POTENTIAL OF BLUE CARBON IN THE PHILIPPINES SEAGRASS MEADOWS

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(529) SITES IN THE PHILIPPINES WHERE SEAGRASSES HAVE BEEN REPORTED (NUMBERS BESIDE GEOMETRIC FIGURES 1983-2008). SITES WITHOUT NUMBERS HAVE BEEN SAMPLED ONLY ONCE OR REPEATEDLY, BROKEN LINES INDICATE NUMBER OF SITES UNDETERMINED ■ INITIAL DATA 1983-2000 O SPOT SURVEYS 2003-2005 PACIFIC SEABOARD PROJECT DATA 2005 O VISUAL ANALYSIS OF MAJOR (AT LEAST 500 M IN BREADTH) SEAGRASS BEDS (LANDSAT TM DATA 1999-2002, BANDS 1, 2, 3, PATHS 116 - 117, ROW 47-54) O FROM ENVIRONMENTALLY CRITICAL AREA NETWORK 2005 PRECEPTUAL SURVEY SAMPLING OVERLAP 30 km

SEAGRASS IN THE PHILIPPINES

27,282 km²

seagrass area

(Fortes 2008)

18 species

(Fortes 2013)

CARBON SEQUESTRATION IN SEAGRASS MEADOWS

In megagram carbon dioxide per hectare (Mg CO₂ ha⁻¹)

522

Global estimate

(Pendleton et al. 2012)

439

Indonesia

(Alongi et al. 2015)

506

Singapore (Phang 2015)

218

Banacon Is, Bohol

(Gevaña et al. 2015)

BLUE CARBON IN SEAGRASS MEADOWS

27,282 km²

X

439 (Mg $CO_2 ha^{-1}$)

seagrass area

(Fortes 2008)

Indonesia (Alongi et al. 2015)

1.2 billion Mg CO₂

National

SEAGRASS IN NIPAS SITES IN THE PHILIPPINES PERSISTENT COVER **NON-PERSISTENT COVER** LAND Seagrass extent was based on 100 200 the analysis of remotely sensed images acquired in 1990, 2000, Philippine Sea and 2010. Persistent cover represents seagrass present in all three images, while non-persistent includes seagrass that was present in only one or two periods. West Philippine Sea Sulu Sea Sources: seagrass data - the Coral Reef Visualization and Assessment (CoRVA) Program; land boundaries - NAMRIA 115°0'0"E 120°0'0"E 125°0'0"E

120°0'0"E

115°0'0"E

125°0'0"E

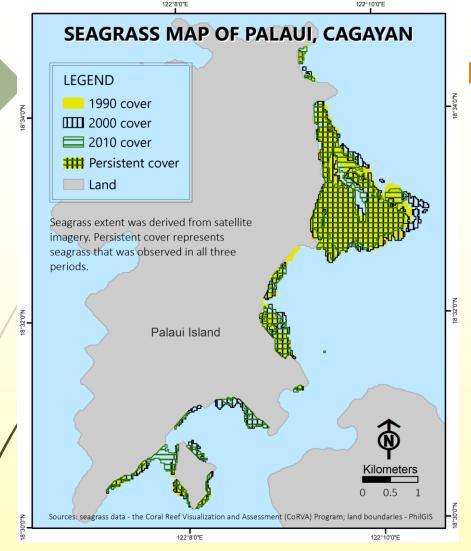
SEAGRASS IN THE PHILIPPINE National Integrated Protected Areas System

222.7km² (1990)

283.4km² (2000)

275.7km² (2010)

(CoRVA Program)



SEAGRASS IN THE PHILIPPINE National Integrated Protected Areas System

57.3 km² (20-25%)

persistent seagrass in NIPAS sites from 1990 to 2010

(CoRVA Program)

465.1 km²

Changing cover of seagrass in NIPAS sites from 1990 to 2010

(CoRVA Program)

C_{org} concentration and density varied with sediment depth and tended to increase from unvegetated to restored sites [revegetation] and the continuously vegetated meadow.. **Marba et al. (2015)**

BLUE CARBON POTENTIAL OF PH SEAGRASS MEADOWS

1.2 billion Mg CO₂

National

239 million Mg CO₂

in persistent seagrass

THREATS TO SEAGRASS

Fortes, MD 2013 "A Review: Biodiversity, Distribution and Conservation of Philippine Seagrasses":

