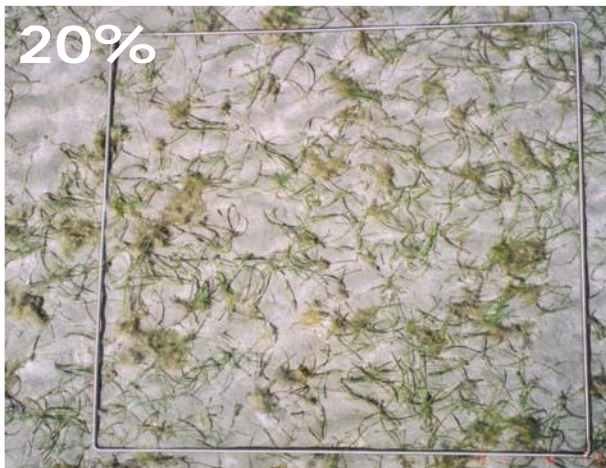
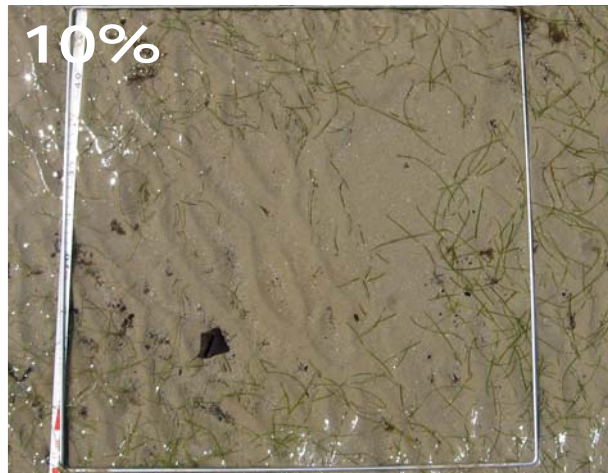
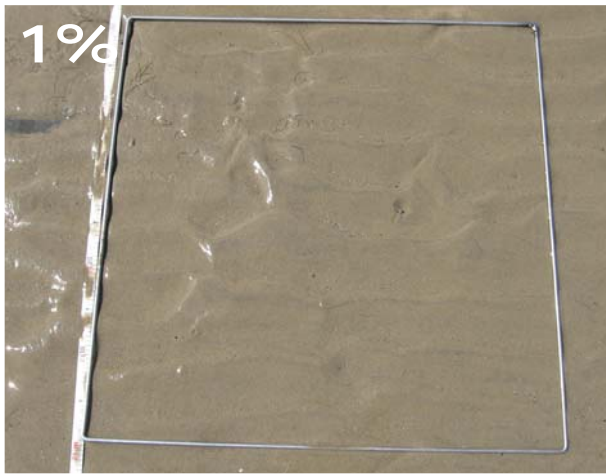


