WR Methodology Module
Wetland Restoration Methodology Framework (WR-MF)

I. GENERAL GUIDANCE

A. Scope

This 'Wetland Restoration Methodology Framework' is the basic structure of a modular methodology. It provides the generic functionality of the methodology, which frames pre-defined modules and tools that perform a specific function. It constitutes, together with the modules and tools it calls upon, a complete wetland restoration offset project baseline and monitoring methodology.

The modules and tools called upon in this document are applicable to quantify greenhouse gas (GHG) removals and emission reductions from wetland restoration (WR) activities, including wetland management, implemented on degraded forested and nonforested wetlands in the Mississippi Delta ranging from fresh to saline conditions. The modular approach is used to simplify the methodology, including allowing accounting for projected wetland loss in baseline scenario and project activities that include hydrologic management to enhance CO_2 removals.

This WR carbon offset methodology does not attempt to provide guidance or applicability criteria for wetland restoration in general, a diverse activity that requires the expertise of wetland ecologists and other experts to be designed and implemented successfully. The methodology only attempts to provide requirements for the quantification and crediting of carbon offset credits by WR activities that meet its applicability conditions. The methodology assumes the Project Proponent has or engages the necessary expertise, and requires that WR activities implemented under this methodology comply with all applicable regulations.

B. Sources

The methodology structure and text have been adapted from the following methodologies:

AR-AM0002/Version 03

AR-ACM0001/ Version 05

AR-AMS0003/ Version 01

ACR IFM Methodology Sept 2010

ACR REDD Methodology Modules

C. Definitions and Acronyms

ACR	American Carbon Registry
A/R	afforestation and or reforestation
ARR	afforestation, reforestation, and revegetation
Baseline	most likely management scenario in the absence of the project
C	carbon
CO_2	carbon dioxide
CO_2-e	carbon dioxide equivalent
CF	carbon fraction
CH_4	methane
d.m.	dry matter
DBH	diameter at breast height
ERT	emission reduction ton
Ex-ante	'before the event' or predicted response of project activity
Ex-post	'after the event' or measured response of project activity
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
Historical reference period	the historical period prior to the project Start Date that serves as the source of data for defining the baseline
H	tree height
i	used to represent a stratum
Leakage	any change in carbon stocks or greenhouse gas emissions that occur outside a project's boundary (but within the same country) that is measurable and attributable to the project activity
Module	Component of a methodology that can be applied on its own to perform a specific task
Most likely	the scenario having the highest probability of occurrence

N_20	nitrous oxide
QA	quality assurance
QC	quality control
Stratification	a standard statistical procedure to decrease overall variability of carbon stock estimates by grouping data taken from environments with similar characteristics (e.g., vegetation type; age class; hydrology; elevation)
Tool	Guideline or procedure for performing an analysis (e.g., "Tool for testing significance of GHG emissions in A/R CDM project activities) or to help use or select a module or methodology
WR	wetland restoration and management activities that are implemented to increase carbon sequestration and/or prevent/reduce GHG emissions

D. Modules and tools

This framework uses the following modules and tools:

Carbon Pool Modules:

CP-TB	Estimation of carbon stocks in above- and belowground tree biomass
CP-S	Estimation of carbon stocks in the soil organic carbon pool

Baseline Modules:

BL-WR	Estimation of baseline carbon stock changes from WR
BL-WR-WL	Estimation of baseline carbon stock changes from WR including projected wetland loss for the baseline scenario
BL-WR-HM	Estimation of baseline carbon stock changes from WR where the project activity includes hydrologic management
BL-WR-HM-WL	Estimation of baseline carbon stock changes from WR where the project activity includes hydrologic management as well as projected wetland loss for the baseline scenario

Emissions Modules:

E-E	Estimation of greenhouse gas emissions
E-FFC	Estimation of emissions from fossil fuel combustion

Project Scenario Modules:

PS-WR	Estimation of project scenario carbon stock changes and greenhouse gas emissions from WR
PS-WR-HM	Estimation of project scenario carbon stock changes and greenhouse gas emissions from WR with hydrologic management

Miscellaneous Modules:

X-UNC	Estimation of uncertainty

Tools:

T-DEG	"Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities (Version 1)"
T-SIG	"Tool for testing significance of GHG emissions in A/R CDM project activities (Version 1);"
T-RISK	"ACR Tool for Risk Analysis and Buffer Determination."
T-PERM	"(VCS) AFOLU Non-Permanence Risk Analysis and Buffer Determination"
T-PLOTS	"Calculation of the number of sample plots for measurements within A/R CDM project activities."

All the above-mentioned tools are available at: www.americancarbonregistry.org, http://cdm.unfccc.int/Reference/tools/index.html and http://www.v-c-s.org/VCSv3.html.

Wetland restoration projects applicable under the Methodology Framework are divided into two broad activity types: WR activities that are limited to assisted natural regeneration, seeding, or tree planting; and WR activities that include a hydrologic management component. Under both activity types, Project Proponents may choose a conservative baseline scenario that assumes a constant wetland project area, or a projected wetland loss baseline scenario that includes the projected reduction of total wetland project area due to wetland loss that would occur in the baseline over a 40-year Crediting Period. A single project may delineate project boundaries to include both activity types as well as both baseline scenarios.

Table 1. Determination of when module/tool use is mandatory (M), conditional (C), or optional (O).

Determination	Module/Tool	Wetland Restoration	Wetland Restoration with Hydrologic Management
Always Mandatory	WR-MF	M	M
	T-DEG	M	M
	T-RISK / T-PERM	M	M
	X-UNC	M	M
Baselines	BL-WR	M	N/A
	BL-WR-WL	O	N/A
	BL-WR-HM	N/A	M
	BL-WR-HM-WL	N/A	O
Pools	CP-TB	C[1]	C[2]
	CP-S	O	O
Emissions	E-E	N/A	C[3]
	E-FFC	C[4]	C[5]
Project Scenario	PS-WR	M	N/A
	PS-WR-HM	N/A	M

M Modules marked with an M are mandatory: the indicated modules and tools must be used.

C Modules marked with a C are conditional: the modules must be used under specific scenarios.

O Modules marked with an O are optional: wetland loss may be included or excluded in the baseline. The indicated pools and sources can be included or excluded as decided by the project, but if included in the baseline they must also be included in the with-project scenario and be monitored accordingly.

E. Applicability Conditions

This WR Methodology Framework is a compilation of modules and tools that together define the project activity and necessary methodological steps. By choosing the appropriate modules, a project-specific methodology can be constructed. The justification of the choice of modules and why they are applicable to the proposed project activity shall be given in the GHG Project Plan.

This methodology framework applies to private individuals and businesses, as well as public entities (i.e., county, state, federal, tribal, etc.) provided the Project Proponents demonstrate eligibility of project activities, and clear land and offsets title documentation.

