Handbook for Project Development

Protocol Requirements and Options for Compliance

Version 1.0a

Notes on this document and its use:
*This Handbook is meant to be a companion document to assist users of the **Grassland Project Protocol V1.0**. It should be viewed as advice, rather than official guidance of the Climate Action Reserve. In situations where this document contradicts the Protocol, the Protocol always takes precedence. This document will be updated periodically, and the Reserve welcomes feedback and suggestions to assist with those updates. If you have comments, please send an email to policy@climateactionreserve.org.*

This material is based upon work supported by the Natural Resources Conservation Service, U.S. Department of Agriculture, under number 69-3A75-16-025.

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Last Updated May 2016

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Abbreviations and Acronyms

AGC	Avoided grassland conversion
CARB	California Air Resources Board
CD	Cooperative developer
CDL	Cropland Data Layer
CDM	Clean Development Mechanism
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon dioxide
CRP	Conservation Reserve Program
CRT	Climate Reserve Tonne
EPA	U.S. Environmental Protection Agency
GHG	Greenhouse gas
GIS	Geographical Information Systems
GPP	Grassland Project Protocol
GRP	Grassland Reserve Program
IPCC	United Nations Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
lb	Pound
LCC	Land Capability Classification
MLRA	Major Land Resource Area
MODIS	Moderate Resolution Imaging Spectroradiometer
MT (t)	Metric ton (or tonne)
NASA	National Aeronautics and Space Administration
NLCD	National Land Cover Database
N_2O	Nitrous oxide
NRCS	USDA Natural Resources Conservation Service
PD	Project developer
PIA	Project Implementation Agreement
QCE	Qualified Conservation Easement
Reserve	Climate Action Reserve
SOC	Soil organic carbon
SSR	Source, sink, and reservoir

SSURGO	Soil Survey Geographic Database
tCO_2e	Metric ton of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WSS	Web Soil Survey

1 The Basics

This Handbook has been developed to assist users of the Climate Action Reserve's Grassland Project Protocol V1.0. Where the protocol is a technical standard laying out the specific requirements of the Reserve program for the issuance of CRTs for grassland projects, this document is meant as a plain-language companion, providing unofficial guidance and advice to assist with project development and verification.

1.1 Eligibility Checklist

In order to be eligible for crediting, a grassland project must meet the following eligibility criteria:

Eligibility Item	Criteria	Met?
Location	Lower 48 United States	☐
Ownership prior to project commencement	Either: A) Private ownership, or B) Public ownership other than the Federal government	☐
Action to be taken to initiate project	Either: A) Recordation of a conservation easement, or B) Transfer of ownership	☐
Land use history	At least 10 years of continuous grassland cover prior to project initiation	☐
Tree cover	Less than 10% tree canopy on the project by area	☐
Financial additionality	Must be located in a county which is identified as eligible in the table of county parameters published by the Reserve	☐
Soil suitability	The project area must be at least 75% class I-IV soils as determined by the Land Capability Classification system	☐
Prohibited activities during the project	▪ Land conversion or disturbance ▪ Irrigation ▪ Synthetic fertilizer application ▪ Alteration of natural hydrology	☐

1.2 Summary of Inputs

LOCATION & STRATIFICATION	
State	Click here to enter text.
County	Click here to enter text.
Discount for Uncertainty of Conversion (DF_{conv})	Click here to enter text. *Find your county in the table of project parameters located at:* *http://www.climateactionreserve.org/how/protocols/grassland/*
Zip Code	Click here to enter text.
Major Land Resource Area (MLRA) *See Handbook Section 4*	Which MLRAs have been identified in the project area? 1st: Click here to enter text. 2nd:Click here to enter text. 3rd:Click here to enter text. 4th:Click here to enter text.

Soil Texture *See Handbook Section 4*	Which soil surface textures have been identified in the project area? ☐ Sand ☐ Loam ☐ Clay
Prior Land Use History *See Handbook Section 5*	For how long can you document that the project area has been in continuous grassland cover prior to the project start date? ☐ 10-30 years ☐ More than 30 years
Project Strata	List the strata that have been identified for this project, based on the answers above: Stratum 1: Click here to enter text. Stratum 2: Click here to enter text. Stratum 3: Click here to enter text. Stratum 4: Click here to enter text.
LEGAL & OWNERSHIP	
Land Ownership *See Handbook Section 3.1*	**Name of landowner: Click here to enter text.** Need clear documentation to identify the current fee owner of the property(s).
GHG Emission Reduction Ownership (Project Developer) *See Handbook Section 3.1*	**Name of Project Developer: Click here to enter text.** Need clear documentation to identify the owner of the GHG emission reductions which will result from the project. This person/entity is the "Project Developer" and will open an account with the Reserve. Ownership of emission reductions may not be covered by the conservation easement.
Qualifying Conservation Easement (QCE) *See Handbook Section 3.2*	**Name of easement holder: Click here to enter text.** Unless ownership of the project area is being transferred to the federal government, a conservation easement is required, which must meet the minimum standards in the protocol. In most cases, the date of the QCE will mark the project start date.
Project Implementation Agreement (PIA) *See Handbook Section 3.2*	The Project Developer must execute a contract with the Reserve, known as the Project Implementation Agreement. There are two types of PIAs available. Please check the box next to the PIA choice for this project: ☐ Recorded PIA ☐ Contract PIA
OTHER INPUTS	
Project Start Date *See Handbook Section 2.2.3*	What is the start date? Click here to enter a date. What action identifies this date? Click here to enter text.
Shrubs	Will the project be claiming baseline emissions from woody shrubs? ☐ Yes ☐ No