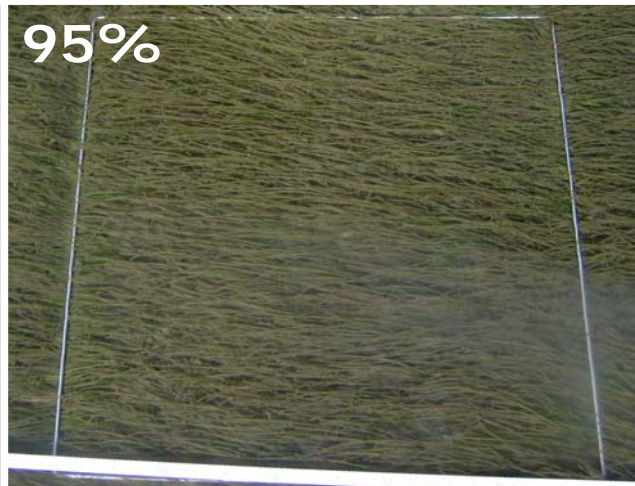
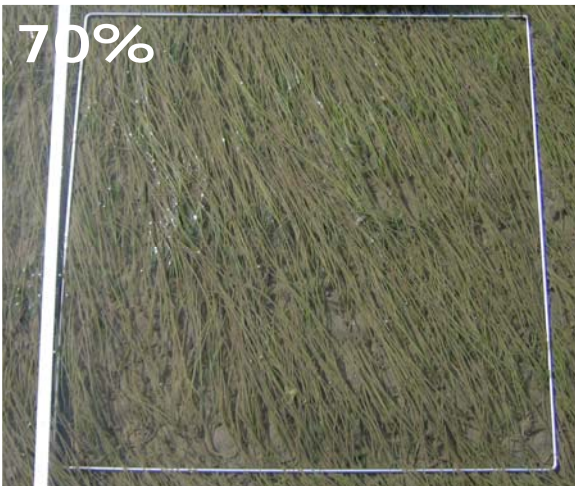
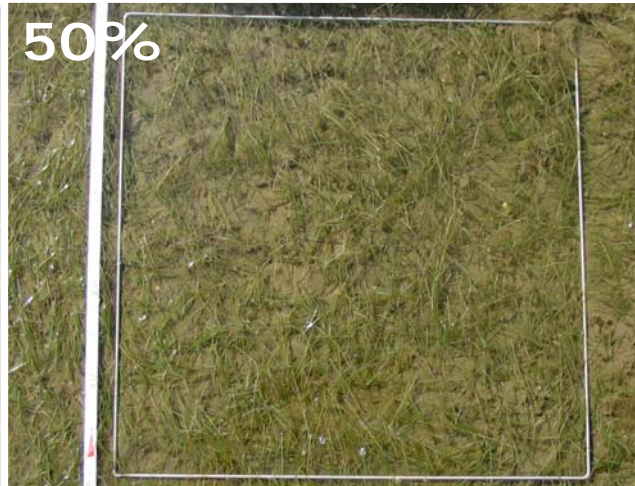
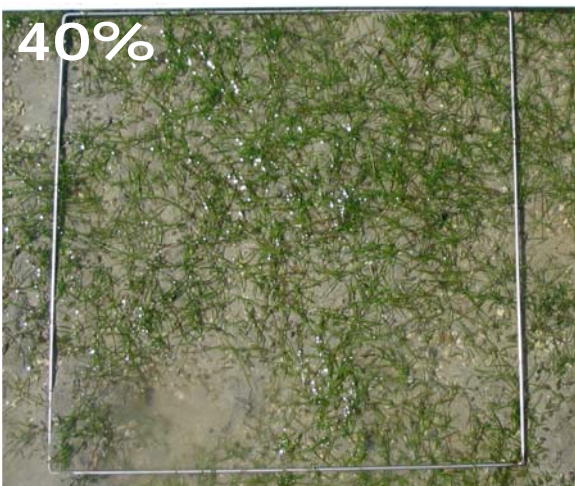
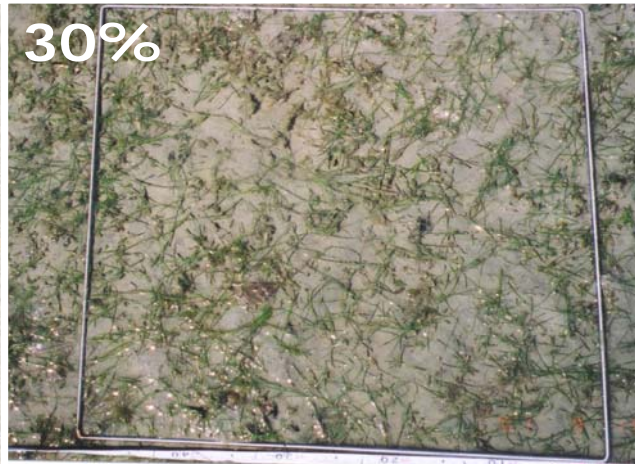
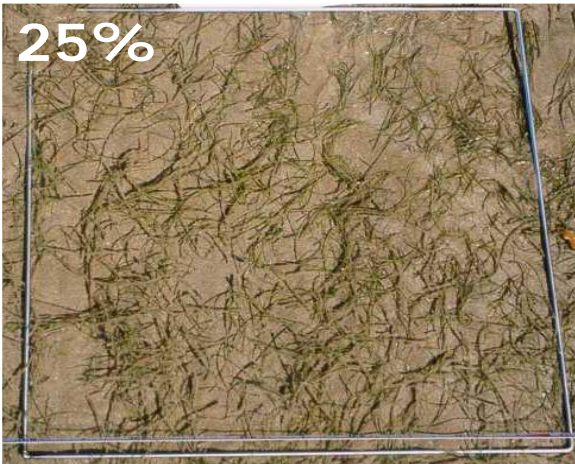
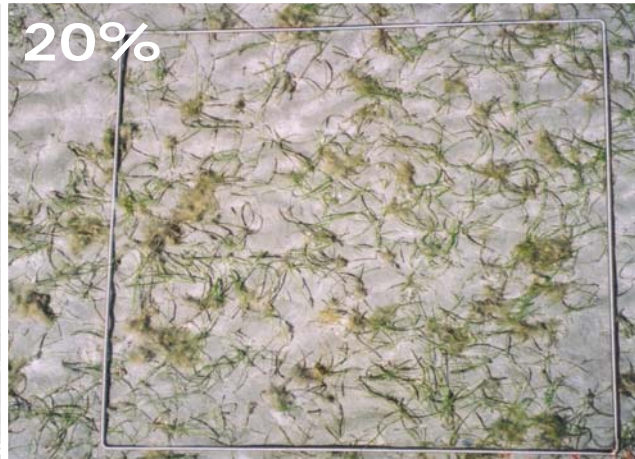
Percent cover standards



