Continuation of monitoring seagrass resources in Moreton Bay using Seagrass-Watch methods: January 2016 – January 2017

Report No. 20

(Permit: QS2014/MAN82)

Monday, 30 January 2017

Includes Seagrass-Monitoring Report and MangroveWatch Report

By: Simon Baltais

Outline:

1. Introduction.

The Moreton Bay Community Seagrass-Monitoring Program (SGWMB) is part of the Wildlife Queensland Coastal Citizen Science (WQCCS) program. This program is supported by several independent and government bodies.

The primary source of funding has been secured from the Wildlife Preservation Society of Queensland's Bayside Branch (WPSQBB) and Wildlife Preservation Society of Queensland (WPSQ-HO), with valuable funds also generously given by Healthy Waterways, the Port of Brisbane and SEQ Catchments. Support has also been given by the Department of National Parks, Sport and Racing (QPWS) and Tangalooma Resort.

Previous reports have covered the period from April 2006 to January 2016 (Table 1). This report chiefly provides summaries and analysis of Seagrass-Monitoring activities up to January 2017. This period covers three, two-month, monitoring sessions per year (March-April, July-August and November-December).

This report also contains the reporting information from the Gold Coast Seagrass-Monitoring program. It was considered appropriate, and useful, to combine all Citizen Science seagrass monitoring findings in the one document. Wildlife Queensland manages its coastal citizen science projects through the Wildlife Queensland Coastal Citizen Science project team.

Table 1. Summary of all reports prepared and the periods that each report covers.

Report No.	Period covered	Date submitted
1	September 2005 to February 2006	April 2006
2	March to May 2006	June 2006
3	June to October 2006	December 2006
4	November 2006 to May 2007	June 2007
5	June to November 2007	December 2007
6	December 2007 to May 2008	June 2008
7	June to November 2008	December 2008
8	December 2008 to February 2009	February 2009
9	March 2009 to August 2009	September 2009
10	September to November 2009	December 2009
11	December 2009 to May 2010	June 2010
12	June to September 2010	October 2010
13	November 2010 to June 2011	June 2011
14	July 2011 to August 2011	August 2011
15	September 2011 to February 2012	February 2012
16	February 2012 to June 2013	June 2013
17	June 2013 to June2014	July 2014
18	June 2014 to January 2015	January 2015
19	January 2015 to January 2016	January 2016
20	January 2016 to January 2017	January 2017

Seagrass monitoring is based on the methodology developed by Seagrass-Monitoring Head Quarters located at James Cook University (JCU). This methodology is supported by the continued training and monitoring of volunteer seagrass monitoring practices to keep skills up to date (see Section 3). The quality of the data collected by SGWMB volunteers is of a high standard (Finn *et al.* Environmental Conservation, 2010).

There are 61 established sites in Moreton Bay. Several these are monitored regularly (see Sections 4 and 5). From March - April 2016 1 site was monitored; 13 sites during July – August 2016 and 10 sites during November 2016 – December 2016 (see Section 5). Summaries of the data collected during these periods, including both seagrass percent cover and *Lyngbya* prevalence, are reported in Sections 6 and 7 respectively. Section 8 provides an overview of the general seagrass condition within sections of the Bay over a longer time scale.

Wildlife Queensland continues to support The Gold Coast Seagrass-Monitoring Program (SGWGC). Details of activities in this region are reported in Section 16. Ongoing related projects and future directions are discussed in Section 11. The individuals and organisations involved in Seagrass-Monitoring are acknowledged in Section 12. All data that SGWMB has collected to date is attached (see Appendix A & B).

2. Volunteers.

Our volunteers represent a diverse cross-section of society. There are currently 40 volunteers who have adopted sites and regularly monitor their Seagrass-Monitoring sites. During 2016 WQCCS provided resources to Quandamooka Yoolooburrabee Aboriginal Corporation. WQCCS currently has a database of over 400 persons who have received electronic news, as well as the WQ Coastal Citizen Science blog and Facebook page. In 2016 volunteer team members contributed 177 hours to seagrass monitoring with a further 75 hours spent by indigenous volunteers and 10 hours by college students to undertaking seagrass monitoring. While volunteers contributed 104.75 hours to mangrove monitoring (SVAM) and indigenous volunteers contributed 121.5 hours and students 58 hours.

3. Workshops and training.

During the last reporting period SGWMB conducted in-field training sessions and other events to keep volunteers and public updated on seagrass monitoring methodologies and the outcomes of those activities. WQCCS coordinators presented their findings and experiences at the Moreton Bay Quandamooka and Catchment Forum 2016. A copy of the papers presented at this forum are attached.

Further reference is made in detail about these activities in the Wildlife Queensland Coastal Citizen Science blog (https://wpsqccs.wordpress.com/) and Figure 1.

Figure 1: Volunteers and supporters undertaking seagrass and mangrove monitoring.

4. Locations and sites.

The SGWMB pilot program established six sites in May of 2001. These were expanded from October 2002 to include 55 additional sites. In total, SGWMB has 61 established sites within Moreton Bay, with 48 of these currently adopted by trained volunteers (Table 2, Figure 2).

Most of the 13 sites which have not been adopted are logistically difficult to access and monitor, due to either excessive mud (PP4, FI1, FI3, LT1, OR2 & VP2) and/or accessible by boat only (PP4, MB1, AB2, AB3, PI1, PI2, PI3, PI4 and SB3) and therefore finding suitable volunteers to adopt them over the medium to long term is difficult.

