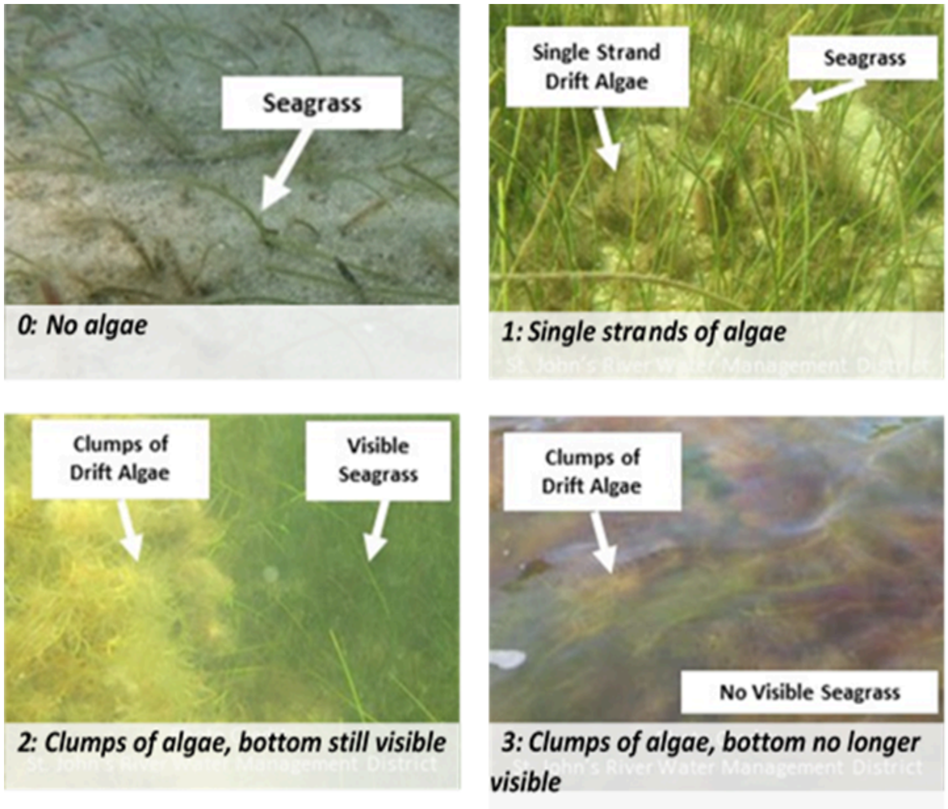


Figure 3 *: Classification scale of drift algae type, modified from St John's Water Management District. (FOS CSSN Protocol).*

<u>Braun-Blanquet Abundance Method</u>

To reduce bias across multiple observers, species cover will be estimated using percentage bins according to the Braun-Blanquet method. This method allows quick, rapid assessments across a site. It is highly replicable and reduces among-observer differences.

To determine the percent cover of seagrass and algae, volunteers will use a visual estimate (from 0 to 100%) of quadrat cover for each species present within the 0.25-m^2 quadrat. This is typically achieved by visually 'pushing' all the species in the quadrat to a single side until it reaches dense coverage. The amount each species coverage in the quadrat is assigned using the values in Table 1 and examples are shown in Fig. 5.