Problem	Immediate	Short-term	Long-term
Habitat destruction***	1	1	1
Sewage pollution***	2	2	3
Industrial pollution***	3	3	2
Fisheries overexploitation***	4	4	6
Siltation/sedimentation***	5	5	4
Oil pollution **	6	6	8
Hazardous waste*	7	7	7
Agricultural pollution**	8	8	5
Red tides*	9	9	11
Coastal erosion*	10	10	10
Natural hazards*	11	12	12
Sea level rise*	12	11	9

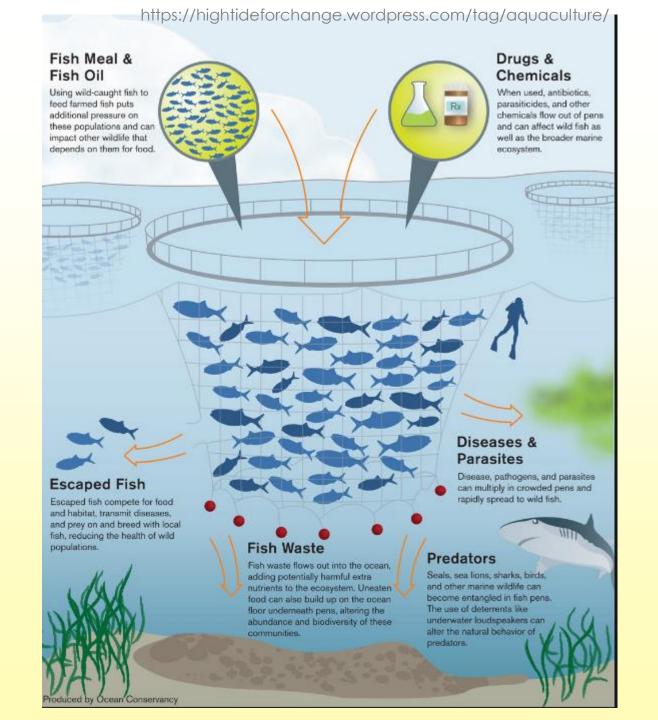
MARICULTURE

9

Based on increasing sensitivity (decreasing resistance) to a combined effect of nutrients, chlorophyll-a and siltation:

Enhalus acoroides > Thalassia hemprichii > Cymodocea rotundata > Halodule uninervis > C. serrulata > Halophila ovalis > Syringodium isoetifolium.

Fortes et al., 2012

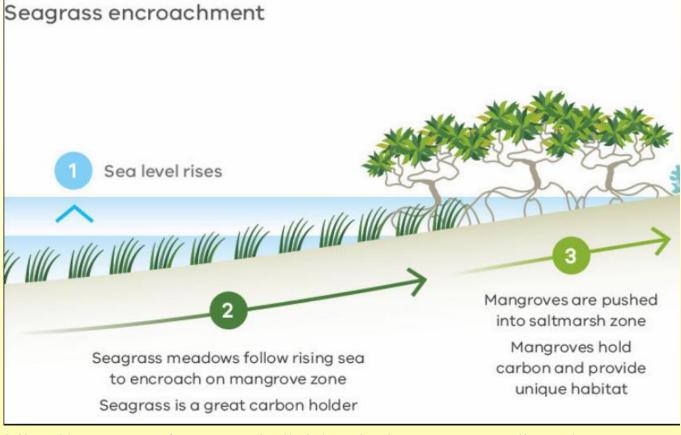




MANGROVE REPLANTATION

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https://www.ces.vic.gov.au/sotb/chapter/mangroves-saltmarsh

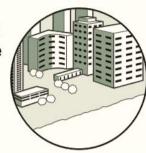
WHERE DO WE GO FROM HERE?

Threats to seagrass meadows

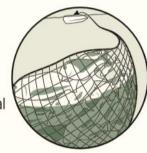
Seagrass meadows supply a vast suite of ecosystem services such as carbon sequestration, fisheries support, and coastal protection. They are part of an interconnected seascape; degradation of any habitat in this seascape has negative consequences for the other component habitats.

Major threats

1 Habitat destruction, coastal development, and aquaculture lead to increasing inputs of nutrients and other pollutants into the sea, threatening coastal habitats.

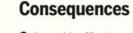


2 Overfishing threatens biodiversity, ecosystem resilience, and the food security of local people. Anchors and moorings result in direct physical damage to seagrass meadows.