Six sites (PP4, FI1 & 3, LT1, OR2 and VP2) are considered too difficult to monitor by a volunteer due safety concerns during site access. These sites are however checked occasionally by Wildlife Queensland Coastal Citizen Science officers. Two sites in Horseshoe Bay, Peel Island (PI3 and PI4) are sub-tidal and no-longer monitored. Any further sites found to be too muddy are likewise being abandoned.

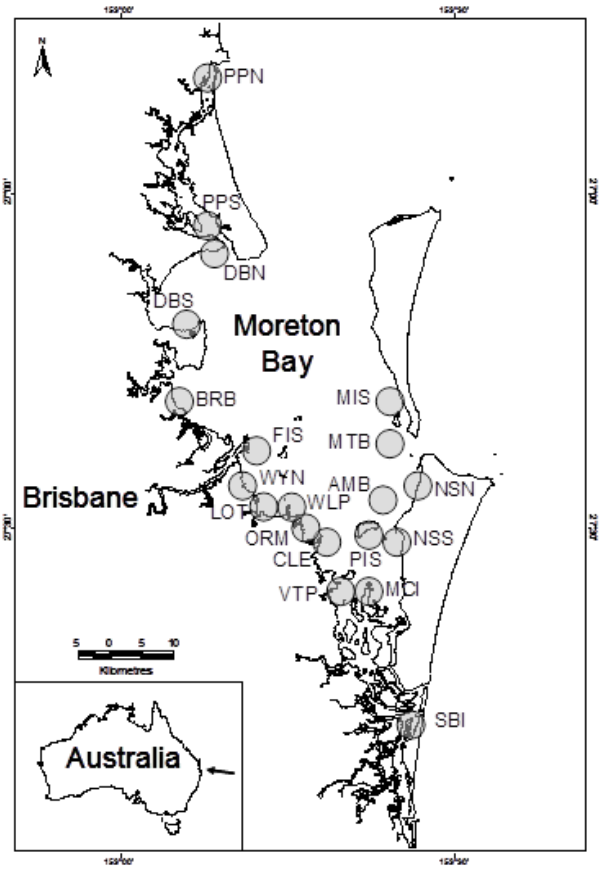


***Figure 2**. Map of the 20 Seagrass-Monitoring locations in Moreton Bay. There are one to five sites within each location making a total of 61 sites. See also Table 2 and our online ArcGIS database (Appendix B).*

Table 2. *Locations of the 61 Seagrass-Monitoring sites in Moreton Bay, including which section of The Bay they belong to and whether they are currently adopted by volunteers. The GPS datum used for all latitudes and longitudes was WGS84.*

	Site Code	Site Location	Monitored	Section	Lat	Long
1	AB1	Amity Banks	yes	East	-27.45112	153.39847
2	AB2	Amity Banks	no	East	-27.46467	153.37822
3	AB3	Amity Banks	no	East	-27.48063	153.38722
4	BB1	Bramble Bay	yes	West	-27.34591	153.10737
5	BB2	Bramble Bay	yes	West	-27.31991	153.0749
6	BB3	Bramble Bay	yes	West	-27.30555	153.06723
7	CL1	Cleveland	yes	West	-27.51048	153.28833
8	CL2	Cleveland	yes	West	-27.51207	153.29137
9	CO1	Coochiemudloo Island	yes	West	-27.574651	153.332062
10	CO2	Coochiemudloo Island	yes	West	-27.574717	153.333233
11	DB1	Deception Bay	yes	West	-27.19861	153.10007
12	DB2	Deception Bay	yes	North	-27.08659	153.11429
13	DB3	Deception Bay	yes	North	-27.08435	153.136617
14	FI1	Fisherman Islands	yes	West	-27.371079	153.189488
15	FI2	Fisherman Islands	yes	West	-27.37704	153.18551
16	FI3	Fisherman Islands	no	West	-27.37857	153.18584
17	LT1	Lota/Thornside	yes	West	-27.46435	153.19251
18	LT2	Lota/Thornside	yes	West	-27.46799	153.1945
19	LT3	Lota/Thornside	yes	West	-27.47848	153.20491
20	MB1	Moreton Banks	no	East	-27.36413	153.4093
21	MB2	Moreton Banks	no	East	-27.38416	153.37765
22	MB3	Moreton Banks	no	East	-27.41336	153.37961
23	MI1	Moreton Island	yes	East	-27.3275	153.38995
24	MI2	Moreton Island	yes	East	-27.2935	153.40127
25	MY1	Macleay Island	yes	South	-27.587943	153.357254
26	MY2	Macleay Island	yes	South	-27.59787	153.36248
27	NS1	North Stradbroke Island (One Mile)	yes	East	-27.48999	153.40529
28	NS2	North Stradbroke Island (Myora)	yes	East	-27.46923	153.42175
29	NS3	North Stradbroke Island (Amity)	yes	East	-27.40877	153.43748
30	NS4	North Stradbroke Island (Adams Beach)	yes	East	-27.50652	153.40818
31	NS5	North Stradbroke Island (Blakesleys Anchorage)	yes	East	-27.58083	153.41129
32	OR1	Ormiston	yes		-27.51296	153.26201
33	OR2	Ormiston	no	West	-27.49291	153.2662
34	OR3	Ormiston	yes	West	-27.50654	153.26386
35	OR4	Ormiston	yes	West	-27.49609	153.26282
36	PI1	Peel Island	yes	West	-27.50578	153.35618
37	PI2	Peel Island	no	East	-27.50075	153.36712
38	PI3	Peel Island	no	East	-27.50508	153.35731
39	PI4	Peel Island	yes	East	-27.50157	153.36876
40	PI5	Peel Island		East		
41	PP1	Pumicestone Passage	yes	North	-27.0569	153.13746
42	PP2	Pumicestone Passage	yes	North	-27.06138	153.14178
43	PP3	Pumicestone Passage	yes	North	-27.06437	153.12793
44	PP4	Pumicestone Passage	yes	North	-27.02423	153.08829
45	PP5	Pumicestone Passage	yes	North	26.82094	153.12475
46	SB1	Southern Bay Islands	no	South	-27.77917	153.41905
47	SB2	Southern Bay Islands	no	South	-27.78019	153.42776
48	SB3	Southern Bay Islands	no	South	-27.78355	153.42885
49	SB4	Southern Bay Islands	yes	South	-27.80875	153.4205
50	SB4	Southern Bay Islands	yes	South	--27.78019	153.42776°
51	VP1	Victoria Point	yes	South	-27.58303	153.31668
52	VP2	Victoria Point	no	West	-27.58629	153.31301
53	VP3	Victoria Point	yes	West	-27.59082	153.3101
54	WN1	Wynnum	yes	West	-27.43877	153.17605
55	WN2	Wynnum	yes	West	-27.4437	153.1797
56	WN3	Wynnum	yes	West	-27.44567	153.18781
57	WN4	Wynnum	yes	West	-27.4501	153.18727
58	WP1	Wellington Point	yes	West	-27.46373	153.2381
59	WP2	Wellington Point	yes	West	-27.4577	153.23381
60	WP3	Wellington Point	yes	West	-27.46458	153.23798
61	WP4	Wellington Point	yes	West	-27.47727	153.23637