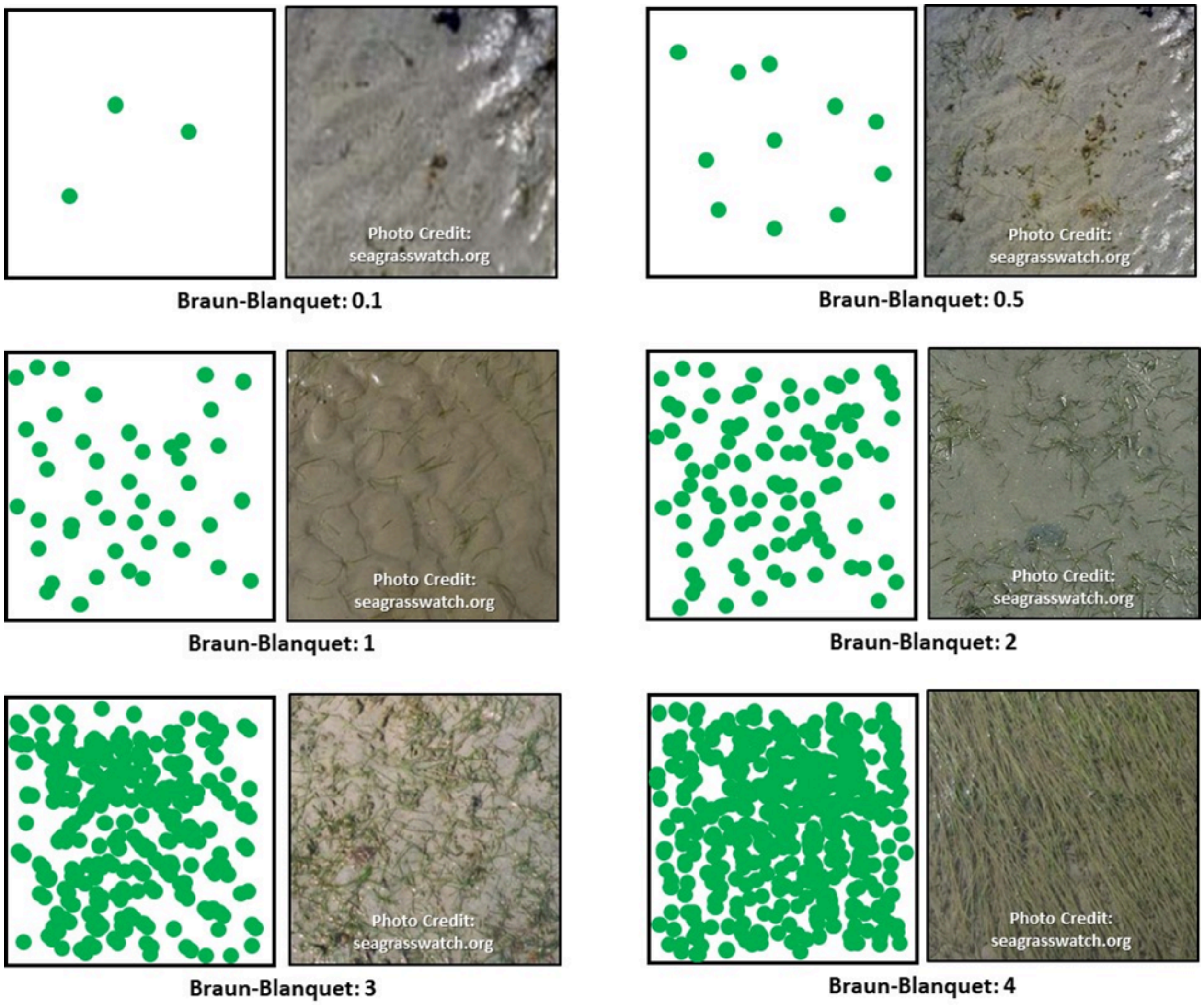


Figure 4: *Examples of percent cover evaluations utilizing the Braun-Blanquet methodology. (FOS CSSN Protocol).*

Table 1. Values of the Braun-Blanquet scale.

Braun-Blanquet Bin	Description	Percent Cover Equivalence
0	Absent (no seagrass present)	0%
0.1	A single shoot	< 5% (1-2% Cover)

0.5	A few shoots	< 5% (3-5% Cover)
1	Some shoots	5 – 25%
2	Moderate shoots	25 – 50%
3	Majority shoots	50 – 75%
4	Total or near-total shoots	75 – 100%

Seagrass Species Identification

Zostera marina (eelgrass):

Eelgrass is the dominant species of seagrass in the Peconic Estuary. Z. marina is typically identified as a “shoot”. Along with those shoots are anywhere from 3 to 5 longer, strap-like leaves coming from the base of the root.

