



CLIMATE  
ACTION  
RESERVE

# Grassland Project Protocol

Avoiding Greenhouse Gas Emissions Related to the  
Conversion of Grassland to Cropland

## *Working Draft*

October 2014

### *Guide to this document*

This protocol version is extremely preliminary. Almost everything should be considered open for discussion. With that said, there are certain items which require more thorough consideration by workgroup members. The table below describes the color scheme that is used to identify different protocol components.

**BLACK text** indicates material that is relatively finished or does not require deep consideration by the workgroup. Comments are always welcome.

**BLUE text** indicates material that is pulled from another Reserve protocol and has been initially adapted for the GPP. It has already been through a public, stakeholder process, but merits thorough consideration in the context of the GPP.

**GREEN text** indicates material that is new to this protocol, or taken from a methodology not adopted by the Reserve, and merits thorough review and discussion.

**HIGHLIGHTED text of any color** is where the Reserve would like to draw particular attention and review.

**ROSE boxes** will highlight areas where material has not yet been developed, and will describe what is needed to fill the void.

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## Abbreviations and Acronyms

AGC	Avoided Grassland Conversion
CARB	California Air Resources Board
CDM	Clean Development Mechanism
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
CRP	Conservation Reserve Program
CRT	Climate Reserve Tonne
EPA	U.S. Environmental Protection Agency
GHG	Greenhouse gas
GRP	Grassland Reserve Program
IPCC	United Nations Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
lb	Pound
MT (t)	Metric ton (or tonne)
N <sub>2</sub> O	Nitrous oxide
NRCS	Natural Resources Conservation Service
Reserve	Climate Action Reserve
SOC	Soil Organic Carbon
SSR	Source, sink, and reservoir
tCO <sub>2</sub> e	Metric ton of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture

## 1 Introduction

The Climate Action Reserve (Reserve) Grassland Project Protocol (GPP) provides guidance to account for, report, and verify greenhouse gas (GHG) emission reductions associated with projects which avoid the loss of soil carbon due to conversion of native grasslands to cropland.

The Climate Action Reserve is the most experienced, trusted and efficient offset registry to serve the California cap-and-trade program and the voluntary carbon market. With deep roots in California and a reach across North America, the Reserve encourages actions to reduce GHG emissions and works to ensure environmental benefit, integrity, and transparency in market-based solutions to address global climate change. It operates the largest accredited registry for the California compliance market and has played an integral role in the development and administration of the state's cap-and-trade program. For the voluntary market, the Reserve establishes high quality standards for carbon offset projects, oversees independent third-party verification bodies and issues and tracks the transaction of carbon credits (Climate Reserve Tonnes) generated from such projects in a transparent, publicly-accessible system. The Reserve program promotes immediate environmental and health benefits to local communities and brings credibility and value to the carbon market. The Climate Action Reserve is a private 501(c)(3) nonprofit organization based in Los Angeles, California.

Project Developers and Aggregators that initiate avoided grassland conversion (AGC) projects use this document to quantify and register GHG reductions with the Reserve. The protocol provides eligibility rules, methods to calculate reductions, performance-monitoring instructions, and procedures for reporting project information to the Reserve. Additionally, all project reports receive annual, independent verification by ISO-accredited and Reserve-approved verification bodies. Guidance for verification bodies to verify reductions is provided in the Reserve Verification Program Manual and Section 8 of this protocol.

This protocol is designed to ensure the complete, consistent, transparent, accurate, and conservative quantification and verification of GHG emission reductions associated with an avoided grassland conversion project.<sup>1</sup>

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<sup>1</sup> See the WRI/WBCSD GHG Protocol for Project Accounting (Part I, Chapter 4) for a description of GHG reduction project accounting principles.

## 2 The GHG Reduction Project

### 2.1 Background

Grasslands have the ability to both emit and sequester carbon dioxide (CO<sub>2</sub>), a leading GHG that contributes to climate change. Grasses and shrubs, through the process of photosynthesis, naturally absorb CO<sub>2</sub> from the atmosphere and store the gas as carbon in their biomass (i.e. leaves and roots). Carbon is also stored in the soils that support the grassland.

When grasslands are disturbed, through events like fire, disease, pests, harvest, tilling, or crop cultivation, some of their stored carbon may oxidize or decay over time (or immediately) releasing CO<sub>2</sub> into the atmosphere. The quantity and rate of CO<sub>2</sub> that is emitted may vary, depending on the particular circumstances of the disturbance. Grasslands function as reservoirs in storing CO<sub>2</sub>. Depending on how grasslands are managed or impacted by natural events, they can be a net source of emissions, resulting in a decrease to the reservoir, or a net sink, resulting in an increase of CO<sub>2</sub> to the reservoir. In other words, grasslands may have a net negative or net positive impact on the climate.

Through sustainable management and protection, grasslands can also play a positive and significant role to help address global climate change. The Reserve's GPP is designed to address the grassland sector's unique capacity to sequester, store, and emit CO<sub>2</sub> and to facilitate the positive role that grasslands can play to address climate change.

### 2.2 Project Definition

For the purpose of this protocol, the GHG reduction project is defined as a planned set of activities designed to prevent emissions of GHGs to the atmosphere through conserving grassland carbon stocks and avoiding cultivation activities on an eligible project area. The project area must be grassland, as defined in Section 9, and it must be suitable for conversion to agriculture, as defined in Section 3.X.

Should the project definition also include shrubland?

#### 2.2.1 Project Activities

An AGC project involves preventing the conversion of natural grassland (as defined in Section 9) to cropland by dedicating the project area to continuous grassland cover through a conservation easement or transfer to public ownership. An AGC project is only eligible if:

1. The project meets the eligibility requirements of Section 3 of this protocol.
2. The project does *not* employ synthetic fertilizer additions.
3. The project area does not require artificially-altered drainage or irrigation to be maintained as permanent grassland.
4. If grazing is employed in the project scenario, the manure must not be managed in liquid form, and grazing levels must meet the criteria in Section 6.3.
5. The project does not take place on land that was part of a previously registered Grassland Project, unless the previous Grassland Project was terminated due to an Unavoidable Reversal (Section 5.4.2).

An AGC project may involve seeding, application of organic fertilizer (i.e. manure, compost, etc.), or livestock grazing as part of the project activity.

AGC projects are eligible only on lands that are privately owned prior to the project start date.

#### Project definition

Questions for the workgroup:

1. Is it necessary to require a conservation easement or transfer to public ownership? This is what we do in the forest avoided conversion protocol to support permanence.
2. We'd like to discuss the merits of including/excluding synthetic fertilizer additions. The intent here is to avoid the most intensive types of pasture management. We'd like to limit so-called "cultural" amendments to the project area.
3. The forest protocol does not allow projects which were previously registered as forest projects unless they were terminated due to an unavoidable reversal. We propose including this policy.

#### 2.2.2 Defining the Project Area

For the purposes of quantifying emission reductions with this protocol, an eligible project area consists of **natural** grassland which meets the criteria in Section 3 regarding the threat of conversion to cropland and the lack of legal barriers to such conversion. **Only areas that are suitable for conversion to cropland, as defined in Section 3.3.1, are eligible to report under this protocol.**

#### Project Area

The Reserve is interested in exploring the question of continuity/contiguity as it pertains to defining the project boundaries. In general, we are ok with physically-separate parcels being included in a single project as long as they are under common ownership. However, to avoid potentially serious problems with verification and quantification, we propose that the entire project area must be able to meet the same performance standard for eligibility. We would like workgroup feedback on this issue.

The geographic boundaries defining the Project Area must be described in detail at the time a Grassland project is listed on the Reserve. The boundaries must be defined using a georeferenced map, or maps that displays public and private roads, major watercourses (fourth order or greater), topography, towns, and public land survey townships, ranges, and sections or latitude and longitude. The maps should be of adequate resolution to clearly identify the required features. The shapes delineating the project area must contain only areas which meet the eligibility requirements of this protocol.

A Geographical Information System file (GIS shapefile) must be submitted to the Reserve with the project. The shapefile may be converted to a KML file. The acres reported for the project must be based on the acres calculated from the shapefile. The Project Area can be contiguous or separated into tracts, **but must share common ownership.** See Section 5.1 for guidance regarding the stratification of the project area. **Non-contiguous sections of the Project Area must pass the same Performance Standard Test, as described in Section 3.3.1, to be considered a single Project Area.** For example, if the Project Area contains two non-contiguous parcels in different counties, and those counties fell into different categories of the Financial Threshold under the Performance Standard Test, those parcels would be considered two different Project Areas.

Where any Grassland Owner chooses to exclude some or all of the soil carbon it controls from becoming part of the Grassland Project, the project's baseline must demonstrate the exclusion as a legal constraint.

## 2.3 Grassland Owners and Project Operators

A Grassland Owner is an individual or a corporation or other legally constituted entity, city, county, state agency, or a combination thereof that has legal control of any amount of soil carbon within the Project Area. Control of soil carbon means the Grassland Owner has the legal authority to effect changes to soil carbon quantities, e.g. through mineral rights or other grassland management or land-use rights. Control of soil carbon occurs, for purposes of satisfying this protocol, through fee ownership and/or deeded encumbrances, such as conservation easements. A lessee is not a Grassland Owner, but may work as an agent of the Grassland Owner to implement a project.

Multiple Grassland Owners may exist with respect to a single Grassland Project, since control of soil carbon may be associated with fee ownership or through one or more deeded encumbrances that exist within a Project Area, any one of which may convey partial control of the project's soil carbon. Any unencumbered soil carbon is assumed to be controlled by the fee owner. Individuals or entities holding mineral, gas, oil, or similar *de minimis*<sup>2</sup> interests in the soil carbon, are precluded from the definition of a Grassland Owner. Such an individual or entity is only considered to have a *de minimis* interest if it can be demonstrated (per Section X.X) that the exercising of their rights will not result in a reversal which is greater than the materiality threshold applicable to that project.

### De minimis ownership interests

**Context:** Any person or entity that has a right that could impact the quantification of emission reductions on the project area needs to be considered a "grassland owner" and be subject to the same attestation rules. For example, if a company owns surface mining rights on a grassland project, and they decided to exercise those rights, it is possible that they would remove all of the carbon protected by the project activities. Thus, that entity would be a grassland owner and need to be involved in the project development.

**Questions:** We would like the workgroup to consider what types of entities are likely to have an ownership interest in the project area, including any surface or sub-surface development rights, e.g. mineral estates (oil and gas fracking). We would like to lay out these potential owners and discuss the possible impact they may have on the soil carbon (were they to exercise their rights) to determine the following items:

1. Can we identify certain owners as *de minimis*? These owners would not have to sign anything or participate in the project in any way.
2. For owners which are not *de minimis*, is it going to be a deal breaker to get them on the record for the project?
3. Are there certain development activities which we want to simply prohibit outright, outside of the provisions for avoidable reversals?
4. Is it going to be problematic to seek signed attestations from all grassland owners?

A Project Operator is the Grassland Owner (or one of the Grassland Owners) of the project area who is responsible for undertaking the Grassland Project and registering it with the Reserve. The Project Operator must execute the Project Implementation Agreement (PIA) with the

<sup>2</sup> *De minimis* control includes access right of ways and residential power line right of ways.

Reserve; all Grassland Owners must also be party to the PIA (see Section 3.6). The Project Operator is also responsible for the accuracy and completeness of all information submitted to the Reserve, and for ensuring compliance with the Grassland Project Protocol.

Whenever there are multiple Grassland Owners for a given project area, the Project Operator must also secure an agreement from all other Grassland Owners that (1) assigns authority to the Project Operator to undertake a Grassland Project, subject to any conditions imposed by any of the other Grassland Owners to include or disallow any carbon they control; and (2) waives any right on the part of the Grassland Owners to seek damages, penalties, costs, losses, expenses, or judgments from the Reserve arising from or in any way connected with the Grassland Project, except as explicitly provided for in the PIA.

The Reserve maintains the right to determine which individuals or entities meet the definition of “Grassland Owner.”

The “Project Developer” is an entity that has an active account on the Reserve, submits a project for listing and registration with the Reserve, and is ultimately responsible for all project reporting and verification. The Project Developer may be either the Project Operator or the Project Aggregator, in the case where a project has joined a Project Aggregate. The Project Operator may act as his/her own Project Developer, may participate as part of an aggregate (in which case the “Project Aggregator,” defined in Section 2.4, will act as the Project Developer), or may engage a third-party project developer to assist or consult with the Project Operator and to implement the Grassland Project. Project Operators may also serve as his/her own Project Aggregator, representing both his/her own project area as well as one or more discrete projects, as defined in Section 2.4. All information submitted to the Reserve on behalf of the Project Operator shall reference the Project Operator, who is ultimately responsible for the accuracy and completeness of the information submitted, and for ensuring compliance with the Grassland Project Protocol. Figure 2.1 depicts the relationships between these entities and possible project ownership structures.

In all cases, the Project Operator must attest to the Reserve that they have exclusive claim to the GHG reductions resulting from the project. Each time a project is verified, the Project Operator must attest that no other entities are reporting or claiming (e.g. for voluntary reporting or regulatory compliance purposes) the GHG reductions caused by the project.<sup>3</sup> The Reserve will not issue CRTs for GHG reductions that are reported or claimed by entities other than the Project Operator (e.g. Grassland Owners that are not the Project Operator, or others not designated as the Project Developer). In the case of project aggregates, each Project Operator must submit an attestation.

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<sup>3</sup> This is done by signing the Reserve’s Attestation of Title form, available at: <http://www.climateactionreserve.org/how/program/documents/>

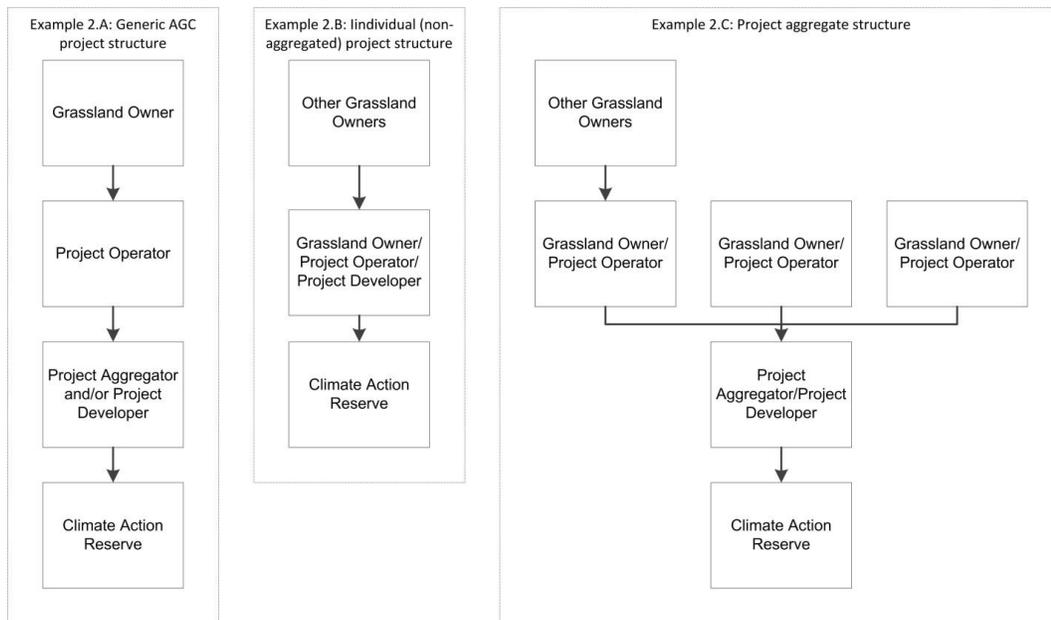


Figure 2.1. Grassland Project Ownership Structures and Terminology

## 2.4 Project Aggregates

### Aggregation

There are a handful of ways in which aggregation can be used to streamline the process of project development, reporting, and verification, all with the ultimate goal of reducing barriers to entry, both in terms of expertise and financing. The approach being proposed here could be characterized as “joint reporting and verification,” where multiple projects report and are verified jointly, yet are still complete, individual projects in their own right. We believe this approach will offer some of the benefits of aggregated projects while also meshing with what we believe to be the needs of the ARB program.

A “project aggregate” or “aggregate” is a collection (two or more) of individual Grassland Projects that share a common Project Developer, also referred to as the “Project Aggregator,” whose role is defined further below, in Section 2.4.1, as well as joint reporting, and verification activities. Participation in a project aggregate can improve the cost-effectiveness of smaller grassland projects while maintaining rigor in overall reporting and verification.

#### 2.4.1 Qualifications and Role of Aggregators

An Aggregator is defined as the Project Developer of a collection (two or more) of individual Grassland Projects that report and verify jointly, i.e. the Project Developer for a project aggregate. An Aggregator may be a corporation or other legally constituted entity, city, county, state agency, agricultural producer, or a combination thereof. An Aggregator must have an account on the Reserve. In some circumstances, the Aggregator may be an individual Project Operator serving as the Project Aggregator for his/her own grassland holdings (if defined as separate projects), as well as the Project Aggregator for a group of parcels with different owners, that includes his/her own grassland holdings.

An Aggregator must open an “Aggregator” account on the Reserve. An Aggregator must remain in good standing. Failure to remain in good standing will result in all account activities of the participant projects in the aggregate managed by that Aggregator being suspended until issues are resolved to the satisfaction of the Reserve. In order for an Aggregator to remain in good standing, Aggregators must perform as follows:

- Complete aggregation contracts with Project Operators which include mandatory components. (See following section on Joining an Aggregate.)
- Select a single verification body for all Grassland Projects enrolled in the aggregate in any given year or set of years.
- Coordinate the verification schedule which maintains appropriate verification status for the aggregate. Document the verification work and report to the Reserve on an annual basis how completed verifications demonstrate compliance. (See sections on Monitoring and Verification with regard to Aggregates.)
- Maintain a Reserve account

Project Operators are ultimately responsible for submitting all required forms and complying with the terms of the GPP. Aggregators may, however, manage the flow of ongoing monitoring and verification reports to the Reserve as a service to Project Operators. Aggregators may also engage in project development, provide monitoring/reporting services, assist in facilitating verification activities, and provide other services for the Project Operator. The scope of Aggregator services would be up to negotiation between Project Operators and the Aggregator and reflected in the contracts between the Project Operator and the Aggregator.

#### **2.4.2 Forming and Entering an Aggregate**

Individual Grassland Projects may join an aggregate by being added to the aggregate’s Project Submittal Form (if joining an aggregate at initiation) or by being added through the New Grassland Project Enrollment Form (if joining once the aggregate is underway).

Individual Grassland Projects that have already been submitted to the Reserve may choose to join an existing aggregate by submitting an Aggregate Transfer Form to the Reserve. The Project Aggregator will also need to submit a New Project Enrollment Form, listing that project area, if the aggregate is already underway. Emission reductions occurring on single projects or new projects entering an aggregate will start counting toward the aggregate CRTs in the reporting period immediately following the transfer.