5. Monitoring.

The number of sites monitored during each survey period steadily increased from the beginning of 2003 to the end of 2004 (Figure 3), mainly due to the progressive establishment of new sites and training of new volunteers to adopt them. Since November-December 2004 the number of sites monitored during each survey period ranged from 9 to 42 (Figure 3). 20 sites were monitored in 2016.

New sites have been established since November-December 2004 as community interest and participation increased. At present the monitoring of approximately 20 - 24 sites per year is sustainable within the resource capability and capacity available to WQCCS. Monitoring using photographic techniques is becoming more prevalent and this helps in the management of the project.

During the past year SGWMB helped the Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) in inspecting the SGWMB sites established in their Native Title Areas. In August and December 2013 respectively QYAC opted to establish two more sites, one at Myora Banks (NS6) further south than the existing (NS2) site; and another on the northern side of Peel Island (PI5).

Residents of Coochiemudlo Island and members of the Coochiemudlo Island Coastcare Care group have sought WPSQ's assistance in monitoring the impacts of dredging and jetty construction on the island's seagrass beds. A monitoring site was established near the jetty and given the limitations of the site, transect lines were established parallel to the shoreline. WQCCS Officers have met with SEQ Catchments Officers to discuss monitoring, particularly in relation to changes since the installation of their Environmentally Friendly Moorings (EFMs). Monitoring of the intertidal zone will also occur so as best to determine changes due to EFM installation.

Sites need only be monitored once (1) per year though three (3) times a year is encouraged. For various reasons, some sites are not able to be monitored during every survey period. While some other sites are accessible by boat only. These are particularly susceptible to weather conditions and consequently are infrequently monitored (e.g. AB2-3, MB1-3, PI13-4, MY1-2 and SB3; see Figure 4.

One infrequently monitored site at Ormiston (OR2) is no longer accessible due to changed hydrodynamic conditions (i.e. the formation of a new deep channel) and is unlikely to be monitored again in the future. Figure 4 shows the number of times that each site has been monitored since the establishment of the pilot program in May 2001.

Of the sites, which have been monitored most frequently, many were among of the six sites established as a part of the pilot program (VP1-3 and WN1-3) and therefore have been monitored for longer (Figure 4). Several of the six volunteer teams that first adopted these pilot sites in May 2001 are still actively involved in the program.