Coastal - low



Percent cover standards



Coastal - high



Percent cover standards

2%



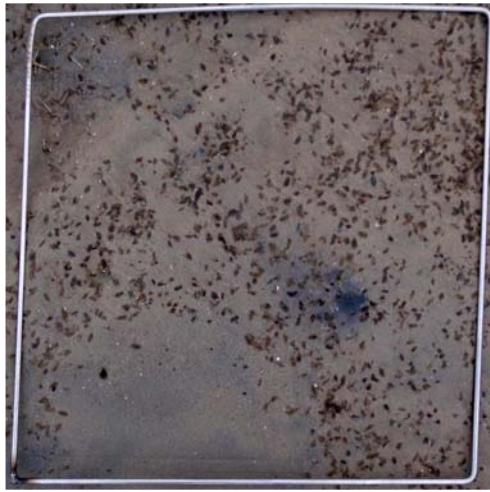
5%



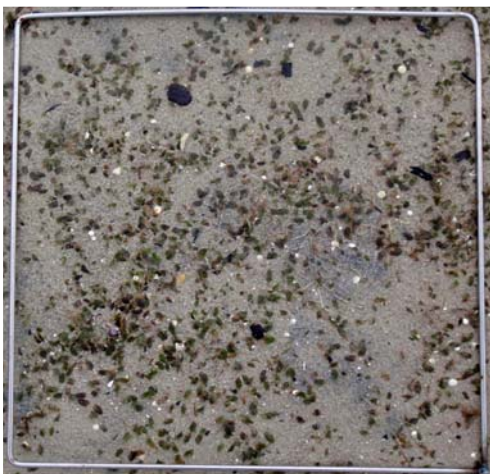
7%



17%



25%



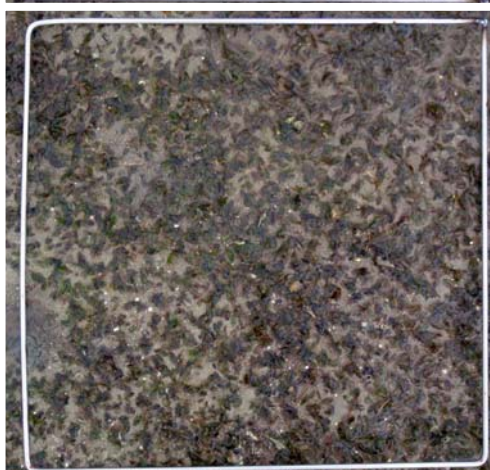
38%



60%



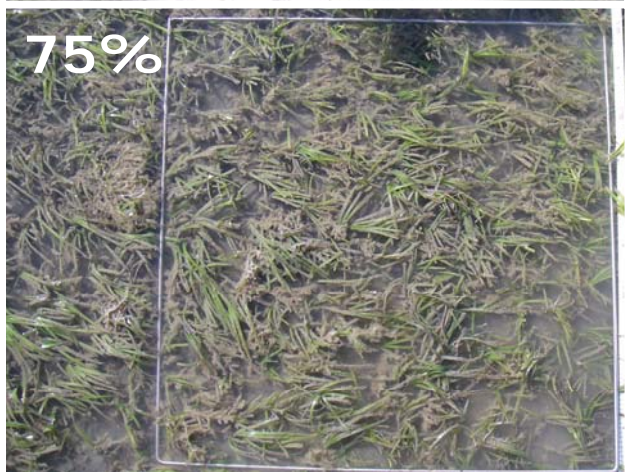
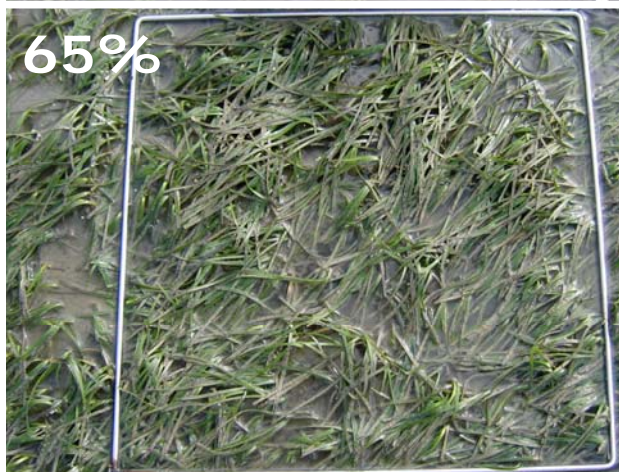
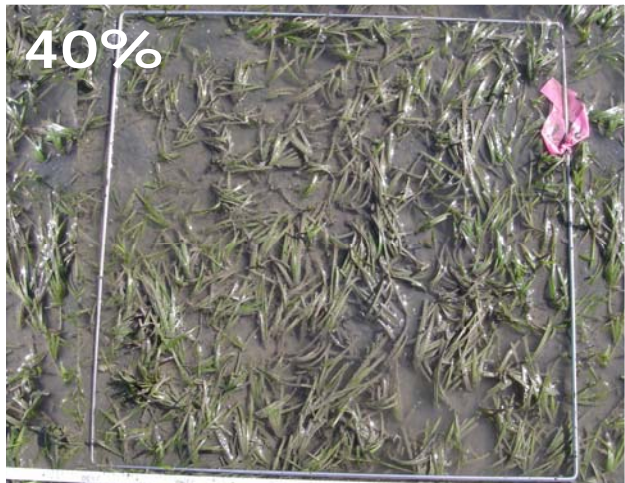
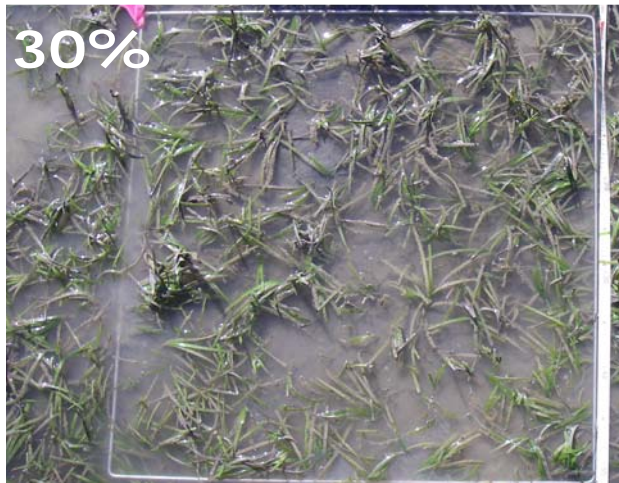
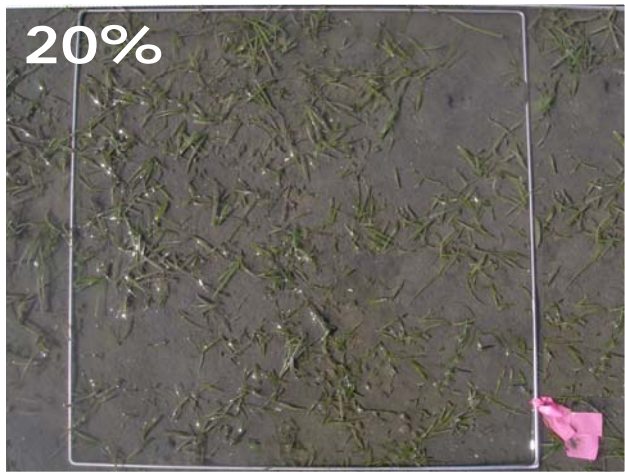
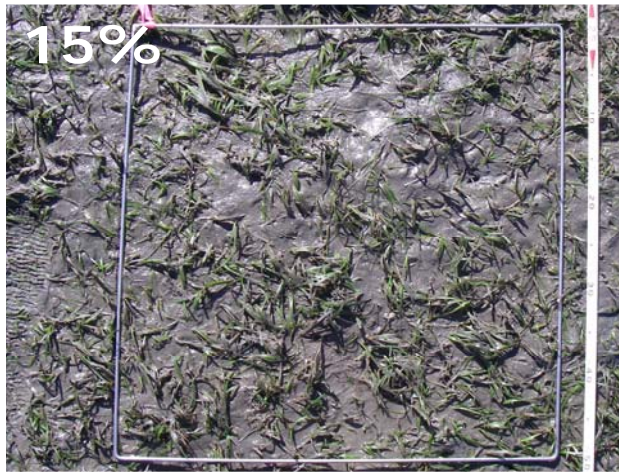
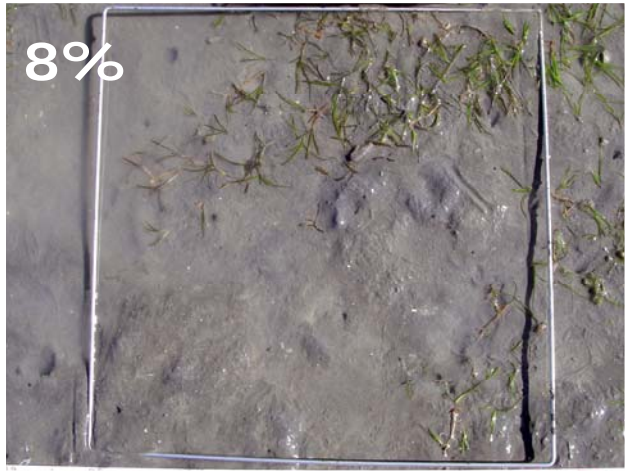
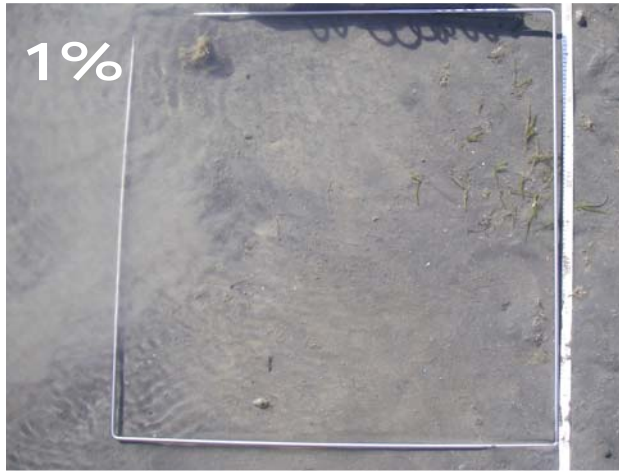
70%