The crediting periods of the individual projects within an aggregate are derived from their individual project start dates, and are not affected by the crediting periods of other projects within the aggregate. All projects within an aggregate must follow the same version of this protocol. If a project which is subject to a more recent version of the protocol wishes to enter an existing aggregate, the rest of the projects in that aggregate must elect to upgrade to the newer version of the protocol.

#### **2.4.3 Leaving an Aggregate or Termination of Contract between Project Operator and Aggregator**

Individual grassland projects must meet the requirements in this section in order to leave or change aggregates and continue reporting emission reductions to the Reserve. Reporting must be continuous.

Due to permanence requirements, as outlined in Section X.X, project activities on an individual field may not be terminated prior to XX. Individual Project Operators may elect to leave an aggregate and participate as an individual grassland project for the duration of their crediting period. To leave an aggregate and become an individual grassland project, the Project Operator must submit a Project Submittal Form to the Reserve, noting that it is a “transfer project” and identifying the aggregate from where it transferred.

Projects can switch their participation to another aggregate during a crediting period if, and only if:

1. The project area changes ownership during the crediting period and the new owner, tenant or manager has other project areas already enrolled with a different Aggregator.
2. The original aggregate is terminated (e.g. goes out of business).
3. The Aggregator breaches its contract with the project operator and the contract is terminated.

Fields seeking to change aggregates during a crediting period under one of the above allowed circumstances must submit an Aggregate Transfer Form to the Reserve prior to enrolling in the new aggregate. In the case of termination of a contract between the Project Operator and Aggregator or if an Aggregator ceases to exist or is unable to provide aggregation services, the Project Operator may choose a replacement Aggregator. The participating Project Operator has 24 months to indicate the replacement Aggregator while account activities are suspended before requiring that Project Operator to become a standalone project.

#### 2.4.4 Accounts on the Reserve, Transfers, and Sales of CRTs

Each Project Operator with a Grassland Project in an aggregate must have a separate account with the Reserve. For each participating Grassland Project, the Project Operator must sign a PIA with the Reserve and meet all other requirements of described in this protocol.

Each Grassland Project is required to contribute to the Reserve's Buffer Pool and compensate for reversals similar to standalone Grassland Projects as described in Section X.X of the GPP. Each Grassland Project is responsible to meet independently all reporting requirements described in Section 7 of the GPP. Many of these tasks, such as the transmission of annual documents may be managed by the Aggregator, if these are included in the scope of services negotiated between the Project Operator and the Aggregator and reflected in the contracts between the Project Operator and the Aggregator.

All participating Grassland Projects are identified in the Reserve's software as a part of a named aggregate along with the contact information of the Aggregator. The total credits issued to each individual Grassland Project, total issued to the Grassland Projects in an aggregate, and current total credit holdings of that aggregate's Grassland Projects are available by query in the Reserve's software. In addition, the software tracks the verification history of Grassland Projects within an aggregate to ensure transparency and disclosure of compliance to verification standards for each individual project over time.

**Comment [TL1]:** Language based on Forest Project Protocol. Minor Updates. This section will be updated further once the Reserve figures out what is possible in terms of Registry software.

Plan: Project Developer accounts are associated with fees. We want to explore options for a discounted account holder type which allows for “subaccounts” under a given Aggregator.

### 3 Eligibility Rules

Projects must fully satisfy the following eligibility rules in order to register with the Reserve. The criteria only apply to projects that meet the definition of a GHG reduction project (Section 2.2).

<b>Eligibility Rule I:</b>	Location	→	<i>Conterminous U.S. states and tribal areas</i>
<b>Eligibility Rule II:</b>	Project Start Date	→	<i>No more than six months prior to project submission</i>
<b>Eligibility Rule III:</b>	Additionality	→	<i>Meet performance standard</i>
		→	<i>Exceed regulatory requirements</i>
<b>Eligibility Rule IV:</b>	Regulatory Compliance	→	<i>Compliance with all applicable laws</i>

#### 3.1 Location

Only projects located in the conterminous United States and on U.S. tribal lands are eligible to register reductions with the Reserve under this protocol. All sources that contribute to the AGC project must be located within the United States. Under this protocol, reductions from international projects are not eligible to register with the Reserve. Grassland Projects must be implemented on private land, unless the land is transferred to public ownership as part of the project. Grassland Projects in tribal areas must demonstrate that the land within the Project Area is owned by a tribe or private entities.

Projects are not eligible on organic soils (histosols), including areas identified as wetlands or peatlands. The Project Area must have been in continuous grassland cover for at least 10 years prior to the project start date.

#### 3.2 Project Start Date

The project start date is defined as the on which an activity is initiated that will lead to increased GHG reductions relative to the Grassland Project's baseline. For an AGC project, the action is committing the Project Area to continued grassland management and protection through recording a conservation easement with a provision to maintain the Project Area as grassland or transferring the Project Area to public ownership where the Project Area will be maintained as grassland.

To be eligible, the project must be submitted to the Reserve no more than six months after the project start date, unless the project is submitted during the first 12 months following the date of adoption of this protocol by the Reserve board (the Effective Date).<sup>4</sup> For a period of 12 months from the Effective Date of this protocol (Version 1.0), projects with start dates no more than 24 months prior to the Effective Date of this protocol are eligible. Specifically, projects with start dates on or after \_\_\_\_\_ are eligible to register with the Reserve if submitted by \_\_\_\_\_. Projects with start dates prior to \_\_\_\_\_ are not eligible under this protocol. Projects may always be submitted for listing by the Reserve prior to their start date.

**Comment [MD2]:** Assuming we adopt this protocol in June 2015, this policy will allow for start dates back to June 2013, as long as they are submitted by June 2016.

<sup>4</sup> Projects are considered submitted when the Project Developer has fully completed and filed the appropriate Project Submittal Form, available at <http://www.climateactionreserve.org/how/program/documents/>.

### 3.3 Additionality

The Reserve strives to register only projects that yield surplus GHG reductions that are additional to what would have occurred in the absence of a carbon offset market.

Projects must satisfy the following tests to be considered additional:

1. The Performance Standard Test
2. The Legal Requirement Test

#### 3.3.1 The Performance Standard Test

Projects pass the Performance Standard Test (PST) by meeting a performance threshold, i.e. a standard of performance applicable to all Grassland projects, established by this protocol. The PST is applied at the time a project applies for registration with the Reserve. [The PST for an AGC project has three parts:](#)

1. Financial threshold,
2. Suitability threshold,
3. Emission reductions threshold, and
4. Limits on payment stacking.

##### 3.3.1.1 Financial Threshold

The Reserve has determined that there is a financial barrier to project activities due to the economic incentives to convert grassland to cropland. Rather than have each project demonstrate the existence of this barrier individually, the Reserve has developed a standardized threshold for financial additionality. The Cropland Premium is determined as the difference in the value of cropland and pastureland in the county where the project is located. Separate Premiums are calculated for non-irrigated and irrigated cropland. Project eligibility is based on the Cropland Premium for the county where the project is located, based on the steps below:

1. Counties with a Non-Irrigated Cropland Premium greater than \$\$\$ are eligible
2. Counties with a Non-Irrigated Cropland Premium greater than \$\$ but less than \$\$\$ are eligible, but must apply a value of 0.5 for the parameter  $DF_{conv}$ , unless the county can meet the requirements of step 4 or step 5
3. Counties with a Non-Irrigated Cropland Premium less than \$\$ are not eligible, unless the county can meet the requirements of step 4 or step 5
4. Counties which cannot meet the requirements of step 1, and for which the Irrigated Cropland Premium is greater than \$\$\$\$ are eligible, provided the project area can meet the requirements of Section X.X to document access to irrigation
5. Counties which meet the description in step 3 and cannot meet the requirements of step 4 have the option to obtain a certified appraisal to determine a site-specific Cropland Premium, following the guidelines below for the appraisal process.

See Figure X.X for a map of eligible counties. More information regarding the development of this threshold is available in Appendix A. The list of eligible counties will be updated annually based on updated rent rate data.

### Standardized Eligibility Map

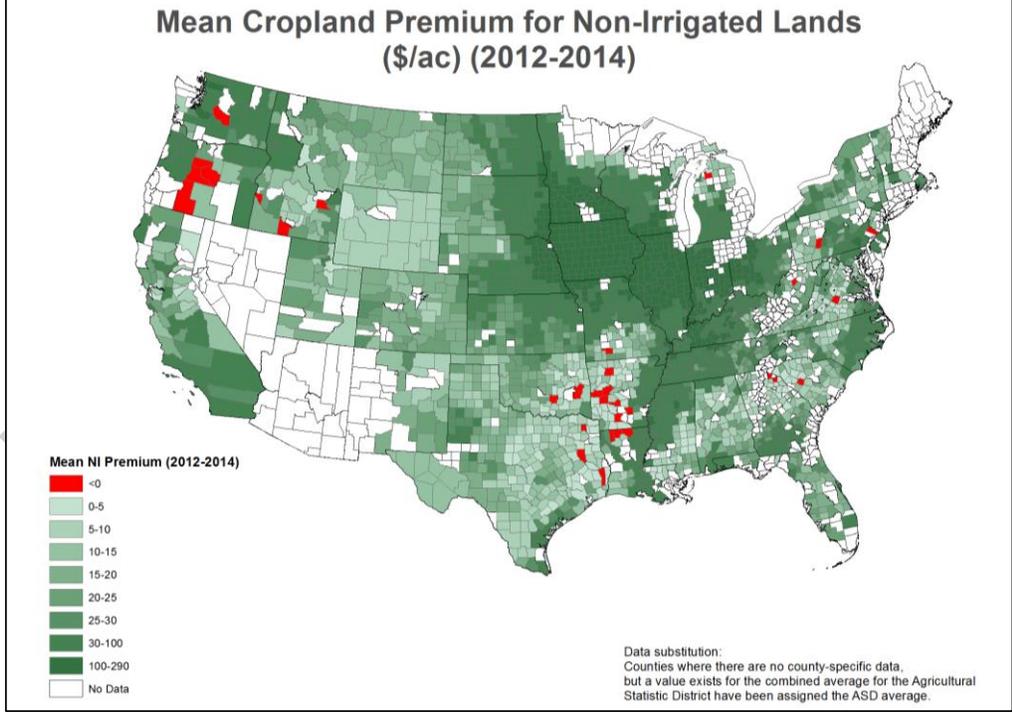
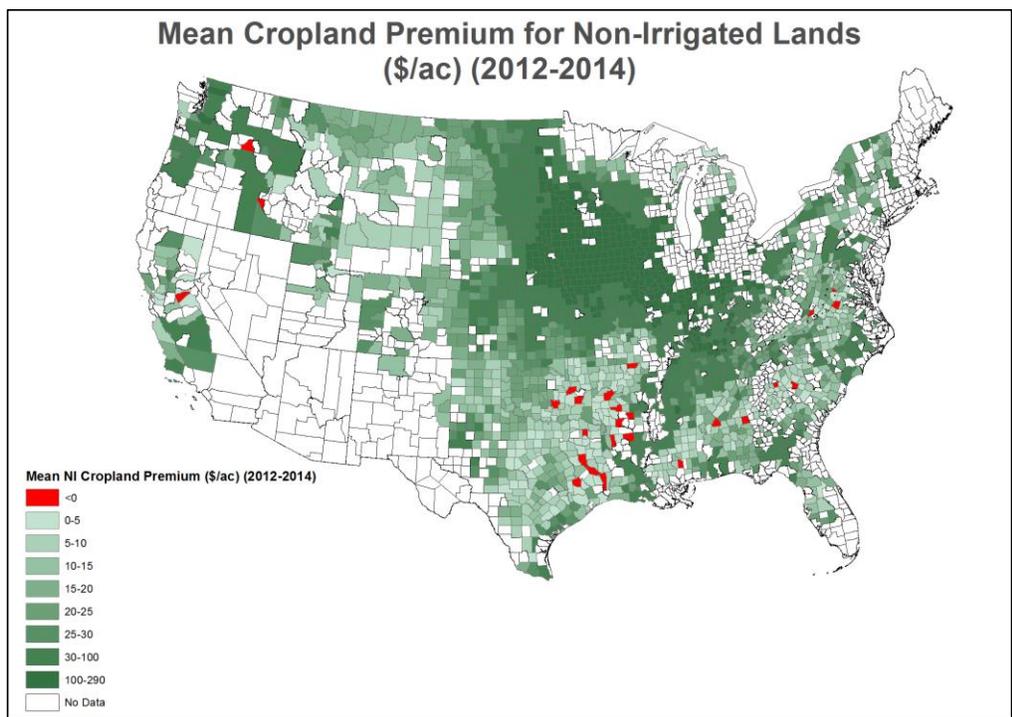
We are moving forward with identifying eligibility at the county level based on annual rent rate data. However, the mechanics of this have yet to be finalized, and we need WG help with the process. Joe Fargione at TNC has graciously provided conversion rate data at the county level for 2008-2012. While these data confirm the overall positive correlation between the “cropland premium” and the conversion rate, the data are noisy and a statistically-precise relationship is nonexistent. On the other hand, our current example threshold, the percentages used in the forest protocol, are based on WG discussions, rather than tied to a specific quantitative relationship. So, even a weak correlation is still something more concrete than our current starting point.

What we need now is to determine three things:

1. **The threshold for eligibility for non-irrigated lands.** It seems that around \$5/acre leads us into a positive conversion rate, and about \$20/acre gets us to about a 5% conversion rate, with a good deal of error on either side of those rates.
2. **The threshold for eligibility of irrigated lands.** For counties which fail the non-irrigated threshold, we need a second threshold based on the irrigated rent rate. This should be higher. We haven’t done the same statistical analysis yet because we don’t know which counties will be below the non-irrigated threshold.
3. **The basis for applying the threshold.** Once we’ve determined that the threshold will be \$X, we need to decide how this applies to projects. Here are the options as we see them, though there may be others:
  - a. Apply threshold to most recent year’s data, affecting projects submitted as of Jan 1<sup>st</sup> the following year. For example, right now we’d publish the map based on 2014 rent rates, and it would apply to projects beginning 1/1/15. Some counties don’t have responses every year, so they would then be ineligible if the data are missing.
  - b. Apply the threshold to a running average of rent rates from a set number of prior years. We could average the last two years, or three years, etc. This helps smooth interannual variability and more closely match the timescales of making a decision to convert. Some counties don’t have data every year, due to fluctuating survey response rates. This approach would give the option of including prior data to make up for the gap. The maps below represent a three year average, excluding years of missing data.

The example map below shows the average cropland premium (non-irrigated lands) for the years 2012-2014. Counties in red represent areas where pastureland is more valuable than cropland. Some of the “No Data” counties may be filled in later using the average from that county’s Agricultural Statistics District. Other “No Data” counties represent areas where irrigation is required, so those counties may still be eligible based on a threshold for the value of irrigated lands. This map is meant to provide a general idea of what counties will be included or excluded based on different rent rate thresholds.

The second map displays the same data as the first, but with data substitution for counties where there was no county-specific value in a given year. In some cases, there are too few survey responses for a given county to publish a county-specific number for that year. In that case, the NASS combines those survey responses together, within the ASD. If that occurs, the data contain a county named “Other (Combined) Counties” which represents an average for all of the counties within that ASD which do not have their own value. Using Excel formulas we substituted those ASD averages for missing county data wherever possible.



**APPRAISAL OPTION**

An AGC project satisfies the performance test if the Project Operators provides a real estate appraisal for the Project Area (as defined in Section 2.2.2) indicating the following:

1. *The Project Area is suitable for conversion.* The appraisal must clearly identify the highest value alternative land use for the Project Area as crop production, and indicate how the physical characteristics of the Project Area are suitable for crop production.
2. The appraisal must conform with the following minimum standards<sup>5</sup>:
  - a. Appraisal reports shall be prepared and signed by a Licensed or Certified Real Estate Appraiser in good standing.
  - b. Appraisal reports shall include descriptive photographs and maps of sufficient quality and detail to depict the subject property and any market data relied upon, including the relationship between the location of the subject property and the market data.
  - c. Appraisal reports shall include a complete description of the subject property land, site characteristics and improvements. Valuations based on a property's development potential shall include:
    - i. Verifiable data on the conversion potential of the land (e.g. Certificates of Compliance, Tentative Map, Final Map).
    - ii. A description of what would be required for a conversion to cropland to proceed (e.g. legal entitlements, infrastructure).
    - iii. Presentation of evidence that sufficient demand exists, or is likely to exist in the future, to provide market support for the conversion to cropland.
    - iv. The appraisal must demonstrate that the slope of Project Area land is compatible with crop production by identifying two areas with similar average slope conditions to the Project Area that have been converted within the past ten years in the project's MLRA. Alternatively, the Project Area must have an average slope less than 40 percent.
    - v. The appraisal must also provide:
      1. Evidence of soil suitability for the type of expected agricultural land use.
      2. Evidence of water availability for the type of expected agricultural land use.
  - d. Appraisal reports shall include a statement by the appraiser indicating to what extent land title conditions were investigated and considered in the analysis and value conclusion.
  - e. Appraisal reports shall include a discussion of implied dedication, prescriptive rights or other unrecorded rights that may affect value, indicating the extent of investigation, knowledge, or observation of conditions that might indicate evidence of public use.
  - f. Appraisal reports shall include a separate valuation for ongoing grassland management prepared and signed by a certified or registered professional qualified in the field of specialty interest. This valuation shall be reviewed and approved by a second qualified, certified or registered professional, considered by the appraiser, and appended to the appraisal report. The valuation must identify and incorporate all legal constraints that could affect the valuation of the ongoing grassland management.
  - g. The appraisal must provide a map that displays specific portions of the Project Area that are suitable for crop production. (For example, an appraisal that identified corn production as an alternative land use must specify the approximate acres suitable for both the crops and any related roads, buildings, or other infrastructure.). The smaller of the two areas identified in the appraisals must be used.
3. *The alternative land use for the Project Area has a higher market value than maintaining the Project Area for sustainable grassland management.* The appraisal for the property must provide a value for the current grassland use condition of the Project Area and a fair market value of the anticipated alternative land use for the Project Area. The anticipated alternative land use for the

**Comment [MD3]:** Two areas? Not sure what this means, so I'm not yet deleting it.

<sup>5</sup> Adapted from Sections 5096.501 and 5096.517, Public Resources Code, State of California.

Project Area must be at least \$\$\$/acre greater than the value of the current grassland use (\$\$\$\$/acre if the appraisal identifies that irrigation will be required for the converted land use).

The appraisals must be conducted in accordance with the Uniform Standards of Professional Appraisal Practice<sup>6</sup> and the appraiser must meet the qualification standards outlined in the Internal Revenue Code, Section 170 (f)(11)(E)(ii).<sup>7</sup>

### 3.3.1.2 Suitability Threshold

The project area must be suitable for conversion to cropland. Suitability is demonstrated through the following mechanisms:

[ADDITIONAL SUITABILITY LANGUAGE NEEDED]

#### Determining suitability for conversion

It is necessary that the project area be suitable for conversion to cropland. We would like help from the Workgroup to determine the appropriate mechanisms for this test. Our first suggestion was to use the Land Capability Classification system, choosing a set threshold value which would be required, and easily documented through the SSURGO database. However, we have been told in areas where conversion pressure is high, lands with seemingly poor LCC ranks are being converted, especially if they are part of a parcel which contains multiple LC classes.