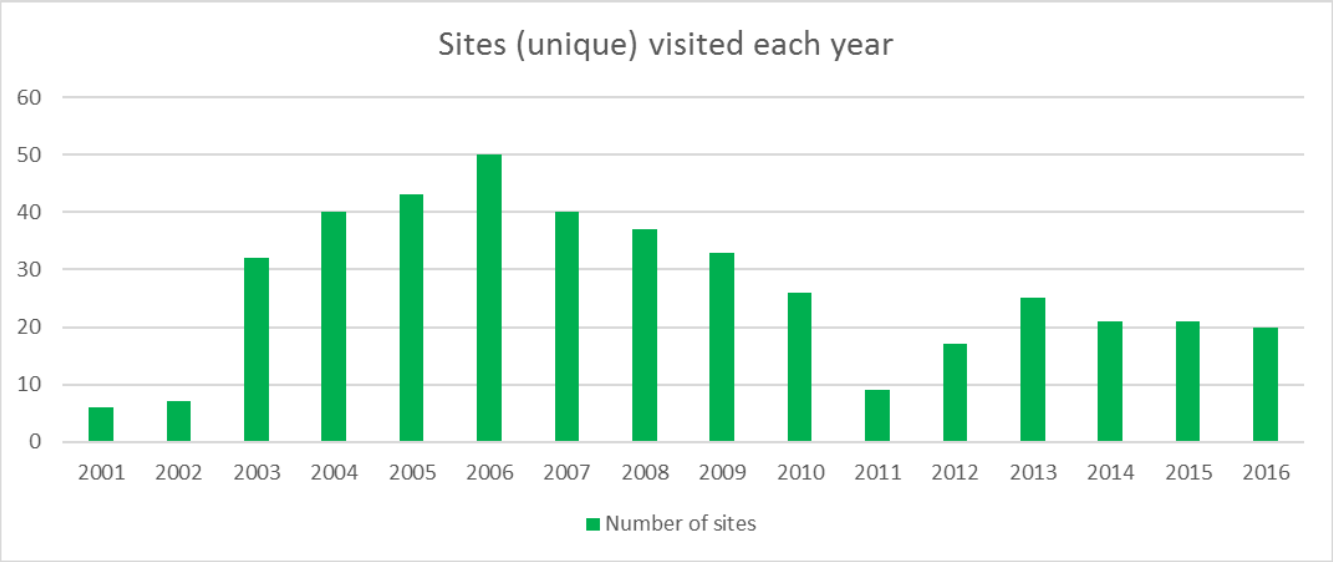


Figure 3. *Number of sites monitored each year since the seagrass monitoring period in Moreton Bay commenced.*

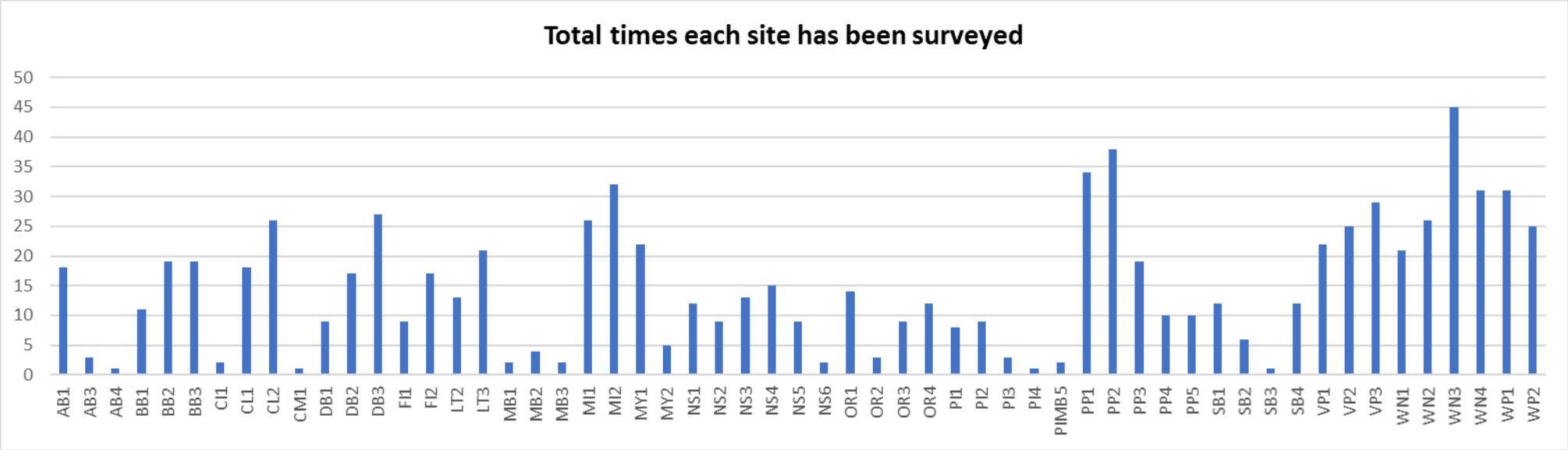


Figure 4: *Total times each site has been surveyed since the commencement of the monitoring program in May 2001 to 2016.*

6. Seagrass data summary.

Moreton Bay supports seven seagrass species (Zostera muelleri ssp. capricorni, Halophila ovalis, Halophila spinulosa, Halophila decipiens, Halodule uninervis, Cymodocea serrulata and Syringodium isoetifolium), totalling about 25,000 ha, which occur in intertidal and subtidal areas (Hyland et al., 1989, Blackman and Craven, 1999, Davie et al., 2011).

The seagrass cover by species composition for sites monitored since 2001 are shown in Figure 5a.

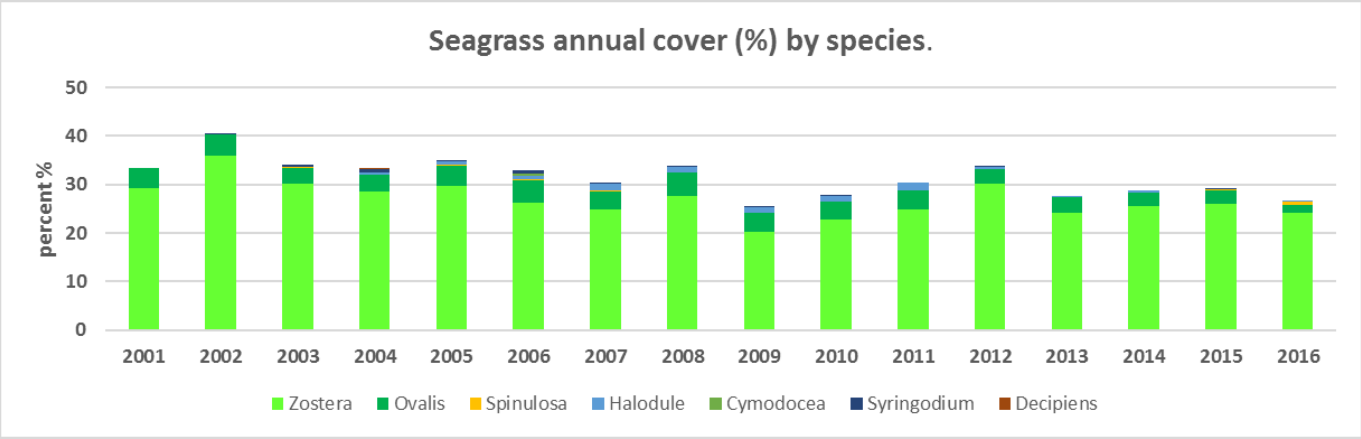


Figure 5a. *The total average intertidal seagrass cover (%) for Moreton Bay by major species for all sites monitored from 2001 to January 2016.*

