VCS Module

VMD0052

Demonstration of additionality of tidal wetland restoration and conservation project activities (ADD-AM)

Version 1.0

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Sectoral Scope 14

Document prepared by Restore America's Estuaries and Silvestrum Climate Associates.

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1   SOURCES

This module is based on the following methodologies:

- VM0033 *Methodology for Tidal Wetland and Seagrass Restoration, v1.0*

- VM0007 *REDD+ Methodology Framework (REDD+ MF), v1.6.*

2   SUMMARY DESCRIPTION OF THE MODULE

This module provides an activity method for the determination of additionality of tidal wetland restoration and conservation that meet the applicability conditions set out in Section 4 below.

3   DEFINITIONS

Definitions are set out in the VCS Program document *Program Definitions* and VCS methodology VM0007 *REDD+ MF*. This module does not set out any further definitions.

4   APPLICABILITY CONDITIONS

This module is applicable to tidal wetland and conservation meeting the applicability conditions set out in Section 4.5 of VCS methodology *VM0007 REDD+ Methodology Framework*.

5   PROCEDURES

Step 1: Regulatory surplus

The project proponent must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the *VCS Methodology Requirements.*

Step 2: Positive list

The applicability conditions of this module represent the positive list. The project must demonstrate that it meets all of the applicability conditions listed in Section 4 above, and in so doing, it is deemed as complying with the positive list.

The positive list was established using the activity penetration option (Option A in the *VCS Methodology Requirements*). Projects which meet the applicability conditions are deemed additional.

Justification for the activity method is provided in Appendix A.

6   REFERENCES

N/A

APPENDIX A: POSITIVE LIST JUSTIFICATION

A. Tidal Wetland Restoration (RWE) Activities

Tidal Wetland Restoration Activities in the United States

VM0033 Methodology for Tidal Wetland and Seagrass Restoration established a positive list for tidal wetland restoration activities in the United States. All such activities remain on the positive list and are deemed additional.

Tidal Wetland Restoration Activities not in the United States

The level of tidal wetland restoration in the U.S. was determined to be 2.74 percent of maximum potential (or lower) in VM0033, which is below the 5 percent threshold set by the VCS rules for positive lists justified via the activity penetration option. No global data sets exist to determine the level of tidal wetland restoration activities outside of the U.S. However, as one of the most developed nations, with the most robust national and state level programs for tidal wetland restoration in the world, the U.S. has the highest activity level of tidal wetland restoration of any country in the world. Accordingly, the level of tidal wetland restoration for the rest of the world is conservatively assumed to be below the activity penetration of tidal wetland restoration in the U.S.; this conclusion relies on expert judgement (see below).

The activity penetration level for tidal wetland restoration globally is therefore ≤ 2.74percent.

All tidal wetland restoration outside of the U.S. meeting the applicability conditions in Section 4 above, and the regulatory surplus requirement, therefore qualifies for the positive list as well.

B. Tidal Wetland Conservation (CIW) Activities

Summary

For tidal wetland conservation activities, the activity penetration option is also used to justify the positive list. Geospatial data were used to determine the extent of tidal wetlands which fall into coastal and marine protected areas and were analyzed to determine what percentage of tidal wetland areas are being conserved. The results of this analysis indicate that 3.64 percent of tidal wetlands are currently being conserved, as compared to maximum adoption potential.

Many tidal wetlands are being converted for activities such as aquaculture, agriculture, wood harvesting, industry, and urban development (Murray *et al.*, 2011; Pendleton *et al.*, 2012). The rate of loss of tidal wetlands is estimated to be the highest of any ecosystem. Estimated losses are a cumulative 25-50% of total area of each type of tidal wetland habitat (mangrove, tidal marsh, seagrass) within the last 50-100 years (Mcleod *et al.*, 2011); a 50% loss of tidal wetlands and 30% loss of seagrasses (Barbier *et al.*, 2011); and a 50% loss of the historical global coverage of mangroves in the past 50 years (Pendleton *et al.*, 2012). Tidal wetland losses are ongoing, with estimated losses of 0.5%-3% annually: 1-2% for tidal marshes, 0.4–2.6% for seagrasses, and 0.7-3% for mangroves (Pendleton *et al.*, 2012). Given current conversion rates, it is projected that in the next 100 years, 30-40% of tidal marshes and seagrasses and 100% of mangroves could potentially be lost (Pendleton *et al.*, 2012).

The geographic scope of the module is global. Tidal wetland restoration and conservation activities face a common set of barriers in every country: insufficient funding, willing landowners, competing land uses, community support, and physical and ecological limitations and changes, such as sea level rise. These barriers are the relevant factors for determining the geographic scope of the methodology.

Analysis

Tidal wetland conservation activities globally are at a low level of penetration relative to their maximum adoption potential. Specifically, the activity penetration level of such activities is conservatively calculated to be 3.6 percent (or lower), as demonstrated below. This level is below the 5 percent threshold specified in the *VCS Standard*. Therefore, tidal wetland conservation projects meeting the applicability conditions of this module are deemed additional.

Activity penetration is given as:

APy = OAy / MAPy x100

Where:

APy   Activity penetration of the project activity in year *y* (percentage)

OAy   Observed adoption of the project activity in year *y*

MAPy   Maximum adoption potential of the project activity in year *y*

For tidal wetland conservation, these terms are further defined as follows:

OAy   Geospatial data from United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC) for world-protected areas

MAPy   Geospatial data from UNEP-WCMC for mangrove, salt marsh, and seagrass ecosystems

The geospatial data from UNEP-WCMC is the most commonly used data in many global blue carbon studies (Murray *et al.*, 2011; Pendleton *et al.*, 2012; Atwood *et al.*, 2015).

***MAPy* Calculation**

The mangrove dataset from the UNEP-WCMC shows the global distribution of mangrove forests. This dataset was prepared by the United States Geological Survey (USGS) with the temporal range from 1997 to 2000, and published in 2011 (Giri *et al.*, 2011). This dataset was prepared by classifying satellite imagery of the earth using Global Land Survey (GLS) data and Landsat archives (Giri *et al.*, 2011). About 1,000 Landsat scenes were interpreted using both supervised and unsupervised digital image classification techniques (Giri *et al.*, 2011). These datasets mostly consist of small polygons along the coastline. For each mangrove ecosystem location, there is information on the country of mangrove location, surface area in squared kilometers, and surface area in square miles (Giri *et al.*, 2011).

The seagrass dataset was compiled by the UNEP-WCMC in collaboration with Dr. Fred Short, a researcher from the University of New Hampshire. This dataset ranges from 1934-2004, was published in 2005 and has been updated since then (UNEP-WCMC and Short, 2005). The polygon data are relatively comparable to other blue carbon ecosystem data. The point data only

indicates the presence of seagrass, but not the aerial extent covered or a specific site of seagrass. This underrepresentation of data is most likely due to the challenges and costs of mapping submerged habitats such as seagrass meadows. During analysis, it was difficult to combine the point data with polygon data and calculate total blue carbon area. Therefore, point data were not utilized in this analysis, yielding a conservative approach to calculating activity penetration because it underestimates the total area of seagrass habitat globally.

The saltmarsh dataset has not been published yet, but these are the most recent available data. This dataset is being prepared for a peer-review journal publication by researchers at the UNEP-WCMC and was acquired through special licensing permission. This dataset was collected via remote sensing techniques.

The total global extent of tidal wetland habitats is the sum of the global extent of mangrove, seagrass and saltmarsh habitat and is represented numerically in Table 1 and visually in Figure 1, below.

Table 1: *MAPy* – Global Extent of Tidal Wetland Habitats

MAPy	Estimate of Global Extent (km^2)
Mangrove	145,500
Seagrass	365,155
Salt Marsh	143,172
Total	653,827

The *MAPy* for tidal wetland conservation is 653,827 km^2.

Figure 1: Global Extent of Tidal Wetland Habitats (Butt, 2016)
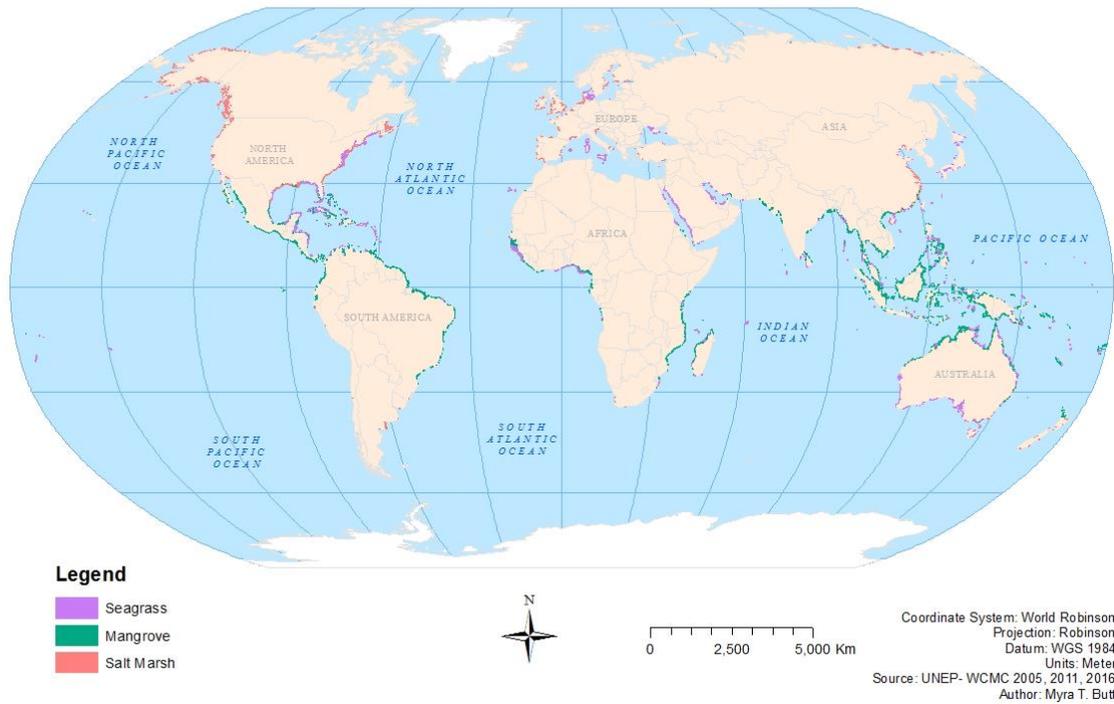
OAy Calculation

The protected areas dataset from the UNEP-WCMC shows the global distribution of the world's protected areas. The World Database on Protected Areas (WDPA) is a joint project with UNEP and the International Union for Conservation of Nature (IUCN). The data are compiled and managed by the UNEP-WCMC along with governments and nongovernmental organizations (NGO), and constitute the most comprehensive global database for terrestrial and marine protected areas (UNEP-WCMC, 2015).

This dataset provides spatial data with a well-documented associated attribute data table that is well formatted, since all data provided must meet the WDPA data standards. Coastal and marine protected areas were used for this analysis. Furthermore, the analysis includes IUCN management categories Ia, Ib, and II (strict nature reserves, wilderness areas, and national parks), consistent with research demonstrating that these management approaches are effective at preventing habitat loss (Miteva et al., 2015) while other management categories do not correlate to effective habitat conservation (Juffe-Bignoli et al., 2014).

As with the seagrass dataset, this dataset also contains both point and polygon data. Sites reported as points have no digitized boundaries, because this information was not submitted by the data providers and thus the actual extent of the protected area is unknown. Therefore, protected area point data were not used in this study, consistent with the above approach for determining seagrass habitat extent.

Not all areas in management categories Ia, Ib, and II are being effectively conserved. Leverington *et al.* (2010) identified 8,163 protected area management effectiveness assessments from 6,200 protected areas, which used 54 different methodologies. They created a framework for meta-analysis that enabled conversion to a common scale for comparison and analysis. Just 22 percent of these protected areas are soundly managed (Leverington *et al.*, 2010). Strongest management factors "related to establishment of protected areas (legal establishment, design, legislation and boundary marking) and to effectiveness of governance…" These factors are clearly relevant for effective conservation.

For purposes of calculating OA*y*, the percentage of protected areas being soundly managed (22 percent) is applied to the overlapping tidal wetland and protected areas. Coastal areas are more difficult to manage due to issues with enforcement. Many marine protected areas do not belong to individual countries and lack functional boundaries. Therefore, the legal frameworks for marine protected areas often fail (Boersma and Parrish, 1999). A great deal of marine protected area is found along coastlines near shipping lanes and human centers of activity, also making the strict management of these areas more difficult (Boersma and Parrish, 1999). The 22 percent adjustment is therefore a conservative estimate, since the Leverington *et al.* (2010) analysis included non-coastal as well as coastal areas.

The total global extent of tidal wetland habitat protection is the sum of the areas reported as protected for mangroves, seagrass and saltmarsh, adjusted for effectiveness as described above. The global total protected area is reported in Table 2 and shown in Figure 2, below.

Table 2: *OAy* – Global Extent of Protected/Conserved Tidal Wetland Habitats

OAy	Reported Protected (km^2)	Effectively Protected (km^2)
Mangrove	34,849	7,667
Seagrass	57,753	12,706
Salt Marsh	15,665	3,446
Total	108,267	23,819

The *OAy* for tidal wetland conservation globally is 23,819 km^2.

Figure 2: Global Extent of Protected/Conserved Tidal Wetland Habitats (Butt, 2016)
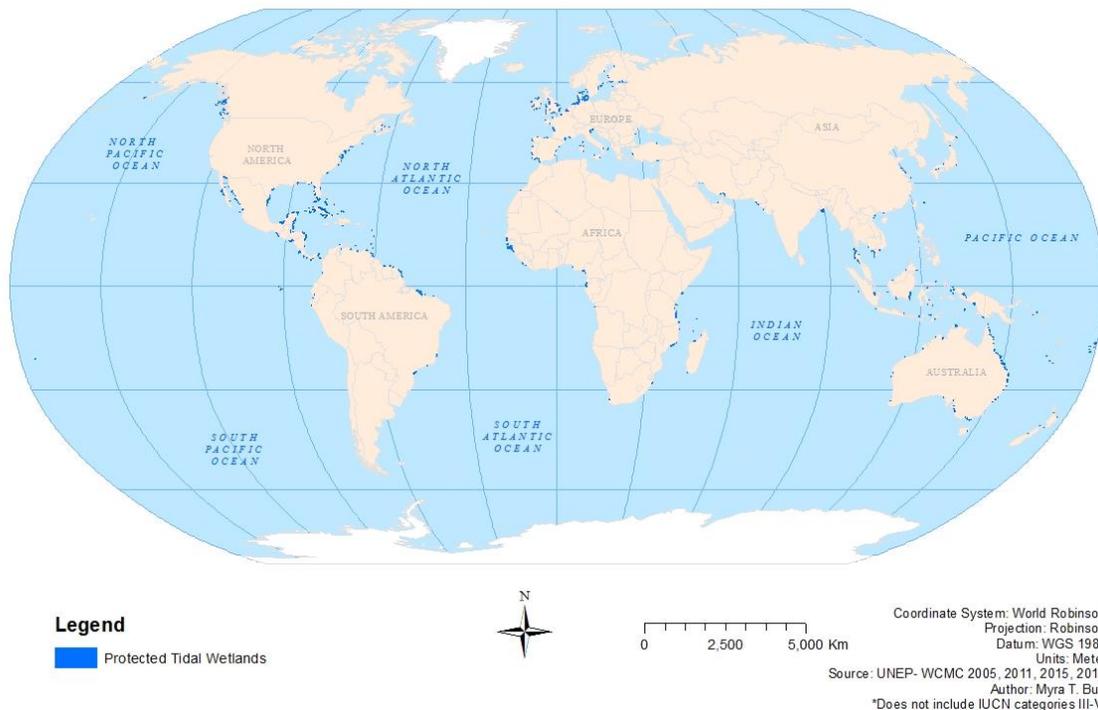
APy Calculation

APy = OAy / MAPy x100

APy = 23,819/653,827 x100

APy = 3.6%

Therefore, tidal wetland conservation activities qualify for the positive list because global activity penetration is less than 5%.

Further Discussion:

The geospatial software, ArcGIS 10.3.1, was used to view data, calculate geographic area, and produce maps of each blue carbon ecosystem for this analysis. Each blue carbon ecosystem dataset was intersected with coastal and marine protected areas to determine the areas that fell within protected boundaries. It is important to note that the raw data was often repaired while processing due to errors in the geometry of the raw datasets. Next, the geometric area was calculated for the protected ecosystems and total protected area was summed.

Acknowledgement:

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<u>Protected Blue Carbon Procedure (Butt, 2016)</u>

<u>Preparing marine and coastal protected area data:</u>

- Download the protected areas data
- Select for coastal and marine protected areas
- Create new layer for selection.
- In this new layer, select for not IUCN category III, IV, V, VI
- Export new layer
- Run data repair
- Save new layer.

<u>Calculating areas:</u>

- Download all ecosystem datasets from UNEP WCMC
- For all the datasets, make sure the projection of the data is the same (I would select open street map first then export to that data frame)
- Run a data repair on each dataset multiple times until there are no more errors

First calculate the total area of blue carbon:

- In the repaired raw data file create a new field for the geometry area
- Set its parameters as share kilometers and double.
- Sum the area in the field
- Add up all the geometry areas for each of the ecosystems to get the total blue carbon area.

Protected blue carbon area:

- Run an intersect for each ecosystem data layer with the protected area layer
- Run a dissolve with the new intersected data layer (optional)
- Create a new field of x_coord or the x coordinated.
- Run a delete identical on the x coordinate field
- Create a new field of geo_area using kilometers squared and select double (if it is not already there)
- Sum geo_ area. This provides the protected area for that ecosystem.

* Note for some reason this procedure did not work for salt marsh. In this case, I divided the salt marsh data into 4 smaller datasets and followed the above procedures.

DOCUMENT HISTORY

Version	Date	Comment
v1.0	8 Sep 2020	Initial version