### 3.3.1.3 Emission Reductions Threshold

To be eligible, the Grassland project must be able to generate emission reductions through project activities. This is determined by identifying the project strata following the guidance in Section 5.1. For the project to be eligible, the project strata must be listed as eligible in Table C.X of Appendix C.

### 3.3.1.4 Ecosystem Services and Payment Stacking

When multiple ecosystem services credits or payments are sought for a single activity on a single piece of land, it is referred to as credit stacking or payment stacking, respectively.<sup>8</sup> Under this protocol, credit stacking is defined as receiving more than one mitigation credit for the same activity on spatially overlapping areas (i.e. in the same acre). Payment stacking is defined as issuing mitigation credits for the same activity (i.e. a best management or conservation practice) that is funded by the government or other parties via grants, subsidies, payment, etc. Mitigation credits are used to offset the environmental impacts of another entity such as emissions of GHGs, removal of wetlands or discharge of pollutants into waterways, to name a few.

<sup>6</sup> The Uniform Standards of Professional Appraisal Practice may be accessed at: <http://commerce.appraisalfoundation.org/html/2006%20USPAP/toc.htm>

<sup>7</sup> Section 170 (f)(11)(E) of the Internal Revenue Code defines a qualified appraiser as "an individual who:

(I) has earned an appraisal designation from a recognized professional appraiser organization or has otherwise met minimum education and experience requirements set forth in regulations prescribed by the Secretary, (II) regularly performs appraisals for which the individual receives compensation, and (III) meets such other requirements as may be prescribed by the Secretary in regulations or other guidance."

<sup>8</sup> Cooley, David, and Lydia Olander (September 2011). "Stacking Ecosystem Services Payments: Risk and Solutions," Nicholas Institute for Environmental Policy Solutions, Duke University. NI WP 11-04. Available at: <http://nicholasinstitute.duke.edu/ecosystem/land/stacking-ecosystem-services-payments/>.

### 3.3.1.4.1 Credit Stacking

#### Credit Stacking

The goal is to identify potential overlap between GHG offsets and other ecosystem services credits, both generally as well as with specific discussion of any existing or future programs. Based on a preliminary review of mitigation credit markets in the U.S., the Reserve believes that we will need to address credit stacking in this protocol, with regards to endangered species habitat crediting. Principal drivers are the Endangered Species Act, Fish and Wildlife Service and NOAA guidance, and similar state laws and regulations

#### Question:

- Other than endangered species habitat credits, are there any other ecosystem services markets which might credit activities that avoid the conversion of grasslands? Are any water quality trading markets crediting such activities?
- What other questions should we be asking?

### 3.3.1.4.2 Payment Stacking

#### Payment Stacking

#### Context:

The goal is to identify potential overlap between GHG offsets and other ecosystem services conservation payments, both generally as well as with specific discussion of any existing or future programs. The Reserve has identified a wide range of programs that either provide payments specifically to avoid conversion of grasslands or provide payments for some activity closely related to avoided conversion, such as grassland restoration, hunting easements, etc., which may indirectly incentivize that same avoided conversion activity. The Reserve has included a summary list below of the programs that we have looked into, as well as our preliminary assessment of whether the payments would or would not result in stacking. Except where noted, the majority of these programs are implemented by USDA, either the Natural Resources Conservation Service (NRCS) or the Farm Service Agency (FSA). These are federal programs that are implemented at the state and local level, providing payments for a wide range of ecosystem services.

**Grassland Reserve Program (GRP):** The goal of the GRP is to “prevent grazing and pasture land from being converted into cropland, used for urban development, or developed for other non-grazing uses.” It is implemented in the form of annual rental payments to the landowner, in exchange for 10, 15, or 20 year contracts or conservation easements (both permanent and temporary) promising not to convert the land. The GRP is being phased out and replaced with ACEP (see below), so there will be no new GRP contracts from February 7, 2014 forward, but this phase-out does not affect the validity and terms of existing GRP contracts, agreements or easements entered into prior to that date. As such, it will need to be addressed in this protocol and most definitely would constitute “payment stacking” due to making payments for the exact project activity credited here.

**Agricultural Conservation Easement Program (ACEP):** A new program, starting in 2014, which replaces and consolidates GRP, FRPP, and WRP programs. Provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Under the Agricultural Land Easement program, NRCS provides financial assistance to eligible partners for purchasing Agricultural Land Easements that protect the agricultural use and conservation values of eligible land, which includes protecting grazing uses and related conservation values by conserving grasslands, including rangeland, pastureland and shrubland. Unlike the GRP program, it seems like NRCS will not interact directly with the original landowner, but rather the entity purchasing the conservation easement (Indian tribes, state and local governments, NGOs). This program will be assessed in conjunction with our other thoughts on pre-existing conservation easements, as well as easements put in place for the project, as discussed in Section 3.6.

**Conservation Reserve Program (CRP):** In exchange for a yearly rental payment over a 10 to 15 year period, farmers enrolled in CRP agree to take cropland (primarily environmentally sensitive land) out of production and plant species that will improve environmental health and quality. Under the GPP, the project area must not be cropped for at least 10 years prior to the project start date, meaning that CRP lands in their first enrollment period may not be of concern here, but the Reserve needs to further examine the process by which CRP lands re-enroll for subsequent periods and/or other incentives available to CRP-expiring lands.

- Any information related to re-enrolling in CRP?

**Environmental Quality Incentives Program (EQIP):** EQIP provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits. The Reserve has not yet completed a full review of all relevant conservation practices, which might be cost-shared through EQIP, but there may be conservation practices that directly or indirectly incentivize avoided conversion of grasslands. A non-exhaustive list of practices that might overlap with the project activity that the Reserve plans to examine more closely include: Early Successional Habitat Development/Management (CPS 647), Forage Harvest Management (CPS 511) Forage and Biomass Planting (CPS 512), Silvopasture Establishment (CPS 381).

- Are there any specific CPS you are aware of that we are missing that we should review?
- Any specific comments/concerns on the above CPS

**Conservation Stewardship Program (CSP):** helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns. Eligible lands include grassland, pastureland, and rangeland. Participants earn CSP payments for conservation performance

**Wetlands Reserve Program (WRP):** A voluntary program that offered landowners the opportunity to protect, restore, and enhance wetlands on their property. Wetlands are not eligible under the GPP, but there may be WRP enrolled lands which include some grassland. This program will be part of the ACEP moving forward.

**Farm and Ranch Lands Protection Program (FRPP):** One of the programs being phased out and replaced with ACEP in 2014. FRPP provided matching funds to help 3<sup>rd</sup> parties to purchase development rights to keep productive farm and rangeland in agricultural uses. Seems to work very similarly to ACEP program described above.

**Wildlife Habitat Incentive Program (WHIP):** was a voluntary program for conservation-minded landowners who wanted to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land. Is being phased out in 2014, but existing contracts will be honored.

**Other Conservation Easement Programs:** The Reserve continues to research other conservation easement programs. We believe there may be a number of programs available at the state level, particularly through state Fish and Wildlife agencies, that encourage a variety of conservation easements to support habitat for endangered species and/or hunting purposes, which would likely avoid the conversion of grassland. As noted above, this program will be assessed in conjunction with our other thoughts on pre-existing conservation easements, as well as easements put in place for the project, as discussed in Section 3.6.

**Questions:**

1. If you are particularly familiar with any of these programs, which programs do you think most directly overlap with project activities?
2. Are there any ecosystem service credits or payment programs (federal, state, or local level) that

we have not included above that may affect a Grassland Project?

3. How should these programs be viewed with respect to the additionality (both in terms of financial additionality and timing) of Grassland Projects?

**Policy Options:**

Relevant text on payment stacking can be found in the Reserve's Rice Cultivation and Nitrogen Management protocols. The Reserve is proposing a payment stacking policy which is most analogous to the policy in the Rice Protocol.

Due to high rates of conversion, even with the existence of such payment programs, the working assumption is that these programs on their own, for whatever reason, are insufficient to ensure the project activity of avoided conversion to grasslands. As such, the Reserve proposes the following payment stacking guidelines:

Proposed guidelines:

1. Projects are free to join a conservation payment program if their entry to that program is either concurrent with (i.e. no more than one year prior) or after the year of the project start date. Meeting that criteria, projects would be fully eligible and would not take any sort of "payment stacking" discount (i.e. policy analogous to Reserve Rice Protocol, not Reserve Nitrogen Management Protocol)
2. Projects which were previously in a conservation payment program, but have left such a program more than one year prior to project initiation are fully eligible. As noted above, these projects may rejoin a conservation program at a later date with no consequence.
3. Projects which are enrolled in a conservation payment program at the time of project initiation are either
  - a. Not eligible, or
  - b. Eligible, but must take a X% discount until they exit the conservation payment program

### 3.3.2 The Legal Requirement Test

All projects are subject to a Legal Requirement Test to ensure that the GHG reductions achieved by a project would not otherwise have occurred due to federal, state, or local regulations, or other legally binding mandates. The Legal Requirement Test for AGC projects involved two parts to ensure the project activity is allowed but not compelled:

1. There must be no federal, state, or local regulation, contract, deed restriction, or other legally binding mandate for the Project Area to be maintained as grassland; and,
2. There must be no zoning, permitting, ownership, or other legal obstacle to the conversion of the Project Area to cropland.

To satisfy the Legal Requirement Test, Project Developers must submit a signed Attestation of Voluntary Implementation form<sup>9</sup> prior to the commencement of verification activities each time the project is verified (see Section 8). In addition, the project's Monitoring Plan (Section 6) must include procedures that the Project Developer will follow to ascertain and demonstrate that the project at all times passes the Legal Requirement Test.

**Comment [MD4]:** In many cases this is redundant with #1, but there could be situations where the Project Area is not required to be maintained as grassland, but at the same time may not be converted to crop production. Perhaps if the land were zoned for development, or industrial use.

<sup>9</sup> Attestation forms are available at <http://www.climateactionreserve.org/how/program/documents/>.

**Activity-Triggered Conservation Programs: Habitat Conservation Plan and Sodbuster Regulations****Context:**

The goal is to identify verifiable legal requirements or barriers that would affect a Project Owner's ability to convert grassland to cropland. Two federal regulatory programs have been highlighted as potentially presenting legal barriers to converting grassland to other land-uses including cropland. These programs do not provide financial incentives for conserving grassland or species habitat, but rather shield the landowner from legal liability so long as he engages in conservation activities that mitigate the environmental effect of the economic activities being undertaken. In both cases specific areas of land become subject to conservation plans as a result of the land owner engaging in certain economic activities that threaten either endangered species or habitat. Up until the point of activity though, the land may not be subject to any legal restrictions. Arguably, even after the land is subject to each program, the landowner could exit the program – potentially subject to certain fines or penalties – or could amend the plan to cover a different area of land under his control, or to opt-out of the program entirely. The Reserve's Forest Project Protocol workgroup determined that, although legally permissible, it was in fact so practically difficult to opt-out of these programs once entered into that for the purposes of the legal requirement test pre-existing participation would be considered a barrier to passing the legal requirements test.

- Habitat Conservation Plans (FWS)
- Conservation Plan of Operation under Sodbuster Regulations (USDA)
- Similar state programs, e.g. California Endangered Species Act Permitting (CESA)

**Questions:**

1. Would the Habitat Conservation Plan necessarily prevent a landowner from converting grassland to cropland, as opposed to another more intensive land use like a shopping center?
2. Under both programs, would it be practically feasible to amend the conservation plan, or to opt-out, so as to avoid having the would-be project land subject to the legal requirements of the programs?
3. Are there other programs that are similar in nature to these, either at the state or federal level?

**3.4 Project Crediting Period**

The baseline for any Grassland Project registered under this version of the GPP is assumed to be valid for 25 years. This means that a registered Grassland Project will be eligible to receive CRTs for GHG reductions quantified using this protocol, and verified by Reserve-approved verification bodies, for a period of 25 years following the project's start date. *In the case of project aggregates, project crediting periods will be tied to each individual Grassland Project within the aggregate and their respective start dates.*

**Crediting period length**

The text above proposes a 25 year crediting period. This is consistent with the ARB Forest Project Protocol. Our baseline emission factors are being developed using a model, so they will reflect the actual soil dynamics rather than a simple linear change over time. A longer crediting period will allow for additional emission reduction credits. There will be a point of diminishing returns, however, where the annual emission reductions are too small to justify project reporting and verification. Here are a few other, equally valid options for the length of the crediting period:

1. **20 years.** This is the crediting period for the ACR ACoGS methodology, based on the IPCC guidelines which assume a 20 year linear change between two equilibria following conversion. However, there is evidence that the soil carbon change takes longer than 20 years, and because

we are relying on modeled default values, they do not follow a linear change. Thus, a 20 year crediting period may leave good emission reductions off the table for no clear reason.

2. **30+ years.** It has been posited that the soil carbon change can take 30 years or longer. Our contractor is going to develop emission factors in 5 year increments, so it is not a problem to continue the modeling out to 30, 35, or 40 years (or more). We will assess whether there are worthwhile emission reductions that could justify a continued crediting period.
3. **100 years.** This is the length of the crediting period for the Reserve Forest Project Protocol. We feel that it is excessive for a grassland project.
4. **Flexible.** Another option would be for the protocol to set a maximum crediting period, one which would not truncate any feasible projects, but to also allow project to cease reporting after completion of any 5 year period. The emission factors are modeled in 5 year increments. To account for uncertainty, we need projects to complete the 5 year blocks. However, there should not be any downside risk to ending a project after 5 years, 10 years, etc. This would add flexibility.

#### Immediate crediting of future avoided emissions

This protocol is currently organized to issue credits for AGC projects in rough accordance with the actual timeline over which the emissions would have occurred in the counterfactual baseline scenario. There are two types of avoided emissions being credited in this protocol:

1. Avoided emissions due to the land use change
2. Avoided emissions from ongoing land management activities

There is precedent within the Reserve program for crediting the first type of emissions all at once. For example, the Organic Waste Composting protocol and Ozone Depleting Substances protocols both issue credits for 10 years' worth of avoided emissions at one time. The Reserve has published a paper on this topic, laying out the issues and our thinking: [http://www.climateactionreserve.org/wp-content/uploads/2009/04/Policy\\_Brief\\_on\\_Immediate\\_Crediting\\_of\\_Future\\_Avoided\\_Emissions.pdf](http://www.climateactionreserve.org/wp-content/uploads/2009/04/Policy_Brief_on_Immediate_Crediting_of_Future_Avoided_Emissions.pdf).

Based on this thinking, an argument could be made in favor of crediting all of these "type 1" emission reductions at the time of the initial project registration. After that point, projects need only verify the ongoing protection of the project area and the quantification of "type 2" emission reductions. Alternatively, all emission reductions could be credited up-front. In either case, this raises the quantitative impacts of an avoidable reversal. On the plus side, this approach may improve the economics for certain projects and could provide for crediting periods as short as 1 year (although this would not change the requirements for permanence).

Note that this is NOT consistent with the Avoided Conversion guidelines in the Reserve Forest Project Protocol. We would like thought and discussion on this topic.

### 3.5 Minimum Time Commitment

Project Operators must monitor and verify a Grassland Project for a period of 100 years following the issuance of any CRT for GHG reductions achieved by the project. For example, if CRTs are issued to a Grassland Project in year 24 following its start date, monitoring and verification activities must be maintained until year 124. All Grassland Projects must undergo an initial site visit verification in order to register with the Reserve. After the initial verification all Grassland Projects must undergo a site visit verification at least once every six years.

There are four possible exceptions to this minimum time commitment:

1. A Grassland Project automatically terminates if a Significant Disturbance occurs,<sup>10</sup> leading to an Unavoidable Reversal that affects the entire project area. Once a Grassland Project terminates in this manner, the Project Operator has no further obligations to the Reserve.
2. A Grassland Project may be voluntarily terminated prior to the end of its minimum time commitment if a Significant Disturbance occurs,<sup>11</sup> leading to an Unavoidable Reversal that affects an area that is less than the entire project area, but large enough that the Project Operator determines that continued participation is not viable. Once a Grassland Project terminates in this manner, the Project Operator has no further obligations to the Reserve for the area that was subject to the Unavoidable Reversal, but for the remaining area the Project Operator must retire a quantity of CRTs, as specified under Retiring CRTs Following Project Termination, below.
3. A Grassland Project may be voluntarily terminated prior to the end of its minimum time commitment if the Project Operator retires a quantity of CRTs, as specified under Retiring CRTs Following Project Termination, below.
4. A Grassland Project may be automatically terminated if there is a breach of certain terms described within the PIA. Such a termination will require the Project Operator to retire a quantity of CRTs, as specified under Retiring CRTs Following Project Termination, below.

#### Retiring CRTs Following Project Termination

1. For an AGC project, the Project Operator must retire a quantity of CRTs from its Reserve account equal to the total number of CRTs issued to the project for the acres which are being voluntarily terminated.
2. The retired CRTs must be those that were issued to the Grassland Project, or that were issued to other Grassland Projects registered with the Reserve.
3. The retired CRTs must be designated in the Reserve's software system as compensating for the Avoidable Reversal

**Comment [MD5]:** Could we accept forest CRTs here?

### 3.6 Project Implementation Agreement

For a Grassland Project to be eligible for registration with the Reserve, the Project Operator is required to enter into a Project Implementation Agreement (PIA) with the Reserve. The PIA is an agreement between the Reserve and a Project Operator setting forth: (i) the Project Operator's obligation (and the obligation of its successors and assigns) to comply with the Grassland Project Protocol, and (ii) the rights and remedies of the Reserve in the event of any failure of the Project Operator to comply with its obligations. It is not possible to terminate the PIA for only a portion of the Project Area. The PIA must be signed by the Project Operator before a project can be registered with the Reserve. It must be signed by all entities that are fee simple owners of the Project Area property. The PIA is recorded and submitted after the Reserve has reviewed the verification documents and is about to register the project.

**Comment [MD6]:** This section has not been revised for the AGC context.

<sup>10</sup> The natural disturbance shall not be the result of intentional or grossly negligent acts of any of the Project Operator.

<sup>11</sup> The natural disturbance shall not be the result of intentional or grossly negligent acts of any of the Project Operator.

### 3.7 Use of Qualified Conservation Easements or Qualified Deed Restrictions

**Comment [MD7]:** This section has not been revised for the AGC context.

A Qualified Conservation Easement is a conservation easement that explicitly (1) refers to, and incorporates by reference, the terms and conditions of the PIA agreed to by the Project Operator, thereby binding both the grantor and grantee – as well as their subsequent assignees – to the terms of the PIA for the full duration of the Grassland Project’s minimum time commitment, as defined in Section 3.5 of this protocol; (2) makes all future encumbrances and deeds subject to the PIA; and (3) makes the Reserve a third party beneficiary of the conservation easement.