Figure 5a shows that *Zostera muelleri* ssp. *capricorni* continues to be the most dominant seagrass species found amongst the 24,000ha of seagrass found in Moreton Bay (Davie *et al.*, 2011) particularly on the Western sections of Moreton Bay (Figure 5b), Southern Moreton Bay and generally in the Pumicestone Passage (Figure 5c).

The monitoring undertaken continues to highlight seasonal trends in seagrass cover with seagrass density increasing in summer and declining in winter (Zostera highlighted in orange) at many monitoring sites this is notable along Western Moreton Bay (Figure 5b) and generally similar in the Pumicestone Passage (Figure 5c).

There has been anecdotal evidence to suggest intertidal seagrass on the Western side of Moreton Bay increased –one to two months after high rainfall events in summer.

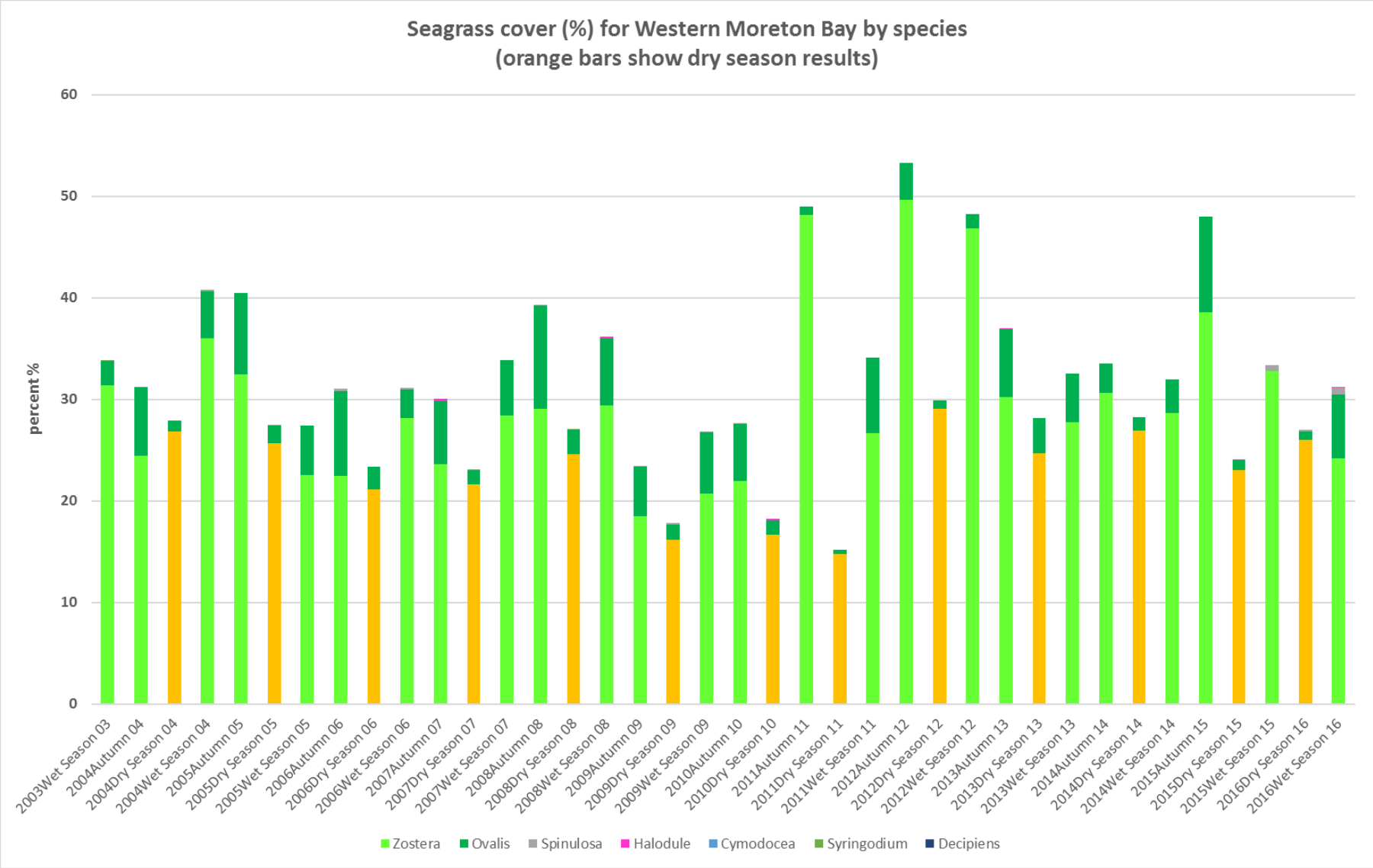


Figure 5b: *Total intertidal seagrass cover (%) for the Western region of Moreton Bay by species, showing seasonal seagrass cover pattern.*