Coastal – *H. ovalis*



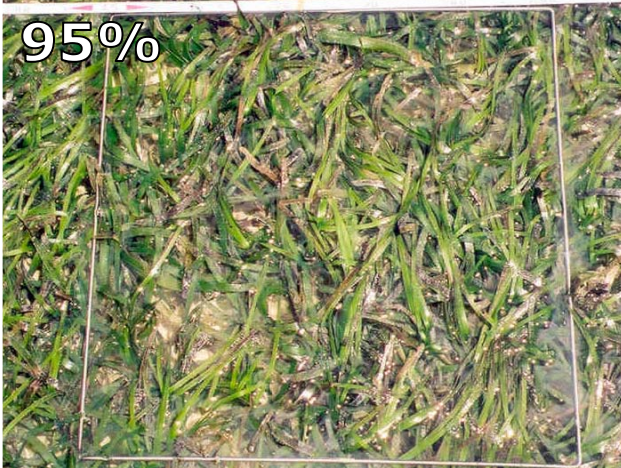
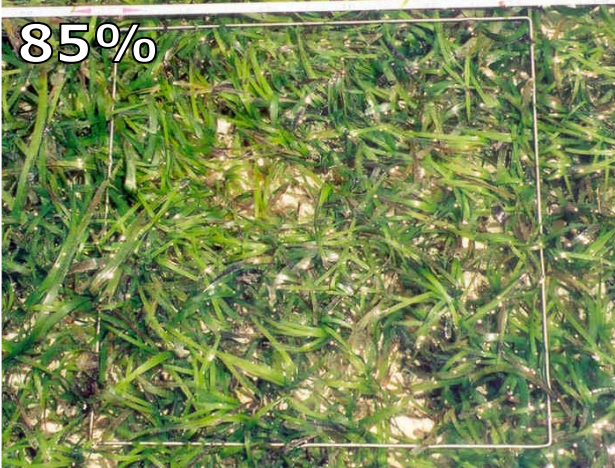
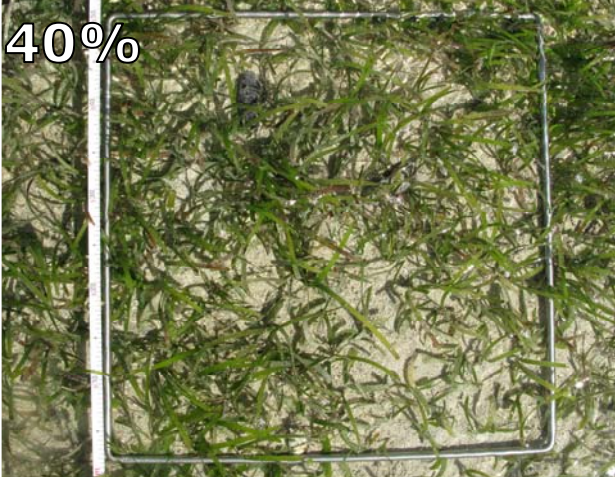
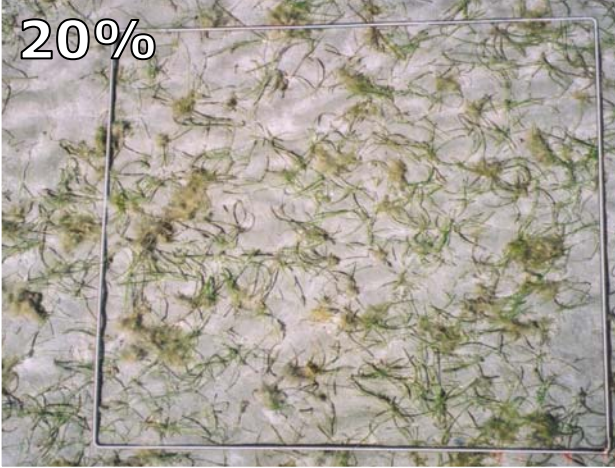
Percent cover standards