A Qualified Deed Restriction is a deed restriction that ensures that the Project Implementation Agreement runs with the land and explicitly (1) refers to, and incorporates by reference, the terms and conditions of the PIA agreed to by the Project Operator, thereby Project Operator— as well as their subsequent assignees to the terms of the PIA for the full duration of the Grassland Project’s minimum time commitment, as defined in Section 3.4 of this protocol; (2) makes all future encumbrances and deeds subject to the PIA; and (3) makes the Reserve a third party beneficiary of the deed restriction. A deed restriction is not "qualified" if it merely consists of a recording of the Project Implementation Agreement or a notice of the Project Implementation Agreement, as such a recording is already required by the Project Implementation Agreement. The Reserve maintains the discretion to determine whether a deed restriction meets the terms to be considered a Qualified Deed Restriction.

Projects that choose to employ Qualified Conservation Easements or Qualified Deed Restrictions have reduced obligations to the Reserve’s CRT Buffer Pool, as described in Section X.X and Appendix A.

Qualified Conservation Easements and Qualified Deed Restrictions must be recorded no earlier than one year before a project’s start date. If a Qualified Conservation Easement or Qualified Deed Restriction was recorded more than one year prior to the start date, the limits imposed by the easement or deed restriction on grassland management activities must be considered as a legal mandate for the purpose of satisfying the legal requirement test for additionality (Section 3.3.1.3) and in determining the project’s baseline (Section X.X).

### 3.8 Regulatory Compliance

As a final eligibility requirement, Project Developers must attest that project activities do not cause material violations of applicable laws (e.g. air, water quality, safety, etc.). To satisfy this requirement, Project Developers must submit a signed Attestation of Regulatory Compliance form<sup>12</sup> prior to the commencement of verification activities each time the project is verified. Project Developers are also required to disclose in writing to the verifier any and all instances of legal violations – material or otherwise – caused by the project activities.

A violation should be considered to be “caused” by project activities if it can be reasonably argued that the violation would not have occurred in the absence of the project activities. If there is any question of causality, the Project Developer shall disclose the violation to the verifier.

If a verifier finds that project activities have caused a material violation, then CRTs will not be issued for GHG reductions that occurred during the period(s) when the violation occurred. Individual violations due to administrative or reporting issues, or due to “acts of nature,” are not

<sup>12</sup> Attestation forms are available at <http://www.climateactionreserve.org/how/program/documents/>.

considered material and will not affect CRT crediting. However, recurrent administrative violations directly related to project activities may affect crediting. Verifiers must determine if recurrent violations rise to the level of materiality. If the verifier is unable to assess the materiality of the violation, then the verifier shall consult with the Reserve.

#### Regulatory compliance

Are there additional regulatory compliance concerns that are specific to grasslands and should be mentioned here?

Further discussion to include:

- Water quality regulations
- Livestock management regulations
- Other land-related regs? Tax regulations?

### 3.9 Natural Grassland Management

All Grassland Projects must promote and maintain a diversity of native species and utilize management practices that promote and maintain native grasslands within the Project Area and at multiple landscape scales ("Native Grassland Management").

All Grassland Projects are required to establish and/or maintain flora types that are native to the Project Area. For the purposes of this protocol, native grasslands are defined as those grasslands occurring naturally in an area, as neither a direct nor indirect consequence of human activity post-dating European settlement.

#### Natural grassland management

The Reserve forest protocol seeks to not only quantify GHG emission reductions due to project activities, but also to ensure that the projects themselves represent healthy, natural forest ecosystems. To achieve this, the protocol has a section providing specific requirements for Natural Forest Management. The Reserve proposes to include something similar for grassland projects, although potentially at a much simpler scale. The Reserve seeks feedback from the workgroup on this area.

1. Do you agree with the concept of natural grassland management requirements?
2. What constitutes natural or native grassland?
3. Is there a widely-available resource for determining the typical native plant species for grassland in different parts of the country? For forest we have the US Forest Service Forest Inventory and Analysis Assessment Area data tables.
4. The forest protocol defines a minimum percentage of native species, limits on the prevalence of individual species (i.e. promoting diversity), and allowances for improvement over time to achieving the goals of the section.
5. This section could also be where we prohibit certain intensive management activities.

## 4 The GHG Assessment Boundary

The GHG Assessment Boundary delineates the GHG sources, sinks, and reservoirs (SSRs) that must be assessed by Project Developers in order to determine the net change in emissions caused by an avoided conversion of grasslands project.<sup>13</sup> The GHG Assessment Boundary encompasses all of the GHG SSRs that may be significantly affected by project activities, including biological CO<sub>2</sub> emissions and soil carbon sinks and sources of N<sub>2</sub>O. For accounting purposes, the SSRs included in the GHG Assessment Boundary are organized according to whether they are predominantly associated with an avoided conversion of grasslands project's "primary effect" (i.e. the project's avoided conversion of grasslands and loss of soil carbon), or its "secondary effects" (i.e. unintended changes in carbon stocks, CH<sub>4</sub> emissions, or other GHG emissions).<sup>14</sup> Secondary effects may include increases in CO<sub>2</sub> emissions associated with fossil fuel consumption from site preparation, as well as increased GHG emissions caused by the shifting of cultivation activities from the project area to other agricultural lands (often referred to as "leakage"). Projects are required to account for all SSRs that are included in the GHG Assessment Boundary regardless of whether the particular SSR is designated as a primary or secondary effect.

Figure 4.1 illustrates all relevant GHG SSRs associated with grassland project activities and delineates the GHG Assessment Boundary.

Table 4.1 provides greater detail on each SSR and justification for the inclusion or exclusion of certain SSRs and gases from the GHG Assessment Boundary.

<sup>13</sup> The definition and assessment of sources, sinks, and reservoirs is consistent with ISO 14064-2 guidance.

<sup>14</sup> The terms "primary effect" and "secondary effects" come from World Business Council on Sustainable Development / World Resources Institute. (2005). The Greenhouse Gas Protocol for Project Accounting, World Resources Institute, Washington, DC. Available at <http://www.ghgprotocol.org>.

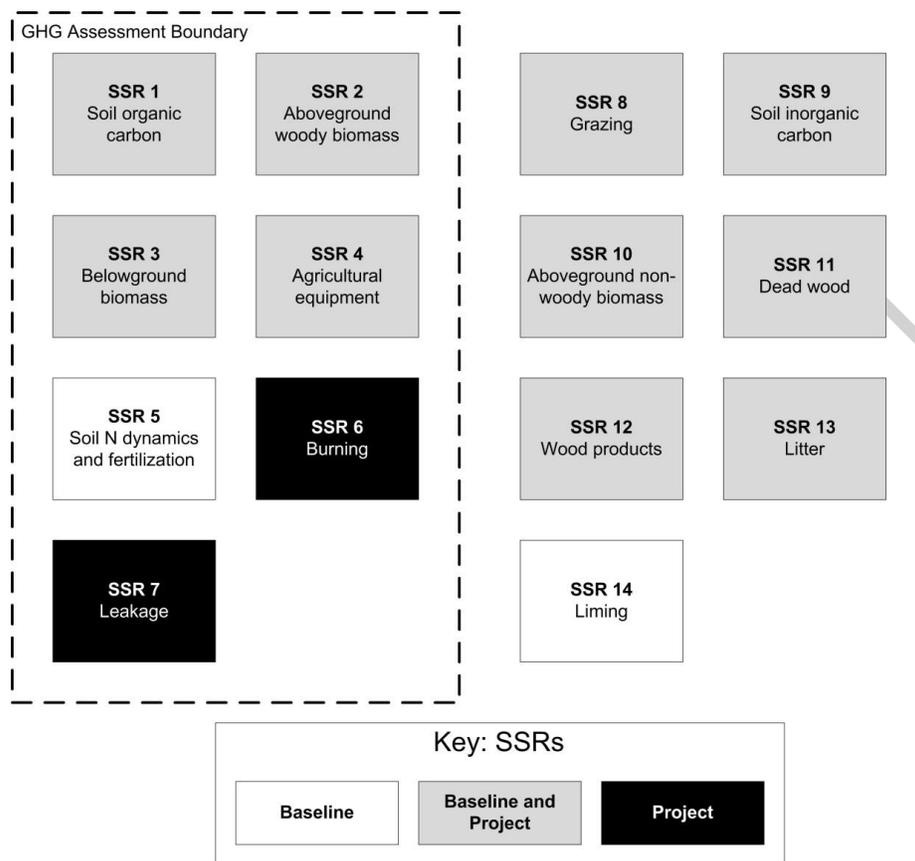


Figure 4.1. General Illustration of the GHG Assessment Boundary

The GHG assessment boundary is always difficult to display visually for sequestration projects. This is merely a first attempt to spark discussion.

**Table 4.1.** Description of all Sources, Sinks, and Reservoirs

SSR	Source Description	Gas	Included (I), Optional (O), or Excluded (E)	Quantification Method	Justification/Explanation
1	Soil organic carbon	CO <sub>2</sub>	I	Default emission factor modeled using DAYCENT	Emissions from the loss of soil organic carbon are a primary effect and major emission source in the baseline.
2	Aboveground woody biomass	CO <sub>2</sub>	O	Field measurement and quantification	Emissions from the loss of above-ground woody biomass can be a significant emission source in the baseline for certain projects. Exclusion would be conservative.
3	Belowground biomass	CO <sub>2</sub>	E	Default factor modeled using DAYCENT	Emissions from the loss of below-ground biomass are a primary effect and major emission source in the baseline.
4	Agricultural equipment from site preparation and ongoing operations	CO <sub>2</sub>	I	<b>Baseline:</b> Default emission factor <b>Project:</b> Calculated based on monitored data	Fossil fuel emissions from equipment used for conversion site preparation and ongoing field operations (tillage, fertilization, etc.) may be significant in the baseline.  Emissions from equipment used for grassland management may be significant in the project scenario.
		CH <sub>4</sub>	E	N/A	Excluded, as this emission source is assumed to be very small. The exclusion is conservative.
		N <sub>2</sub> O	E	N/A	Excluded, as this emission source is assumed to be very small. The exclusion is conservative.
5	Soil nitrogen dynamics and fertilization	N <sub>2</sub> O	I	<b>Baseline:</b> Default emission factors modeled using DAYCENT <b>Project:</b> Calculated based on monitored data	Direct and indirect N <sub>2</sub> O emissions from conversion activities, soil processes and fertilization can be significant in the baseline.  Direct and indirect N <sub>2</sub> O emissions from fertilization can be significant in the project scenario, if applicable.
6	Burning	CO <sub>2</sub>	E	N/A	[TBD]
		CH <sub>4</sub>	E	N/A	[TBD]
		N <sub>2</sub> O	I	Calculated based on monitored data	[TBD]

7	Grazing	CO <sub>2</sub>	E	N/A	Excluded, as this source is not expected to change as a result of project activities.
		CH <sub>4</sub>	E	N/A	
		N <sub>2</sub> O	E	N/A	
8	Leakage	CO <sub>2</sub>	I	Calculated as a percentage of baseline emissions	[TBD]
		CH <sub>4</sub>	E	N/A	[TBD]
		N <sub>2</sub> O	I	Calculated as a percentage of baseline emissions	[TBD]
9	Soil inorganic carbon	CO <sub>2</sub>	Excluded	N/A	Excluded, as this source is not typically included in modeling.
10	Aboveground non-woody biomass	CO <sub>2</sub>	Excluded	N/A	Excluded, as the permanent pool is assumed to be very small, despite seasonal fluxes. The exclusion is conservative.
11	Dead wood	CO <sub>2</sub>	Excluded	N/A	Excluded, as this emission source is assumed to be very small. The exclusion is conservative.
12	Wood products	CO <sub>2</sub>	Excluded	N/A	Excluded, as this emission source is assumed to be very small. The exclusion is conservative.
13	Litter	CO <sub>2</sub>	Excluded	N/A	Excluded, as this emission source is assumed to be very small. The exclusion is conservative.
14	Liming	CO <sub>2</sub>	Excluded	N/A	Excluded, as the direction and magnitude of this emission source is uncertain. Current IPCC emission factors <sup>15</sup> treat liming as an emission source, whereas current USDA quantification methodologies <sup>16</sup> treat it as a net sink.

<sup>15</sup> IPCC (2006), 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, Chapter 11: N<sub>2</sub>O Emissions from Managed Soils and CO<sub>2</sub> Emissions from Lime and Urea Application. Available at: [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\\_Volume4/V4\\_11\\_Ch11\\_N2O&CO2.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf)

<sup>16</sup> USDA (2014), Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory. Available at: [http://www.usda.gov/oce/climate\\_change/Quantifying\\_GHG/USDATB1939\\_07072014.pdf](http://www.usda.gov/oce/climate_change/Quantifying_GHG/USDATB1939_07072014.pdf)

**Project emissions from grazing activities**

Under a strict comparison of direct project and baseline emissions, it would seem that livestock grazing emissions occur only in the project scenario and therefore must be included within the GHG assessment boundary. However, it is unlikely that AGC project activities under this protocol will have an overall impact on the amount of livestock production in the U.S.

First, if grazing occurs in the project scenario, it is highly likely that this grazing would have been occurring before project implementation. Thus, when considering the baseline scenario, it is reasonable to conclude that conversion to cropland would be displacing existing grazing activity. There are two likely results of this displacement, assuming that there is no overall reduction in livestock production:

1. The grazing would move elsewhere, and thus grazing emissions in the baseline and project scenarios will be equal.
2. The livestock would be moved from pasture to a concentrated animal production facility, in which case the GHG emissions per animal are expected to be higher. In this case the project grazing emissions would actually represent a reduction in GHG emissions compared to the baseline scenario.

Some combination of these scenarios is also possible, depending on local land availability and the economics of livestock production. Regardless, if we assume that AGC project activities will not impact the overall amount of livestock production in the U.S., then it is reasonable to consider project emissions from grazing to not be higher than baseline emissions.

We would like workgroup thoughts and feedback on this rationale.

Carbon Pool	Description	Included (I), Optional (O), or Excluded (E)	Justification
A	Soil Organic Carbon	I	
B	Aboveground Non-Tree Woody Biomass	O	
C	Aboveground Non-Woody Biomass	E	
D	Belowground Biomass	E	
E	Dead Wood	E	
F	Wood Products	E	
G	Litter	E	

## 5 Quantifying GHG Emission Reductions

GHG emission reductions from an avoided grassland conversion project are quantified by comparing actual project emissions to the calculated baseline emissions. Baseline emissions are an estimate of the GHG emissions from sources within the GHG Assessment Boundary (see Section 4) that would have occurred in the absence of the project. In the case of AGC projects, the baseline emissions include the loss of soil carbon through conversion to cropland, as well as the GHG emissions from crop production. Project emissions are actual GHG emissions that occur at sources within the GHG Assessment Boundary. In the case of AGC projects, the project emissions include GHG emissions from grassland maintenance and grazing, as well as any leakage of baseline conversion activities. Project emissions must be subtracted from the baseline emissions to quantify the project's total net GHG emission reductions (Equation 5.1). **GHG emission reductions must be quantified and verified on at least an annual basis.** Project Developers may choose to quantify and verify GHG emission reductions on a more frequent basis if they desire. The length of time over which GHG emission reductions are periodically quantified and verified is called the "reporting period".

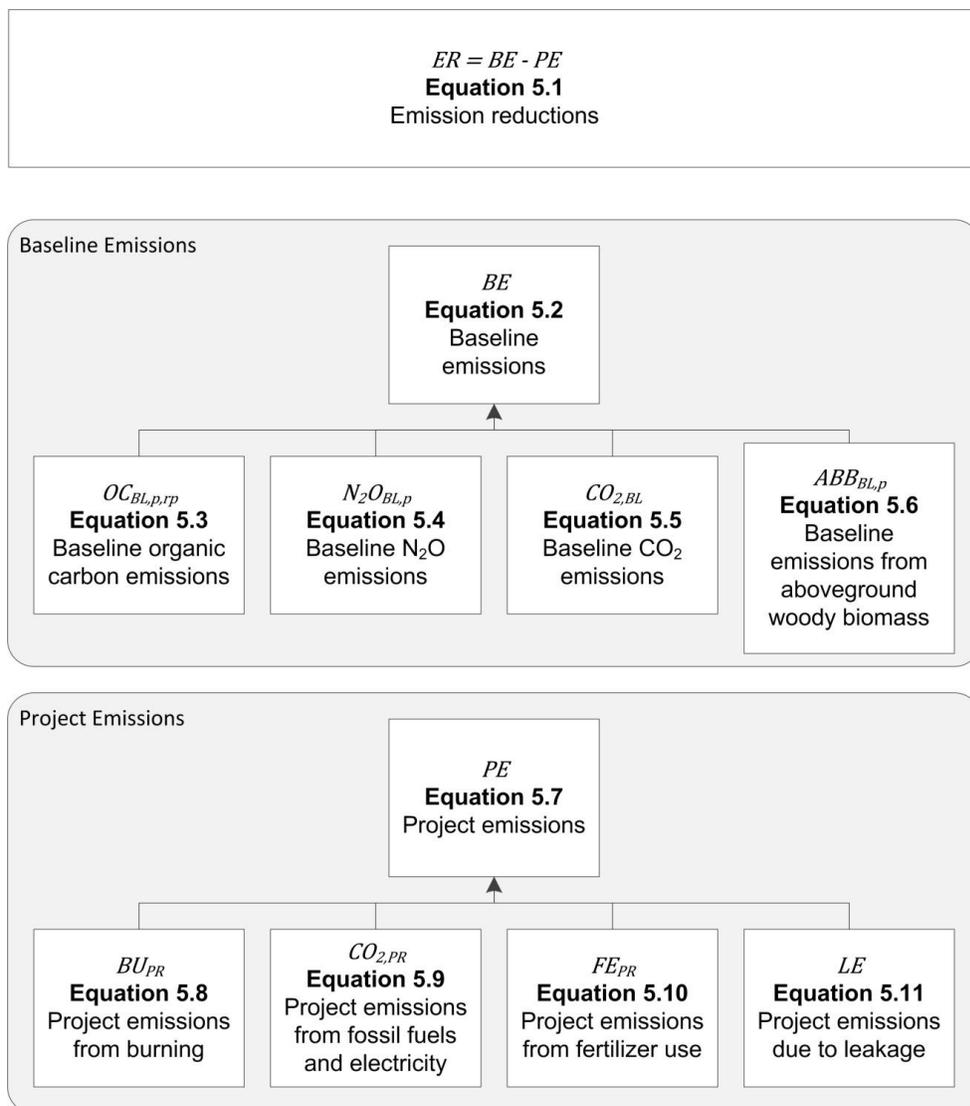


Figure 5.1. Organization of Quantification for Grassland Projects

**Equation 5.1. GHG Emission Reductions**

$$ER = BE - PE$$

Where,

		Units
ER	= Total emission reductions for the reporting period	MTCO <sub>2</sub> e
BE	= Total baseline emissions for the reporting period, from all SSRs in the GHG Assessment Boundary (as calculated in Section 5.1)	MTCO <sub>2</sub> e
PE	= Total project emissions for the reporting period, from all SSRs in the GHG Assessment Boundary (as calculated in Section 5.3)	MTCO <sub>2</sub> e

One major goal of this protocol development effort is the streamlining of the quantification section.