Interconnected seascape

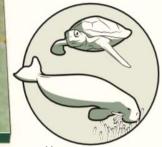




3 Local buffering of ocean acidification by healthy seagrass meadows may help to reduce the negative impacts of changing pH on nearby **calcifying organisms** such as corals.



4 Seagrass meadows store large amounts of carbon in both the plants and the sediments below. If their integrity is disturbed, this **carbon is released.**



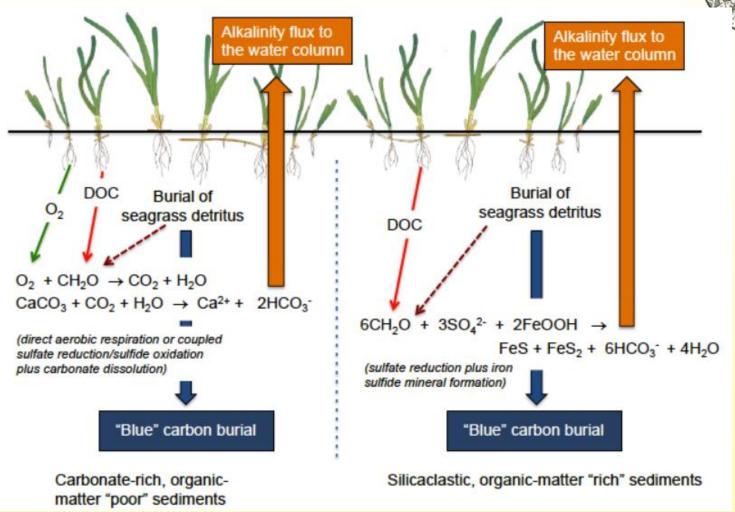
5 Seagrass meadows are important habitats for **marine herbivores** such as turtles and dugong. Loss of these habitats threatens **the survival of these species.**

Cullen-Unsworth & Unsworth, 2018

GRAPHIC: V. ALTOUNIAN/SCIENCE

Consequences

3 Local buffering of ocean acidification by healthy seagrass meadows may help to reduce the negative impacts of changing pH on nearby calcifying organisms such as corals.



https://www2.whoi.edu/staff/mlong/projects/project-2/

BLUE CARBON POTENTIAL OF PH SEAGRASS MEADOWS

1.2 billion Mg CO₂

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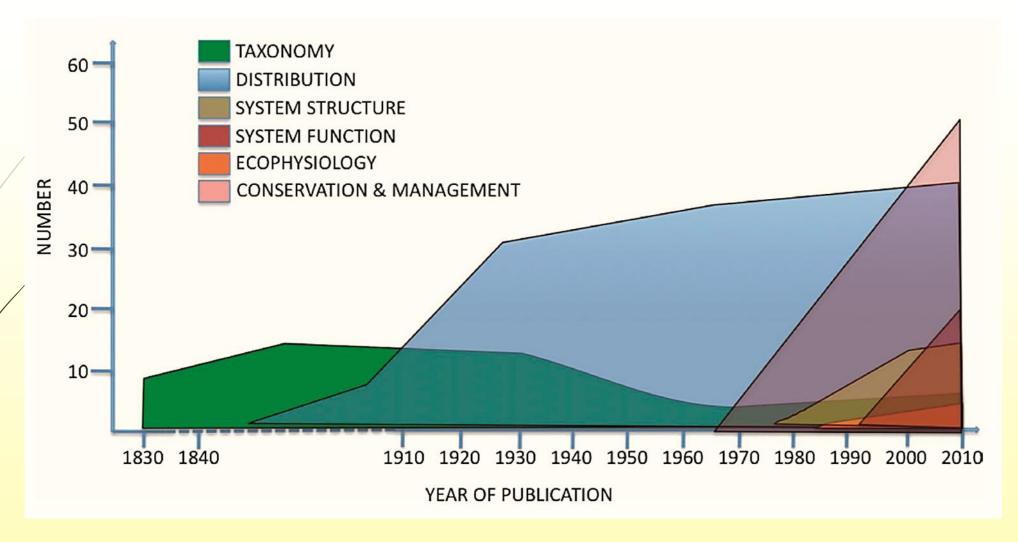
756 million Mg CO₂

in seagrass revegetation

239 million Mg CO₂

in persistent seagrass

Loss of seagrass triggers the erosion of historic carbon deposits/stocks and that revegetation effectively restores seagrass carbon sequestration capacity. Marba et al. (2015)



The relative distribution of published materials on seagrass among the 6 major research concerns in the Philippines (1830–2010) (Fortes, M 2012)