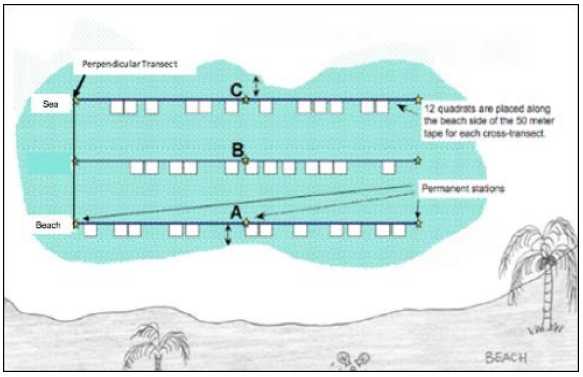
Seagrass Blue Carbon Data Collection
Cheat Sheet

In the Field

Choosing a Site

Any site with eelgrass will work great. Take a few sediment and biomass cores from different places in the meadow to get a representative sample. Don't forget to take the latitude and longitude of your core and biomass locations using a GPS.



Source: modified from Short et al. (2015)

In the figure above, three transects (A, B, and C) are placed in a seagrass meadow. Along each transect, quadrats are randomly placed, and cores and biomass samples are collected from each.

If possible, try to get a "reference" sediment core from a nearby site that does not contain eelgrass. Comparing the carbon storage in this core can show us how much extra a seagrass meadow can store vs a bare ecosystem!

Sediment Coring

Cores can be collected using a variety of methods. The simplest method, which works well for soft seagrass sediment, is called the push coring method. This method involves pushing a large tube (such as a 3", ~1m Polycarbonate tube), sharpened on one end, into the sediment, capping it at the bottom, and pulling it back up. You want to push the core into the sediment until you can't push anymore (we call this "depth of refusal"). Then you need to dig around the core and cap the bottom of it using a round, solid disk (soft practice hockey pucks work well!).

Core Extraction

Use a core "extractor" to push the sediment out of the core (i.e. the Polycarbonate tube), 1 cm at a time. To make an extractor at home, you can use: a metal pole (a bit longer than the length of your core); a wood base (to attach one end of the pole into); and another round disk (to attach to the other end of the pole, which pushes up from the bottom of the core).

The disk of the extractor should fit snugly into the bottom of your core. You may need a slim metal disk to fit between the rod and the disk depending on the material of your disk.

Slowly push the core up through the tube until 1cm of sediment is present at the top of the core. You want to extract each sediment core 1cm at a time onto a sterile surface. At this point, you want to take a measurement for the density of the soil, which will be important for your carbon analysis later.

Photo source: eijkelkamp

To do this, you'll need to use a ring (of known volume) and press it into the soil (to calculate ring volume: *3.14 x radius of the cylinder squared x cylinder height*). Taking this near the edge will be easiest. Carefully remove all the sediment contained in that ring and place into sterile sample bags or containers.

Then, place the remainder of the sediment into another sterile container. Keep the containers in a refrigerator or in a cooler until you're ready to analyze them and don't forget to label them!

Biomass Collection

Place a quadrat of any known size (e.g. 0.25 m^2) in random locations around the meadow, corresponding with your sediment cores. Count the number of eelgrass shoots within each quadrat and measure the length of 5 blades from 5 different shoots to the nearest millimetre (mm)

Use the same coring strategy (i.e. the push coring method) that you used for the sediment, but this time use a smaller core (5 cm diameter and 10 cm deep) to collect the biomass samples from each quadrat.

Make sure you place the core over an area of the quadrat that you think accurately represents the overall eelgrass coverage of your quadrat. Once a biomass core is removed, contents should be placed into a mesh bag and rinsed to remove sediment and mud. The shoots and rhizomes from each core then need to be placed into sterile bags and stored in a freezer.

You'll need to know the volume of your core, which can be calculated by: *3.14 x radius of the cylinder squared x cylinder height*

Back At the Lab

Measuring Sediment Density

First, you need to measure the density of your sediment: dry and weigh the sediment you collected with the steel ring in a microwave or oven. You might want to weigh an empty container first, then calculate dry sediment weight by subtracting the container weight from the total weight (of sediment + container). Then calculate density in g/cm^3: *dry sediment weight (g) / soil volume (cm^3).*

Measuring Sediment Carbon

Now that you know the density of your sediment, it's time to calculate carbon content. The easiest way to do this is using the Loss-On-Ignition (LOI) method. For this you will need a muffle furnace, which is a small oven that exceeds temperatures of 500°C.

First, dry and weigh a small amount of sediment (from your main sediment container). You can do this in a regular oven or microwave.

Next, you're going to put your dry, weighed sediment into a weighed crucible that can withstand extreme heat. Combust the sediment for 4 hours at 550°C and then re-weigh the sediment (you can weigh the sediment and crucible together and subtract the crucible weight).

The difference between the weights before and after combusting the sediment in the muffle furnace is your LOI value. Compare your LOI value with those of other studies. To get exact amounts of carbon, send a small number of samples out for elemental analysis and develop a regression equation, or use an equation already developed from another similar study.

Calculating Biomass

Before we can measure biomass carbon, we need to know how much biomass is present. In the lab, remove your biomass cores from the freezer and count the number of shoots in each core sample taken. Then separate shoots and leaf blades (aboveground biomass; AGB) from the roots and rhizomes (belowground biomass; BGB). Place your AGB and BGB samples into separate aluminum tins and dry; weigh your dry samples.

To estimate the AGB and BGB of your quadrat, the dry weight biomass of a single eelgrass shoot and root in each core you collected needs to be calculated. You can do this by dividing the weight of the AGB or BGB in each core sample by the total number of shoots in the core sample to give you the average weight of a single shoot or single root of eelgrass. To estimate the AGB or BGB for each quadrat you used, the single shoot or root dry weight needs to be multiplied by the number of shoots in its respective quadrat. To compare with other studies, scale your value up or down to 1m^2.

Measuring Biomass Carbon

To measure biomass carbon, you can use a standard conversion factor of 0.36, which is the standard for seagrass habitats in the Pacific Northwest (that are dominated by the *Zostera marina*). Multiply your total quadrat above- and belowground biomass estimates by 0.36 to get an estimate of biomass carbon in your quadrat. To compare with other studies, scale your value up or down to 1m^2.