Estuary – *Zostera*



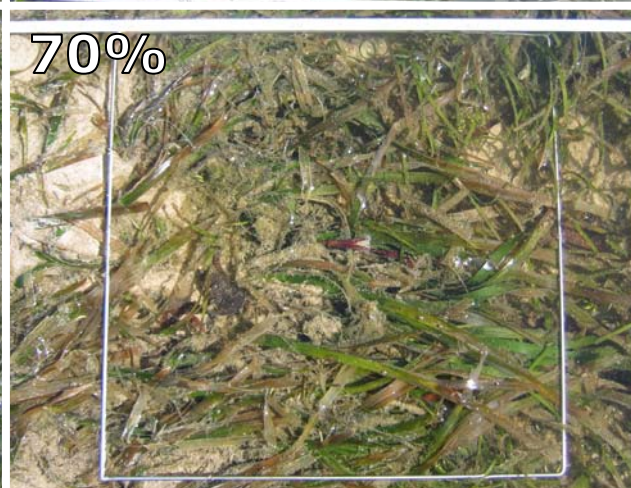
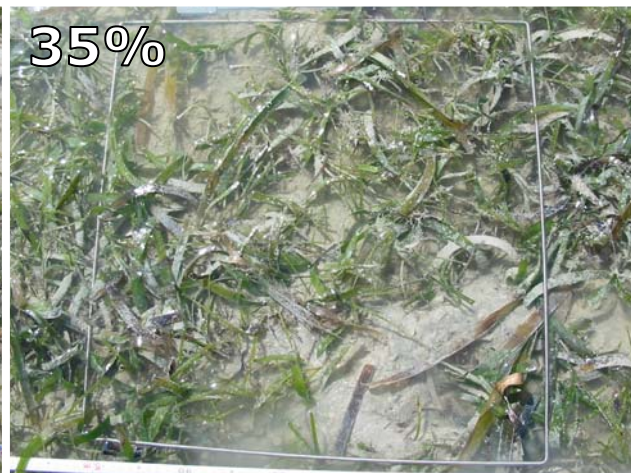
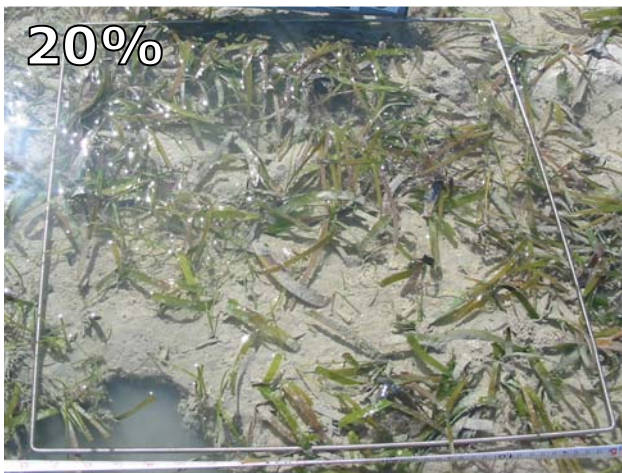
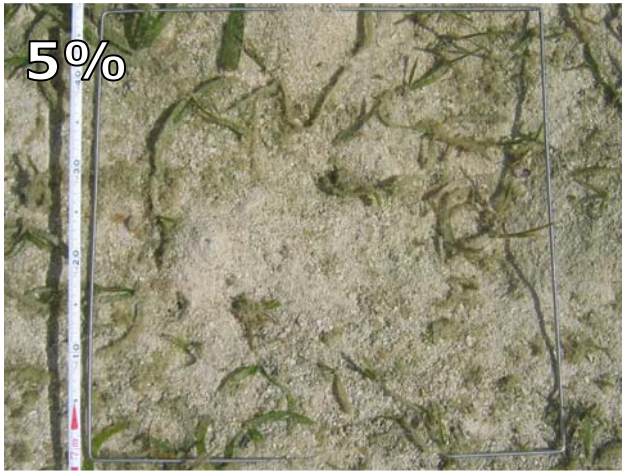
Percent cover standards