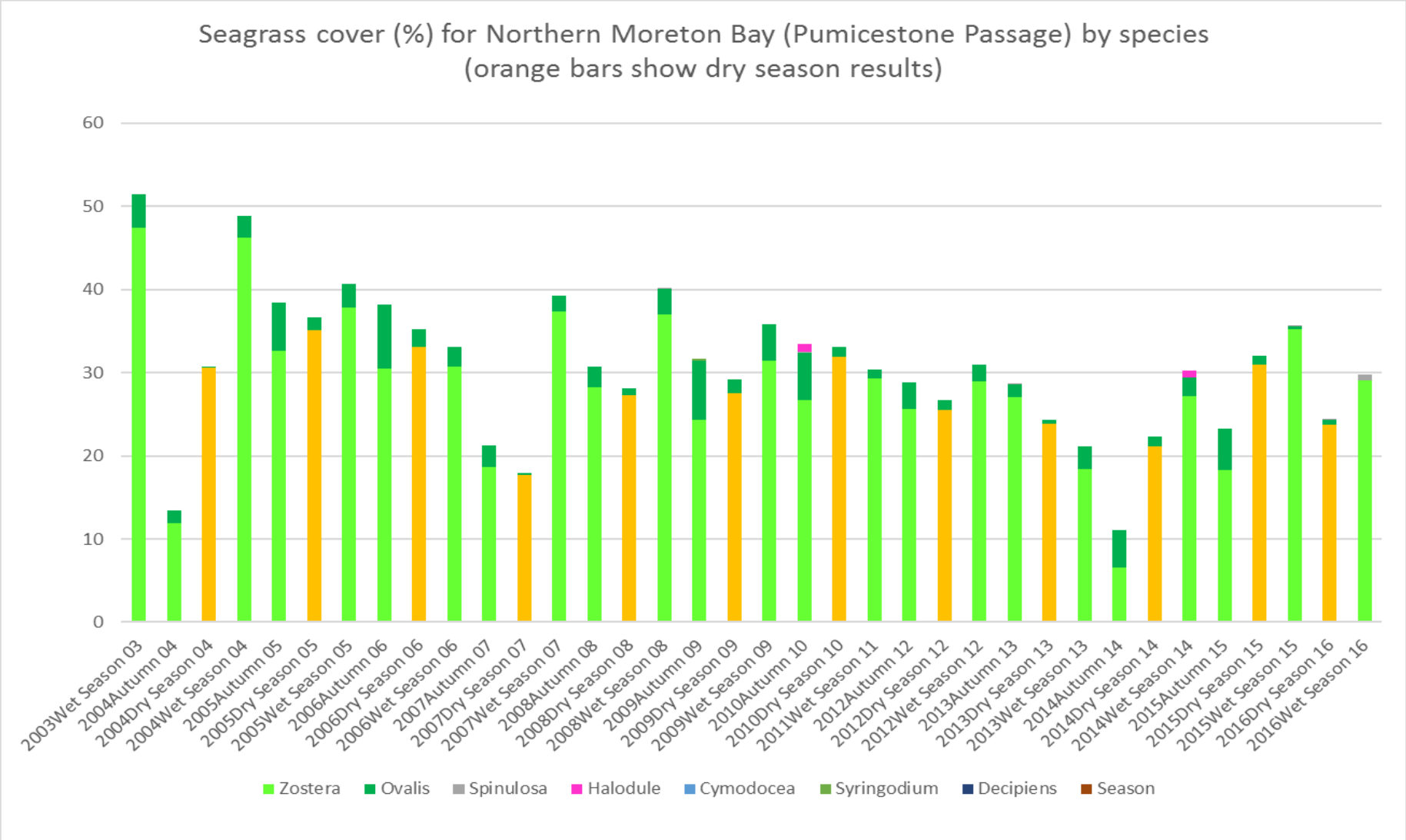


***Figure 5c**: Seagrass cover Pumicestone Passage. Winter shown by orange bar (Zostera).*

Seagrass monitoring in Moreton Bay has also established the extent and growth in commercial bait worming in some areas of Moreton Bay. It has provided evidence of the impact of both recreational and commercial bait worming activities on seagrass meadows.

Commercial bait worming involves the raising of a wall around an area, then digging within the bunded area (pit) with a digging fork to find and take bloodworms (Figure 6) (Skilleter, 2004). As bloodworms are a burrowing animal, harvesting involves the complete turn-over of the top 20-50cm of sediment and seagrass (Skilleter, 2006).

Figure 6: *Commercial Bait worming. Photograph by S. Baltais.*

Due to the low wave and tidal energy in these areas in many instances the disturbed sediments and surface do not return to their normal form. Harvesting has caused the loss of seagrass, permanent changes in topography and seagrass species and the mixing and compaction of sediment (Fowler and Nature, 1999, Skilleter et al., 2006). The impact of bait worming in Moreton Bay is shown in Table 3.

Table 3: *Impact of commercial bait worming on seagrass meadows in Moreton Bay shown in hectares (ha).*

	Bait worming activity 2010	**Bait worming activity 2013**
Manly	0 m²	9,628 m²
Snipe Island	0 m²	20,558 m²
	Bait worming activity Oct 2009	**Bait worming activity 2013**
Lota / Thorneside	70,654 m²	344,739 m²
Total increase		304,271m² (30.5 ha)

The loss of seagrass at Ormiston (OR4) in 2014 due to commercial bait worming was estimated to be approximately 50%. Similar losses of seagrass have been recorded at other seagrass monitoring sites where commercial bait worming occurs.

Past researchers such as Skilleter (2004; 2006) support findings on seagrass loss. Refer to attached reports on Manly (WN4) and Thorneside (LT3), which further highlight the negative impact of commercial bait worming upon seagrass meadows.