**Issue 1: Optional Pools**

Other methodologies provide complex quantification options for carbon pools that are ultimately optional. The methodology overall could be greatly simplified by leaving these out entirely where it can be reasonably considered to be conservative. Is there enough potential credit benefit from these optional pools (e.g. woody biomass) to justify the added complexity? Project Developers would be directed to use the Reserve forest protocol in some capacity to carry out the quantification.

**5.1 Stratification**

For the purposes of this protocol, the U.S. has been stratified in order to enable the development of baseline and project emissions estimates that correspond to local soil conditions, climatic conditions, starting condition, and agricultural practices. A stratum represents a unique combination of these variables. All baseline and project modeling has been performed at the stratum level, enabling the resulting emissions estimates to represent relatively fine distinctions in the primary drivers of variation in emissions. In total, this protocol established emissions estimates for X total strata within the U.S. By stratifying the country in this manner, the emissions estimates used in this protocol provide greater local accuracy and representation than would emission estimates generated at a national scale or with fewer variables. These variables act as filters that each brings greater specificity to the emissions estimates by more precisely estimating the conditions of the project. Land is first broken down by climate and geography, then further delineated by the major soil type and texture, and finally evaluated based on the previous land use.

For large or aggregated projects, properties may fall into more than one stratum. In these instances, the project itself shall be divided up on an acreage basis into all appropriate strata. Instructions for calculating acreage in each stratum are provided in Section 5.1.5. All calculations shall be performed at the stratum level.

The following variables are used to stratify the U.S., and shall be used to determine the appropriate stratum for a project or project area:

- Geography and Associated Climate
- Soil Texture
- Previous land use

Each project shall be evaluated on the basis of each of these variables to determine its appropriate stratum, or strata should its area contain multiple strata. The following sections provide guidance on determining the appropriate stratum for any parcel or portion of the project area.

### 5.1.1 Geography and Associated Climate

The first level of stratification used in this protocol delineates land based on its geography and associated climate, due to these factors important influence over carbon pools and sources in both natural and managed ecosystems.<sup>17</sup> Regional climate and geographic conditions are determined through the use of Major Land Resource Area (MLRA) designations, as defined by the U.S. Department of Agriculture, Natural Resources Conservation Services.<sup>18</sup> These designations are used for a variety of policy and planning decisions, as they represent information about land suitability for farming and other purposes. As such, they constitute a land area that has similar physical and climatic characteristics. In total, there are approximately 280 MLRA's in the U.S. However, some of these MLRAs contain very little cropland or grassland feasible for conversion. Appendix B provides an overview of the methodology used to screen out certain MLRA's based on the absence of significant areas of grassland or cropland, and constraints on data availability and modeling confidence.

### 5.1.2 Soil Texture

Soil texture has a significant impact on land productivity and carbon dynamics through influences on soil fertility and water balance and on soil organic matter stabilization processes.<sup>19</sup> Accordingly, the second level of stratification requires differentiating by soil texture. While successively finer delineations of soil type and texture would yield greater precision, this protocol limits the stratification of soils into three major classes of surface soil texture as defined by USDA. These are:

- Sandy (sand, loamy sand, sandy loam)
- Loamy (loam, silt loam, silt)
- Clayey (clay, clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay)

By adding soil texture to the stratification, the quantification is improved in two ways. First, the texture itself plays a considerable role in the carbon dynamics being modeled<sup>20</sup>, allowing more refined and representative results. Second, defining the stratum with the soil texture limits the cropping systems and management practices that are modeled to those suitable to these soils by evaluating only those systems seen on other similar soils within the MLRA. Use of soil texture therefore gives greater precision to the crop system inputs and resulting model accuracy.

<sup>17</sup> Schimel, D.S., Braswell, B.H., Holland, E.A., McKeown, R., Ojima, D.S., Painter, T.H., Parton, W.J., Townsend, A.R. (1994) *Climatic, edaphic, and biotic controls over storage and turnover of carbon in soils*. Global Biogeochemical Cycles 8, 279-293.

<sup>18</sup> United States Department of Agriculture, Natural Resources Conservation Service (2006) *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296.

<sup>19</sup> Six, J., R.T. Conant, E.A. Paul, and K. Paustian (2002) *Stabilization mechanisms of soil organic matter: Implications for C-saturation of soils*. Plant and Soil 241:155-176.

<sup>20</sup> Hassink, J. (1997) *The capacity of soils to preserve organic C and N by their association with clay and silt particles*. Plant and Soil 191, 77-87.

### 5.1.3 Previous land use

Initial carbon pools at project commencement will be significantly influenced by previous land uses. Additionally, soil quality at project initiation influences nutrient inputs and farming practices in the baseline scenario. Because this protocol allows for the avoided conversion of grasslands with somewhat varied histories, the third level of stratification requires grasslands to be delimited by the duration of time it has been in a grassland state. This protocol defines the following two categories for grasslands:

- Greater than 10, but less than 30 years continuous grassland or pastureland
- Greater than 30 years continuous, long-term permanent grassland or pastureland

Per Section 3.1, all lands enrolled under this protocol must have been in a documented grassland or pastureland state for at least 10 years prior to project commencement, including CRP lands. Project Developers shall establish previous land use through the use of remote imaging, FSA or NRCS field office records, tax assessments, and other appropriate resources.

### 5.1.4 Results of Stratification

In total, this protocol stratifies the U.S. into **X** unique strata based on the three variables previously discussed. Box 5.1 describes the method for naming each individual stratum.

**Box 5.1. Stratum Naming Convention**

Name format: **X\_Y\_Z**

where,

	<u>Range of Values</u>
X = Numbered designation of the MLRA in which the stratum is found	1 – 278
Y = Soil texture classification	sandy, loamy, or clayey
Z = Minimum year threshold for the previous land use	10 or 30

EXAMPLES:

Stratum	MLRA	Soil Texture	Previous Land Use
<b>1_Loamy_10</b>	1 - Northern Pacific Coast Range, Foothills, and Valleys	Loamy	Greater than 10, but less than 30 years continuous grassland or pastureland
<b>150A_Clayey_30</b>	150A - Gulf Coast Prairies	Clayey	Greater than 30 years continuous, long-term permanent grassland or pastureland

### 5.1.5 Determining Project Area in Each Strata

All quantification in this protocol is conducted at the strata level. Equations require inputs in the form of total acreage within each stratum, and use of stratum-specific emission factors for various carbon pools and N<sub>2</sub>O emissions sources. To enable Project Developers to divide their project acreage into strata, the Reserve has developed a GIS shapefile that delineates each

stratum in the U.S.<sup>21</sup> Project Developers must prepare a shapefile that contains all project parcels, excluding any portion of the project parcel not legally permitted to be converted due to buffer restrictions or other requirements. Each parcel shall be designated by its previous land use. Project Developers must use the Reserve shapefile in combination with their own project parcel shapefiles to determine total acreage in each stratum. Complete instructions for executing this activity are available on the Reserve's webpage at [www.climateactionreserve.org](http://www.climateactionreserve.org).

### 5.1.6 Using Strata to Estimate Baseline Emissions

The baseline emissions estimates provided in this protocol were derived from an analysis of each individual stratum using the DAYCENT model, by adapting the methodologies used in developing the U.S. Inventory of Greenhouse Gases.<sup>22</sup> For each unique stratum, baseline practice was estimated based on the real-world practices on agricultural land within the same stratum, as derived from USDA National Resource Inventory (NRI), Economic Research Service Cropping Practice Survey (ERS), and National Agricultural Statistics Service (NASS).<sup>23,24,25</sup> Additional data on weather and soil conditions were derived from the North America Regional Reanalysis Product (NARR) and Soil Survey Geographic Database (SSURGO), respectively.<sup>26,27</sup> The cropping systems, tillage, irrigation, and fertilizer practices from these data sources were modeled stochastically on NRI grassland parcels within the stratum to compute a weighted average emission factor where weighting was determined by the relative prevalence of each practice within the stratum. A complete summary of the methodology is available in Appendix X.

## 5.2 Quantifying Baseline Emissions

Total baseline emissions for the reporting period are estimated by calculating and summing the emissions from all relevant baseline SSRs that are included in the GHG Assessment Boundary (as indicated in Table 4.1).

<sup>21</sup> Available at [www.climateactionreserve.org](http://www.climateactionreserve.org).

<sup>22</sup> United States Environmental Protection Agency. 2014. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012*. EPA 430-R-14-003

<sup>23</sup> U.S. Department of Agriculture (2013) *Summary Report: 2010 National Resources Inventory*, Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1167354.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167354.pdf)

<sup>24</sup> USDA-ERS (2011) *Agricultural Resource Management Survey (ARMS) Farm Financial and Crop Production Practices*, available at: <http://ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices.aspx>

<sup>25</sup> NASS (2014) *2012 Census of Agriculture*, available at: <http://www.agcensus.usda.gov/Publications/2012/>

<sup>26</sup> NOAA/OAR/ESRL PSD, *North America Regional Reanalysis Product*, available at: <http://www.esrl.noaa.gov/psd/>

<sup>27</sup> Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. *Web Soil Survey*. Available online at <http://websoilsurvey.nrcs.usda.gov/>

**Equation 5.2. Baseline Emissions**

$$BE_{rp} = \sum_p^P \left[ \left( (OC_{BL,p,rp} + N_2O_{BL,p} + CO_{2,BL,p}) \times (1 - DF_{\sigma}) + ABB_{BL,p} \right) \times (1 - DF_{conv}) \right]$$

Where, Units

$BE_{rp}$	=	Total baseline emissions for the reporting period, summed for all participant fields	tCO <sub>2</sub> e
$P$	=	Total number of participant fields	
$p$	=	Individual participant field	
$OC_{BL,p,rp}$	=	Baseline emissions due to loss of organic carbon in soil and biomass in participant field $p$ during the reporting period (Equation 5.3)	tCO <sub>2</sub> e
$N_2O_{BL,p,rp}$	=	Baseline emissions of nitrous oxide for participant field $p$ (Equation 5.4)	tCO <sub>2</sub> e
$CO_{2,BL,p}$	=	Baseline CO <sub>2</sub> emissions due to fossil fuel combustion and electricity usage for participant field $p$ during the reporting period (Equation 5.5)	tCO <sub>2</sub> e
$ABB_{BL,p}$	=	Baseline emissions due to the loss of above-ground woody biomass in participant field during the reporting period (Equation 5.6)	tCO <sub>2</sub> e
$DF_{conv}$	=	Discount factor for the uncertainty of baseline conversion (Table 5.1)	%
$DF_{\sigma}$	=	Discount factor for the uncertainty of modeling future management practices and climatic conditions (Table 5.2)	%

**5.2.1 Discount Factors**

**Discount factor:  $DF_{conv}$**

The equation is currently setup to discount the project 50% if the value of the Cropland Premium (the increased value per acre of cropland over pastureland) is between \$\$ and \$\$\$, with no discount if the Cropland Premium is greater than \$\$\$\$. This is obviously a very blunt instrument and the Reserve would like discussion on its merits. The Cropland Premium will be calculated by the Reserve annually as Cash Rent Survey data are released, more discussion on this can be found in Section 3.

**Table 5.1. Discount Factor for the Uncertainty of Baseline Conversion**

Value of Cropland Premium	Between \$\$ and \$\$\$	Greater than \$\$\$
Value of $DF_{conv}$	50%	0%

**Discount factor:  $DF_{\sigma}$**

The baseline emissions quantified in this protocol will be discounted to account for increasing uncertainty about input assumptions and model outputs into the future. Uncertainty arises due to anticipated but unknown shifts in practices in, among other things, tillage, cropping, and nitrogen management, and the interaction of agricultural systems with a changing climate. Model inputs and outputs are expected to accurately reflect baseline conditions in early years, but will have less accuracy in future years. Accordingly, the quantification of baseline emissions will be discounted according to Table 5.2 to account for this uncertainty, with the discount increasing through time in accordance with increasing uncertainty. If the modeling exercise is updated in the future, it is likely that this schedule would reset back to x% for new projects which are using the updated emission factors.

We would like the workgroup's assistance with determining the value of x and y.

**Table 5.2.** Discount Factor for the Uncertainty of Modeling Future Practices and Climate

Reporting Year	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039
Discount Factor (DF <sub>o</sub> )	x%	(x+y)%	(x+2y)%	(x+3y)%	(x+4y)%

### 5.2.2 Baseline Organic Carbon Emissions

Refer to Appendix B for the development of the emission factors used in this quantification.

[PLACEHOLDER FOR TEXT REGARDING BASELINE ORGANIC CARBON EMISSIONS]

**Equation 5.3.** Baseline Organic Carbon Emissions from Soil and Biomass Loss

$$OC_{BL,p,rp} = \sum_s [BEF_{OC,s,y} \times Area_{p,s}]$$

Where, Units

$OC_{BL,p,rp}$	= Baseline quantity of organic carbon emissions from soil and biomass in participant field $p$ during the reporting period	tCO <sub>2</sub> e
$S$	= Total number of strata	
$s$	= Individual stratum	
$BEF_{OC,s,y}$	= Annual baseline emission factor for organic carbon in stratum $s$ during project year $y$ (Table X.X, select appropriate stratum and time category)	tCO <sub>2</sub> e/ac/yr
$Area_{p,s}$	= Area of participant field $p$ in stratum $s$	acres

### 5.2.3 Baseline N<sub>2</sub>O Emissions

[TEXT REGARDING N<sub>2</sub>O EMISSIONS]

**Equation 5.4.** Baseline Emissions of N<sub>2</sub>O

$$N_2O_{BL,p,rp} = \sum_s [BEF_{N_2O,s,rp} \times Area_{p,s}] \times GWP_{N_2O}$$

Where, Units

$N_2O_{BL,p,rp}$	= Baseline emissions of N <sub>2</sub> O for participant field $p$ during the reporting period	tCO <sub>2</sub> e
$BEF_{N_2O,s,rp}$	= Annual baseline emission factor for N <sub>2</sub> O emissions in stratum $s$ during the reporting period (Table X.X, select appropriate stratum and time category)	tN <sub>2</sub> O/ac/yr
$Area_{p,s}$	= Area of participant field $p$ in stratum $s$	acres
$GWP_{N_2O}$	= The 100-year global warming potential of N <sub>2</sub> O. A value of 310 shall be used unless otherwise instructed by the Reserve.	CO <sub>2</sub> e/N <sub>2</sub> O

### 5.2.4 Baseline CO<sub>2</sub> Emissions

[TEXT REGARDING FOSSIL FUEL EMISSIONS]

Equation 5.5. Baseline CO<sub>2</sub> Emissions from Fossil Fuel and Electricity Usage

$$CO_{2,BL,p} = BEF_{CO_2} \times EF_{FF} \times Area_{p,s}$$

Where,

		<u>Units</u>
CO <sub>2,BL,p</sub>	= Baseline emissions due to fossil fuel combustion and electricity use for participant field <i>p</i>	tCO <sub>2</sub> e
BEF <sub>CO<sub>2</sub></sub>	= Annual baseline emission factor for carbon dioxide emissions from fossil fuel combustion	gal/ac/yr
EF <sub>FF</sub>	= Emission factor for fossil fuels. A value of X shall be used unless otherwise instructed by the Reserve.	tCO <sub>2</sub> e/gal
Area <sub>p</sub>	= Area of participant field <i>p</i>	acres

**Comment [MD8]:** This could be done a few different ways. Depending on the actual fuel that is designated, we could specify one national EF, or we could specify a reference source which is updated periodically.

### 5.2.5 Baseline Emissions from Aboveground Woody Biomass (Optional)

[TEXT REGARDING WOODY BIOMASS EMISSIONS]

Equation 5.6. Baseline Emissions from Aboveground Woody Biomass (Optional)

$$ABB_{BL,p,rp} =$$

Where,

		<u>Units</u>
ABB <sub>BL,p</sub>	= Baseline emissions due to the loss of aboveground woody biomass in participant field during the reporting period	tCO <sub>2</sub> e

**Comment [MD9]:** Incomplete

## 5.3 Quantifying Project Emissions

Project emissions are actual GHG emissions that occur within the GHG Assessment Boundary as a result of the project activity. Project emissions must be quantified every reporting period on an *ex post* basis.

**Equation 5.7. Project Emissions**

$$PE_{rp} = \sum_p [BU_{PR,p} + FF_{PR,p} + FE_{PR,p}] + \sum_p LE_{p,rp}$$

Where,

	<u>Units</u>
PE <sub>rp</sub>	= Project emissions during the reporting period tCO <sub>2</sub> e
BU <sub>PR,p</sub>	= Emissions from burning in the project scenario for participant field <i>p</i> during the reporting period (Equation X.X) tCO <sub>2</sub> e
FF <sub>PR,p</sub>	= Emissions from fossil fuel and electricity use in the project scenario for participant field <i>p</i> during the reporting period (Equation X.X) tCO <sub>2</sub> e
FE <sub>PR,p</sub>	= Emissions from fertilizer amendments in the project scenario for participant field <i>p</i> during the reporting period (Equation X.X) tCO <sub>2</sub> e
LE <sub>p,rp</sub>	= Leakage emissions for participant field <i>p</i> during the reporting period (Equation X.X) tCO <sub>2</sub> e

**5.3.1 Project Emissions from Burning**

[TEXT REGARDING BURNING EMISSIONS]

**Project emissions from burning**

The Reserve currently does not have a quantification approach to burning which occurs in the project scenario, either prescribed or accidental/natural. The IPCC does provide default emission factors for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions related to the prescribed burning of savannahs:

Units in g/kg dry matter combusted		
CH <sub>4</sub>	CO <sub>2</sub>	N <sub>2</sub> O
2.3 (±0.9)	1613 (±95)	0.21 (±0.1)

If the Reserve adopted this approach, projects would need an additional method of estimating the kg of dry matter combusted in the fire, likely through an estimate of aboveground biomass per acre.