Figure 5: *Image of Zostera marina*

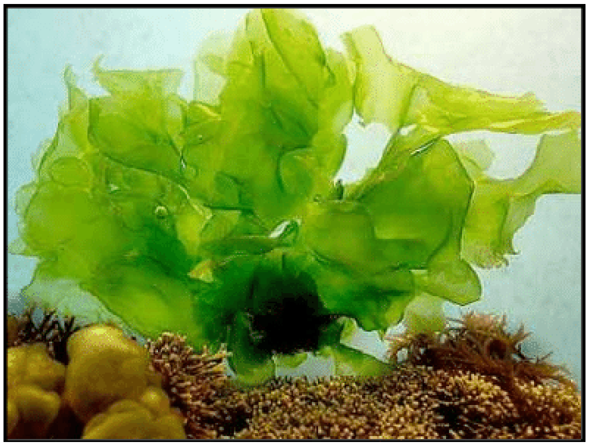
Ruppia maritima (widgeongrass):

Widgeon Grass is typically found in shallow waters and in areas of low salinity like at the mouths of rivers. Characteristics include long leaves that taper to a pointed tip and form distinct flowering stalks. It can look similar to *Z. marina* initially; however, it has leaves that branch at each internode and appears more rigid, and stalk-like compared to *Z. marina.*

Figure 6*: Image of Ruppia maritima.*

Common Macroalgae Identification

Below are the images of common drift algaes that one can find within a seagrass meadow. If there is something that you cannot identify, please record it by taking a picture and making notes on the field sheet.



Ulva lactuca

Codium fragile

Graciliaria

Saccharina latissima (kelp)

Equipment

Note: The following equipment is part of every test kit and includes everything needed to perform the tests described in this manual. Testers are expected to use the kit responsibly and only for PEP Citizen Science SeagrassNET testing. Kits should be kept clean and stored safely. Lost or damaged equipment should be reported and will be replaced by PEP.

PEP will provide:

- · 0.25 m^2 PVC grid quadrat with buoy
- · Meter stick
- · Dive flag with float
- · Secchi disk
- · Waterproof camera
- · Waterproof datasheets and ID guides
- · Clipboard & pencil
- · Deionized (DI) water squeeze bottle
- · Salinity refractometer and pipette
- - Permanent screw anchors to mark each site

Participants will be responsible for supplying:

- · Snorkel equipment (mask, fins, wetsuit, etc.)

Testing Protocols

Volunteers will monitor their assigned site at a minimum of once a year in the month of August when seagrass meadows contain peak biomass. If volunteers wish to monitor the site more frequently, logistics will be discussed with the PEP Program Office. The consistency in an August sampling period will standardize the timeframe for sampling at all sites. Sampling should be conducted at low tide for efficiency, and environmental parameters for each site should be checked prior to sampling. Datasheets are designed to be used for 1 sampling event only (Appendix A). It is important to record your data on the standardized forms provided, please do not rely on your memory.

Site Specific Measurements

<u>Step 1: Site Selection</u>

This is one of the most important steps when it comes to seagrass monitoring. The selected monitoring site(s) should be representative of the seagrass communities in that location.The site should also be continuous with a fairly even distribution of seagrass without any large empty patches or physical disruptions (e.g. reefs, tidal channels). The need for a homogeneous seagrass meadow is to enable the collection of replicate samples reflecting the natural conditions but not incorporating a high degree of variability. In this way, long-term change can more easily be detected. A site which can be visited without difficulty is preferred since repeated access over the long term will be required. Choosing a site away from any large human or natural impact is important to ensure long-term repeated monitoring without total loss of the seagrass habitat in that location. In addition to monitoring a pristine location, additional sites can be chosen based on special interests (e.g., a restoration area or impacted area). Criteria for appropriate site selection has been incorporated from the SeagrassNET Rapid Protocol (*Mittermayer et al 2025*). Site selection will be conducted with the PEP Natural Resources Program Manager or another seagrass expert provided through the PEP Program Office

<u>Step 2. Measuring Site Conditions</u>

2a: Record the GPS location (handheld, pin on a map, etc.), weather conditions, water surface appearance and tide at your site on the day of sampling.