7. Lyngbya prevalence.

As *Lyngbya majuscula* is of concern (i.e. a sporadically occurring cyanobacteria toxic to humans and wildlife). SGWMB volunteers are trained in the ability to detect and record it whenever it is present during normal monitoring. Volunteers are also encouraged to record the presence of *Lyngbya* outside of normal monitoring periods or locations on an ad hoc basis.

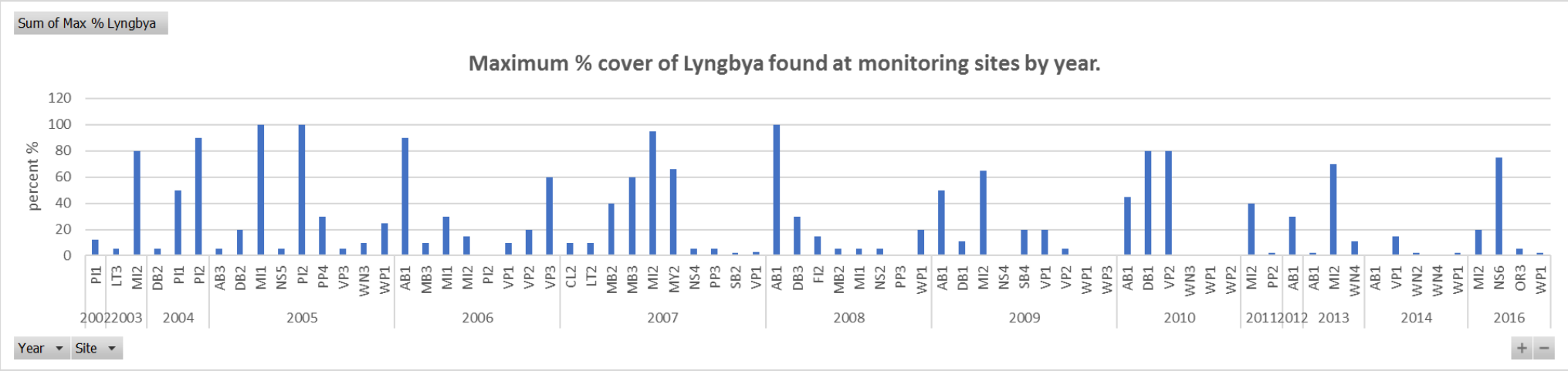
Of the sites monitored since 2005 it is shown there has been a decline in the number of sites affected by Lyngbya since summer 2010 and a reduction in Lyngbya cover (Table 4). *Lyngbya* tends to be more prevalent during the warmer months of summer, and prior to 2005 was only ever recorded by SGWMB during summer.

In winter (July-August) 2005 *Lyngbya* was recorded in Moreton Bay for the first time outside of summer months and since then it has been present to some degree during all survey periods (Table 4). This suggests that *Lyngbya* may be ubiquitous in small amounts, waiting for favourable conditions to bloom. *Lyngbya* blooms appear to have occurred to a notable extent in Moreton Bay from 2003 – April 2010 (Table 4).

During 2003 – 2005 and 2007 – April 2010 *Lyngbya* cover has exceeded 15% cover at one site per year. The locations of highest *Lyngbya* prevalence from 2002 to 2014 have been: Deception Bay (DBN), Moreton Banks (MTB), Amity Banks (AMB), Moreton Island (MIS), Peel Island (PIS), Wellington Point (WLP), Victoria Point (VTP) and Macleay Island (Table 4).

The 2016 results show that there were only 2 notable events (over 15% cover) and only one significant event.

Table 4: Lyngbya cover (%) found at seagrass monitoring sites in Moreton Bay.



8. Overview of seagrass condition, 2001- January 2016

Overall seagrass distribution appears to be relatively stable in Moreton Bay and the average percent of seagrass cover is highlighted in Figure 8a. It is useful to reflect upon Figure 5b, as this has been produced from long-term regular monitoring of the Western side of Moreton Bay.

Although there may have been some distributional shifts within seagrass meadows, sites very rarely move from supporting seagrass to being completely devoid or vice versa. There has been an interesting case where seagrass appeared in an area where it was once devoid (DB1) and another where seagrass almost completely disappeared (AB1). It is also noted that while there is seasonal variation at some individual sites, the variation across all sites over time cannot be explained by season alone.

SGWMB were concerned that there appeared to be a general decline is seagrass cover in the Northern Section of Moreton Bay. A recent study undertaken by one of our team has processed 25 years of Landsat data and this is currently being reviewed to establish seagrass change across Moreton Bay (see attached paper). This study has highlighted seagrass changes at several specific sites. Further, work with the Quandamooka people has also been processed and a report on their findings is also attached.