**Equation 5.8. Project Emissions from Burning**

$$BU_{PR,p} = Area_{burn,p} \times ?$$

Where,

	<u>Units</u>
BU <sub>PR,p</sub>	= Emissions from burning in the project scenario for participant field <i>p</i> during the reporting period (Equation X.X) tCO <sub>2</sub> e
Area <sub>burn,p</sub>	= Area of participant field <i>p</i> which was burned during the reporting period (Equation X.X) acres

Comment [MD10]: Incomplete

### 5.3.2 Project Emissions from Fossil Fuel and Electricity Use

[TEXT REGARDING FOSSIL FUEL USAGE IN THE PROJECT SCENARIO]

**Equation 5.9.** Project Emissions from Fossil Fuels and Electricity

$$CO_{2,PR,p,rp} = \frac{\sum_f (FF_{f,p,rp} \times PEF_{FF,f})}{1000} + \frac{(EL_{p,rp} \times PEF_{EL,p})}{2204.623}$$

Where,

		<u>Units</u>
$CO_{2,PR,p,rp}$	= Carbon dioxide emissions due to fossil fuel combustion and electricity use in the project scenario for participant field $p$ during the reporting period (Equation X.X)	tCO <sub>2</sub> e
$FF_{f,p,rp}$	= Volume of fossil fuel type $f$ consumed on participant field $p$ during the reporting period	volume
$PEF_{FF,f}$	= Project emission factor for fossil fuel type $f$	kgCO <sub>2</sub> /volume fossil fuel
1000	= Conversion factor	kg/t
$EL_{p,rp}$	= Quantity of electricity consumed for participant field $p$ during the reporting period	MWh
$PEF_{EL,p}$	= Project emission factor for electricity for the eGRID subregion containing participant field $p$	lbCO <sub>2</sub> /MWh
2204.623	= Conversion factor	lb/t

### 5.3.3 Project Emissions from Fertilizer Use

[TEXT REGARDING N<sub>2</sub>O EMISSIONS]

#### Project emissions from fertilizer use

Options for quantifying the N<sub>2</sub>O emissions from fertilizer amendments in the project scenario.

1. Default IPCC value. The 2006 IPCC Guidelines for national inventories provides a default emission rate of 0.01 kg N<sub>2</sub>O-N per kg N input. Projects would monitor fertilizer inputs during the reporting period and then use this default to quantify the N<sub>2</sub>O emissions.
2. Other?

**Equation 5.10. Project Emissions from Fertilizer Use**

$$FE_{PR,p,RP} = [(QF_{PR,p,RP} \times PEF_{N_2O,D}) + (QF_{PR,p,RP} \times PEF_{N_2O,ID})] \times \frac{44}{28} \times GWP_{N_2O} \div 1000$$

Where,

		<u>Units</u>
$FE_{PR,p,RP}$	= Nitrous oxide emissions in the project scenario for participant field $p$ during the reporting period (Equation X.X)	tCO <sub>2</sub> e
$QF_{PR,p,RP}$	= Quantity of fertilizer applied to participant field $p$ during the reporting period	kg N
$PEF_{N_2O,D}$	= Emission factor for direct emission of N <sub>2</sub> O from fertilizer application in the project scenario. The value of this parameter shall be 0.01 <sup>28</sup> for all projects	kg N <sub>2</sub> O-N/kg N
$PEF_{N_2O,ID}$	= Emission factor for indirect emissions of N <sub>2</sub> O from fertilizer application in the project scenario. This term combines the default factor for N volatilization and re-deposition with the default factor for leaching/runoff. The value of this parameter shall be 0.0175 <sup>29</sup> for all projects.	kg N <sub>2</sub> O-N/kg N
$\frac{44}{28}$	= Conversion factor	kg N <sub>2</sub> O/kg N <sub>2</sub> O-N
$GWP_{N_2O}$	= ###	tCO <sub>2</sub> e/tN <sub>2</sub> O
1000	= Conversion factor	kg/t

**5.3.4 Project Emissions Due To Leakage**

[TEXT REGARDING LEAKAGE EMISSIONS]

**Leakage emissions**

AGC projects may result in leakage (i.e. the “avoided” baseline emission simply shift and occur elsewhere, thus never actually being avoided) if the project activities result in the conversion of other grassland outside of the project area. The extent to which this occurs depends on the economics of crop production. The leakage discount represents the probability that the avoided baseline emissions will occur outside of the project area due to the project activities. Calculating a precise value for this probability is both highly complex and highly uncertain. As this protocol relies on default baseline assumptions which are composites of multiple baseline scenarios, it is not possible to determine a precise leakage value for each specific project. We propose to use a default leakage discount of 20%, similar to what is used in the ACR ACoGS methodology (Section F.3.2).

**Equation 5.11. Project Emissions from Leakage**

$$LE_{p,RP} = 0.2 \times BE_{p,RP}$$

Where,

		<u>Units</u>
$LE_{p,RP}$	= Leakage emissions for participant field $p$ during the reporting period	tCO <sub>2</sub> e
0.2	= Leakage discount	
$BE_{p,RP}$	= Baseline emissions for participant field $p$ during the reporting period	tCO <sub>2</sub> e

<sup>28</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 11, Table 11.1, page 11.11.

<sup>29</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 11, Table 11.3, page 11.24.

## 5.4 Ensuring Permanence of GHG Emission Reductions

This protocol credits for avoided emissions of carbon which is stored in the grassland soils. These credits therefore rely on the maintenance of this carbon storage over time to avoid a reversal, whereby carbon is released after a credit has been issued for its storage. For the purposes of this protocol, an emission reduction will be considered “permanent” when the carbon has been maintained for 100 years following the issuance of the credit.

### 5.4.1 Avoidable Reversals

A reversal is considered avoidable when it is not caused by natural forces. Avoidable reversals in the context of an AGC project will likely take the form of a decision to exit the project and convert the project area to cropland. However, it could also occur on smaller scales, such as mining or drilling activities, or installation of wind turbines. In these instances, the project operator is required to determine the acreage that is affected by the reversal and follow the quantification steps to determine how many credits were issued on those acres. The credits associated with avoided emissions from soil or biomass must be transferred to the Reserve. If the project operator no longer holds a sufficient quantity of project credits, the balance may be fulfilled with credits from other grassland or forest projects.

### 5.4.2 Unavoidable Reversals

#### Risk of unavoidable reversals

The Reserve Forest Project Protocol utilizes a buffer pool of credits to provide insurance against unavoidable reversals (defined in protocol text below). The risk of events which could result in an unavoidable reversal is assessed and then equated to a percent contribution of credits which go to the buffer pool at the time of issuance. Thus, there are a certain percentage of credits that projects never receive. We would like to discuss the potential categories of unavoidable reversals which could impact grassland projects and attempt to assess the general risk of each. If it can be determined that there is no or very low risk of unavoidable reversals, it may be possible to avoid the use of the buffer pool.

Please refer to Appendix A of the Forest Project Protocol V3.3 for a description of the determination of an annual forest project risk rating:

<http://www.climateactionreserve.org/how/protocols/forest/dev/version-3-3/>

#### Insurance through deep soil carbon

There was a suggestion of allowing projects to avoid buffer pool contributions by documenting the existence of deep soil carbon which is not accounted in the default emission factors, but would have been emitted in the baseline conversion scenario. Due to the extensive additional monitoring and documentation steps that would be required for this relatively minor gain in credits, Reserve staff is not in favor of pursuing this approach. In addition, such an approach would require the quantification of these carbon pools to ensure sufficient insurance against reversals. That would necessitate sampling components which are currently not included in this protocol.

A reversal is considered unavoidable when it is caused by a phenomenon completely outside of the control of the project operator. Examples include major floods, extreme fires, volcanic activity, etc. For each reporting period, the project operator will assess the reversal risk of the project area as a percentage, and this percentage will be transferred to the Reserve Buffer Pool at the time of credit issuance. Credits that enter the buffer pool are not returned to the project. The buffer pool is shared by all grassland projects, and the quantity of potential credits that could be received in the event of an unavoidable reversal is not related to the quantity of credits that project has previously contributed.

The risk rating is determined as a sum of the risk ratings for the applicable risk categories. If a project determines that a risk category is not applicable, supporting evidence must be provided at the time of verification.

Category	Description	Risk Rating

DISCUSSION DRAFT

## 6 Project Monitoring

The Reserve requires a Monitoring Plan to be established for all monitoring and reporting activities associated with the project. The Monitoring Plan will serve as the basis for verifiers to confirm that the monitoring and reporting requirements in this section and Section 7 have been and will continue to be met, and that consistent, rigorous monitoring and record keeping is ongoing at the project site. The Monitoring Plan must cover all aspects of monitoring and reporting contained in this protocol and must specify how data for all relevant parameters in Table 6.1 will be collected and recorded.

At a minimum, the Monitoring Plan shall include the frequency of data acquisition; a record keeping plan (see Section 7.2 for minimum record keeping requirements); the frequency of instrument cleaning, inspection, field check, and calibration activities; the role of individuals performing each specific monitoring activity; and a detailed project diagram. The Monitoring Plan should include QA/QC provisions to ensure that data acquisition and meter calibration are carried out consistently and with precision.

Finally, the Monitoring Plan must include procedures that the Project Developer will follow to ascertain and demonstrate that the project at all times passes the Legal Requirement Test and the Regulatory Compliance Test (Section 3.3.2 and 3.8, respectively).

Project Developers are responsible for monitoring the performance of the project and ensuring that the operation of all project-related equipment is consistent with the manufacturer's recommendations.

### 6.1 Monitoring Parameters

Prescribed monitoring parameters necessary to calculate baseline and project emissions are provided in Table 6.1.

**Table 6.1. Grassland Project Monitoring Parameters**

Comment [MD11]: Incomplete

Eq. #	Parameter	Description	Data Unit	Calculated (c) Measured (m) Reference (r) Operating Records (o)	Measurement Frequency	Comment
<b>General Project Parameters</b>						
	Regulations	Project Developer attestation of compliance with regulatory requirements relating to the composting project	Environmental regulations	n/a	Each verification cycle	Information used to: 1) To demonstrate ability to meet the Legal Requirement Test – where regulation would require _____. 2) To demonstrate compliance with associated environmental rules, e.g. criteria pollutant limits.
<b>Baseline Calculation Parameters</b>						
<b>Project Calculation Parameters</b>						

## 6.2 Pre-Project Land Use

The third step in the stratification process for AGC projects is to identify the length of time that the project area has been in continuous grassland cover prior to the project start date (Section 5.1.3). To be eligible, all project areas must have been in continuous grassland cover for at least 10 years prior to the project start date (Section 3.2). This requirement is necessary to ensure the validity of the baseline soil carbon emission factors. Areas that have exceeded 30 years of pre-project grassland cover may be classified in a different stratum.

### Monitoring pre-project land use

As described above, it is necessary for the project area to have been in continuous grassland cover for at least 10 years. If Project Developers can document 30 years of continuous grassland coverage, they can access more favorable emission factors. We would like WG assistance determining the most straightforward approach to meeting this requirement. There are a number of different types of evidence that could be provided. It may not be necessary to require all of these items, but at the same time we'd need to make sure that the evidence which is used is sufficient for the purpose. There are numerous ways this could be organized, and we would like feedback on the most effective and feasible options.

1. Aerial photos
2. Satellite images
3. Tax records
4. Letter from local agency
5. Conservation contracts
6. Other?

## 6.3 Grazing

### Preventing Overgrazing

The Reserve seeks Workgroup feedback and assistance on the most straightforward yet reliable (and enforceable) methods of ensuring that overgrazing does not occur in the project scenario. The section below lays out possible mechanisms for this purpose, with the intent that these mechanisms would be used in concert and verified prior to credit issuance.

Livestock grazing is allowed in the project scenario. While low to moderate levels of grazing may have a beneficial effect on the grassland ecosystem and soil carbon storage,<sup>30</sup> overgrazing can be detrimental to both the storage of soil carbon and the health of the grassland ecosystem. Project grazing must be limited to moderate intensity levels. This is monitored through several mechanisms:

- An updated grazing management plan
- Legal limitations on grazing intensity
- Monitoring of grazing intensity during the reporting period

#### 6.3.1 Updated Grazing Management Plan

The project operator must provide a grazing management plan for livestock grazing on the project area during the reporting period. The monitored level of grazing intensity must not exceed the level of grazing specified in the management plan. This plan shall be updated to reflect any significant changes to the grazing management practices.

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<sup>30</sup> Reference?

### 6.3.2 Legal Limitations on Grazing Intensity

The conservation easement put into place for the project may contain language specifically limiting livestock grazing to moderate intensity levels. Overgrazing will be considered a violation of the terms of the easement, subject to legal enforcement. If the project area is subject to legal limits on grazing intensity, the verifier may consider this as a mitigating factor when conducting their risk based assessment of the project prior to verification.

### 6.3.3 Monitoring of Grazing Intensity during the Reporting Period

All grazing activities must be monitored and documented on a monthly basis during the reporting period. On a monthly basis, project operators must document the type of livestock being grazed, the average population, and a description of the rotational practices.

**Comment [MD12]:** WG, please comment on this specifically.

### 6.4 Monitoring Project Emission Sources

On a monthly basis, project operators must document the following parameters used for the quantification of project emissions:

- Total acres burned and cause of fire(s)
- Purpose, type, and quantity of fossil fuels used (e.g. tractor, diesel, 100 gallons)
- Purpose, source, and quantity of electricity used (e.g. electric fencing, MROW grid, 100 kWh)

## 7 Reporting Parameters

This section provides requirements and guidance on reporting rules and procedures. A priority of the Reserve is to facilitate consistent and transparent information disclosure among Project Developers. Project Developers must submit verified emission reduction reports to the Reserve annually at a minimum.

**Comment [MD13]:** This section has not been tailored to AGC projects, but the Reserve would like to receive feedback on this area.

### 7.1 Project Submittal Documentation

Project Developers must provide the following documentation to the Reserve in order to register a grassland project:

- Project Submittal form
- Project area map
- Signed Attestation of Title form
- Signed Attestation of Voluntary Implementation form
- Signed Attestation of Regulatory Compliance form
- Verification Report
- Verification Statement

Project Developers must provide the following documentation each reporting period in order for the Reserve to issue CRTs for quantified GHG reductions:

- Verification Report
- Verification Statement
- Signed Attestation of Title form
- Signed Attestation of Voluntary Implementation form
- Signed Attestation of Regulatory Compliance form

At a minimum, the above project documentation (except for the project diagram) will be available to the public via the Reserve's online registry. Further disclosure and other documentation may be made available on a voluntary basis through the Reserve. Project submittal forms can be found at <http://www.climateactionreserve.org/how/program/documents/>.

### 7.2 Record Keeping

For purposes of independent verification and historical documentation, Project Developers are required to keep all information outlined in this protocol for a period of 10 years after the information is generated or 7 years after the last verification. This information will not be publicly available, but may be requested by the verifier or the Reserve.

System information the Project Developer should retain includes:

- All data inputs for the calculation of the project emission reductions, including all required sampled data
- Copies of all permits, Notices of Violations (NOVs), and any relevant administrative or legal consent orders dating back at least 3 years prior to the project start date
- Executed Attestation of Title, Attestation of Regulatory Compliance, and Attestation of Voluntary Implementation forms
- Onsite fossil fuel use records
- Onsite grid electricity use records

- Other monitoring data TBD
- Results of CO<sub>2</sub>e annual reduction calculations
- Initial and annual verification records and results
- All maintenance records relevant to the monitoring equipment

### 7.3 Reporting Period and Verification Cycle

Project Developers must report GHG reductions resulting from project activities during each reporting period. Although projects must be verified annually at a minimum, the Reserve will accept verified emission reduction reports on a sub-annual basis, should the Project Developer choose to have a sub-annual reporting period and verification schedule (e.g. monthly, quarterly, or semi-annually).

#### Reporting Period and Verification Cycle

The current text is in-line with most other Reserve protocols. We generally limit reporting periods and verification cycles to 12 months or less, but do not require adherence to a calendar schedule. The choice of these schedules can have a significant bearing on the organization of the quantification section. This is something to keep in mind when considering whether an alternative reporting and verification cycle is appropriate.

Examples:

1. **Standard Reserve cycle:** Initial RP may be >12 months, subsequent RPs are 12 months or less, verification periods cover no more than 12 months. No relation to the calendar.
2. **Livestock alternative option:** Verification cycle may be up to 24 months with a monitoring report submitted in the interim to cover the first 12 month RP.
3. **Forest schedule:** Initial RP may be more than 12 months and the second RP may be less than 12 months, after which time projects continue on an annual, calendar schedule.
4. **ARB cycle:** Initial RP is 6-24 months, subsequent RPs are 12 months, not tied to the calendar. Projects which generate less than 25k CRTs per year may verify on a 24 month schedule.
5. **Some combination of above**

To meet the annual verification deadline, the Project Developer must have the required verification documentation (see Section 7.1) submitted within 12 months of the end of each reporting period. A reporting period cannot exceed 12 months, and no more than 12 months of emission reductions can be verified at once, except during a project's initial verification. Although there is some flexibility in the length of the initial reporting period, the Project Developer must still meet the 12-month verification deadline.

### 7.4 Joint Reporting of Project Aggregates

Project aggregates will carry out a certain amount of joint effort for reporting. While each project will apply the quantification section independently, this may be collected and reported to the Reserve by the Project Aggregator.

See box in the verification section for discussion of joint reporting and verification

[ADDITIONAL TEXT AND DETAILS NEEDED]

## 8 Verification Guidance

This section provides verification bodies with guidance on verifying GHG emission reductions associated with the project activity. This verification guidance supplements the Reserve's Verification Program Manual and describes verification activities specifically related to grassland projects.

Verification bodies trained to verify grassland projects must be familiar with the following documents:

- Climate Action Reserve Program Manual
- Climate Action Reserve Verification Program Manual
- Climate Action Reserve Grassland Project Protocol V1.0

The Reserve's Program Manual, Verification Program Manual, and project protocols are designed to be compatible with each other and are available on the Reserve's website at <http://www.climateactionreserve.org>.

Only ISO-accredited verification bodies trained by the Reserve for this project type are eligible to verify grassland project reports. Verification bodies approved under other project protocol types are not permitted to verify grassland projects. Information about verification body accreditation and Reserve project verification training can be found on the Reserve website at <http://www.climateactionreserve.org/how/verification/>.

### 8.1 Joint Verification of Project Aggregates

Projects which participate in a project aggregate will be verified together for every reporting period.

#### Joint verification of project aggregates

We envision the following characteristics of joint verification, subject to workgroup feedback and discussion:

- Aggregator has their own Reserve account through which they submit all documentation for the aggregate
- Each project has their own account
- Submittal and account fees paid by Aggregator, potentially on a reduced schedule compared to that paid by individual (non-aggregated) projects
- A single verification report which covers the entire aggregate
- Site visits to all projects in the initial verification
  - When a project joins an existing aggregate, site visit is required during its first verification as part of an aggregate
  - When a project leaves an aggregate, it requires a site visit upon its first verification as an individual project
- Site visits to a subset of projects in subsequent verifications
  - Very large projects (>x% of total emission reductions) always get a visit
  - Risk-based (or random?) sample of other projects get a visit
  - Every project gets visited at least once every 10 years (different number?)
  - In years without a site visit a project must submit georeferenced remote sensing evidence (aerial photo or satellite image)
- CRTs are issued to the Aggregator account, transfers between Aggregator and participants are free

**Comment [MD14]:** This section has not been tailored to AGC projects, but the Reserve would like to receive feedback on this area.