2b: Describe the extent of the seagrass bed using the following categories:

Sparse: **Very little seagrass is present at the site**

Patchy: **Seagrass is present in isolated, individual patches**

Continuous: **Seagrass is present with little to no gaps within the bed**

Dense: **Seagrass is present with no gaps at high density**

2c: Record the type of sediment at your site; ***Mud, Sand, Clay, Rock, or Shell Hash (broken up shells)***

Step 3. Secchi Depth and Water Depth

3a: Secchi Depth: It is important to not wear sunglasses while determining Secchi depth. With your back to the sun, lower the disk with the premeasured line into the water until the black can no longer be distinguished from the white. Record the depth to the nearest tenth (0.1) of a meter based upon the length of the suspension line that is submerged (i.e. count from the disk up to the surface). If you can still see the disk on the bottom then record this number as both Secchi and water depth.

3b: Water Depth: Use the Secchi Disk and its rope as a depth finder. Lower the disk until you see the disk hit the bottom or feel the line just go slack. Pull up on the line gently to straighten it out. Read the measured line at the surface. Record the depth of the water to the nearest tenth (0.1) of a meter.

Step 4. Determine the Salinity

4a: A handheld optical refractometer with two scales is used to measure salinity. Ignore the left hand scale (measures specific gravity), and solely use the right-hand scale which measures salinity in parts per thousand (ppt).

4b: An initial calibration is made with a sample of 0 ppt distilled water. Place a few drops of distilled water on the main prism. Close the cover so the water spreads evenly over the entire surface without any air bubbles or dry spots (Fig. 20).

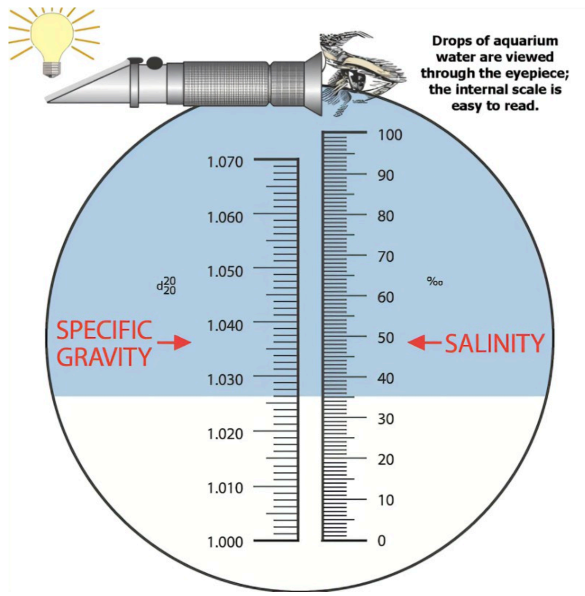


Figure 7: *Droplets of sampled water are placed with a pipette into the sample holder. Then raise the refractometer towards the light and look to see where the blue line meets the white. Salinity is measured on the lefthand scale. In this example the salinity would read as 35 ppt.*

4c: Hold the refractometer in the direction of a light source and look into the eyepiece. Rotate the eyepiece until the scales are in focus. The upper portion of the field will be blue, while the lower portion will be white. If the line crosses at the 0, the refractometer is calibrated, go to step **4d**. If not, adjust the calibration screw until the line crosses exactly on zero.

Note: The refractometer should hold its calibration for an extended period of time. However, calibration checks should be made before each reading.

4d: Dry the prism with a clean cloth then place a few drops of the sample water on the main prism. Close the cover and ensure that there are no bubbles. Look through the refractometer and record the number where the boundary line of the blue and white cross the graduated scale on the right-hand side

Step 5: Quadrat Sampling

5a. Sampling Description

To determine how representative the twelve, fixed quadrats are along each transect line, samplers will conduct: seagrass identification, percent coverage evaluation, and canopy height measurements at each randomly selected quadrat sample.