Reeftop – *Cymodocea/Halodule*



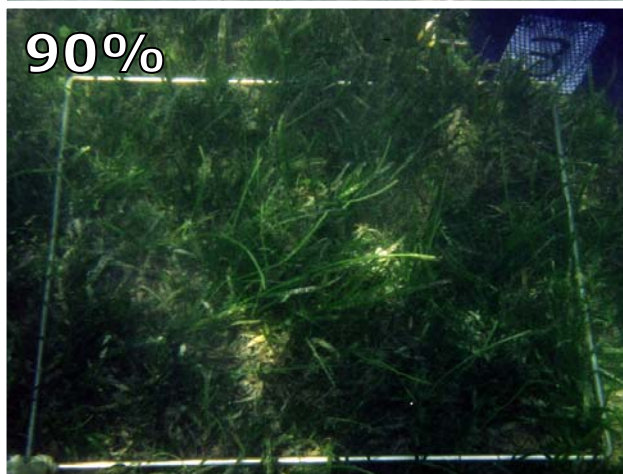
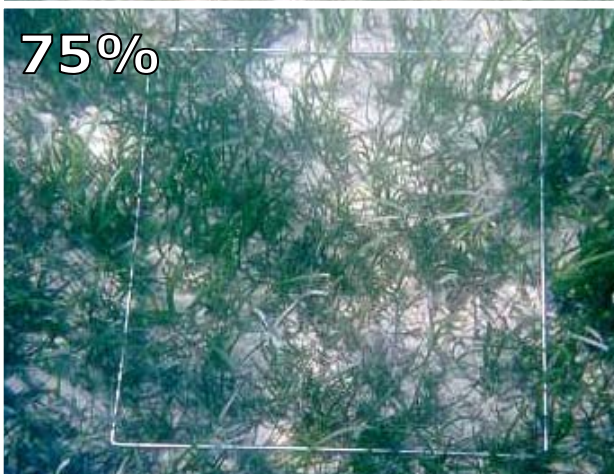
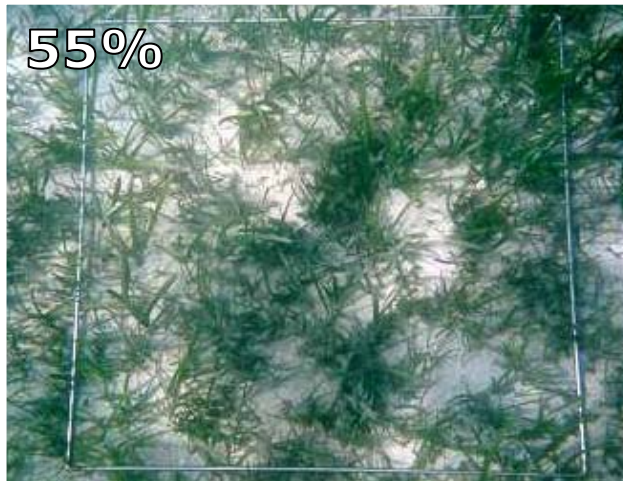
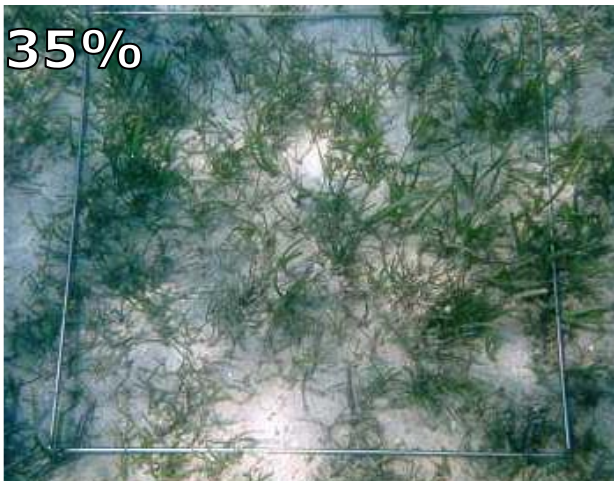
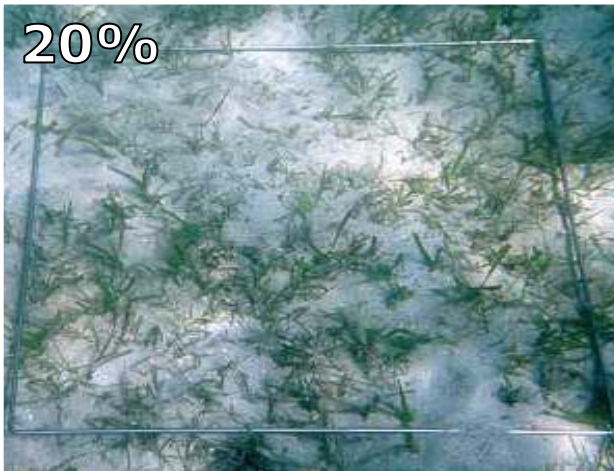
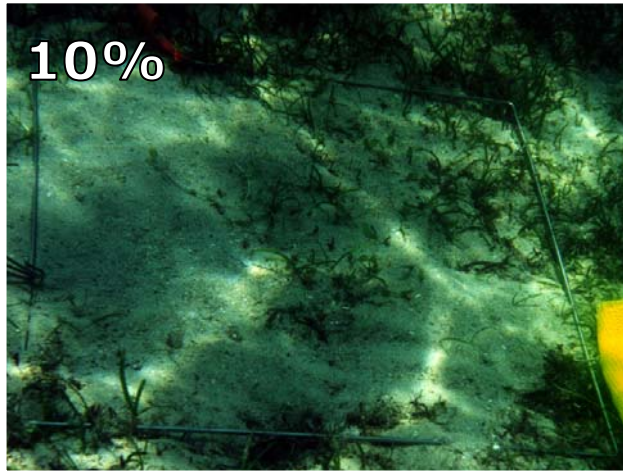
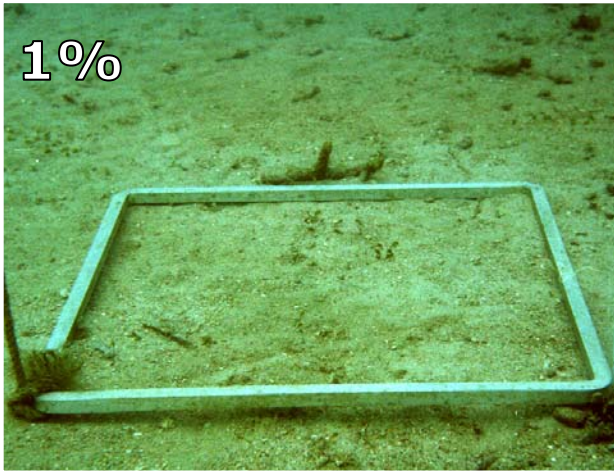
Percent cover standards



Reeftop – mixed *Thalassia/Cymodocea/Enhalus*



Percent cover standards



Subtidal



SEAGRASS SPECIES CODES

Zc

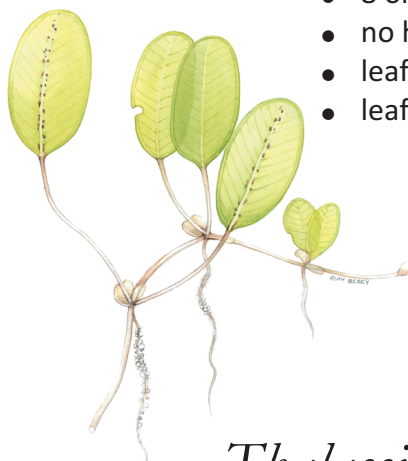
Zostera muelleri subsp. *capricorni*



- leaf with 3-5 parallel veins
- cross-veins form boxes
- leaf tip smooth and rounded, may be dark point at tip
- rhizome usually brown or yellow in younger parts
- leaf grows straight from rhizome (no stem)

Ho

Halophila ovalis



- 8 or more cross veins
- no hairs on leaf surface
- leaf margins smooth
- leaf 5-20mm long

