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SeagrassNet Manual – Site Selection Update (Feb. 4, 2009)

(See the Worldwide Edition of the Manual for more detail)

4.1. Site selection & mapping

4.1.1. Background

The SeagrassNet monitoring site is selected to be representative of the seagrass communities in that location. It is useful to review any available information on the distribution and status of seagrass meadows in the region, state, or country before you start to select a site. Good sources of baseline information include earlier maps of seagrass habitat or aerial and satellite photographs (the latter two may not reliably show all seagrasses). The exact placement of the SeagrassNet monitoring site is critical for many reasons. We recommend you distinguish between establishment of a “reference” site, in a pristine area and with the lowest amount of impact typical for your region, and an “impact” site, where the monitoring is targeted toward looking at the effects of a particular stressor.

Selecting a good monitoring site is the first critical step in any monitoring effort. For a site to be typical or representative, it should contain the same assemblage of seagrass species found throughout the area, reflect the depth range where seagrasses are typically found, and in general not be exceptional in any characteristic. A homogeneous seagrass site has a fairly even seagrass distribution without large empty patches or physical disruptions such as reefs or tidal channels. A homogeneous seagrass meadow allows the collection of replicate samples reflecting the natural conditions without incorporating a high degree of variability. In this way, long-term change can more easily and quickly be detected. Clearly, a site that can be visited without difficulty is preferred since repeat access over the long term will be required.

A good monitoring site is:

1. a seagrass meadow which is typical/representative of the location
2. a seagrass meadow that is small enough so it can be accessed without too much difficulty from shore (if it's accessible at low tide) or by boat (via a channel or other easy access). The preferred meadow is on a depth gradient from shore and includes a deep edge of the meadow which is not too far from shore to be accessible. For reef top sites, the distant edge of the meadow will be measured (even if it is not the deep edge), and should be accessible.
3. a seagrass meadow that is relatively homogeneous within depth ranges – that is, at a given distance from shore, a similar suite of seagrass species occur

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(with similar seagrass cover or abundance) in bands parallel to shore (where the three cross-transects will eventually be established). The idea is that the quadrat samples along each cross transect will be replicates.

4. a seagrass meadow that is easily accessible, in a place which you can come back to and monitor again at regular intervals. Considerations include car or boat access and whether or not SCUBA is required, but also include the type of sediment (if mud, the bed can be damaged, resuspension of sediments can make measurements or photographs impossible, or walking can be difficult), the distance from shore to the deep edge of the meadow (should typically be < 1 km) and safety (danger from currents, tide, wind exposure, etc.).
5. a seagrass meadow that is removed from any large ongoing or future obvious impact such as a marina, a dredge channel, or a sewage outfall. The exception is a site that is chosen as an “impact site” which will be monitored relative to a “pristine” reference site to detect distinct trends or trajectories over time.

Selection of a reference monitoring site

Choosing a reference site away from any large human or natural impact is important to insure monitoring of baseline conditions. Also, for the monitoring of reference conditions in an area, it is important to avoid an immediate or point source of impact. The aim of the SeagrassNet monitoring protocol is to detect trends in seagrass health and abundance over time: establishing a reference site for a particular location creates a baseline and allows comparison to other, more impacted sites.

Selection of an “impact” monitoring site

Often, an additional SeagrassNet site is created that is under some known threat or that has a known impact so that it can be compared to the relatively pristine reference site. The impact site can be a location where anthropogenic factors have been identified or where future anthropogenic impacts are anticipated. The site should be selected and laid out similarly to the reference site, but does not need to “match” the reference site in terms of seagrass species or abundance, although again, a homogeneous seagrass meadow is preferred.

4.1.2. In the field - Sites accessible at low tide

Once you have decided on the general area in which to locate your SeagrassNet site, you will need to choose actual seagrass meadow in which you will lay out the site. The meadow you will monitor should meet the criteria above

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(1 – 5) and, further, the meadow should be chosen so that placement of the site, that is, the location of the main transect (and cross-transects) are within a bed representative of the conditions of the area. Prepare a sketch map of the area. The sketch may include the whole seagrass meadow or a geographically defined area (e.g., bay, reef top).

Necessary materials & equipment

To choose the site and mark the transect, you will need:

- Suitable field clothing & footwear (e.g., hat, dive booties, etc)*
- Geographic Positioning System (GPS)*
- Datasheets and pencils*
- Aerial photographs or marine charts (if available)*
- Temporary markers (9, e.g., poles, flags, plastic tent pegs, buoys or floats attached to a weight with a line)*