Note: The twelve quadrat locations will be fixed along a transect line at randomly selected distances along the quadrat. For example: if the randomly generated numbers for your site are assigned as 2,7,8,16,18,25,26,33,38,40,44,46 (Figure 9, transect line A), samplers would place the quadrat at the 2m mark on the transect line. Samplers will then determine the seagrass species within the quadrat, the percent cover of each seagrass species (if applicable) within the quadrat, percent algae coverage in the fixed quadrat, and canopy height measurements of seagrass in the fixed quadrat. Researchers will note all aforementioned parameters on the data sheet and will take a photo of the quadrat area. Once sampling is complete at 2m quadrat, researchers will move on to quadrat 7 and repeat steps above.

A total of one to three transect lines can be installed at your respective sampling location. This will be determined by volunteer organization capacity and the PEP Natural Resources Program Manager.

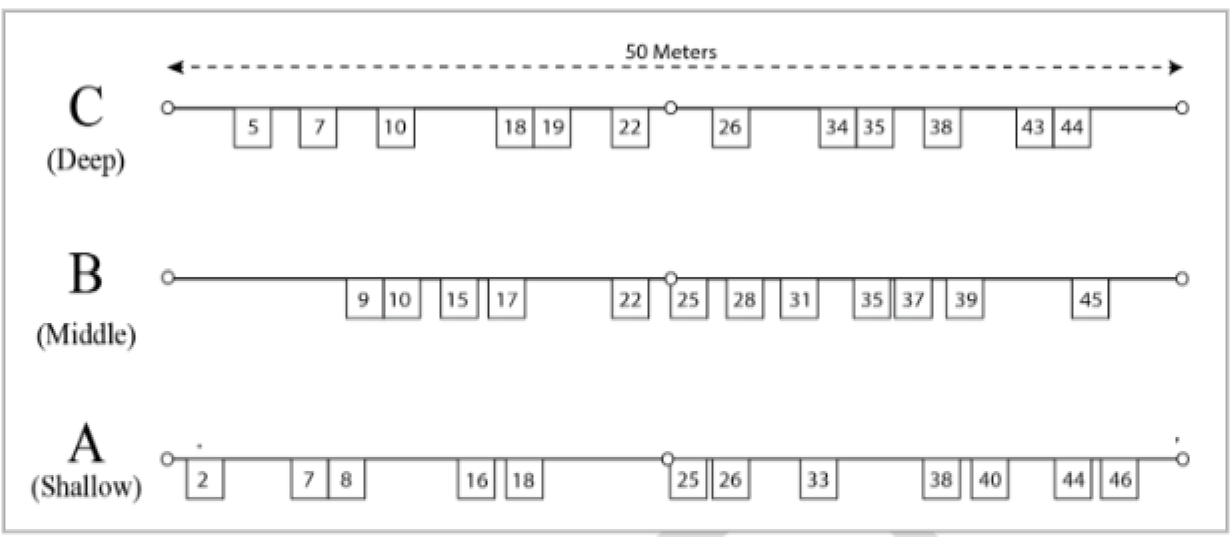


Figure 8: *Sketch of transect line positioning and quadrat sampling within a seagrass meadow at each respective site. (Mittermyer et al. 2025).*

5b. Assessment of Percent Algae Cover

Visually estimate the percent cover (from 0 to 100%) inside the quadrat for all drift algae present.

Determine the type of drift algae using the 0-3 scale described above where 0 = no algae, 1 = single strands of algae, 2 = clumps of algae but bottom still visible, 3 = clumps of algae and bottom is no longer visible. Visually estimate the percent cover (from 0 to 100%) inside the quadrat for all drift algae species present.

5c. Assessment of Seagrass Percent Cover

Conduct a percent cover estimate of **each seagrass species** (from 0 to 100%) of quadrat cover for all seagrass species present within the 0.25-m^2 quadrat.

Note: Percent cover within one quadrat should not exceed 100%. See Appendix 2.

5d. Use the provided measuring stick to measure average canopy height for the site to the nearest centimeter (image to the left). Average canopy height ignores the top 20% tallest blades of the respective meadow.