Th

Thalassia hemprichii

- ribbon-like, curved leaves 10-40cm long
- leaf tip rounded, slightly serrated
- short black tannin cells, 1-2mm long, in leaf blade
- thick rhizome with scars between shoots



Hu

Halodule uninervis

- trident leaf tip, not rounded
- 1 central vein
- Rhizome usually pale, with small black fibres at the nodes
- narrow leaf blades 0.25-5mm wide



Cs

Cymodocea serrulata

- serrated leaf tip
- wide leaf blade (5-9mm wide)
- leaves 6-15cm long
- 13-17 longitudinal veins
- robust/strong rhizome



Cr

Cymodocea rotundata

- rounded leaf tip
- narrow leaf blade (2-4mm wide)
- leaves 7-15 cm long
- 9-15 longitudinal veins
- well developed leaf sheath



Si

Syringodium isoetifolium

- narrow spaghetti-like leaves
- cylindrical in cross section, 1-2mm diameter
- leaves contain air cavities
- leaf tip tapers to a point
- leaves 7-30cm long



Ea

Enhalus acoroides

- very long (>30cm) ribbon-like leaves with inrolled leaf margins
- thick rhizome with long black bristles and cord-like roots



SEAGRASS SPECIES CODES

Hm

Halophila minor



- less than 8 pairs of cross veins
- small oval leaf blade less than 5mm wide
- leaf margins smooth
- no leaf hairs

Hs

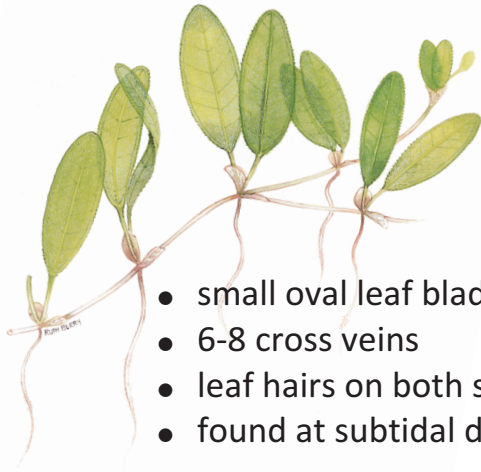
Halophila spinulosa



- leaves arranged in opposite pairs
- leaf margin serrated
- erect shoot up to 15cm long
- 10-20 pairs of leaves per shoot
- thin rhizomes
- found at subtidal depths

Hd

Halophila decipiens



- small oval leaf blade 1-2.5cm long
- 6-8 cross veins
- leaf hairs on both sides
- found at subtidal depths

Ht

Halophila tricostata



- Leaves with 3 veins
- 2-3 leaves at each node
- Leaves "whorl" around stem
- Found at subtidal depths
- Erect shoots 8-18cm long

Rm

Ruppia maritima

- leaves fine and thread-like
- pointed tip on leaves, sometimes serrated
- inflorescence on a long stalk, sometimes spiralled
- rhizome fragile
- semi-fresh or estuarine environments



Tc

Thalassodendron ciliatum

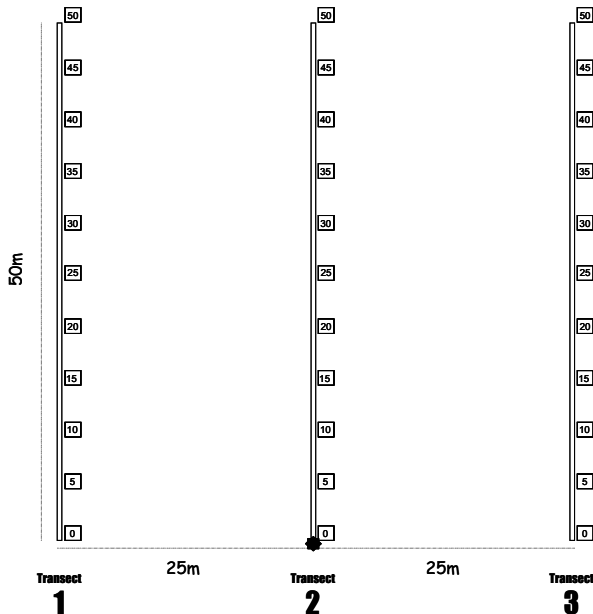
- erect stem up to 65cm long bearing leaf cluster
- rhizome tough and woody
- ribbon-like, sickle-shaped leaves with ligule
- round, serrated leaf tip
- often found attached to rock or coral substrate



Seagrass-Watch Protocols

Source: www.seagrasswatch.org/manuals.html

Site layout



Quadrat code = site + transect+quadrat

e.g., AP1225 = Archer Pt. site 1, transect 2, 25m quadrat

Pre-monitoring preparation

Make a Timetable

Create a timetable of times of departure and arrival back, and what the objective of the day is and what is to be achieved on the day. Give a copy of this to all participants involved in advance so they can make their arrangements to get to the site on time. List on this timetable what the participants need to bring.

Have a Contact Person

Arrange to have a reliable contact person to raise the alert if you and the team are not back at a specified or reasonable time.

Safety

- Assess the risks before monitoring - check weather, tides, time of day, etc.
- Use your instincts - if you do not feel safe then abandon sampling.
- Do not put yourself or others at risk.
- Wear appropriate clothing and footwear.
- Be sun-smart.
- Be aware of dangerous marine animals.
- Have a first aid kit on site or nearby
- Take a mobile phone or marine radio

Necessary equipment and materials

- 3x 50metre fibreglass measuring tapes
- 6x 50cm plastic tent pegs
- compass
- 1x standard (50cm x 50cm) quadrat
- 3x Monitoring datasheets
- clipboard, pencils & 30 cm ruler
- camera
- quadrat photo labeller
- percent cover standard sheets
- seagrass identification sheets

Each sampling event

Within the 50m by 50m site, lay out the three 50 transects parallel to each other, 25m apart and perpendicular to shore (see site layout). Within each of the quadrats placed every 5m along each transect for sampling, complete the following steps:

Step 1. Take a photograph of the quadrat

- Photographs are taken of **every quadrat** along each transect. Use a quadrat free of strings and place the quadrat photo labeller beside the quadrat and tape measure with the correct code on it.
- Take the photograph from an angle as **vertical** as possible, which includes the entire quadrat frame, quadrat label and tape measure. Fill the field of view as best as possible and avoid any shadows or patches of reflection off any water. Check the photo taken box on datasheet for quadrat.