Preliminary site assessment

- ↪ Go to the general area that you have identified as a potential location for your SeagrassNet site. The aim is to create a sketch map of the location including the general pattern of seagrass in the area. Use GPS to map the boundaries of the seagrass bed (Fig. 1). The boundaries, or edges, of the seagrass bed are defined as any area where seagrass shoots or small clumps make the transition from growing within one meter of one another to growing more than one meter apart. If there are large patches of seagrass which are separated by more than a meter, they are considered part of the meadow which is designated as “patchy.”
- ↪ If mapping can be conducted at a low spring tide when the seagrass meadow is exposed, the boundaries can be mapped by walking or wading around the perimeter of the meadow and making observations every 5 – 25 meters depending on size of the area and time available. If the meadow is too large or the water is too deep, this will not be feasible; a rougher map will have to suffice.
- ↪ Place a temporary marker at the inner (near to the beach) and outer (towards the open sea) edges of the seagrass meadow. Bear in mind that with these two markers, you are creating a transect roughly perpendicular to the shoreline which will act as the center of the three cross-transects for monitoring (below). The outer edge of the seagrass meadow is defined for SeagrassNet monitoring as the seaward limit of the strap-leaved seagrasses; the petiolate (having a leaf on a stem) seagrasses often extend to depths not accessible (even beyond

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access by SCUBA) and thus cannot be reliably sampled in many of our monitoring efforts. If you choose to sample the petiolate seagrasses, then the location of the offshore cross-transect becomes somewhat arbitrary and may not represent the actual deep edge. The inner edge is located one meter inside the boundary of the seagrass bed shoreward.

Points to consider:

- Is seagrass the dominant habitat at the site?.....Yes
- Is the seagrass community representative of the area?.....Yes
- Is the seagrass coverage similar along a contour of constant depth?.....Yes
- Are there any large sand/ mud banks or other physical disruptions at the site?.....No
- Is the site logistically (e.g., weather, access, safety) feasible?.....Yes

4.1.3. In the field- Subtidal sites (requiring SCUBA)

Necessary materials & equipment

- To choose the site and mark the transect, you will need:
- All essential SCUBA equipment (including Oxygen Safety kit).
- Six temporary marker buoys for ends of transects (plastic bottles make good markers), weights to anchor the markers, and enough rope or heavy string to anchor each.
- Waterproof bag for the GPS.

Safety considerations for SCUBA accessible sites:

- Can you sample a full site in a single dive? If the seagrasses are too deep it will be difficult or dangerous to sample. Choose a safe working depth.
- Are there obstacles or hazards that may impede sampling in the future (e.g., low visibility, currents, frequent and strong wave action)?

4.2. SeagrassNet transect establishment & marking

4.2.1. Background

A SeagrassNet monitoring site is set up based on a transect perpendicular to the shore and running from onshore to offshore, ideally capturing a gradient of increasing water depth. The length of this transect will vary from site to site, depending on the extent of the seagrass meadow it crosses. At right angles to this transect, three “cross-transects,” each 50m long, are established. Each cross-transect is a straight line with its mid-point on the primary transect. The cross-

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transects are labeled “A” (nearshore) “B” (at a midpoint or transition area) and “C” (furthest from shore and usually deepest). The idea is to have all three cross-transects completely within the seagrass meadow, running parallel to shore and parallel to each other, and within a homogeneous portion of the seagrass meadow. Additionally, cross-transect A should be 1m inside the shoreward margin (shallow edge) of the seagrass meadow so that the entire cross-transect lies within seagrass. Cross-transect C should be 1m inside the offshore margin (deep edge) of the seagrass meadow, also fully within seagrass. Cross-transect B can be roughly centrally located between A and C, or at a point of transition across the seagrass meadow that represents a change in seagrass density, species composition, or habitat structure.

Transect establishment is important to ensure consistency of the monitoring program, and is done once you have identified the most appropriate monitoring site. Every SeagrassNet site worldwide has the same approximate layout and experimental design, an element that allows us to draw scientific conclusions from the findings of the sampling program.

Transect establishment should be achieved with minimum disturbance of the seagrass meadow. The SeagrassNet sampling site will be marked with nine permanent station markers, three for each cross-transect. Each 50m cross transect is marked in the center and at each end. These nine permanent markers will be left in place throughout the monitoring program regardless of changes in the seagrass community. Finding the cross-transects again for the next sampling will be made easier by ensuring that the permanent markers are secure, and preparing a good sketch map and description of the site, using GPS to identify the exact coordinates of each permanent marker. When you prepare the map and description, write it in a way that someone who has never been to the site could still find it.