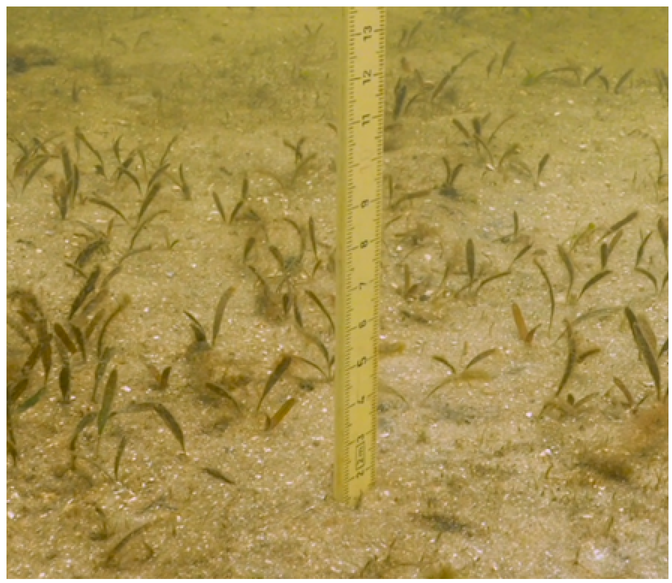


Figure 9 : *Meter stick to measure the average canopy height of the seagrass meadow. (FOS CSSN Protocol).*

5e. Quadrat Photos

After recording all measurements, take a photo of the quadrat. It might be difficult to achieve high quality photos due to increased biomass, high turbidity, overall darkness etc. This is normal.

Repeat above steps 11 more times for all quadrats selected along the transect line!

Step 6. Clean Up and Storage of Equipment

6a: Rinse the refractometer with distilled water. The remainder of the equipment (Secchi disk, quadrat, camera and dive flag) can be rinsed with tap water. Be sure to thoroughly dry all equipment before storing it away in a safe, dry, cool location until the next sampling event.

6b: After rinsing the camera, make sure to dry off and store appropriately. Be sure to download images promptly.

References:

J. Lefcheck. 2025. Recommendations for Comprehensive Seagrass Monitoring Plan for the Peconic Estuary. 2025-04-25-pep-seagrass-monitoring-plan-.pdf.

A. Mittermayr, A. Novak, H.K. Plaisted, J. Gaeckel, J. Lefcheck, F. Short. 2025. SeagrassNet Rapid – Manual for scientific Monitoring of Seagrass Essential Ocean Variables.

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https://www.flseagrant.org/citizenscience/eyes-on-seagrass/

https://sarasotabay.org/our-estuaries/seagrass-algae-monitoring/

https://tampabay.wateratlas.usf.edu/seagrass-monitoring/

Appendix A: PEP Citizen Science Seagrass Monitoring Data Sheet

(Interpreted from the Citizen Science Seagrass Monitoring Network, Florida Oceanographic Society)

Peconic Estuary Partnership Citizen Science Seagrass Monitoring Program - Data Sheet

Transect Line A

GPS Location/Waypoint/Coordinates:

Site Name: | **Date:** | **Time:** | **Tide:**

Weather: Clear (1), Partly Cloudy (2), Overcast (3), Fog/Haze (4), Drizzle (5), Intermittent Rain (6), Rain (7)

Water Surface Characteristics: Calm (1), Water Ripples (2), Waves (3), White Caps (4)

Water Depth (m): | **Secchi Depth (m):** | **Canopy Height (cm):**

Condition of Seagrass Bed (Circle one): Sparse Patchy Continuous Dense

Sediment Type (Circle one): Sand Mud Clay | **Salinity (ppt):**

Quadrat #	1	2	3	4	5	6	7	8	9	10	11	12	
% Cover Drift Algae													
Drift Algae Type													
% Cover *Zostera (eelgrass)*													
% Cover *Ruppia (widgeongrass)*													
Canopy Height (cm)													

Notes:

Appendix B: Assessment of Percent Seagrass Coverage

(SeagrassNET Rapid Protocol, Mittmayer et al 2025)