All definitions, eligibility requirements, and other criteria of the ACR Standard and ACR Forest Carbon Project Standard shall apply. This includes the definitions of "forest", Afforestation/Reforestation (AR), Improved Forest Management (IFM), and Reduced Emissions from Deforestation and Degradation (REDD).

[1] If project activities include planting of woody biomass this module must be used.
[2] If project activities include planting of woody biomass this module must be used.
[3] If project activities include hydrologic management this module must be used.
[4] If project activities include moving sediment this module must be used.
[5] If project activities include moving sediment this module must be used.

Wetland restoration is unique, but the WR activities covered by this methodology are eligible under three broad categories of AR, IFM and REDD in the ACR Forest Carbon Project Standard, as follows:

- WR will qualify under the AR category where project lands in the baseline do not meet the "forest" definition per the ACR Forest Carbon Project Standard, but project planting activities target the eventual establishment of a forest to increase carbon stocks.
    - Note however that in cases where the WR activity constitutes re-vegetation and the project lands may not, as a result of the WR activity, over the duration of the Crediting Period ever reach the "forest" threshold of 10% tree cover, as in the case of herbaceous wetlands, the project activity is allowed under the AR category as long as carbon stocks increase beyond the baseline case.
- Where project lands as of the project Start Date already meet the applicable "forest" definition due to percent tree cover or other factors, and will continue to constitute "forest" in the project scenario, WR activities qualify under the IFM category. The IFM project activity will include activities to increase carbon stocks by 1) assisted natural regeneration, seeding, or tree planting; 2) through hydrologic management; or 3) through a combination of these activities.
    - Note that project lands may or may not have been actively managed for forest products prior to the Start Date, and cannot be actively managed for forest products in the project scenario (since timber harvest is not allowed per the applicability conditions below).
- Project Proponents may choose to select modules to account for projected wetland loss in the baseline scenario. Project wetland loss in the baseline may or may not cause the project lands to fall below the "forest" thresholds. Such activities qualify under the REDD category, noting that:
    - Where project lands constitute "forest" as of the Start Date, in the baseline scenario are projected to fall below the "forest" threshold (including converting to open water), and in the project scenario are prevented from falling below the "forest" threshold, such WR activities constitute Reduced Emissions from Deforestation (i.e. avoided conversion from forest to non-forest).
    - Where project lands constitute "forest" as of the Start Date, in the baseline scenario are projected to degrade but not necessarily fall below the "forest" threshold, and in the project scenario degradation is reduced, such WR activities constitute Reduced Emissions from Degradation.
    - Where project lands do not constitute "forest" as of the Start Date, in the baseline scenario are projected to degrade and/or convert to open water, and in

the project scenario degradation is reduced, such WR activities constitute Reduced Emissions from Degradation.

Specific applicability conditions exist for each module and must be met for the module to be used. Use of the methodology framework is subject to the following applicability conditions:

1) All Activity Types

- This methodology is only applicable for forested and non-forested wetlands in the Mississippi Delta ranging from fresh to saline conditions. Wetlands are defined as having one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and/or (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year[6].
- Project activities must conform to all applicable policies and legislation relevant to wetland restoration.
- Project activities must not be required under Section 404 of the Clean Water Act to mitigate onsite or offsite impacts to wetlands.
- The WR project activity is implemented on degraded wetlands that are expected to remain degraded or to continue to degrade in the absence of the project, and hence the land cannot be expected to revert to a non-degraded state without human intervention. The tool T-DEG shall be applied.
- Per the ACR Forest Carbon Project Standard, Project Proponents shall document that project lands were not cleared of trees during the 10 years preceding the project Start Date in order to implement a WR project. This exclusion does not apply in the case of natural disturbances.
- The baseline is defined as existing or historical changes in carbon stocks of the carbon pools within the project boundary, where the land would remain degraded in the absence of the project activity. Baseline scenarios may fall into the following categories:
    - Conservative baseline scenario: uses the degraded carbon sequestration rate determined just prior to Start Date or that would have occurred in the absence of the project activity. This baseline assumes a constant wetland project area in the baseline scenario;
    - Projected wetland loss baseline scenario: uses the degraded wetland carbon sequestration rate determined just prior to the Start Date or that would have

[6] Cowardin, L.M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater habitats of the United States. FWS/OBS-79/31, U.S. Fish and Wildlife Service, Washington, DC. 103 pp.

occurred in the absence of the project activity, and also incorporates a projected reduction of total wetland project area due to wetland loss that would occur over a 40-year Crediting Period if no project activity were to take place.

- Drainage of wetland soils is not allowed.
- Not more than 10% of the project area may be disturbed as result of project planting.
- The project activity does not lead to a shift of pre-project activities outside the project boundary above the *de minimis* threshold (e.g., the land under the proposed project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity).
- WR activities may include wetland management activities to increase net wetland sequestration as long as activities do not cause deleterious impacts or diminish the GHG sequestration function of habitat outside the project area.
- The project must demonstrate an increase in net wetland sequestration above the baseline condition by the end of the Crediting Period.
- Controlled burning is allowed to assist in the control of exotic or problematic species but the SOC pool must be monitored.
- Activities that involve the use of natural resources within the project boundary that do not lead to deforestation or further degradation are permitted (e.g., fishing, hunting, etc.). Harvesting of wood products is not allowed.

2) Wetland Restoration with Hydrologic Management

- For project activities involving hydrologic management the applicability conditions under 1) All Activity Types must be met, in addition to the following applicability conditions:
- Hydrologic management can be implemented to provide suitable conditions for wetland vegetative productivity and carbon sequestration. Examples of eligible hydrologic management project activities include:
    a. Diversion of river water (e.g., Mississippi River or other) into wetlands;
    b. Introduction of nonpoint source runoff (e.g., agricultural, stormwater) into wetlands;
    c. Discharge of treated municipal effluent into wetlands (e.g., wetland assimilation).
    d. Outfall management to maximize sheet flow and minimize impounded or stagnant conditions.

- Project activities that increase emissions beyond the baseline scenario must be accounted for. Refer to BL-WR-HM and BL-WR-HM-WL for detailed procedures to determine how to account for GHG emissions related to hydrologic management and when they may be excluded.

II. ASSESSMENT OF NET GREENHOUSE GAS EMISSION REDUCTIONS

General

The methodological procedure for the assessment is implemented by applying the following eight steps:

Step 0. Identification of the most plausible project activity baseline

Step 1. Definition of the project boundaries

Step 2. Demonstration of additionality

Step 3. Development of monitoring plan

Step 4. Estimation of baseline carbon stock changes and GHG emissions

Step 5. Estimation of total net GHG emissions reductions (project minus baseline and leakage)

Step 6. Calculation of uncertainty

Step 7. Assessment of reversal risk

Step 8. Calculation of ERTs

The same steps shall be followed *ex-ante* and *ex-post.* For parameters that will be monitored subsequent to project initiation, *ex-ante* guidance is given in the relevant modules CP-S, CP-TB, E-E, and E-FFC.

Step 0. Identification of the most plausible project activity

Use the following decision tree to identify the appropriate ACR-eligible WR project activity baseline. The decision tree shall be used to provide a broad indication of likely baseline type and applicability. Ultimately the relevant baseline modules (BL-WR – wetland restoration; BL-WR-WL – wetland restoration including projected wetland loss; BL-WR-HM – wetland restoration with hydrologic management; BL-WR-HM-WL – wetland restoration with hydrologic management including projected wetland loss) must be applied, complying with the relevant applicability conditions and criteria given in those modules.

Will hydrologic management be implemented as part of the project activity?			
NO		**YES**	
Will wetland loss be included in the baseline scenario?		Will wetland loss be included in the baseline scenario?	
NO	**YES**	**NO**	**YES**
BL-WR	BL-WR-WL	BL-WR-HM	BL-WR-HM-WL

A project can include areas subject to different activities/baselines (e.g., Area A = BL-WR; Area B = BL-WR-WL; Area C = BL-WR-HM-WL). In such cases, the areas that are eligible for different categories shall be clearly delineated in the GHG Project Plan and the procedures outlined below applied to each of them separately.

Step 1. Definition of the project boundaries

The following categories of boundaries shall be defined:

a. The geographic boundaries relevant to the project activity;

b. The temporal boundaries;

c. The carbon pools that the project will consider; and

d. The sources and associated types of greenhouse gas emissions that the project will affect.

a. <u>Project Geographic Boundary</u>

The Project Proponents must provide a detailed description of the geographic boundary of project activities. Note that the project activity may contain more than one discrete area of land, but each area must meet the project eligibility requirements. Information to delineate the project boundary may include:

- USGS topographic map or property parcel map where the project boundary is recorded for all areas of land. Provide the name of the project area (e.g., compartment number, allotment number, local name); and a unique ID for each discrete parcel of land;
- Aerial map (e.g. orthorectified aerial photography or georeferenced remote sensing images);
- Geographic coordinates for the project boundary, total land area, and land holder and user rights.

Depending on the WR category further boundary requirements may be detailed in the baseline module.

The geographic boundaries of a WR project are fixed (*ex-ante*) and thus cannot change over the Crediting Period (40 years). Where multiple baselines exist (BL-WR; BL-WR-WL; BL-WR-HM; BL-WR-HM-WL) there shall be no overlap in boundaries between areas appropriate to each of the baselines. Thus, two project types cannot occur on the same piece of land.

b. Temporal Boundaries

Projects with a Start Date of November 1, 1997, or later are eligible to receive offsets retroactively to the Start Date[7]. The project Start Date is defined as the day Project Proponents began land management activities to increase carbon stocks and/or reduce GHG emissions. Projects with a Start Date earlier than November 1, 1997, may be approved on a case-by-case basis.

Project Proponents must provide documentation that GHG mitigation was an objective from project inception in order to receive offsets retroactively for pre-1997 projects.

A 40-year Crediting Period has been selected for this methodology, based on the allowed Crediting Period for AR in the Forest Carbon Project Standard. Wetland systems require longer Crediting Periods (i.e., 40 years) to ensure that long-term trends of wetland loss/gain are captured for baseline validity. Spatial and temporal patterns of wetland loss/gain are dynamic, resulting from complex and interactive effects of natural and human-induced processes. Wetland areas often fluctuate between land and water categories, making wetland loss/gain difficult to quantify. Wetland area estimates can vary substantially due to seasonality, wind, and water level fluctuations present at the time of acquisition of aerial and/or satellite imagery. Additionally, wetlands can fluctuate between land and water multiple times prior to persistent conversion to open water. Initial losses may recover temporarily, only to be lost again because of a secondary or compound stressor. However this methodology does not allow the WR project area to be re-defined over time; as noted above, the project boundary is fixed (*ex-ante*) and cannot change over the Crediting Period.

Generally, baseline wetland management results in the continued loss of wetlands. Wetlands are unique from forestry and silviculture in that baseline wetlands are not actively managed by landowners due to high costs and lack of technical expertise for wetland restoration. Therefore, baseline management is not subject to change and will not need to be incorporated into the baseline.

WR projects will have a Crediting Period of forty (40) years. The minimum Project Term, also 40 years for all forest carbon projects, begins on the Start Date (not the first or last year of crediting). Baseline revisions at 40-year intervals similar to AR requirements will ensure

[7] American Carbon Registry, 2010. American Carbon Registry Forest Carbon Project Standard, version 2.1. Winrock International, Little Rock, Arkansas.

baseline validity because baseline wetland loss can be more accurately predicted using longer intervals that reveal long-term land change trends.

c. Pools and Sources

Tables 2, 3 and 4 shall be followed in determining the GHG assessment boundary, along with the guidance in the ACR *Forest Carbon Project Standard,* Chapter 2. Exclusion of carbon pools and emission sources is allowed subject to considerations of conservativeness and significance testing. Pools or sources may always be excluded if conservative, i.e. exclusion will tend to underestimate net GHG emission reductions/removal enhancements. Pools or sources can be neglected (i.e., counted as zero) if application of the tool T-SIG indicates that the source is insignificant, provided that all sources, sinks and pools determined to be insignificant and excluded from accounting represent less than 3% of the *ex ante* calculation of emission reductions/removal enhancements (per ACR *Forest Carbon Project Standard*).

Table 2. Carbon Pools

Carbon pools	Included / Optional / Excluded	Justification / Explanation of choice
Aboveground biomass carbon	**Included**	Major carbon pool subjected to project activity. This methodology quantifies the aboveground biomass of trees.
Belowground biomass carbon	**Included**	This is the belowground biomass of trees, calculated as a ratio of aboveground biomass, and can only be included if SOC is not measured.
Harvested wood products	**Excluded**	Harvesting of wood products is ineligible in this version of the methodology.
Dead wood	**Excluded**	This pool is conservatively omitted.
Litter / Surface debris	**Excluded**	This pool is conservatively omitted.
Soil organic carbon (SOC)	**Included**	Carbon pool subjected to the project activity. SOC stock is expected to increase due to the implementation of project activity.

Table 3. Wetland Emission Sources

Gas	Source	Included / excluded	Justification / Explanation of choice
CO_2	**Decomposition**	**Excluded**	This source can be conservatively omitted.
CH_4	**Decomposition/ Methanogenesis**	**Included/ excluded**	Shall be included if this source in the project scenario is significantly greater than baseline scenario, otherwise can be conservatively omitted.

N_2O	**Decomposition/ Denitrification**	**Included/ excluded**	Shall be included if this source in the project scenario is significantly greater than baseline scenario, otherwise can be conservatively omitted.

Table 4. Leakage and Project Activity Emission Sources

Leakage and Project Activity Emission Source	Included / optional/ excluded	Justification / Explanation of choice
Activity-Shifting		
Site Preparation	**Excluded**	Negligible. The potential emission source from fossil fuel combustion in the vehicles used for the transportation of seedling, labor, and site preparation is considered insignificant.
Site / Project Specific Activity ***Hydrologic Management***	**Excluded**	Negligible. The potential emission source from fossil fuel combustion due to water management activities is considered insignificant.
Site / Project Specific Activity ***Moving Sediment***	**Included/ excluded**	Can be neglected if the restoration activity does not include moving sediments or fossil fuel combustion emissions are determined not to be significant using module T-SIG.
Harvesting	**Excluded**	Negligible. The GHG Project Plan shall demonstrate that at least the same amount of goods and services will continue to be provided (e.g., alligator egg harvesting, fisheries, and hunting).
Crops	**Excluded**	This methodology is not applicable if agricultural or pastoral activities will be displaced to other locations.
Livestock	**Excluded**	This methodology is not applicable if livestock activities will be displaced to other locations.
Market Effects		
Timber	**Excluded**	Not applicable because timber harvest is not allowed.
Fuelwood	**Excluded**	Not applicable because harvesting of fuelwood is not allowed.

d. Leakage and Project Activity Emission Sources

According to the Applicability Conditions, this methodology is not applicable if leakage exceeds *de minimis* levels. Wetlands are distinct from other terrestrial sequestration types in that there is generally no activity shifting to other locations, such as with silviculture or agriculture, when

wetlands are restored. Healthy wetlands increase the production of goods supplied to a market, such as fisheries, game hunting, or hurricane protection, without a corresponding reduction in the demand for that good. Furthermore, degraded wetlands in the Mississippi Delta are not a source of fuel wood.

The project activity will not result in a reduction of wetland restoration activities or increase wetland loss outside of the project boundary. This methodology is not applicable if livestock or other pastoral activities will be displaced to other locations

The potential project activity emission source from fossil fuel combustion due to water management activities is considered insignificant. Most systems such as river diversions are gravity fed, while other systems will require equivalent fossil fuel combustion to reroute existing flows. Fossil fuel combustion in the vehicles used for the transportation of seedlings, labor, and site preparation is also considered insignificant. Project activities that include moving sediments may be a significant source of emissions due to fossil fuel combustion. Fossil fuel combustion emission sources due to moving of sediments shall be quantified using module E-FFC if determined to be significant using module T-SIG.

Step 2. Demonstration of Additionality

The baseline scenario generally results in the continued loss of wetlands. Project Proponents must demonstrate that the wetland restoration project is not common practice per the Practice-based Performance Standard defined below. The restoration project must not be required to mitigate onsite or offsite impacts to wetlands under Section 404 of the Clean Water Act.

Emission reductions from the project must be additional, or deemed not to occur in the business-as-usual scenario. Assessment of the additionality of a project will be made based on passing the two tests cited below. These two tests require the Project Proponents to demonstrate that the project activity is surplus to regulations, and reduces emissions below the level established, through the practice-based performance standard as defined below, to represent common practice or "business-as-usual".

Project Proponents utilizing this methodology should consult the latest version of the ACR Standard, which may be updated periodically. At the time of the drafting of this methodology, the two additionality tests include:

1. Regulatory Surplus Test, and
2. Practice-based Performance Standard

Further guidance on these tests is given below.

TEST 1: Regulatory Surplus Test

In order to pass the regulatory surplus test, a project must not be mandated by existing laws, regulations, statutes, legal rulings, or other regulatory frameworks in effect now, or as of the project Start Date, that directly or indirectly affect the credited GHG emissions associated with a project.

The Project Proponents must demonstrate that there is no existing regulation that mandates the project or effectively requires the GHG emission reductions associated with wetland restoration.

TEST 2: Practice-based Performance Standard

An assessment of the causes and consequences of wetland loss and management options for protection and restoration, based on national and regional information from various government agencies (federal, state, local), academic and research institutions as well as environmental NGOs, demonstrates that the percentage of land building (including natural land building and wetland restoration activities) is approximately 15% or less of the area of persistent wetland loss that is occurring in Louisiana.[8] Because wetland restoration is not common practice by landowners, wetland restoration projects using this methodology are deemed "beyond business as usual" and therefore additional.

Projects that meet the eligibility criteria for this methodology can use the performance standard to demonstrate additionality without providing additional implementation barrier analysis. Projects that are certified under this version of the methodology do not need to reassess additionality with each verification during the 40-year Crediting Period. However, the following common practice assessment and the applicability of the practice-based performance standard will be reassessed periodically after significant changes to the market, wetland management, or, at a minimum, every 10 years. Future common practice assessments should differentiate between wetland restoration projects that occurred as emission reduction projects or as business-as-usual activities.

ACR reserves the right to review the common practice assessment as necessary to ensure additionality of future projects. All GHG Project Plans for new projects, and all applications for Crediting Period renewal on existing projects, shall apply the regulatory surplus and practice-based performance standard tests in the latest approved revision of this methodology in effect at the time of GHG Project Plan submission or application for Crediting Period renewal.

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[8] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

Common Practice Assessment for Wetland Restoration:

Louisiana contains more than 4 million acres of coastal wetlands, representing 40% of the country's total. However, 80% of the coastal wetland loss in the entire continental United States has occurred in the Mississippi Delta, with about 90% of the current coastal wetland loss in the continental United States occurring in Louisiana.[9,10] The U.S. Geological Survey (USGS) and others have been studying the rates and causes of this wetland loss for many years. Based on USGS data and analysis from a 2011 report documenting the land area change in coastal Louisiana from 1932 to 2010, it is estimated that the percentage of land building is approximately 15% or less of the area of persistent wetland loss that is occurring in Louisiana.[11]

Land loss in the delta is a result of the complex interactions of natural and human-induced processes. The Mississippi delta was formed over the past 6,000-7,000 years as a series of overlapping delta lobes fed by river distributaries.[12,13] In the past, seasonal flooding of the Mississippi River deposited large amounts of sediments and nutrients into the Mississippi River delta, compensating for subsidence by mineral matter deposition and organic matter production.[14] There was an increase in wetland area in active deltaic lobes and wetland loss in abandoned lobes, but there was an overall net increase in the area of wetlands over the past several thousand years. The construction of flood-control levees and closure of distributary channels began soon after colonization of New Orleans by the French in 1719,[15,16,17] and by mid-20th century the Mississippi River delta was almost completely separated from the

[9] Louisiana Department of Natural Resources (LDNR), 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. Louisiana Department of Natural Resources, Baton Rouge, LA, USA.

[10] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[11] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[12] Roberts, H.H., 1997. Dynamic changes of the holocene Mississippi river delta plain: the delta cycle. Journal of Coastal Research 13: 605-627.

[13] Day, J.W., D.F. Boesch, E.J. Clairain, G.P. Kemp, S.B. Laska, W.J. Mitsch, K. Orth, H. Mashriqui, D.J. Reed, L. Shabman, C.A. Simenstad, B.J. Streever, R.R. Twilley, C.C. Watson, J.T. Wells, and D. F. Whigham. 2007. Restoration of the Mississippi delta: lessons from hurricanes Katrina and Rita. Science 315: 1679-1684.

[14] Day, J.W., D.F. Boesch, E.J. Clairain, G.P. Kemp, S.B. Laska, W.J. Mitsch, K. Orth, H. Mashriqui, D.J. Reed, L. Shabman, C.A. Simenstad, B.J. Streever, R.R. Twilley, C.C. Watson, J.T. Wells, and D. F. Whigham. 2007. Restoration of the Mississippi delta: lessons from hurricanes Katrina and Rita. Science 315: 1679-1684.

[15] Boesch, DF (1996) Science and management in four U.S. coastal ecosystems dominated by land-ocean interactions. Journal of Coastal Conservation 2:103-114

[16] Welder, FA (1959) Processes of deltaic sedimentation in the lower Mississippi River. Louisiana State University, Coastal Studies Institute Technical Report 84, 56p

[17] Colten, C. (ed.) 2000. Transforming New Orleans and its Environs. University of Pittsburgh Press, Pittsburgh, PA, USA.

river.[18,19,20] Since that time there has been massive amounts of wetlands lost irrespective of any "no net loss policy", primarily due to levee and canal construction that caused impoundment, sediment and nutrient deprivation, land subsidence, and saltwater intrusion.[21,22,23,24,25]

In 2011, the USGS released a comprehensive analysis of historical trends and rates of land area change in coastal Louisiana based on land and water classifications from 17 data sets.[26] The goal of the study was to provide updated estimates of persistent land changes and historical land change trends for coastal Louisiana and for each hydrologic basin, as defined by the Coastal Wetlands Planning, Protection and Restoration Act Program (n.d.), for the 1932-2010 period of record.[27] The analyses of landscape change presented in the report use historical surveys, aerial data, and satellite data to track landscape changes. The data sets were derived from multiple sources including (1) historical survey data (1932); (2) National Wetlands Inventory (NWI) data based on aerial photography (1956); (3) Landsat Multi-Spectral Scanner (MSS) data (1973-1979); and (4) Landsat Thematic Mapper (TM) satellite imagery classification into land and water categories (1985-2010). Summary data were presented for 1932–2010 and trend data were presented for 1985–2010 because of concerns over the comparability of the 1932 and 1956 datasets that used survey and aerial data, while the later datasets were based on satellite imagery. Statistics were calculated of coastal land change based on isolated coastal regions that excluded fastlands (defined as developed, agricultural, and other protected areas).

[18] Kesel, RH (1988) The decline in the suspended load of the Lower Mississippi River and its influence on adjacent wetlands. Environmental and Geological Water Science 11:271-281

[19] Kesel, RH (1989) The role of the lower Mississippi River in wetland loss in southeastern Louisiana, USA. Environmental and Geological Water Science 13:183-193

[20] Mossa, J (1996) Sediment dynamics in the lowermost Mississippi River. Engineering Geology 45:457-479

[21] Barras, J.A., Beville, S., Britsch, D., Hartley, S., Hawes, S., Johnston, J., Kemp, P., Kinler, Q., Martucci, A., Porthouse, J., Reed, D., Roy, K., Sapkota, S., Suhayda, J., 2003. Historical and projected coastal Louisiana land changes: 1978-2050. USGS Open File Report 03-334, 39 pp.

[22] Boesch, D.F., Josselyn, M.N., Mehta, A.J., Morris, J.T., Nuttle, W.K., Simenstad, C.A., Swift, D., 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. J. Coastal Res. 20, 1-103.

[23] Salinas LM, DeLaune RD, Patrick WH (1986) Changes occurring along a rapidly submerging coastal area: Louisiana. Journal of Coastal Research 2:269-284

[24] Day, J.W., D.F. Boesch, E.J. Clairain, G.P. Kemp, S.B. Laska, W.J. Mitsch, K. Orth, H. Mashriqui, D.J. Reed, L. Shabman, C.A. Simenstad, B.J. Streever, R.R. Twilley, C.C. Watson, J.T. Wells, and D. F. Whigham. 2007. Restoration of the Mississippi delta: lessons from hurricanes Katrina and Rita. Science 315: 1679-1684.

[25] Turner, R. E., E. M. Swenson & J. M. Lee, 1994. A rationale for coastal wetland restoration through spoil bank management in Louisiana, USA. Environmental Management 18: 271-282.

[26] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[27] Louisiana Coastal Wetlands Planning, Protection and Restoration Act Program, n.d., Coastal Louisiana basins: Louisiana Coastal Wetlands Planning, Protection and Restoration Act Program Web site. http://lacoast.gov/new/About/Basins.aspx.

The results show that the percentage of land building ranged from 2-12% of persistent land loss[28] substantiating the argument that wetland restoration and avoided loss are not common practice or "business-as-usual" and wetland restoration under this methodology thus passes the performance standard test. The mapped dataset only identified areas of persistent and consistent change. An area had to experience a change in land/water category that persisted for at least two time periods following the initial conversion before the area could be classified as "loss" or "gain". Rates of wetland loss have been decreasing from the high rates observed in the 1970's, though land building as a percentage of wetland loss has remained below 15%.[29] The Atchafalaya Delta Basin was the only area in coastal Louisiana showing increasing land area, but the rate of growth in this one basin is not sufficient to offset the losses coast wide, which have been as high as 40 square miles (mi^2) per year.[30] Coastal Louisiana has undergone a net change in land area of about -1,883 mi^2 from 1932 to 2010.[31,32,33,34,35,36,37,38] This net change in

[28] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[29] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[30] Gagliano, S.M., Meyer-Arendt, K.J. and Wicker, K.M. 1981. Land loss in the Mississippi river deltaic plain. Transactions of the gulf coast association of geological societies 31:295-300.

[31] Barras, J.A., Beville, S., Britsch, D., Hartley, S., Hawes, S., Johnston, J., Kemp, P., Kinler, Q., Martucci, A., Porthouse, J., Reed, D., Roy, K., Sapkota, S., Suhayda, J., 2003. Historical and projected coastal Louisiana land changes: 1978-2050. USGS Open File Report 03-334, 39 pp.

[32] Britsch, L.D., and Dunbar, J.B., 1993, Land-loss rates-Louisiana coastal plain: Journal of Coastal Research, v. 9, p.324-338.

[33] Boesch, D.F., Josselyn, M.N., Mehta, A.J., Morris, J.T., Nuttle, W.K., Simenstad, C.A., Swift, D., 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. J. Coastal Res. 20, 1-103.

[34] Boesch DF, Shabman L, Antle LG, Day JW, Dean RG, Galloway GE, Groat CG, Laska SB, Luettich RA, Mitsch WJ, Rabalais NN, Reed DJ, Simonstad CA, Streever BJ, Taylor RB, Twilley RR, Watson CC, Wells JT, Whigham DF (2006) A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005. Working Group for Post-Hurricane Planning for the Louisiana Coast, 48p

[35] Shafer GP, Wood WB, Hoeppner SS, Perkins TE, Zoller J, Kandalepas D (2009) Degadation of baldcypress-water tupelo swamp to marsh and open water in southeastern Louisiana, U.S.A.: An irreversible trajectory? Journal of Coastal Research 54: 152-165

[36] Barras, J.A.; Bourgeois, P.E., and Handley, L.R., 1994. Land Loss in Coastal Louisiana, 1956–1990. National Wetlands Research Center Open File Report 94-01. Lafayette, Louisiana: National Biological Survey.

[37] Chambers, J.L.; Conner, W.H.; Day, J.W.; Faulkner, S.P.; Gardiner, E.S.; Hughes, M.S.; Keim, R.F.; King, S.L.; McLeod, K.W.; Miller, C.A.; Nyman, J.A., and Shaffer, G.P., 2005. Conservation, Protection and Utilization of Louisiana's Coastal Wetland Forests. Final Report to the Governor of Louisiana from the Coastal Wetland Forest Conservation and Use Science Working Group. (special contributions from Aust, W.M.; Goyer, R.A.; Lenhard, G.J.; Souther-Effler, R.F.; Rutherford, D.A., and Kelso, W.E.), 121p. Available from: Louisiana Governor's Office of Coastal Activities, 1051 N. Third St. Capitol Annex Bldg, Suite 138 Baton Rouge, LA 70802. http://www.coastalforestswg.lsu.edu

[38] Barras, J.A., J.C. Bernier, and R.A. Morton. 2008. Land area change in coastal Louisiana - A multidecadal perspective (from 1956 to 2006). U.S. Geological Survey Scientific Investigations Map 3019, scale 1:250,000, 14 p. pamphlet.

land area amounts to a decrease of about 25% of the 1932 land area.[39] Over 95% of this loss was wetland, primarily marsh, conversion to open water. Trend analyses from 1985 to 2010 indicate a wetland loss rate of 16.57 mi^2 per year[40], which is equivalent to losing an area the size of a football field per hour.[41]

Wetland loss in coastal Louisiana is rapid despite current wetland restoration efforts. The USGS predicts that by 2050, with 'business as usual', there will be an additional 700 mi^2 of wetland loss if no substantial restoration is undertaken.[42,43] Sea level rise is anticipated to increase, causing increased saltwater intrusion and flooding, ultimately resulting in wetland loss.[44,45] Meanwhile, several studies of Mississippi River deltaic swamps indicate that many areas are in a state of deterioration, are not sustainable,[46,47,48,49,50,51] and exhibit little natural

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[39] Louisiana Department of Natural Resources (LDNR), 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. Louisiana Department of Natural Resources, Baton Rouge, LA, USA.

[40] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

[41] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet

[42] Barras, J.A., Beville, S., Britsch, D., Hartley, S., Hawes, S., Johnston, J., Kemp, P., Kinler, Q., Martucci, A., Porthouse, J., Reed, D., Roy, K., Sapkota, S., Suhayda, J., 2003. Historical and projected coastal Louisiana land changes: 1978-2050. USGS Open File Report 03-334, 39 pp.

[43] Louisiana Department of Natural Resources (LDNR), 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. Louisiana Department of Natural Resources, Baton Rouge, LA, USA.

[44] Conner, W.H. and Day, J.W., Jr., 1988. Rising water levels in coastal Louisiana: implications for two coastal forested wetland areas in Louisiana. Journal of Coastal Research, 4, 589–596.

[45] Blum, M. and H. Roberts. 2009. Drowning of the Mississippi Delta due to insufficient sediment supply and global sea-level rise. Nature Geoscience. 2:488-491

[46] Conner, W.H. and Day, J.W., Jr., 1992. Water level variability and litterfall productivity of forested freshwater wetlands in Louisiana. American Midland Naturalist, 128(2), 237–245.

[47] Hoeppner, S.S., 2002. Feasibility and Project Benefits of a Diversion into the Degraded Cypress–Tupelo Swamp in the Southern Lake Maurepas Wetlands, Lake Pontchartrain Basin, Louisiana. Hammond, Louisiana: Southeastern Louisiana University, Master's thesis, 123p.

[48] Hoeppner, S.S.; Shaffer, G.P., and Perkins, T.E., 2008. Through droughts and hurricanes: tree mortality, forest structure, and biomass production in a coastal swamp targeted for restoration in the Mississippi River Deltaic. Forest Ecology and Management, 256, 937–948.

[49] Chambers, J.L.; Conner, W.H.; Day, J.W.; Faulkner, S.P.; Gardiner, E.S.; Hughes, M.S.; Keim, R.F.; King, S.L.; McLeod, K.W.; Miller, C.A.; Nyman, J.A., and Shaffer, G.P., 2005. Conservation, Protection and Utilization of Louisiana's Coastal Wetland Forests. Final Report to the Governor of Louisiana from the Coastal Wetland Forest Conservation and Use Science Working Group. (special contributions from Aust, W.M.; Goyer, R.A.; Lenhard, G.J.; Souther-Effler, R.F.; Rutherford, D.A., and Kelso, W.E.), 121p. Available from: Louisiana Governor's Office of Coastal Activities, 1051 N. Third St. Capitol Annex Bldg, Suite 138 Baton Rouge, LA 70802. http://www.coastalforestswg.lsu.edu

[50] Pezeshki, S.R.; DeLaune, R.D., and Patrick, W.H.J., 1990. Flooding and saltwater intrusion: potential effects on survival and productivity of wetland forests along the U.S. Gulf Coast. Forest Ecology and Management, 33/34, 287–301.

regeneration.[52,53] Without river reintroductions in the near future, as well as harnessing other point and nonpoint sources of freshwater, many wetlands in coastal Louisiana will continue their trajectory towards open water.[54] Given favorable hydrologic and nutrient conditions, Baldcypress (*Taxodium distichum*) and Water Tupelo (*Nyssa aquatica*) seedlings can reach greater than 10 m heights within one decade. For example, a pilot planting of Baldcypress seedlings at the Caernarvon diversion has yielded trees over 10 m tall in a decade, and all of these resisted wind throw during the hurricanes of 2005.[55] However, even with sustainable water management, most swamps will need to be planted to establish tree growth since conditions for natural regeneration (i.e., several months of dry conditions) rarely occur anymore. In conclusion, if we are to reverse the trajectory of coastal wetland loss, we must find, and wisely use, point and nonpoint sources of freshwater to a much greater extent, as well as undertake large-scale tree plantings.[56]

Costs of Wetland Restoration:

Depending upon the extent of area included, the level of storm protection to communities, and the amount invested in the long-term sustainability of ecosystem services, the cost of restoration of the Mississippi Delta has been debated for the last ten years with estimates ranging from $10 billion for near-term restoration to $150 billion for restoration and protection. Costs for wetland restoration range from $8,000-$60,000 an acre depending on the restoration technique.[57] Past studies have found that restoration plans that address broad wetland loss throughout the Mississippi Delta are too expensive, requiring more recent restoration plans to focus on the most urgent problems.[58]

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[51] Shaffer, G.P.; Perkins, T.E.; Hoeppner, S.S.; Howell, S.; Benard, T.H., and Parsons, A.C., 2003. Ecosystem Health of the Maurepas Swamp: Feasibility and Projected Benefits of a Freshwater Diversion. Final Report. Dallas, Texas: Environmental Protection Agency, Region 6, 95p.
[52] Conner, W.H. and Day, J.W., Jr., 1976. Productivity and composition of a bald cypress-water tupelo site and a bottomland hardwood site in a Louisiana swamp. American Journal of Botany, 63, 1354–1364.
[53] Shaffer, G.P.; Perkins, T.E.; Hoeppner, S.S.; Howell, S.; Benard, T.H., and Parsons, A.C., 2003. Ecosystem Health of the Maurepas Swamp: Feasibility and Projected Benefits of a Freshwater Diversion. Final Report. Dallas, Texas: Environmental Protection Agency, Region 6, 95p.
[54] Shafer GP, Wood WB, Hoeppner SS, Perkins TE, Zoller J, Kandalepas D (2009) Degadation of baldcypress-water tupelo swamp to marsh and open water in southeastern Louisiana, U.S.A.: An irreversible trajectory? Journal of Coastal Research 54: 152-165
[55] Krauss, K.W.; Chambers, J.L.; Allen, J.A.; Soileau, D.M., Jr., and DeBosier, A.S., 2000. Growth and nutrition of baldcypress families planted under varying salinity regimes in Louisiana, USA. Journal of Coastal Research, 16, 153–163.
[56] Boesch, D.F., M.N. Josselyn, A.J. Mehta, J. T. Morris, W.K. Nuttle, C.A. Simestad, and D.J.P. Swift, 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. Journal of Coastal Research, Special Issue No. 20.
[57] http://lacoast.gov/new/Projects/List.aspx
[58] U.S. Army Corps of Engineers (2009). Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report. New Orleans District, Mississippi Valley Division, 292 pp.

After the hurricanes of 2005, Congress directed the Secretary of the Army to develop a full range of risk reduction measures for South Louisiana including coastal restoration. This Louisiana Coastal Protection & Restoration (LACPR) plan estimates that it would take $543,000,000 per year, for a total "life-cycle cost" of $10.7 billion, to restore the coast using Mississippi River diversions, marsh restoration using dredged material, and shoreline stabilization in strategic areas, with the proviso that these coastal measures are for hurricane risk reduction only, sustaining existing coastal landscape.[59]

Louisiana's Comprehensive Master Plan for a Sustainable Coast has recently estimated that between $20 and $50 billion (in present value dollars) will realistically be available for funding over the next 50 years, but acknowledge that a budget five times that size is needed.[60] The State of Louisiana has recently used surplus revenues to accelerate priority restoration projects, and is projecting a larger revenue stream starting in 2017 from the sale of mineral leases and royalty revenue from oil and gas exploration in the Gulf of Mexico. The state admits that there will be a funding gap between now and 2017 and is exploring ways to narrow the gap and expand the coastal program to address broad wetland loss.[61] A goal of the Louisiana Office of Coastal Protection and Restoration is to develop a wetland carbon sequestration program to leverage carbon finance to address the funding gap and to expand the coastal restoration program. In summary, the true cost to restore the Mississippi Delta is beyond the capacity of landowners and current government programs.[62] Constrained budgets will require limited funding to be directed towards priority restoration projects while Louisiana will continue to experience the majority of the nation's wetland loss.[63]

Step 3. Development of monitoring plan

Project Proponents shall include a single monitoring plan in the GHG Project Plan. For monitoring changes in wetland cover and carbon stock changes, the monitoring plan shall use the methods given in PS-WR or PS-WR-HM. All relevant parameters from the modules are to be included in the monitoring plan.

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[59] U.S. Army Corps of Engineers (2009). Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report. New Orleans District, Mississippi Valley Division, 292 pp.

[60] http://coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&nid=24&pnid=0&pid=28&fmid=0&catid=0&elid=0

[61] http://coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&nid=24&pnid=0&pid=28&fmid=0&catid=0&elid=0

[62] Boesch, D.F., M.N. Josselyn, A.J. Mehta, J. T. Morris, W.K. Nuttle, C.A. Simestad, and D.J.P. Swift, 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. Journal of Coastal Research, Special issue No. 20.

[63] Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

The monitoring plan shall address the following monitoring tasks, which should be standard headers in the monitoring plan:

- Revision of the baseline
- Monitoring of actual carbon stock changes and greenhouse gas emissions
- Estimation of *ex-post* net carbon stock changes and greenhouse gas emissions

For each of these tasks, the monitoring plan shall include the following sections:

a. Technical description of the monitoring task.
b. Data to be collected. The list of data and parameters to be collected shall be given in the GHG Project Plan.
c. Overview of data collection procedures.
d. Quality control and quality assurance procedure.
e. Data archiving.
f. Organization and responsibilities of the parties involved in all the above.

Step 4. Estimation of baseline carbon stock changes and greenhouse gas emissions

The baseline scenario is the carbon stock present immediately prior to site preparation, or the most likely carbon stock in the absence of project implementation. Baseline determination is defined from Paragraph 22 of the CDM A/R Modalities and Procedures as "existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary" where the land would remain degraded in the absence of the project activity.

Methods for estimating baseline carbon stock changes and greenhouse gas emissions are provided in the following modules:

- For wetland restoration using a conservative baseline scenario: BL-WR
- For wetland restoration including projected wetland loss in the baseline scenario: BL-WR-WL
- For wetland restoration with hydrologic management project using a conservative baseline scenario: BL-WR-HM
- For wetland restoration with hydrologic management that includes projected wetland loss in the baseline scenario: BL-WR-HM-WL

A description of how the baseline scenario is identified and the description of the identified baseline scenario shall be given in the GHG Project Plan. The results of the estimations shall be presented in the GHG Project Plan.

Step 5. Estimation of total net greenhouse gas emissions reductions (project minus baseline and leakage)

The total net greenhouse gas emissions reductions of the WR project activity are calculated as follows:

$C_{ACR,t} = (\Delta C_{ACTUAL} - \Delta C_{BSL}) * (1-LK)$ (1)

where:

$C_{ACR,t}$	Total net greenhouse gas emission reductions at time t; t CO_2-e
ΔC_{ACTUAL}	Cumulative total of the carbon stock changes and greenhouse gas emissions under the project scenario up to time *t;* t CO_2-e (from PS-WR, or PS-WR-HM)
ΔC_{BSL}	Cumulative total of the carbon stock changes and greenhouse gas emissions under the baseline scenario up to time *t;* t CO2-e (from an individual baseline, or the sum of the following baselines if the project includes more than one baseline type: BL-WR, BL-WR-WL, BL-WR-HM, BL-WR-HM-WL)
LK	Cumulative total of the carbon stock changes and greenhouse gas emissions due to leakage up to time *t;* t CO_2-e; LK must equal zero for this methodology to be used

Step 6. Calculation of uncertainty

Project proponents shall use X-UNC to combine uncertainty information and determine an overall project uncertainty estimate of the total net GHG emissions reductions. If calculated total project uncertainty (UNC) in module X-UNC exceeds 10% at the 90% confidence level, then C_{ACR} calculated in equation (1) shall be adjusted as follows:

$$Adjusted\_C_{ACR,t} = C_{ACR,t} * (100\% - UNC + 10\%) \quad (2)$$

where:

$Adjusted\_C_{ACR},t$	Cumulative total net GHG emission reductions at time *t* adjusted to account for uncertainty; t CO_2-e
C_{ACR},t	Cumulative total net GHG emission reductions at time *t*; t CO_2-e
UNC	Total project uncertainty, as derived in X-UNC; %

If calculated total project uncertainty (UNC) in module X-UNC is less than or equal to 10%, then no adjustment shall be made for uncertainty.

Step 7. Assessment of Risk

Permanence refers to the longevity of an emissions reduction/removal and the risk of reversal (i.e., the risk that the atmospheric benefit will not be permanent). Wetland projects have the potential for GHG reductions and removals to be reversed when a project has exposure to risk factors, such as tropical storms, fires, increased depth and duration (impounded or permanently flooded) of flooding, damage from wildlife (e.g. nutria *Myocastor coypus*), and erosion; or intentional reversals, such as landowners choosing to discontinue project activities before the project minimum term has ended. Wetland offsets are inherently at some risk of reversal, but this risk can be assessed and mitigated, and the offsets thus made fungible with other offsets and allowances. To manage GHG sequestration, Project Proponents must commit to a minimum project term of 40 years, and assess and mitigate reversal risk as described below.

To assess the risk of reversal, the Project Proponents shall conduct a risk assessment addressing both general and project-specific risk factors. General risk factors include, but are not limited to, financial failure, technical failure, management failure, rising land opportunity costs, regulatory and social instability, and natural disturbances. Project-specific risk factors vary by project type. The Project Proponents shall conduct the risk assessment using the tool T-RISK. Only until the release of this tool, the Project Proponents shall use the most updated version of the tool T-PERM.

The output of either tool is an overall risk category for the project, translating into a number of offsets that must be deposited in the ACR buffer pool to mitigate the risk of reversal (unless another ACR approved risk mitigation mechanism is used in lieu of buffer contribution). The Project Proponents shall conduct this risk assessment and propose a corresponding buffer contribution (if applicable). The risk assessment, overall risk category, and proposed buffer contribution shall be included in the GHG Project Plan.

Mitigation of Risk via the ACR Buffer Pool

The Project Proponents shall choose a risk mitigation mechanism. For Project Proponents choosing the ACR buffer pool, the Project Proponents shall contribute either a portion of the project offsets, or an equal number of ERTs of another type and vintage, to a buffer account held by ACR in order to replace unforeseen losses of carbon stocks.

The number of ERTs contributed to the buffer pool shall be determined through the Assessment of Risk given above. Buffer contributions are made with each new issuance of ERTs to a project.

Alternate Risk Mitigation Mechanisms

In lieu of making a buffer contribution of ERTs from either the project or purchased from another acceptable source, Project Proponents may use an alternate ACR-approved risk mitigation mechanism, or propose an insurance product or other risk mitigation mechanism to ACR for approval.

Step 8. Calculation of Emission Reduction Tons (ERTs)

$$ERT_t = (C_{ACR,t2} - C_{ACR,t1}) * (1 - BUF) \quad (3)$$

where:

ERT_t — Number of Emission Reduction Tons at time $t = t_2 - t_1$; t CO_2-e

$C_{ACR,t2}$ — Cumulative total net GHG emission reductions up to time t_2, adjusted for uncertainty if applicable per equation (2); t CO_2-e

$C_{ACR,t1}$ — Cumulative total net GHG emission reductions up to time t_1 adjusted for uncertainty if applicable per equation (2); t CO_2-e

BUF — Fraction of project ERTs contributed to the ACR buffer pool, if applicable; fraction

Per the *Forest Carbon Project Standard, BUF* is determined using an ACR-approved risk assessment tool. If the Project Proponents elects to make the buffer contribution in non-project ERTs, or elects to mitigate the assessed reversal risk using an alternate risk mitigation mechanism approved by ACR, *BUF* shall be set to zero.

PARAMETERS ORIGINATING IN OTHER MODULES

Data /parameter:	$\Delta C_{bsl,WR}$
Data unit:	t CO_2-e
Used in equations:	1
Description:	Cumulative total of the carbon stock changes and greenhouse gas emissions for the baseline scenario.
Module parameter originates in:	BL-WR
Any comment:	

Data /parameter:	$\Delta C_{bsl,WR-WL}$
Data unit:	t CO_2-e
Used in equations:	1

Description:	Cumulative total of the carbon stock changes and greenhouse gas emissions for the baseline scenario including projected wetland loss.
Module parameter originates in:	BL-WR-WL
Any comment:	

Data /parameter:	$\Delta C_{bsl,WR\text{-}HM}$
Data unit:	t CO_2-e
Used in equations:	1
Description:	Cumulative total of the carbon stock changes and greenhouse gas emissions for the baseline scenario when the project activity will include hydrologic management.
Module parameter originates in:	BL-WR-HM
Any comment:	

Data /parameter:	$\Delta C_{bsl,WR\text{-}HM\text{-}WL}$
Data unit:	t CO_2-e
Used in equations:	1
Description:	Cumulative total of the carbon stock changes and greenhouse gas emissions for the baseline scenario including projected wetland loss when the project activity will include hydrologic management.
Module parameter originates in:	BL-WR-HM-WL
Any comment:	

Data /parameter:	ΔC_{ACTUAL}
Data unit:	t CO_2-e
Used in equations:	1
Description:	Cumulative total of carbon stock changes and greenhouse gas emissions for the project scenario.
Module parameter originates in:	PS-WR
Any comment:	

Data /parameter:	$\Delta C_{ACTUAL-HM}$
Data unit:	t CO_2-e
Used in equations:	1
Description:	Cumulative total of carbon stock changes and greenhouse gas emissions for the project scenario when the project activity includes hydrologic management.
Module parameter originates in:	PS-WR-HM
Any comment:	