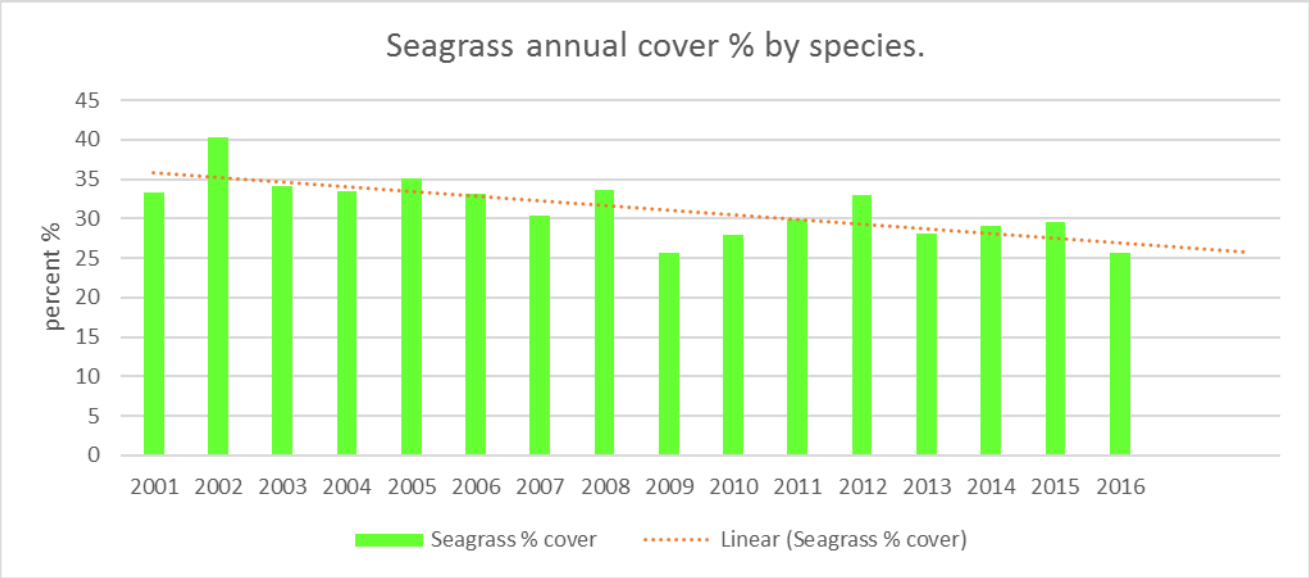


Figure 8a: Total average intertidal seagrass cover for Moreton Bay from 2001 – 2016.

While there appears to be a general decline in seagrass percent cover recent research (see attached paper) indicates intertidal seagrass areal cover (approx. 5,600 ha) is relatively stable. The overall decline in seagrass percent cover needs to be further investigated given there are several reasons for this including statistical bias.

9. Data accuracy and consistency.

All of the 33 quadrats (0.5 m^2 area) sampled by volunteers during each monitoring session are photographed and later scored by a professional scientist (i.e. validated) for data quality assurance and quality control. WQCCS has previously compared the correspondence between volunteer and professional scientists within sites over time and demonstrated that there is generally a very close match between the seagrass cover estimates of volunteer and professional scientists at the site level over time (see Report No. 6 and 7). Published peer reviewed paper assesses the quality of the data collected by our volunteers: *Assessing the quality of seagrass data collected by community volunteers in Moreton Bay Marine Park, Australia* (Finn *et al.* 2010.).

The Program Manager for Wildlife Queensland Coastal Citizen Science has also undertaken a QA and data cleaning exercise of all data. This program of work will continue an ongoing basis.

Coral Point Count (CPCe) (Kohler and Gill, 2006) has been trialled successfully to calculate seagrass coverage for intertidal areas on sandy substrate. CPCe is a useful means to semi automate the process of assessing seagrass cover and evaluate the accuracy of volunteer monitoring data. Coral Net is to a lesser extent also be used for the same purposes.

10. Gold Coast (SGWGC) region.

SGWMB has since 2014 supported SGWGC. SGWMB and SGWGC coordinators meet with the programme manager to discuss strategies and issues. The SGWGC report is found attached.

11. Related projects and future directions.

Digital photography of seagrass meadows has been trialled and now implemented. This technology has now been applied to standard seagrass monitoring activity and all quadrats are photographed. This technique has been expanded to other seagrass monitoring sites across Moreton Bay and consequently a significant GPS referenced photographic library is being developed.

Remote sensing techniques using WQCCS data was utilised in research undertaken during 2016. This research determined the extent and changes in seagrass across the entirety of Moreton Bay to the Broadwater from the 1978 to 2016. A copy of this research paper is attached and further work is being commenced to refine the technique and accuracy.

12. Acknowledgements.

SGWMB could not continue without the support of hundreds of individuals and several organisations. We thank the Port of Brisbane, SEQ Catchments and Healthy Waterways who provide us financial assistance. We appreciate enormously the huge effort put in by the volunteers. In-kind contributions have also been provided by the WPSQ Bayside (WPSQBB) and Logan Branches, and Tangalooma Resort. There are several individuals whose support we highly value: Nicola Udy (QPWS); Steve Homewood and Maureen Tottenham (WPSQBB). We also rely heavily upon the technical support of our capable community scientists Alix Baltais and Emma Watson.

13. Appendix A.

Total Seagrass Cover and Composition by site (2016)

See attached .pdf

14. Appendix B

Supporting reports

Conference papers (* 2) attached to email.

LT3 report attached to email.

WN4 report attached to email.

Reef Check – WQCCS report.

NSI report attached to email.

25 years Landsat / Seagrass research paper attached to email.

Wildlife Preservation Society of Queensland ArcGIS online database.

http://www.arcgis.com/home/webmap/viewer.html?webmap=1bd66a4e9ac44e1a8bca0c31a03dbac0

Facebook: https://www.facebook.com/wpsqccs?ref=aymt_homepage_panel

Blog: https://wpsqccs.wordpress.com/

15. References

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SKILLETER, G. A. 2004. Assessment of the impacts associated with the harvesting of marine benthic invertebrates for use as bait by recreational anglers. *FRDC, Deakin, A. C. T.(Australia). 287***,** 287.

16. Seagrass Monitoring Gold Coast.

Attached to this email.

17. Mangrove Watch data (part of a series of reports)

Visit:

http://www.mangrovewatch.org.au/index.php?option=com_content&view=category&layout=blog&id=143&Itemid=300366