REGEN REGISTRY

Seagrass Module of Seatrees Crediting Protocol for Marine Restoration

External R1 Review

Reviewer #1

December 20, 2025

CONTENT referenced by reviewer's comment *e.g. Section number + paste exact text*	**REVIEWER'S COMMENT** *Please paste the comment from the reviewer*	**AUTHOR'S RESPONSE** *Please describe how the comment was addressed and include new content in quotations*	**Reviewer's Conclusion** [PASSED/ REJECTED *WITH COMMENTS*]
e.g. 2.1 - "approximately 25%	***e.g. Replace** with "adequate"*	*e.g. This was changed to "The majority of the material must have a moisture content of 25% or less, as measured in the field."*	*PASSED*
The following comments refer to the credit class			

Page 93. “Although these meadows cover less than 0.2% of the ocean floor, they are highly productive ecosystems that support diverse marine life, including commercially important fish and shellfish species (Lefcheck et al. 2019, McKenzie et al. 2020, UNEP 2020a, Foster et al. 2025).”	Rather than the Foster reference, you could include this Unworth reference that specifically focuses on global fishery productivity. https://conbio.onlinelibrary.wiley.com/doi/pdf/10.1111%2Fconl.12566	Certainly. This reference has been added in place of the reference from Foster et al.	PASSED
Page 93. “A single hectare of seagrass can support up to 100,000 fish and 120 million invertebrates (Smithsonian)”	It is difficult to find literature to validate where this information has come from. I would suggest removing and instead focus on notion that seagrass supports 1000's of species of animals. The UNEP 2020 reference could be used here.	Given that the preceding sentence discusses the diversity of marine life that seagrass meadows support, and the following sentence discusses the carbon sequestration potential, we've chosen to simply remove this sentence to streamline the overall flow of the introduction.	PASSED
Page 93. “In fact, sediments in seagrass meadows can sequester carbon up to 40 times faster than soils in forests on land, making them powerful allies in the fight against climate change (Serrano et al. 2021).”	This refernece is incorrect and should be attributed to Mcleod et al. 2011. Moreover, I would suggest avoiding use of this statistic. It is extremely out of date and overinflates the carbon sequestration potential of seagrass. More recent studies show this number to be on par	Fair point about “40 times greater” statistic being dated. We would still like to emphasize the carbon sequestration potential of seagrass meadows, but we can do this without referencing a specific number. We've made a slight edit to this sentence to read “Furthermore, sediments in seagrass meadows can sequester carbon faster than soils in forests on land, making them powerful allies in the fight	PASSED

	with other forests, in some cases higher and in others cases lower.	against climate change (McLeod et al. 2011, Serrano et al. 2021). ” The new sentence correctly points out that seagrass meadows ***can*** sequester carbon at faster rates than terrestrial forests, though not always and not at an overly inflated rate (40x). Re: the choice of references, though McLeod et al. 2011 is the originating source of the “40 times greater” statistic, Serrano et al. 2021 is a more recent study demonstrating very high rates of carbon sequestration for a specific seagrass habitat in Colombia, so it still is relevant for inclusion here.	
Page 93. “The world has lost approximately 29% of its seagrass meadows due to coastal development, dredging, pollution, destructive fishing practices, and climate change impacts, and rates of loss are only accelerating (Waycott et al. 2009, Lefcheck et al. 2017).”	Use more recent literature here (Examples below), and state over what time period. 19.1% of surveyed meadow area has been lost since 1880 according to more recent analysis. https://onlinelibrary.wiley.com/doi/10.1111/gcb.15684 Primary threats are coastal development and poor water quality driven by land-use change.	We have restructured this sentence following your suggestions: “Unfortunately, seagrass ecosystems are in crisis globally. The world has lost over 19% of seagrass meadow area since 1880 (Dunic et al. 2021), primarily due to coastal development and poor water quality driven by land-use change (Jones et al. 2025). Loss of seagrass releases previously sequestered carbon back into the atmosphere, contributing to climate change (Arias-Ortiz et al. 2018).”	PASSED

	https://iopscience.iop.org/article/10.1088/2752-664X/adcacb		
Page 93. “When seagrass meadows are destroyed, the carbon they have sequestered for decades or centuries is released back into the atmosphere, contributing to climate change.”	Please add reference for this statement. Avoid use of “destroyed” and maybe change to “lost”. https://doi.org/10.1038/s41558-018-0096-y	See comment above.	PASSED
Page 94. In “Best-practices for Seagrass Restoration” section	I really like this section given it highlights many of the “guidelines” that have been created and focuses on the 10 golden rules. However, what’s missing here is that there is no one method fits all statement. I think this is key for potential project partners to realise and that seagrass restoration is still very much in its infancy. It's highly experimental, and that experimentation is key to setting the groundwork for a much larger project where restoration is the goal. In addition to this, I would also add that there are ~2 examples of large-scale seagrass restoration success (Virgina Coastal Bays	We have edited the second and third sentences of the first paragraph of the best-practices section to read: “Given that no single approach or best-practice will be standard across all contexts and geographies, Project Partners are strongly encouraged to refer to seagrass restoration guidelines tailored to their local ecoregion. These resources are intended to guide the choice of appropriate planting density, species, depth, season, and environmental conditions for restoration.” We also added the following sentence after the list of best practices to highlight the importance of repeated replanting: “Recent examples of large-scale seagrass restoration success from the Wadden Sea, Netherlands (Govers et al. 2022) and Chesapeake Bay, USA (Orth et al. 2020) highlight the importance of persistent and repeated replanting to ensure the resilience of restoration outcomes.”	PASSED