Step 2. Describe sediment composition

- Dig your fingers into the top centimetre of the substrate and feel the texture. Describe the sediment by noting the grain size in order of dominance (e.g., Sand, Fine sand, Fine sand/Mud).

Step 3. Describe other features and ID/count of macrofauna

- Note and count (whole numbers - never use < or > symbols) any features which may be of interest (e.g. gastropods, hermit crabs, crab burrows, worm holes, dugong grazing trails, etc) within the comments column. Also note sediment ripples if present.
- If water covers half or more of the quadrat, measure depth in cm.



Step 4. Estimate seagrass percent cover

- Looking down on the quadrat from above, estimate the total percentage of the seabed (substrate) within the quadrat covered by seagrass. Estimate the footprint/shadow provided by the seagrass shoots.
- Always use the percent cover photo standards (calibration sheets) as your guide, estimating cover as accurate as possible, e.g. 27%, 61%
- If cover is below 3%, you can count the seagrass shoots and calculate percent cover using the rule of 1 shoot = 0.1%. Please note: this will be greater for shoots of larger sized species.

Step 5. Estimate seagrass species composition

- Identify the species of seagrass within the quadrat and determine the percent contribution of each species (starting with least abundant, total composition must equal 100%)
- Use seagrass species identification keys provided and use more than 1 feature to identify each species

Step 6. Measure seagrass canopy height

- Measure canopy height (in centimetres) of the dominant strap-leaf species, ignoring the tallest 20%.
- Measure from the sediment to the leaf tip of 3 shoots, entering all 3 measures onto datasheet

Step 7. Estimate algae percent cover

- Looking down on the quadrat from above, estimate the total percentage of the seabed (substrate) within the quadrat covered by macroalgae (independent of seagrass cover)
- Macroalgae is not attached to seagrass leaves and may be attached to rocks, shells or drifting.

Step 8. Estimate epiphyte percent cover

- Epiphytes are algae attached to seagrass blades and often give the blade a furry appearance.
- First estimate how much of an average seagrass leaf surface is covered, and then how many of the leaves in the quadrat are covered. For example, if 20% of the blades are each 50% covered by epiphytes, then quadrat epiphyte cover is 10%. Use the epiphyte matrix to assist you.
- Do not include epifauna with epiphytes. Epifauna are sessile animals attached to seagrass blades – record % cover of epifauna in the comments or an unused/blank column – do not add to epiphyte cover.

Step 9. Take a voucher seagrass specimen if required

- Place seagrass samples in a labelled plastic bag with a little seawater and a waterproof label. Select a representative specimen of the species and ensure that you have all the plant parts including the rhizomes and roots. Collect plants with fruits and flowers structures if possible.

Step 10. Move to next quadrat

- Repeat steps 1 to 8 for the remaining 32 quadrats

Step 11. At completion of monitoring

- Check data sheets are filled in fully.
- Remove equipment from site (e.g., non-permanent pegs)

At completion of monitoring

Step 1. Wash & pack gear

- Rinse all tapes, pegs and quadrats with freshwater and let them dry.
- Review supplies for next sampling event and replenish as required
- Store gear for next sampling event

Step 2. Press any voucher seagrass specimens if collected

- The voucher specimen should be pressed as soon as possible after collection. Do not refrigerate longer than 2 days.
- Allow to dry the press in a dry/warm/dark place for a minimum of two weeks. For best results, replace the newspaper after 2-3 days.

Step 3. Submit all data

- Data can be entered into the MS-Excel file downloadable from www.seagrasswatch.org. Email completed files to admin@seagrasswatch.org
- Mail original datasheets, photos and herbarium sheets

For postal address, see
<https://www.seagrasswatch.org/contact>



SEAGRASS-WATCH MONITORING

ONE OF THESE SHEETS IS TO BE FILLED OUT FOR EACH TRANSECT YOU SURVEY



START of transect (GPS reading)

Latitude: Longitude:

OBSERVER: Dev Citizen DATE: 17 / 2 / 09
 LOCATION: Burum Heads
 SITE code: BH1 TRANSECT no.: 2
 START TIME: 1304 END TIME: 1340

Quadrat (metres from transect origin)	Sediment (eg. mud/sand/shell)	Comments (eg 10x gastropods, 4x crab holes, dugong/feeding trails, herbarium specimen taken)	Seagrass coverage (%)	% Seagrass species composition			Canopy height (cm)	% Algae cover	% Epi- cover
				HO	HU	ZC			
1 (0m)	Sand	SC x 3 HC x 1	40	30	70		5.4, 7	5	33
2 (5m)	S	GAS x 3	33	50	50		10.7, 8	10	18
3 (10m)	md sand	worm x 1	18	70	20	10	6.8, 5	0	48
4 (15m)	m s	DFT x 1	0				0	17	0
5 (20m)	m s shell	HC x 3	36	5	90	5	9.7, 5	12	57
6 (25m)	m s sh	-	48	100			1cm	2	96
7 (30m)	Fine Sand	Turtle cropping	0				1cm	23	0
8 (35m)	FS	SC x 2 CH x 3	0.7		100		1.5cm	18	31
9 (40m)	S m	Mud w/ork x 2 HC x 1	23	96	4		2cm	6	17
10 (45m)	M		41	2	95	3	2.4, 6	3	21
11 (50m)	m s		16	3	7	90	7.6, 7	38	6

END of transect (GPS reading) Latitude: Longitude:
 SC = Sea Cucumbers HC = Hermit Crab
 GAS = Gastropod CH = Crab Hole
 DFT = Dugong feeding trail