## 8.2 Standard of Verification

The Reserve's standard of verification for grassland projects is the Grassland Project Protocol (this document), the Reserve Program Manual, and the Verification Program Manual. To verify a grassland project report, verification bodies apply the guidance in the Verification Program Manual and this section of the protocol to the standards described in Sections 2 through 7 of this protocol. Sections 2 through 7 provide eligibility rules, methods to calculate emission reductions, performance monitoring instructions and requirements, and procedures for reporting project information to the Reserve.

## 8.3 Monitoring Plan

The Monitoring Plan serves as the basis for verification bodies to confirm that the monitoring and reporting requirements in Section 6 and Section 7 have been met, and that consistent, rigorous monitoring and record keeping are ongoing at the project site. Verification bodies shall confirm that the Monitoring Plan covers all aspects of monitoring and reporting contained in this protocol and specifies how data for all relevant parameters in Table 6.1 are collected and recorded.

### Monitoring plan

What are additional, grassland-specific considerations for project monitoring plans?

## 8.4 Verifying Project Eligibility

Verification bodies must affirm a grassland project's eligibility according to the rules described in this protocol. The table below outlines the eligibility criteria for grassland projects. This table does not present all criteria for determining eligibility comprehensively; verification bodies must also look to Section 3 and the verification items list in Table 8.2.

**Table 8.1.** Summary of Eligibility Criteria for a Grassland Project

Eligibility Rule	Eligibility Criteria	Frequency of Rule Application
Start Date	For 12 months following the Effective Date of this protocol, a pre-existing project with a start date on or after _____ may be submitted for listing; after this 12 month period, projects must be submitted for listing within 6 months of the project start date	Once during first verification
Location	United States and U.S. territories and tribal areas	Once during first verification
Baseline Crop System	Identified according to Section X.X	Once during first verification
Performance Standard	_____	Every verification
Legal Requirement Test	Signed Attestation of Voluntary Implementation form and monitoring procedures for ascertaining and demonstrating that the project passes the Legal Requirement Test	Every verification
Regulatory Compliance Test	Signed Attestation of Regulatory Compliance form and disclosure of all non-compliance events to verifier; project must be in material compliance with all applicable laws	Every verification

## 8.5 Core Verification Activities

The Grassland Project Protocol provides explicit requirements and guidance for quantifying the GHG reductions associated with the avoided conversion of grasslands to croplands. The Verification Program Manual describes the core verification activities that shall be performed by verification bodies for all project verifications. They are summarized below in the context of a grassland project, but verification bodies must also follow the general guidance in the Verification Program Manual.

Verification is a risk assessment and data sampling effort designed to ensure that the risk of reporting error is assessed and addressed through appropriate sampling, testing, and review. The three core verification activities are:

1. Identifying emission sources, sinks, and reservoirs (SSRs)
2. Reviewing GHG management systems and estimation methodologies
3. Verifying emission reduction estimates

### Identifying emission sources, sinks, and reservoirs

The verification body reviews for completeness the sources, sinks, and reservoirs identified for a project, such as, *inter alia*, \_\_\_\_\_.

### Reviewing GHG management systems and estimation methodologies

The verification body reviews and assesses the appropriateness of the methodologies and management systems that the grassland project operator uses to gather data and calculate baseline and project emissions.

### Verifying emission reduction estimates

The verification body further investigates areas that have the greatest potential for material misstatements and then confirms whether or not material misstatements have occurred. This involves site visits to the project facility (or facilities if the project includes multiple facilities) to ensure the systems on the ground correspond to and are consistent with data provided to the verification body. In addition, the verification body recalculates a representative sample of the performance or emissions data for comparison with data reported by the Project Developer in order to double-check the calculations of GHG emission reductions.

## 8.6 Grassland Verification Items

The following tables provide lists of items that a verification body needs to address while verifying a grassland project. The tables include references to the section in the protocol where requirements are further specified. The table also identifies items for which a verification body is expected to apply professional judgment during the verification process. Verification bodies are expected to use their professional judgment to confirm that protocol requirements have been met in instances where the protocol does not provide (sufficiently) prescriptive guidance. For more information on the Reserve's verification process and professional judgment, please see the Verification Program Manual.

**Note: These tables shall not be viewed as a comprehensive list or plan for verification activities, but rather guidance on areas specific to grassland projects that must be addressed during verification.**

### 8.6.1 Project Eligibility and CRT Issuance

Table 8.2 lists the criteria for reasonable assurance with respect to eligibility and CRT issuance for grassland projects. These requirements determine if a project is eligible to register with the Reserve and/or have CRTs issued for the reporting period. If any requirement is not met, either the project may be determined ineligible or the GHG reductions from the reporting period (or subset of the reporting period) may be ineligible for issuance of CRTs, as specified in Sections 2, 3, and 6.

**Table 8.2.** Eligibility Verification Items

Protocol Section	Eligibility Qualification Item	Apply Professional Judgment?
2.2	Verify that the project meets the definition of a grassland project	No
2.3	Verify ownership of the reductions by reviewing Attestation of Title	No
3.2	Verify project start date	No
3.2	Verify accuracy of project start date based on operational records	Yes
3.2	Verify that the project has documented and implemented a Monitoring Plan	No
3.3	Verify that project is within its 10 year crediting period	No
3.3.1	Verify that the project meets the Performance Standard Test	No
3.3.2	Confirm execution of the Attestation of Voluntary Implementation form to demonstrate eligibility under the Legal Requirement Test	No
3.3.2	Verify that the project Monitoring Plan contains a mechanism for ascertaining and demonstrating that the project passes the Legal Requirement Test at all times	No
3.8	Verify that the project activities comply with applicable laws by reviewing any instances of non-compliance provided by the Project Developer and performing a risk-based assessment to confirm the statements made by the Project Developer in the Attestation of Regulatory Compliance form	Yes
6	Verify that monitoring meets the requirements of the protocol. If it does not, verify that a variance has been approved for monitoring variations	No

### 8.6.2 Quantification

Table 8.3 lists the items that verification bodies shall include in their risk assessment and recalculation of the project's GHG emission reductions. These quantification items inform any determination as to whether there are material and/or immaterial misstatements in the project's GHG emission reduction calculations. If there are material misstatements, the calculations must be revised before CRTs are issued.

**Table 8.3.** Quantification Verification Items

Protocol Section	Quantification Item	Apply Professional Judgment?
4	Verify that all SSRs in the GHG Assessment Boundary are accounted for	No
5.1	Verify that the baseline emissions are properly aggregated	No
5.3	Verify that the project emissions were calculated according to the protocol with the appropriate data	No

Protocol Section	Quantification Item	Apply Professional Judgment?
	Verify that the Project Developer correctly monitored, quantified, and aggregated electricity use	Yes
	Verify that the Project Developer correctly monitored, quantified, and aggregated fossil fuel use	Yes
	Verify that the Project Developer applied the correct emission factors for fossil fuel combustion and grid-delivered electricity	No
	Verify that the Project Developer correctly applied _____ emission factors	No
	If default emission factors are not used, verify that project-specific emission factors are based on official source-tested emissions data or are from an accredited source test service provider	No

### 8.6.3 Risk Assessment

Verification bodies will review the following items in Table 8.4 to guide and prioritize their assessment of data used in determining eligibility and quantifying GHG emission reductions.

**Table 8.4.** Risk Assessment Verification Items

Protocol Section	Item that Informs Risk Assessment	Apply Professional Judgment?
6	Verify that the project Monitoring Plan is sufficiently rigorous to support the requirements of the protocol and proper operation of the project	Yes
6	Verify that appropriate monitoring equipment is in place to meet the requirements of the protocol	No
6	Verify that the individual or team responsible for managing and reporting project activities are qualified to perform this function	Yes
6	Verify that appropriate training was provided to personnel assigned to greenhouse gas reporting duties	Yes
6	Verify that all contractors are qualified for managing and reporting greenhouse gas emissions if relied upon by the Project Developer. Verify that there is internal oversight to assure the quality of the contractor's work	Yes
7.2	Verify that all required records have been retained by the Project Developer	No

### 8.6.4 Completing Verification

The Verification Program Manual provides detailed information and instructions for verification bodies to finalize the verification process. It describes completing a Verification Report, preparing a Verification Statement, submitting the necessary documents to the Reserve, and notifying the Reserve of the project's verified status.

## 9 Glossary of Terms

Accredited verifier	A verification firm approved by the Climate Action Reserve to provide verification services for project developers.
Additionality	Project activities that are above and beyond “business as usual” operation, exceed the baseline characterization, and are not mandated by regulation.
Anthropogenic emissions	GHG emissions resultant from human activity that are considered to be an unnatural component of the Carbon Cycle (i.e. fossil fuel destruction, de-forestation, etc.).
Biogenic CO <sub>2</sub> emissions	CO <sub>2</sub> emissions resulting from the destruction and/or aerobic decomposition of organic matter. Biogenic emissions are considered to be a natural part of the Carbon Cycle, as opposed to anthropogenic emissions.
Carbon dioxide (CO <sub>2</sub> )	The most common of the six primary greenhouse gases, consisting of a single carbon atom and two oxygen atoms.
CO <sub>2</sub> equivalent (CO <sub>2</sub> e)	The quantity of a given GHG multiplied by its total global warming potential. This is the standard unit for comparing the degree of warming which can be caused by different GHGs.
Direct emissions	GHG emissions from sources that are owned or controlled by the reporting entity.
Effective Date	The date of adoption of this protocol by the Reserve board: _____.
Emission factor (EF)	A unique value for determining an amount of a GHG emitted for a given quantity of activity data (e.g. metric tons of carbon dioxide emitted per barrel of fossil fuel burned).
Fossil fuel	A fuel, such as coal, oil, and natural gas, produced by the decomposition of ancient (fossilized) plants and animals.
Grassland	An area of land dominated by native grass species with little to no tree canopy. Other plant species may include legumes, forbs, and other non-woody vegetation. Tree canopy may not exceed 10% of the land area on a per-acre basis. Grassland may include managed rangeland or pastureland, but not cultivated cropland.
Greenhouse gas (GHG)	Carbon dioxide (CO <sub>2</sub> ), methane (CH <sub>4</sub> ), nitrous oxide (N <sub>2</sub> O), sulfur hexafluoride (SF <sub>6</sub> ), hydrofluorocarbons (HFCs), or perfluorocarbons (PFCs).
GHG reservoir	A physical unit or component of the biosphere, geosphere, or hydrosphere with the capability to store or accumulate a GHG that has been removed from the atmosphere by a GHG sink or a GHG captured from a GHG source.
GHG sink	A physical unit or process that removes GHG from the atmosphere.

GHG source	A physical unit or process that releases GHG into the atmosphere.
Global Warming Potential (GWP)	The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one unit of a given GHG compared to one unit of CO <sub>2</sub> .
Indirect emissions	Reductions in GHG emissions that occur at a location other than where the reduction activity is implemented, and/or at sources not owned or controlled by project participants.
Metric ton (MT, tonne)	A common international measurement for the quantity of GHG emissions, equivalent to about 2204.623 pounds or 1.102 short tons.
Methane (CH <sub>4</sub> )	A potent GHG with a GWP of 21, consisting of a single carbon atom and four hydrogen atoms.
MMBtu	One million British thermal units.
Mobile combustion	Emissions from the transportation of employees, materials, products, and waste resulting from the combustion of fuels in company owned or controlled mobile combustion sources (e.g. cars, trucks, tractors, dozers, etc.).
Project Aggregator	The project developer for a project aggregate. The project aggregator may or may not be one of the project operators participating in the project aggregate.
Project area	The area defined by the physical boundaries of the project activities. The project area only contains land which meets the eligibility requirements of this protocol.
Project baseline	A "business as usual" GHG emission assessment against which GHG emission reductions from a specific GHG reduction activity are measured.
Project Developer	An entity that undertakes a GHG project, as identified in Section 2.2 of this protocol. The project developer may also be the project aggregator and/or a project operator.
Project operator	A grassland owner who bears the legal and reporting responsibilities of the project activities.
Verification	The process used to ensure that a given participant's GHG emissions or emission reductions have met the minimum quality standard and complied with the Reserve's procedures and protocols for calculating and reporting GHG emissions and emission reductions.
Verification body	A Reserve-approved firm that is able to render a verification opinion and provide verification services for operators subject to reporting under this protocol.

## 10 References

DISCUSSION DRAFT

## Appendix A Development of the Performance Standard

### A.1 Standardized Financial Additionality Threshold

The Reserve has developed a standardized test for additionality based on a financial threshold. The concept is that the monetary incentive provided by offsets is needed to overcome the existing financial incentive to convert grassland to cropland. As a proxy for this financial incentive, the Reserve is using the concept of the “cropland premium.” The cropland premium for a county is the cash rent rate for cropland minus the cash rent rate for pastureland. In other words, the cropland premium represents the increased value (\$/acre) of land that is converted from pasture to crop production. Economics are only one driver of a decision to convert. However, economics are generally a particularly strong driver of land use decisions (reference?).

The Reserve believes that a standardized determination of financial additionality, as long as it is conservative, is preferable to a subjective, project-specific determination of additionality. The goal of any performance standard is to minimize the number of false positive determinations of additionality, while limiting the number of false negative determinations to the greatest extent possible. Project-specific determinations tend to be highly complex, expensive and, over a large number of projects, may not result in an improved balance of false positives and false negatives. Standardized thresholds have a much lower opportunity for “gaming,” or altering project documentation or information in some way to pass a test. Project-specific analyses have a higher opportunity for gaming due to the extent to which the determination rests on information provided by the project proponent.

### A.2 Data Sources

For this effort, the Reserve compared average cropland premiums calculated for U.S. counties over the period 2008-2012 with the rate of conversion of natural land to cropland for that county over the same period. The rent rate data are collected through the annual cash rent survey of the USDA National Agricultural Statistics Service (NASS)<sup>31</sup>. This dataset is robust and published on a regular, annual schedule. The conversion rates were calculated by The Nature Conservancy [additional details needed] and provided to the Reserve for this analysis.

### A.3 Data Substitution and Calculation

The cash rent survey provides a value, in dollars per acre, of the cash rent paid for non-irrigated cropland, irrigated cropland, and pastureland. If there are too few respondents in a particular county to ensure anonymity of the reported data, those counties are combined and averaged together at the level of the Agricultural Statistics District (ASD) and identified in the data as “Other (Combined) Counties”. Thus, where a county did not have a value listed for a particular rent category for a particular year, the average for the ASD was used. If there was no ASD average reported, the value was left out. When averaging the rent values over the 5 year period, only years with reported values were considered (i.e. “no value” was not considered to equal zero).

Once the data substitution was complete, the cropland premiums were calculated by subtracting the average pastureland rent rate from the average non-irrigated cropland rent rate. The

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<sup>31</sup> Information available at [http://www.nass.usda.gov/Surveys/Guide\\_to\\_NASS\\_Surveys/Cash\\_Rents\\_by\\_County/index.asp](http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Cash_Rents_by_County/index.asp). Accessed October 13, 2014.

cropland premium for each county was then plotted against the conversion rate for that county. The conversion rate data are noisy, owing to the existence of non-economic factors to land use conversions, as well as the limitations of the conversion rate analysis itself. However, there is a consistent, positive relationship between cropland premium and conversion rate. Increases in cropland premium tend to lead to increased conversion to cropland.

**A.4 Setting the Threshold**

Once the relationship is determined, a policy decision must be made as to where the threshold should be set.

**A.5 List of Eligible Counties**

Once the threshold is determined, it is then applied to more recent rent rate data to determine the list of eligible counties. Following the data substitution procedures above, the Reserve determined the average cropland premiums for the most recent three year period (2012-2014). The threshold for additionality was then applied to these data. This exercise will be updated annually as new rent rate data become available. The new tables will be published and be effective for new projects submitted during the following year (for example, the next data will be released in September of 2015, so the new tables will impact projects submitted on or after January 1, 2016).

**Table A.1.** List of Eligible Counties (2015)

State	County	Eligibility Status

## Appendix B Development of Standardized Parameters and Emission Factors

The text that follows documents the establishment of baseline conditions and approach to baseline modeling of avoided emissions resulting from the avoided conversion of grasslands to cropland. The approach has been developed by the WSP team, and is intended as an appendix to be included in the final Reserve protocol.

### B.1 Introduction

Establishing the baseline conditions for an avoided conversion of grasslands to cropland project has important implications for the quantification of baseline emissions. The tillage practice, cropping system, fertilizer application rates, types, and application methods, irrigation practices, and other variables will impact considerably the extent to which the soil carbon and biomass pools are affected (and hence net CO<sub>2</sub> emissions) and the magnitude of N<sub>2</sub>O emissions. The importance of establishing an appropriate baseline condition is further challenged by the complexity of the exercise, and any exercise in which a hypothetical future counterfactual must be established.

The methodology defined in this document describes the standardized assumptions used by the Reserve's technical contractor in modeling baseline GHG emissions from the conversion of grasslands to annual croplands. This methodology also describes the modeling approach used by the Reserve's contractor to estimate the baseline emissions from soil processes, soil organic carbon, below-ground biomass, and fertilizer N<sub>2</sub>O emissions using the DAYCENT model and a combination of national data sources. The methodology and standardized baselines are intended to provide accurate estimates of baseline emissions, give certainty over expected project outcomes, minimize project setup and monitoring costs, and reduce verification costs. The resulting emission factors preclude the need for project-level modeling by Project Developers.

Modeling was performed using the same build of the DAYCENT model which is implemented for estimation of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012<sup>32</sup> (U.S. Inventory) compiled by EPA, and which is incorporated in USDA's entity level GHG quantification tool, COMET-Farm<sup>33</sup>. To compute the emissions associated with baseline conversion scenarios, DAYCENT model inputs developed for the US Inventory, which include USDA's Natural Resources Inventory (NRI) as well as ancillary data sets on actual agricultural management practices across the US were used as outlined in the following sections. The NRI is a statistically robust stratified sampling design, which includes land use and management data since 1979 at ca. 400,000 non-federal cropland and grassland locations.

<sup>32</sup> U.S. Environmental Protection Agency. (April 2014). *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012 (April 2014)*. Available at: <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf>

<sup>33</sup> Available at: <http://cometfarm.nrel.colostate.edu>

**Box B.1. The DAYCENT Model and Modeling Approach**

The baseline modeling conducted for this protocol uses the same Tier 3 modeling environment, data sources, and methodological structure employed in the EPA's *Inventories of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012*. The DAYCENT model (i.e. daily time-step version of the Century model) simulates cycling of carbon, nitrogen, and other nutrients in cropland, grassland, forest, and savanna ecosystems on a daily time step. This includes CO<sub>2</sub> emissions and uptake resulting from plant production and decomposition processes, and N<sub>2</sub>O emissions from the application of synthetic and manure fertilizer, the retention of crop residues and subsequent mineralization, and mineralization of soil organic matter. DAYCENT simulates all processes based on interactions with location-specific environmental conditions, such as soil characteristics and weather.