	[VIMS] and Wadden Sea [University of Gronigen]). Both of these examples have relied on repeated yearly seeding (in both cases Zostera marina). Increasing evidence is now pointing to the fact that for scale and speed, potential restoration projects need to do the same activity yearly to build a resilient meadow. Reference for VIMS work: https://www.science.org/doi/10.1126/sciadv.abc6434 Reference for Wadden Sea: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0262845		
Page 94. In "Best-practices for Seagrass Restoration" section	An additional guideline/database/portfolio that you could include here is SeagrassRestorer.org This is supported by many of the leading organisations and institutions working on seagrass restoration and intends to be a database in which restoration experiments and attempts can be	Thanks for suggesting this, we have added it to the list of best practice resources.	PASSED

	reported. Project Partners could learn projects in similar locations as to what is working and what has failed.		
Page 95. "In "Best-practices for Seagrass Restoration" section	As above, I really like the inclusion of the 10 golden rules information. However, this lacks detail. Is the intention for Project Partners to look to the academic publication, or should more information be included here? For example, you may want to include information on Habitat Suitability Models (either ecological models or using local ecological knowledge to understand where seagrass *could* grow) or information on passive restoration approaches.	We appreciate the suggestion for more detail here, but to keep the level of detail in the seagrass restoration module consistent with the coral, mangrove, and kelp modules, we would like to keep this list as is. The link to the original scientific publication (which we include) is intended to serve as further information for the curious/interested reader.	PASSED
Page 95. "Seatrees recommends a minimum of 5 years of monitoring (following UNEP 2020),"	Please include which UNEP reference you are referring to here. I assume it is the Guidelines for Seagrass Restoration in the WIO: UNEP 2020b.	Thank you for catching that, we've updated the citation to UNEP 2020b	PASSED
Page 95. "While species like Posidonia oceanica are notoriously slow growing,	Please change Cystoseira nodosa to Cymodocea nodosa	Changed	PASSED

other species such as Cystoseira nodosa and Zostera marina have been shown to produce more rapid biodiversity outcomes following restoration"			
Page 95. "Depending on the species used and existing environmental stressors, seagrass restoration can take multiple decades to fully recover ecosystem function (including restoration of associated fauna, sediment stabilization, and biogeochemical processes) (Reynolds et al. 2016)."	An additional reference for inclusion here would be: https://www.science.org/doi/10.1126/sciadv.abc6434	Added.	PASSED
Section "Seagrass Biodiversity Metrics"	Very thorough. I really like the tables highlighting both favourable and problematic metrics. Only comment here would be to include some information on seagrass as an Essential Ocean Variable. A good academic article to cite here would be - https://academic.oup.com/bioscience/advance-article-abstract/doi/	We've added the following sentence to the seagrass cover metric in the table: "Projects are encouraged to follow standardized guidelines for reporting seagrass cover (Duffy et al. 2025)."	PASSED

	10.1093/biosci/biaf199/8407550 This has broad applications for restoration and includes guidelines for collecting and reporting seagrass data that fulfill specifications for the EOV.		
Possibly space for new section?	Two things that I feel are missing here are finances and the importance of passive restoration. Applied restoration is expensive, often costing hundreds of thousands of dollars for tiny returns, and in most cases failure. I'm not asking for a review of finances, but more for a "considerations" section. Considering whether applied seagrass restoration is actually the most useful use of money. While passion and appetite for restoration are growing, these are often not aligned with the practicalities and science. Here, considerations could also extend to riparian restoration, and restoration of land systems as the key driver of seagrass loss. For sites and localities with high boating traffic, easy wins can be	While we don't have space to add more sections, the points about passive restoration and riparian restoration are good ones we would like to emphasize. We've added the following sentence to the paragraph preceding the ten golden rules: "In many cases, passive restoration may be more appropriate and cost effective than active restoration. A focus on land-based interventions, such as riparian restoration or advocating for improved agricultural practices, may also be needed in certain contexts."	PASSED

	made with use of environmentally friendly moorings etc.		

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Reviewer's Blind Review Comments regarding Protocol/Methodology

Kindly enter your comments based on these questions in the table below. Also, if referencing specific text, please include text excerpt or row/page number from the protocol/methodology for ease of reference by the authors. All reviewer comments will remain anonymous unless you choose to be named.

Is the protocol/methodology clearly written with adequate detail for implementation?	Yes, although this is less of a protocol (like other sections) and more of an overarching information sheet. This is needed as seagrass restoration is still in its infancy, and there is no single method or approach that works everywhere.
Is the underlying foundation of the protocol/methodology clear?	Yes
Is the protocol/methodology feasible?	Not relevant, as there is no "how-to", but instead guides potential partners towards finding a method that *could* work in a local vicinity.
Are there any alternative or additional points that should be considered?	Yes. Passive restoration has the potential to prevent further seagrass loss, and improve conditions for natural recovery.
Will the proposed guidelines and regulations achieve the results defined in the protocol/methodology?	Not relevant as there is no "how-to". That said, the lack of a "this is how you could do it" will prevent failure and improve success given approaches will be tailored to needs of project partners.

Do you want to be named in the review? (Expert Reviewers will be named after review is completed unless you choose to be anonymous)	No

Recommendation

Kindly mark with an X

Accept As Is:	X
Requires Minor Revision:	
Requires Moderate Revision:	
Requires Major Revision:	
Reject and Re-submit:	
Rejection: (Please provide reasons)	

General/Additional Comments: