Analysis and Recommendation for Grouping Blue Carbon Projects in Tampa Bay

By Stefanie Simpson, Restore America's Estuaries
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The ability of coastal wetlands to sequester and store carbon long term in the soil presents new opportunities to promote and value coastal restoration. In the absence of compliance markets, voluntary carbon markets provide a platform for connecting investors looking to reduce their carbon footprint, with projects yielding a climate benefit. A 2016 study assessed past and potential carbon sequestration and storage values of restoring Tampa Bay habitats (Sheehan et al. 2016), providing local data that can be used to prioritize restoration, enhance coastal management, and develop carbon offset projects. However, cost and scalability are major barriers for coastal offset project development. An alternative project design method called "grouping" allows project developers to aggregate smaller projects in order to achieve economies of scale. This paper describes how to use a grouped project approach and makes recommendations for Tampa Bay stakeholders considering carbon offset projects to support restoration.

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I. Terms to Know

Baseline Scenario – a projection of the status quo or business-as-usual, i.e. during the crediting period without the project.

Carbon Offset/Credit – a unit of measurement equal to one metric ton of carbon dioxide equivalent; results from project activities that reduce and/or prevent atmospheric greenhouse gases and are available to compensate carbon emissions elsewhere through transactions on a carbon market (voluntary or compliance).

Coastal Blue Carbon (Blue Carbon) – the greenhouse gases (GHGs) sequestered by, stored in and released by tidal wetlands including mangroves, marshes, salt barrens, seagrass, and other emergent tidal wetlands; usually refers to the flux of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) within tidal wetland and seagrass systems.

Crediting Period – the time period for which GHG emission reductions or removals generated by the project are eligible for offset/credit issuance.

Grouped Project – a project to which additional instances of the project activity, which meet pre-established eligibility criteria, may be added after initial project validation.

Project Activity Instance (Instance) – a particular set of implemented technologies and/or measures that constitute the minimum unit of activity necessary to comply with the criteria and procedures to the project activity under the methodology applied to the project.

Project Description (PD) – the document describing the geographic areas within which new project instances may be developed and general eligibility criteria for inclusion as a carbon project (i.e. baseline scenario, additionality, non-permanence risk, etc.)

Project Proponent(s) – the individual(s) or organization(s) that has overall control and responsibility for the project together with the owners of the project.

Validation – assessment by a standard-approved validation/verification body (VVB) of a project description to meet rules and requirements.

Verification – periodic independent assessment by a VVB to assess the GHG reductions and removals that have resulted from the project during a monitoring period.

With-project Scenario – a projection of change in GHG reductions or removals due to project activity(s). The estimated climate benefit is determined by comparing the with-project scenario to the baseline scenario for a given geographic area.

II. Introduction

Fueled by an increased understanding of global climate change impacts, companies and governments across the world are investing in ways to reduce greenhouse gas emissions. For those emissions that cannot be avoided, companies, organizations, and individuals may choose to purchase carbon offsets. Carbon offsets or credits are generated by projects that reduce and/or prevent emissions of atmospheric greenhouse gases (GHGs). Increasing interest in carbon offsets has led to the development of standards to provide accounting and verification requirements ensuring generated offsets represent achievable and real emission reductions.

Coastal wetland restoration is among the newest project type established to generate carbon offsets on the voluntary carbon market. Coastal wetlands – seagrass, salt marsh, mangrove and other forested tidal wetlands – are some of the most productive habitats in the world, improving water quality, providing critical habitat, and protecting shorelines from storms. In addition, coastal wetlands are also efficient at sequestering and storing carbon in their soils, where it can remain locked for centuries or more (referred to as 'blue carbon'). Alternatively, the degradation or draining of coastal systems can result in the release of these soil carbon stocks, converting a natural carbon sink to a carbon source. Therefore restoring coastal habitat and preventing habitat degradation can yield a climate benefit. Blue carbon ecosystem services provide an opportunity to add additional value to coastal wetlands and to incorporate coastal restoration and conservation activities into the carbon market. It also has the potential to attract a new type of investor – those interested in global climate benefits.

The Verified Carbon Standard VM0033 Methodology for Tidal Wetland and Seagrass Restoration (Emmer et al. 2015) provides the procedures for measuring, accounting, and verifying GHG reductions in coastal wetlands, allowing coastal restoration activities with a climate benefit to generate offsets. Though not all coastal restoration activities will be appropriate as offset projects, and the potential revenue generated through offset sales generally will not cover the full cost of restoration, blue carbon offset projects can provide support for typically underfunded project components such as monitoring and management and bring additional investors to the table.

One of the barriers for blue carbon offset projects coming to market is the transaction cost associated with registering, monitoring, and verifying project activities. This barrier is particularly relevant for coastal wetlands, as projects can be smaller on an individual parcel scale and geographically dispersed. An aggregated or "grouped" project approach provides an opportunity for projects which may have otherwise been too small to justify the costs needed to receive verified carbon offsets. Smaller projects grouped together can achieve a larger climate benefit than stand-alone projects at a lower overall cost, thus benefiting from economies of scale. In addition to reducing costs, grouping together smaller projects under one project description document also helps streamline the expansion of a project over time. This analysis provides an overview of the benefits of designing a grouped project, specific considerations for planning a grouped project using the VCS VM0033 Methodology, and recommendations for resource managers in Tampa Bay considering the application of blue carbon market incentives.

III. Blue Carbon Potential in Tampa Bay

Coastal wetland activities that can have a climate benefit include conserving the carbon already stored in the ground (avoided conversion), increasing sequestration by restoring or creating new wetlands, and reducing methane emissions by restoring tidal flow to impounded wetlands (increasing salinity to 18-20ppt or higher). It is with these activities in mind that project developers can consider the opportunities for restoration activities in Tampa Bay.

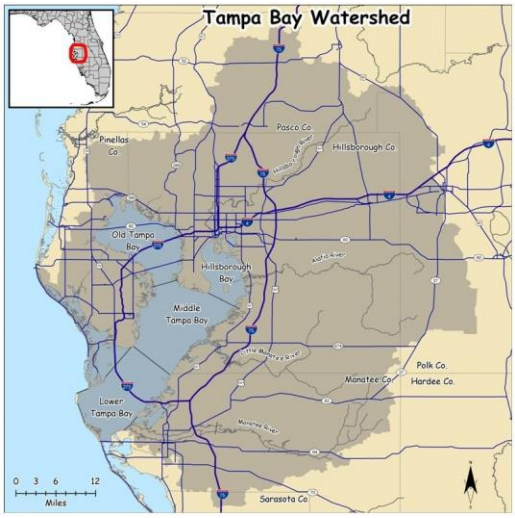

Figure 1: Tampa Bay Estuary Watershed. Courtesy Tampa Bay Estuary Program.

Tampa Bay's coastal wetlands span 400 square miles, stretching from the headwaters of the Hillsborough River to the shorelines of Anna Maria Island. As Florida's largest open-water estuary, Tampa Bay is substantially segmented due to coastal development and infrastructure. Tampa Bay has lost 16,000 acres of seagrass and 5,400 acres of emergent tidal wetlands since the 1950s[i], due primarily to developmental pressures. Sea-level rise is also threatening Tampa's coastal habitats and has been rising at a rate of about an inch per decade[ii]. With the possibility of accelerated sea-level rise due to increased impacts from global climate change, Tampa Bay has set a goal of "restoring the balance" of coastal habitats to levels that existed before the 1950s. One management strategy is to allow room for coastal habitats to migrate landward to keep pace with rising seas; however increasing population and development pressures are squeezing out available land for coastal wetland migration.

Through management efforts and strong community engagement, restoration and habitat quality have improved over the past decade. In 2015, the Tampa Bay Estuary Program announced the recent return of more than 5,000 acres of seagrass meadows, bringing total seagrass extent in Tampa Bay to more than 40,000 acres, exceeding the 38,000-acre restoration goal[iii]. In addition, restoration targets have been defined for salt marsh (6,313 acres), salt barren (1,287 acres), non-forested (17,088 acres) and forested (1,615 acres) freshwater wetlands; while protection targets have been established for existing mangrove and coastal upland habitats (Tampa Bay Estuary Program Habitat Master Plan Update, June 2010; and Master Plan, 2014). The restoration plan specifically targets salt marsh and salt barrens as priorities for restoration as loss of these habitats has been disproportionate compared to other emergent tidal wetlands. However, restoration costs are anticipated to be high for most habitats, and although carbon finance will not pay full restoration costs, it can lead to increased funding from additional sources, provide incentive to land owners to restore or conserve habitat, and support other project components such as monitoring and management.

[i] Tampa Bay Watch strategic plan: http://www.tampabaywatch.org/PDFs/tbw%20strategic%20plan%20web.pdf
[ii] Tampa Bay Estuary Program: http://www.tbep.org/pdfs/Tampa-Bay-and-Sea-Level-Rise.pdf
[iii] Tampa Bay Estuary Program website; posted 10/02/15 <http://www.tbep.org/news_and_events-whats_new.html>

IV. Process Overview for Developing a Carbon Offset Project

The process of developing a carbon offset project involves many steps. This section provides an overview of this process to serve as a review before detailing additional steps and considerations particular to using a grouped approach. For additional details and information on developing blue carbon offset projects, read *Coastal Blue Carbon in Practice: A manual for using the VCS Methodology for Tidal Wetland and Seagrass Restoration VM0033 (Emmer et al. 2015)*.

Carbon credits are generated by project activities that have a net GHG benefit (projects that result in increased sequestration and/or reduction of GHG emissions). Standard-approved methodologies provide the procedures to account for GHG reductions; the only currently available methodology for tidal wetland activities with application to Tampa Bay is the Verified Carbon Standard VM0033 Methodology for Tidal Wetland and Seagrass Restoration. Tidal wetland restoration projects typically include multiple partners, therefore a project proponent will need to be identified to lead project coordination and development. The project proponent can be an individual, organization, or group of organizations that work together to develop the project description (PD) document. Project activity instance(s) is a particular set of implemented technologies and/or measures applied to the project (i.e. project activities). The project proponent would typically begin with a feasibility study to assess the technical, financial, and legal feasibility of the project. The feasibility study can also help accelerate development of the PD if the project proceeds. The PD details the location, project activity instance(s), and monitoring procedures. The PD also includes demonstration of additionality (the project goes beyond business-as-usual) and that the project meets applicability conditions for the methodology being used. The PD must then be validated by a 3rd party that has been approved by the carbon standard. Once validated, the project can begin generating credits.

V. Benefits of a Grouped Project Approach

The cost for developing and validating a PD as well as all costs to monitor GHG changes will add to the overall cost of a project. Because these costs are largely fixed and do not vary by size of the project, larger projects will have greater economies of scale. However, coastal restoration projects are typically smaller in size (a few hundred acres or smaller), thus transaction costs may be prohibitive for entry into the carbon market. Given the fragmentation of remaining habitat in Tampa Bay, opportunities to develop a carbon offset project will necessitate grouping together multiple projects at smaller scales. Grouping smaller projects can help reduce the burden of transaction costs by allowing a single validation for multiple project instances in a similar or the same geographic area and by combining monitoring and verification procedures.

Using a grouped approach can be advantageous for many reasons. A grouped project approach is ideal for projects that, separately, have small GHG reduction potential, but when grouped together have larger GHG offset potential. Land-use projects like coastal restoration typically include multiple partners, and arranging for all project partners to undertake project activities at the same time can be difficult. Project proponents using a grouped approach can allow the addition of project instances over time, avoiding the need for a single start date; however all grouped project instances must share the same crediting period (typically at least 30 years for land-use projects, but can be up to 100 years) – meaning if the project has a 30 year crediting period starting in year one, project instances starting in year three will be able to generate credits for 27 years. In addition, instead of monitoring each individual project instance,

monitoring is performed over the entire area of project instances, spreading this largely fixed cost over a larger project area. This can have a significant impact on reducing overall monitoring costs.

VI. Requirements for Grouping Offset Projects Using VCS Methodologies

Before embarking on developing a blue carbon offset project, restoration sites and activities will need to be clearly identified. Not all restoration projects will yield a climate benefit. Determining if a project will be appropriate as a carbon project is part of the feasibility study, during which time project developers determine the most likely baseline and with-project scenarios. The baseline scenario is the projection of GHG emissions/removals for the project area in the absence of the project activities (business-as-usual). The with-project scenario is a projection of GHG emissions/removals that will occur as a result of project activities. Both scenarios must assess the emissions/removals of greenhouse gases in the project area (e.g. carbon dioxide, methane and/or nitrous oxide). By comparing the with-project scenario to the baseline scenario, the project developer can demonstrate if there will be a net climate benefit (i.e. an increase in GHG removals and/or a decrease in GHG emissions).

Carbon offset projects must also meet general criteria, as established by the standard. The Verified Carbon Standard (VCS) sets the following criteria for methodologies:

- Offsets must be *real* – representing an actual reduction of emissions (demonstrated by rigorous and scientifically sound accounting procedures);
- Offsets must be *additional* – outside of business-as-usual and not part of a regulatory or compliance measure;
- Offsets must be *permanent*, taking sea-level rise into account and mitigating for risk of emission reversals (E.g. VCS requires a portion of the credits to be set aside in a buffer pool to mitigate future risks of emissions reversals due to storms, sea-level rise, etc.); and
- Project methods must be *verified* by an independent 3rd party to ensure proper methods of accounting are followed.

Following a standard-approved methodology (e.g. VM0033 Methodology) will ensure the above criteria are being met. Additionally, the VCS provides a set of rules and procedures for grouping project instances.

Process/requirement	Details
Predetermine eligibility	Includes (1) the geographic boundaries for the grouped project, including where any new project activity instances may be added, and (2) establishes criteria for determining eligibility of future project instances.
Complete Initial Validation	Validation is contracted to an approved validation/verification body (VVB) to ensure the requirements of the standard and follows an approved methodology.
Verification	Verification by a VVB of the monitored emission reductions/removals for a specified time period (to verify generated credits).
Add New Instances	New project instances are included during a verification event. The VVB will verify the new instances comply with eligibility criteria and fall with-in the predetermined geographic boundaries (as set out in the PD). New instances are then monitored with other project activities.

Table 1: Summary of general requirements for grouped projects under the Verified Carbon Standard[iv].

Coastal restoration projects will often involve many project partners. Grouped projects require a designated "project aggregator" to lead efforts and keep track of all project documentation. The project aggregator may also be the project proponent. New project proponents may be added to the grouped project, following VCS requirements[v].

For grouped projects, the geographic scope, baseline scenario and eligibility criteria for all instances (initial and future) must be provided in the PD for validation. After validation and project implementation, new project instances can only be added that meet the pre-established criteria.

Geographic Boundaries and Baseline Scenarios

All carbon offset projects require a well-defined geographic area using geodetic polygons. Grouped projects require geographic areas of where initial project instances occur *and* areas where future project instances may occur (even if no initial instance occurs there). A baseline scenario is needed for each geographic area. Since baseline scenarios can vary depending on existing land uses and/or management activities, multiple baseline scenarios may be required. If the geographic area where project activities will take place require multiple baseline scenarios, the area will need to be delineated appropriately so there is only one baseline scenario per defined geographic area. For example, one area may be abandoned with high water tables, thus not emitting CO_2 but emitting CH_4; another area may be drained to varying depths, and thus have various CO_2 emissions. Project developers grouping such areas together for the whole estuary would need to delineate according to existing land use and subsequent baseline. Those instances with a common land use may be grouped together under a common (or as conservative) baseline, and

[iv] VCS Grouped Project requirements listed online at: http://www.v-c-s.org/grouped-projects/
[v] See VCS document: *Registration and Issuance Process* at: http://database.v-c-s.org/program-documents

areas with differing baselines will need to be defined as separate geographic areas. The PD will also designate which instances are permitted to occur in which geographic areas.

Pre-set Eligibility Criteria

The project proponent is responsible for including a set (or several sets) of eligibility criteria upon which the inclusion of new project instances will be determined. As project instances and geographic boundaries can vary, it may be necessary to establish multiple sets of eligibility criteria as well. At minimum, eligibility criteria is to include:

1. Applicability conditions set out in the applied methodology (see Applicability Conditions in the VCS VM0033 Methodology[1]);
2. A baseline (business-as-usual) scenario;
3. Clearly defined geographic boundaries;
4. Technical characteristics, including restoration techniques and measures, quantification, and monitoring criteria, for all project instances; and
5. Demonstration of additionality. (The VCS VM0033 Methodology uses a standardized activity method for demonstrating additionality of projects in the U.S., and has already established additionality for all tidal wetland and seagrass restoration projects in the U.S. which are eligible to use the methodology, and which are not part of a regulatory or compliance measure.)

Assessing Risks

As with all forestry and land use projects, blue carbon projects are subject to non-permanence risks (natural or man-made which are outside the control of the project proponent), such as sea-level rise, that could result in a reversal of emission reductions that have been previously achieved and credited. The VCS requires credits issued to have a permanence of at least 100 years. The project proponent must conduct a risk assessment using the non-permanence tool provided by the VCS to determine the appropriate amount of buffer credits that will be subtracted from the net issuance of credits to the project. Buffer credits are then pooled together at the VCS program level to serve as insurance against reversals in individual projects. When there is a reversal event resulting in a loss of credits, an equivalent amount of buffer credits are cancelled to account for this loss. A non-permanence risk analysis will be assessed for each project geographic area identified in the PD, regardless of whether a grouped approach is taken or not.

Additional risks that may need to be assessed include those that deal with possible externalities caused by the project, such as activity-shifting, market, and ecological leakage. Activity-shifting leakage refers to activities causing GHG emissions being relocated to another location outside of the project boundary (e.g. displacement of land clearing to adjacent habitat). Similarly, market and ecological leakage refer to changes in GHG sources outside of the project area caused by activities inside the project area. The VCS VM0033 Methodology does not allow for projects that could lead to leakage.

Validation and Verification

Once a PD meeting all standard and methodology requirements is developed, it must be validated by a standard-approved validation/verification body[vi] (VVB) at the onset of the project. It is at this time that the general criteria, baseline, geographic area, and monitoring plan are approved. VCS requires new project activity instances to be documented in the monitoring report and audited in the verification report. As new project instances are added (in accordance with the pre-established eligibility criteria), credit can only be claimed from the start of the next verification period.

Summary of Grouped Project Requirements

The project description for a grouped project must include:

1. Defined geographic boundaries for all project instances (initial and future);
2. Baseline scenario and demonstration of additionality for all project instances/geographic areas;
3. Set of eligibility criteria for all future project instances; and
4. Description of the GHG accounting and monitoring procedures for all project instances.

And new project instances must:

1. Occur within one of the geographic areas defined in the PD;
2. Comply with the eligibility criteria in the PD;
3. Be included in the monitoring report;
4. Have clear right of use; and
5. Be validated at time of verification.

VII. Insight from an Afforestation Grouped Project

As there are currently no examples of grouped blue carbon projects, other land use grouped projects can provide insight into project development. The Lower Mississippi Valley Grouped Afforestation project description was prepared for The Nature Conservancy (TNC) by TerraCarbon in August 2012. The project aimed to convert degraded land, including cropland, pasture, and abandoned agricultural land, to bottomland forest. All lands involved in the project enrolled in a USDA conservation program, were planted with native bottomland species, and adopted a conservation easement held by TNC. The initial project instance consisted of 89.4 ha. This grouped project had a start date of October 5, 2011 and an expected crediting period of 32 years (Eaton et al. 2012).

The Nature Conservancy served as the project proponent/aggregator for the *Lower Mississippi Valley Grouped Afforestation Project* registered with the VCS. Non-profits or local community/governmental organizations representing both the community members and the environment make an ideal project proponent as they generally have more flexibility and can address issues more quickly than larger, federal government entities. The project included several offices within TNC, with the help of an independent consultant. A detailed list of proponents (and any other entities involved) was outlined with the respective roles and responsibilities clearly laid out (e.g. overall project management, contracting,

[vi] Validation/verification bodies (VVBs) approved by the Verified Carbon Standard are listed online at: http://www.v-c-s.org/verification-validation/find-vvb

landowner/agency liaison, investor relations, project validation, land purchase negotiations, easement compliance, reporting, etc.).

The Nature Conservancy identified the project area to be located "in the Lower Mississippi Valley within the states of Louisiana, Arkansas, and Mississippi." An overview including description of the project activities and monitoring plan was provided for the entire geographic boundary along with detailed boundary information (including GPS location) for the initial instance and areas for future instances. A baseline scenario was determined for the geographic area, and process for evaluating additionality was established.

Wherever possible, being consistent with technical and monitoring characteristics, as well as rights of use for all project instances in a grouped project, will help streamline documentation. The TNC PD included a list of permitted and prohibited uses for property included in the project area, as well as rights of entry for the project proponents. The PD also included a streamlined monitoring plan with which all project instances must comply. As new project instances are implemented, they are included in monitoring reports with relevant geographic and other information to demonstrate meeting eligibility criteria.

As blue carbon habitats can vary greatly in habitat type and characteristics, determining a baseline may be the most challenging aspect. When determining the baseline scenario for the project geographic area(s), including factors relevant for all project instances (not just the initial instance) will be helpful when adding new instances later. The TNC grouped project provided a baseline scenario for the entire geographic range of the Lower Mississippi Valley, including factors relevant to the initial instance as well as future instances (e.g. use of fire management).

For the TNC project, most of the afforestation activities occurred on privately-owned land, so TNC used carbon finance as an incentive to encourage land owners to adopt conservation easements in exchange for a percentage of carbon benefits, promoting land stewardship and addressing permanence with regard to land-use change. Using this strategy, TNC was able to encourage forestry conservation and restoration on privately-owned land and add in land parcels as additional easements were acquired.

Their monitoring strategy included procedures for measuring GHG removals across all project instances as well as evaluating compliance with conservation easement restrictions, proper protocol followed, and success/failure rate of restoration instances. The monitoring plan also outlined any remediation if deficiencies were discovered, e.g. re-vegetation where survival is below a certain threshold. Once finalized, copies of the monitoring plan were made available at all project areas. In their project documentation, TNC anticipated potential variances for new project instances. For example, new project instances could be added that use fire management, so the project documentation stipulated that any emissions incurred will be accounted for appropriately. Finally, each new project instance was given a unique identifier and incorporated into an overall project tracking system.

Key lessons learned from this project:

- Local non-profit/organization made an ideal project proponent;
- The original project documentation included anticipated variances for new project instances;
- Issues of permanence were addressed for project instances by requiring land owners to adopt conservation easements;
- Copies of monitoring plans were made accessible and applicable at all project locations; and
- Project tracking system kept record of all project instances added over time.

VIII. Remaining Challenges to Grouping Blue Carbon Projects

Though a grouped project approach allows for multiple project instances across a geographic area, there are limitations. Coastal wetlands are dynamic systems that can vary in habitat type, salinity, vegetation, soil type, etc., even across relatively small geographic areas. This can present a challenge to project developers when attempting to group project sites to ease the burden of monitoring. Another challenge is data collection. The VCS VM0033 Methodology allows for the use of published and default data – however default values will likely be too conservative to capture an accurate GHG reduction (potentially limiting the amount of credits that could be generated), and the availability of published data is currently quite limited. In most cases it will be necessary to collect field data to determine baseline and with-project scenarios. Field data collection, though more accurate, is more cost and labor intensive, and the development of validated models and proxies for quantifying emissions reduction remains a high priority research need. Blue carbon projects may take several years to generate significant offset amounts, which may affect investor/landowners' expectations on their return on investment. Finally, while monitoring for a group project can be combined, a system for allocating grouped results to individual project instances (including any reversals) in a fair and equitable way will need to be established and agreed upon during PD development.

IX. Grouping Projects in Tampa Bay

Planning a grouped blue carbon project in Tampa Bay will take forethought and planning, but could result in a higher return on investment for individual coastal restoration carbon finance projects. Although grouped projects allow the addition of instances over time, future instances will need to be fairly well identified when developing the PD (rather than adding in un-planned instances). The project proponent will want to have a good understanding of what, where, and when future project instances may be added to ensure they will be eligible for inclusion in the project.

The 2010 Tampa Bay Estuary Program Habitat Master Plan (and subsequent updates) is a valuable resource that may serve as a useful starting place for identifying restoration sites and activities that could be aggregated for a grouped carbon project. The VCS VM0033 Methodology allows for a variety of restoration activities to be used. Recall that depending on the variety of habitat types and restoration activities, grouped project descriptions may require multiple baseline scenarios with accompanying eligibility criteria.

When considering a grouped carbon project for Tampa Bay, referencing the Habitat Master Plan to identify restoration priority areas that are of similar habitat type is recommended. Listing these priority sites along with the recommended restoration activity can be a useful first step in identifying the size and number of projects that will likely have climate benefits, including those that restore/enhance sequestration, avoid conversion/habitat loss, and reduce emissions. While the project areas are being identified, project proponent(s) can also be working to attract additional project partners and stakeholders by promoting the ecosystem services provided by coastal wetlands, including the blue carbon potential. Then a timeframe for implementation can be developed (i.e. when particular project activities would begin).

The Tampa Bay Estuary Program Habitat Master Plan (2010) identifies the following priorities for restoration efforts:

- Restore low salinity tidal marshes which have been disproportionately impacted from development and other causes of habitat loss;
- Restore and preserve high marsh and coastal upland areas in anticipation of sea-level rise; and
- Increase land acquisitions and/or adoption of easements on privately-owned land where appropriate, targeting identified priority lands for conservation and restoration.

The Habitat Master Plan identifies priority sites for acquisition/restoration, including more than 40,000 acres for restoration on land either publicly owned or held in a public-private partnership. These 40,000+ acres are divided across 59 sites, of which 84% are less than 1000 acres and 52% are less than 100 acres, highlighting a benefit to using a grouped project approach for Tampa Bay restoration and land acquisition projects.

One of the identified challenges to developing a blue carbon offset project is the often limited availability of local habitat carbon storage and GHG emission data. This challenge is partly addressed for Tampa Bay by the recently completed Tampa Bay Blue Carbon Assessment (Sheehan et al. 2016), which provides Tampa-specific carbon sequestration and storage rates. In addition to providing local data values, the report notes that as sea-levels continue to rise, upland habitat will likely be converted to salt marsh; in areas where this increases vegetation, there potentially will be an increase in carbon sequestration. Carbon market incentives may support the conservation of upland areas for salt marsh migration in future habitat adaptation planning. The report also offers suggested management plans that can yield higher carbon sequestration rates, including management actions that focus on: restoring habitats bordering upland areas in order to maintain wetland habitat and associated sequestration into the future; targeting upland areas for acquisition and restoration; and improving water quality to help drive seagrass expansion. These recommended management plans may be considered when identifying potential blue carbon offset projects.

Though stakeholder involvement is strong in Tampa Bay and annual funds are made available for restoration, there is no dedicated source of public funding for habitat restoration. The Habitat Master Plan notes “as public funds become increasingly scarce, the need for a coordinated watershed approach that optimizes available funds – both private and public – for… habitat restoration activities” is evident. In addition to providing additional resources and funding streams to support restoration efforts, market mechanisms like the VCS VM0033 Methodology can support preservation of upland areas for habitat migration by providing an economic incentive for private land owners to adopt easements. With much of the restoration potential in Tampa Bay represented by small, fragmented parcels of available land, the option to group offset projects can enable stakeholders to take advantage of market incentives to further support restoration efforts.

Coastal wetlands provide many benefits to the Tampa area, including resilience to storms and coastal flooding, improved water quality, and habitat for many species including recreational and commercial fish species and endangered and threatened species, such as manatees and sea turtles. Due to the generally high costs of coastal restoration, projects are often conducted piecemeal as funding and other resources become available. The recognition of blue carbon as an important ecosystem service presents an opportunity to engage additional stakeholders within the Tampa Bay area, as well as the wider Florida and Gulf region. Options to group potential blue carbon restoration projects could be pursued at a variety

of local, regional, state and Gulf-wide scales. New partners and investors interested in the global climate benefits of blue carbon projects can provide additional resources for restoration projects, helping to support long term management and monitoring at a variety of important ecosystem scales.

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