4.2.2. In the field- Establishing sites accessible at low tide

Necessary materials & equipment

- 3 fiberglass measuring tapes, 50m long*
- 6 temporary markers (e.g., plastic tent pegs or PVC pipe)*
- 9 permanent markers (e.g., screw anchors or eye anchors)*
- Geographic Positioning System (GPS)*
- Hand held compass*
- Sketch map for site location*
- SeagrassNet datasheet*
- Notebook and pencil*

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Cross-transect establishment

- ⌘ Go to the temporary marker that you placed about 1 m inside the continuous seagrass meadow seaward from the beach/ inner edge of the seagrass meadow. Station A (the center point of cross-transect A) must be established so that the 50 meter cross-transect that will have permanent Station A at its center and will lie within the continuous seagrass meadow, with permanent markers at three points along the cross-transect: 0m, 25m, and 50m. The best way to accomplish the establishment of cross-transect A is to identify an area of homogenous seagrass meadow at least 50m wide, start at the left side of the meadow (facing seaward), have one person hold the zero meter end of the tape, a second person take the tape reel and walk along the beach, extending the tape to fifty meters. The second person then walks out into the seagrass meadow until the measuring tape is fully extended and parallel to shore and running entirely within the continuous seagrass meadow. A third person should move to the 25m mark on the tape, being careful not to walk on the seagrass shoreward of the tape and assist in assuring that the tape runs straight from zero to 50 m. The person at 0m puts in the permanent screw anchor at the zero position and attaches the tape to the screw anchor. Screw the permanent anchor into the sediment so that only a few centimeters remain above the sediment. With the assistance of the person at 25m, the person at 50m pulls the tape tight (taut) and straight, puts in the 50m screw anchor, and attaches the tape to the anchor. Once the tape is tight and straight, the person at 25m (the center) puts in the third screw anchor at the 25m mark, the center of the cross-transect, Station A. In this way, cross-transect A is complete: a straight 50m line within a continuous, homogeneous seagrass bed and with permanent screw anchors at the zero, 25 and 50m points along its length.
- ⌘ Take the GPS reading for the shallow, near-shore cross-transect at the zero, 25, and 50m points, and record these positions clearly and legibly on the datasheet. The center point at 25m is referred to as Station A. Use your sketch map to draw the position of cross-transect A; this will be valuable when you or someone else has to come back to find the cross-transect in 3 months' time.
- ⌘ Take a compass reading of the heading for cross-transect A. Record on the data sheet or on the sketch map. This compass heading will be the same for the other two cross-transects (B and C) and the heading plus 90° is the heading for the line connecting the zero point of cross-transects A, B and C.
- ⌘ To establish Station C, take a compass bearing from the zero meter point on Station A to the outer/ deep seagrass edge temporary marker. The transect should be perpendicular (at a right angle) to the water's edge; that is, the transect will run from the beach (at Station A) toward the sea (Station C). Station C is established so that the 50 meter cross-transect lies within the continuous seagrass meadow. *Remember that the outer edge is defined for SeagrassNet monitoring as the seaward limit of the strap-leaved seagrasses.*
- ⌘ Install a permanent markers at three points along cross-transect C similarly to cross-transect A. Record the bearing between C and A on the datasheet.

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Record the GPS position of cross-transect C (at 0, 25 and 50m). Station C will be the center point for the cross-transect at the deep, or offshore, end of the meadow.

- ↻ Cross-transect B is halfway between cross-transects A and C, regardless of depth, or B may be located at an interesting seagrass species transition, i.e., adjacent to a zone of species change.
- ↻ Locate the 0m position on Station B on the bearing between stations A and C. Install the three permanent markers for cross-transect B and record the GPS points of cross-transect B (0, 25 and 50m). Measure and record the distances between cross-transects A and B, and B and C. If the monitoring site is being established on a reef flat, then the offshore cross-transect (C) and the middle cross-transect (B) will be chosen differently. Cross-transect C is located inside the continuous seagrass meadow of the reef flat, and is not necessarily the deepest station. On a reef flat, cross-transect B is often the deepest cross-transect.

4.2.3. In the field- Sites accessible only by SCUBA

Necessary materials & equipment (in addition to above)

- *Waterproof bag for GPS.*
- *Clipboard with “plastic” paper, or a dive slate, and a pencil (this will be necessary to communicate between divers).*

Transect establishment:

- ↻ Follow the instructions above for an intertidal monitoring site, with the following modifications/considerations.
- ↻ Use buoys with line and temporary anchors to lay out the site.
- ↻ The anchor lines for each of the marker buoys should be just long enough so the buoy reaches the surface and the line is taut. In this way, the buoys are directly over the anchor points.
- ↻ It is helpful to have one or two individuals snorkeling on the surface and helping to direct the divers on the bottom.
- ↻ Lay out all three cross-transects -- A, B and C -- as above, using temporary anchors with buoys before installing any permanent markers, insuring that that all cross-transects are contained within the continuous meadow and are correctly positioned to avoid channels or bare areas. Make sure the tape is not caught on any corals or other obstructions as each cross-transect is created.
- ↻ A snorkeler can make sure the 50 m tape is straight by swimming the length while 2 divers hold either end.

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- ↪ Once the entire monitoring site is laid out using temporary anchors, put in the permanent screw anchors to mark the three positions (0, 25 and 50m) on each cross-transect (A, B, C).
- ↪ It may be helpful to mark the screw anchors with flagging tape or short buoys to make them easier to find when sampling.
- ↪ From the surface, a snorkeler then takes the GPS coordinates of each screw anchor (0m, 25m and 50m).