**B.2 Conceptual Overview**

The approach to baseline determination and baseline modeling relies almost exclusively on geographic, historic, and physical characteristics of project parcels – most of which are publicly available in national geospatial databases – in assigning a baseline and associated emissions for any given project parcel. The methodology does not require project proponents to assert a single baseline cropping system, tillage, and management practice, support that assertion with detailed documentation, or justify why assertions represent reasonable baseline assumptions. Rather, this methodology establishes and dictates a composite baseline for any given parcel based on the practices documented on ecologically and geologically similar parcels using a variety of national databases. The methodology does not establish a single tillage practice, average fertilizer practice or other factors and use that as the baseline to model that single scenario to obtain baseline emission factors. Instead, the methodology acknowledges variability in practice, and the uncertainty associated with predicting future practice by assuming that there is a certain probability that the converted land could be managed in a variety of ways. The probabilities for management were generated based on survey data from land within the same eco-climatic region and soil type as the project parcel and observed management data representative for that land, based on the NRI and related data sources defined below. The resulting emission factors represent a weighted average of the potential practices on the parcel were it to be converted to cropland. This approach to baseline determination eliminates subjectivity by standardizing the baseline determination based exclusively on stratification (Section X.X).

Similarly, the methodology does not require project proponents to execute complex biogeochemical process models. Instead, the methodology will provide composite emission factors derived from these same biogeochemical process models utilizing geographic, soil, and cropping system assumptions representative of the project parcel.

Compared to the alternative in which project proponents are responsible for asserting and documenting their baseline assumptions, and then conducting modeling themselves, this method has several important advantages, which are outlined in Section B.8.

**B.3 Baseline Determination**

The baseline for any given project parcel is defined probabilistically as a composite of the likely practices that might occur on that parcel were it to be converted from grassland to cropland.

The stratification regime defined in Section X.X of the protocol plays a fundamental role in establishing the range of practices and relative probabilities for baseline practice. Based on two of the three stratification elements – the Major Land Resource Area (MLRA) and the dominant

surface soil texture from the Soil Survey Geographic Database (SSURGO)<sup>34</sup> – the U.S. was first broken into individual super-strata (unique combinations of these two variables).<sup>35</sup> By first stratifying by MLRA and surface soil texture, the U.S. is effectively subdivided into land areas based on suitability to certain cropping systems and the practices associated with those systems in those geographies. Because MLRAs are based on agroecological classification, they define areas of similar climate, geomorphology, native vegetation and land management systems – all of which are the fundamental drivers of the biogeochemical processes involved in greenhouse gas emissions. Thus they are well-suited as stratification variables than other land area designations that are politically-based (e.g. states) or defined by a more limited set of criteria (e.g. Crop Management Zones based on farm management practices).

For each unique super-strata, baseline practice was estimated based on the real-world practices on agricultural land within the same super-stratum, as derived from USDA National Resource Inventory (NRI), Economic Research Service Cropping Practice Survey (ERS), and National Agricultural Statistics Service (NASS).<sup>36,37,38</sup> These resources represent the best available data sources for agricultural practice in the U.S. A brief description of the relevant data sources is described below:

- **Major Land Resource Area (MLRA):** Agro-ecological classification which defines areas of similar climate, geomorphology, native vegetation and land management systems across the U.S.
- **Soil Survey Geographic Database (SSURGO):** Developed and managed by the USDA Natural Resources Conservation Service (NRCS), the SSURGO database contains geographically linked information on soil properties including texture. SSURGO data were collected by the USDA National Cooperative Soil Survey, covering the U.S., its Territories, and Commonwealths. It was generated from soil samples and laboratory analysis, and represents the finest resolution soil map data available in the U.S.
- **National Resource Inventory (NRI):** Developed and managed by the USDA NRCS, the NRI is a statistical survey of land use and natural resource conditions on non-federal U.S. lands. It provides data on the status, condition, and trends of land, soil, water and related resources. The NRI utilizes established inventory sites for repeated sampling to provide national representation.
- **Conservation Tillage Information Center (CTIC):** Data compiled from annual county-level surveys since 1989 by CTIC of tillage practices, by crop, are used to estimate probabilities for tillage practices and tillage transitions, for NRI points within the surveyed counties.
- **Economic Research Service:** Housed within the USDA, ERS gathers a variety of data on crop and livestock practices through the use of its annual Agricultural Resource Management Survey (ARMS). ERS provides both annual and trend data, illustrating

<sup>34</sup> Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. *Web Soil Survey*. Available online at <http://websoilsurvey.nrcs.usda.gov/>

<sup>35</sup> The third variable, previous land use, will be used later in the modeling of baseline emissions.

<sup>36</sup> U.S. Department of Agriculture (2013) *Summary Report: 2010 National Resources Inventory*, Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1167354.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167354.pdf)

<sup>37</sup> USDA-ERS (2011) *Agricultural Resource Management Survey (ARMS) Farm Financial and Crop Production Practices*, available at: <http://ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices.aspx>

<sup>38</sup> NASS

shifts in agricultural practice. ERS contains valuable data on nutrient management, irrigation practices, and conservation practices.

- **National Agricultural Statistics Service (NASS):** Data on annual county crop area and yields from NASS are used as a secondary data source for quality control of model outputs.

For each super-stratum combination of MLRA and soil texture, relevant variables about baseline conditions were established using these data sources, with specific variables pulled from each as defined in Table B.1. In many cases, these variables and associated probabilities are linked. For example, NRI data are used to establish the various cropping sequences, and then each crop is assigned nitrogen application rate distributions based on regional ERS data. The methodology used to link data and determine practices within regions is based on the methodology used in the U.S. Inventory. For further detail on how these datasets are used to set appropriate conditions, please refer to the sections Agriculture<sup>39</sup> and Land Use, Land-Use Change, and Forestry<sup>40</sup> in the U.S. Inventory.

**Table B.1.** Derivation of Baseline Scenario Input Variables

Baseline Variable	Data Source	Methodology
Tillage practice	NRI, CTIC	Probability of till, no till, and conservation till practices established using actual NRI and CTIC data in each super stratum and associated expansion factors, based on previous five years of data.
Typical cropping sequence	NRI	Probability of each cropping sequence established using actual NRI data in each super stratum and associated expansion factors, based on the most recent five years period.
Fertilizer N application	ERS, NASS	Crop-specific N rates assigned based on state-level statistics, subdivided by MLRA, based on the most recent five years period.
Application of other nutrients/organic matter	NRCS	Livestock manure application rates estimated based on NRCS data and adjusted for county-level estimates of manure availability, based on the most recent five years period.
Irrigation practice	NRI	Irrigated vs. non-irrigated status are specified for each NRI point, based on the most recent five years period. For irrigated land, full irrigation (i.e. no significant water stress) is modeled.

Table B.2 provides an overview of the crop system data elements that went into the establishment of the composite baseline conditions for any given super-stratum, and a highly simplified example distribution. Based on the cropping systems established from historic NRI data, additional nutrient input data were applied based on ERS and NASS data. In addition to the cropping and management variables extracted from these data sources, the methodology employs the NRI expansion factors to appropriately weight each practice based on its representativeness across the landscape. The NRI expansion factors were established during

<sup>39</sup> U.S. Environmental Protection Agency (2014) *Inventory of U.S. Greenhouse Gas Emissions and Sinks, Chapter 6-Agriculture*.

<sup>40</sup> U.S. Environmental Protection Agency (2014) *Inventory of U.S. Greenhouse Gas Emissions and Sinks, Chapter 7-Land Use, Land Use Change, and Forestry*.

survey design, and are used to indicate the number of acres across the landscape that each NRI sample point represents.

The baseline for this example super stratum would be, for example, 20% constructed from data point #1 which is a practice that includes the use of no till and cover crops on irrigated land, and with a crop rotation of corn, soy, corn, soy, fallow. This is based on the existence of an NRI data point with that practice and its expansion factor (100) being 20% of the aggregate of NRI data points' expansion factors (500) within the super stratum.

**Table B.2.** Example Crop Systems and Resulting Probabilities in Baseline

NRI Data Point	Tillage Practice	Irrigation Practice	Cropping System	Expansion Factor	Probability
#1	No Till	Irrigated	corn, soy, corn, soy, fallow	100	20%
#2	Conservation Till	Not Irrigated	corn, soy, fallow, wheat, soy	150	30%
#3	Conservation Till	Irrigated	wheat, fallow, wheat, wheat, fallow	50	10%
#4	Standard Till	Not Irrigated	corn, soy, fallow, wheat, soy	200	40%

Using this methodology, each project parcel effectively has multiple baseline scenarios. One way to think about this approach would be that for every acre of a project in the above example, 0.2 acres would be converted according to practice #1, 0.3 acres according to practice #2, 0.1 acres according to practice #3, and 0.4 acres according to practice #4.

## B.4 Baseline Modeling Approach

In order to model baseline emissions for use in quantifying emission reductions, the composite baseline practices defined in Section B.3 were combined with additional climatic and initial condition inputs. Local weather data inputs were based on values from the North America Regional Reanalysis Product (NARR).<sup>41</sup> All modeling was performed using stochastic modeling techniques and the DAYCENT model to evaluate the change in carbon pools and emissions sources across multiple scenarios. More specifically, this was done by modeling the conversion to cropland of NRI sites throughout the U.S. that are currently categorized as grasslands. It includes analysis of the composite baselines defined in Section B.3 in a manner consistent with the compilation of the U.S. Inventory.

Modeling was conducted based on the strata delineated in Section X.X of the protocol, which include previous land use in addition to the variables used to define the super strata. For each stratum (unique combination of MLRA, soil texture, and previous land use), the following methodology was employed by utilizing the Colorado State University parallel computing capability, which includes dedicated database servers and a ca. 300 CPU computing cluster:

1. All NRI grassland data points within the stratum are selected and will be modeled individually to create a composite baseline.
2. Initial carbon pools are established for each data point based on soil data and a long-term spin-up of the DAYCENT model using historical management practices established for the US national GHG inventory analysis.

<sup>41</sup> NOAA/OAR/ESRL PSD, *North America Regional Reanalysis Product*, available at: <http://www.esrl.noaa.gov/psd/>

3. Each NRI point is modeled using the baseline practices and probabilities determined in Section B.3 through the DAYCENT model for 25 years. The baseline practices for each NRI point are pulled at random according to the previously calculated probabilities.
4. Average emissions for each NRI grassland data point within the stratum are extracted from DAYCENT in five year increments for:
  - a. Soil organic carbon
  - b. Belowground biomass
  - c. Fertilization (N<sub>2</sub>O only)
5. The extracted emissions in five year increments are averaged across NRI points within the strata and translated into average annual, per acre emission factors applicable to corresponding five year increments.

The resulting emission factors are provided by stratum in a tabular form and included as lookup tables in Section X.X of the protocol. A sample of the table format is provided as Table B.3 below.

**Table B.3.** Sample Output of Emission Factors

Stratum	MLRA	Soil Texture	Previous Land Use	Annual Emission Factor (mtCO <sub>2</sub> e/acre)				
				Year 1-5	Year 6-10	Year 11-15	Year 16-20	Year 21-25

### B.5 Geographic Coverage, Data Substitution, and Data Quality

The establishment of baseline conditions and baseline modeling was performed for a subset of super-strata within the U.S. where data was available and deemed reliable. In order to maintain data integrity and robustness of modeling results, certain MLRA's or super-strata for which there is limited data were not evaluated. Specifically, the following rules were used to exclude either entire MLRA's or super-stratum:

- MLRA's which have fewer than 10 total NRI sampling points in cropland or fewer than 10 total NRI sampling points in grassland (total – including all soil texture groups) were excluded
- Super-strata (MLRA and soil texture combinations) that have no NRI sampling points in either cropland or grassland were excluded

In addition to these exclusionary rules, data substitution techniques have been applied which allow the modeling of individual strata, but nonetheless result in lesser data quality. In other instances, low availability of data diminishes the robustness of the modeling results. The following instances triggered data substitution techniques or a determination of low data availability and have been flagged:

- If a super-strata is missing NRI sampling points for cropland or grassland (but not both), soil conditions for the missing points will be drawn from the existing land use sampling points. These super-strata were flagged due to the required data substitution.
  - Practice data in these instances will be drawn from the soil texture that most closely resembles the substituted soil texture within the same MLRA

- If a super-stratum has fewer than X NRI sampling points in grassland *and/or* fewer than X NRI sampling points in cropland, it is flagged due to low sample size. X was determined based on an interpretation of model results and distribution

These rules were established in order to ensure a level of confidence in the resulting emission reduction estimates related to both grassland and cropping systems.

[PLACEHOLDER. THREE MAPS INDICATING WHICH SUPER-STRATA ARE INCLUDED, EXCLUDED, OR FLAGGED (ONE FOR EACH SOIL TEXTURE).]

**Comment [KT15]:** Note to workgroup: Following the completion of modeling, these flagged results will be reviewed to determine whether they should be retained, discounted in some manner, or excluded.

## B.6 Uncertainty

Although some level of uncertainty is inherent in any modeling exercise, there are several important uncertainties unique to the establishment of baseline conditions and modeling performed over a 25 year horizon. Several sources of uncertainty are particularly noteworthy:

- **Tillage Practice.** The use of no-till and conservation tillage practices in the U.S. has been increasing in recent decades, and this trend is expected to continue. The USDA ERS evaluated tillage data for a variety of crops and geographies across the U.S. and found that no-till has increased at a rate of 1.5% per year between 2000 and 2007, though there is considerable variation across crops and regions. No-till agriculture, particularly when practiced over a prolonged time, has the potential to lower soil carbon emissions or increase sequestration.<sup>42</sup>
- **Fertilizer Use.** Inorganic and organic nitrogen are common inputs for many cropping systems in the U.S., and have considerable GHG impacts through both direct and indirect N<sub>2</sub>O emissions. Nitrogen management activities focus on minimizing excess nitrogen in the system by matching the rate, timing, placement, and source of nitrogen to the requirements of the crop system to efficiently utilize nitrogen and maximize crop yields. Despite data showing that nitrogen application rates on some crops have increased even since 1990 (e.g. corn, wheat)<sup>43</sup>, emissions from this source may be flat or declining due to increased nitrogen use efficiency and yields. Shifts in practice and technology have the potential to reduce net N<sub>2</sub>O emissions from fertilization on a yield basis.
- **Climate Change.** Over the coming decades, weather patterns across the country are expected to change in several ways. Temperatures are projected to rise, the intensity of the heaviest precipitation events is projected to increase, crop yields may be more strongly influenced by anomalous weather events, weeds, diseases and pests may increase crop stress, and other climate disruptions to agricultural production are projected to increase over the next 25 years.<sup>44</sup> These impacts will vary considerably across regions, and will have varied impacts on agricultural GHG emissions.

During the workgroup consultation process, the concept of including shifts in tillage practice and fertilizer use within the modeling environment was evaluated. However, because of data and modeling limitations, uncertainty around inputs, and the assumptions required to conduct

<sup>42</sup> USDA Economic Research Service (2010) "No-Till" Farming is a Growing Practice, available at: <http://www.ers.usda.gov/media/135329/eib70.pdf>

<sup>43</sup> USDA Economic Research Service (2013) *Fertilizer Use and Price*, available at: <http://www.ers.usda.gov/data-products/fertilizer-use-and-price.aspx>

<sup>44</sup> Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

modeling that included these shifts, it was deemed more appropriate to account for the uncertainty outside of the modeling exercise rather than compromise the model's inherent strengths and data sources. Both tillage and nitrogen management practice will further interact with climate change and weather events, with the result being unknown net impacts to field-level GHG emissions. The quantification methodology includes a discount factor intended to conservatively address the uncertainty associated with these and other factors.

## B.7 Summary Statistics

[PLACEHOLDER. SUMMARY STATISTICS TO CHARACTERIZE STRATA WILL BE PROVIDED HERE FOLLOWING THE COMPLETION OF BASELINE MODELING]

## B.8 Justification for a Standardized Baseline

This section provides a brief overview of the benefits associated with use of a highly standardized approach to baseline determination and quantification of baseline emissions.

### B.8.1 Transaction Costs and Verifiability

One of the primary goals to standardization is to cut down to the extent practicable on project costs and verification complexity. If the project proponent is required to assert the baseline cropping system and management practice, this would necessitate considerable costs both in project development and verification. Existing protocols rely on resources such as appraisals, government surveys, and universities in establishing baseline cropping systems. While government surveys provide some insight into dominant crops in a region, they are not generally differentiated by relevant soil characteristics, and do not reveal detailed crop rotation information nor do they link across variables (e.g. crop rotations and tillage practices). Further, while appraisals are useful in establishing that land may have a higher value as "cropland" versus grassland, it is unclear that these appraisals would consider specific cropping systems, inputs and management practices. Instead, these appraisals may assess only the publicly available rent information on cropland in the region, itself a composite of multiple practices.

In short, relying on project proponent assertions would require considerable project proponent resources to identify and document the likely cropping system, provided it can reliably be done at all. Additionally, the asserted crop system will need to be verified by the verification body, adding additional costs and uncertainty. Alternatively, the standardized approach does not require the project proponent to assert a baseline cropping system or management practice at all, or the verifier to assure this data. The baseline scenario and emissions estimates would be defined exclusively based on geographic, historic, and physical characteristics of the project parcels, most of which are publicly available in national geospatial databases.

### B.8.2 Customizability and Opportunity for Gaming

One potential shortcoming of a highly standardized approach to baseline determination and baseline emissions modeling is that it limits the opportunity for projects to be customized. Greater project proponent input provides greater opportunity to reflect specific knowledge or greater detail. For example, there may be characteristics of the land (e.g. slope) or local market (e.g. proximity to processing) that cannot be captured in the standardized methodology that nonetheless can reasonably be expected to influence cropping or practice.

However, this shortcoming of standardization is also a potential benefit in the ability it provides to avoid gaming. For example, if the emission factors for two cropping systems is different, then gaming could occur if project proponents take steps to establish the system with higher

**Comment [KT16]:** I am still not sure whether this section belongs in this appendix, elsewhere in the document, or should be excluded altogether.

emissions as their baseline. Given the complexity of verification and the potential methodological flexibility due to varying levels of data availability that may need to be afforded project proponents in establishing the baseline practice, it is possible that this gaming could occur without detection. Use of highly standardized composite baselines minimizes this gaming risk by basing stratification and the determination of baseline emissions purely on geographic, historic, and physical characteristics of project parcels, most of which are publicly available in national geospatial databases.

### **B.8.3 Future Uncertainty**

While the uncertainty of knowing what may occur on grassland directly following conversion is obviously significant, the uncertainty about what may occur 10 years or 20 years hence is even greater. Given a crediting period of 25 years, it is therefore extremely important that the baseline determination and associated baseline emissions are not overly influenced by short-term considerations.

Means of evaluating the highest value cropping systems are highly dependent on short-term projections about commodity and crop prices which are subject to change in the future. As such, even if one knew with certainty that a parcel would be converted to a given crop rotation and management practice tomorrow, there is no reasonable way to know that it would persist in that manner for 10 or 20 years. As such, it is more reasonable to treat each parcel as essentially a composite of a multitude of crop systems in the area reflecting longer term practices and trends.



## Appendix D Example Project Area Map

[Insert image file with example GIS map of a fictional project area]

DISCUSSION DRAFT