Prevention of Overgrazing	Will there be livestock grazing on the project area? ☐ Yes ☐ No If yes, does the conservation easement place specific, enforced limits on grazing within the project area? ☐ Yes ☐ No If no, will any livestock grazing within the project area be subject to an official Prescribed Grazing Management Plan? ☐ Yes ☐ No
Grazing Data *See Handbook Section 6.1*	During the reporting period, you need to know types of grazing animals and grazing days, as well as the average ambient temperature during the grazing season.
Fertilizer Use *See Handbook Section 6.2*	Need to document the type of organic fertilizer applied during the reporting period, as well as its nitrogen content and the amount applied.
Fossil Fuels & Electricity *See Handbook Section 6.3*	Need to document the consumption of fossil fuels and electricity by vehicles and equipment used in support of the project.
Fires *See Handbook Section 6.4*	Need to document the specific areas of the project which burned during the reporting period, and determine the acres burned by stratum.
Reversals *See Handbook Section 6.5*	Need to document any acres which were disturbed (or otherwise removed from the project), document the reason for the disturbance, and quantify the amount of credits affected.

2 The Process

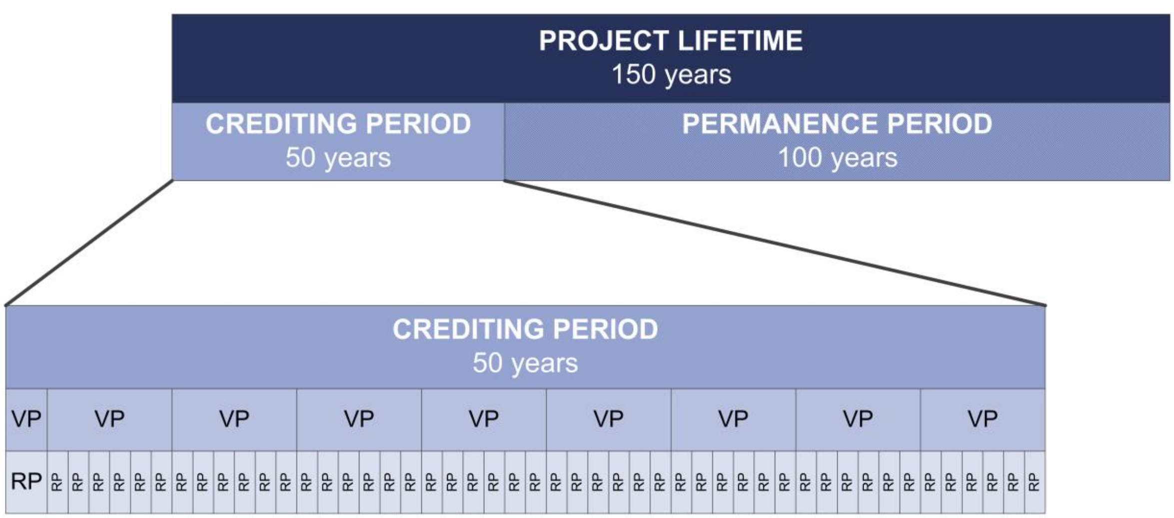
The process described here is roughly the same for individual projects and projects that participate in a cooperative, with the difference being that the Cooperative Developer will likely do most or all of the work. The table below highlights the major phases of creating offsets from a grassland project and the important activities at each phase.

Project Initiation	○ Determine eligibility & feasibility ○ Identify ownership ○ Engage with conservation organization (or federal agency) ○ Engage technical assistance and/or Cooperative Developer
Project Development	○ Open an account with the Reserve ○ Submit project to Reserve ○ Negotiate terms of conservation easement (or transfer to government) ○ Prepare monitoring plan ○ Record easement and start initial reporting period ○ Monitor all required project parameters ○ Quantify emission reductions for the reporting period
Verification	○ Engage with Reserve-approved verification body ○ [optional] Conduct verification site visit ○ Verifier conducts desk review verification ○ Submit verification report and statement to the Reserve for review
Credit Issuance	○ Verification report is approved ○ Project becomes "Registered" ○ CRTs are created and Project Developer is invoiced ○ CRTs are deposited into the Project Developer's account and may be transferred to a buyer

It is also important to understand the distinctions between several important periods of time:

Name	Description	Minimum	Maximum
Project lifetime	The period of time which includes the crediting period and the permanence period. The maximum project lifetime is 150 years.	101 years	150 years
Crediting period (CP)	The total period of time over which GHG reductions may be earned for a project. The maximum CP is 50 years, but some projects may have shorter CPs, either by choice or due to their specific baseline emission factors (see GPP Section 3.4).	1 year	50 years
Reporting period (RP)	The period of time over which GHG reductions are quantified, its length to be determined by the PD. The initial RP may cover up to 24 months. Subsequent RPs may not cover more than 12 months. The Reserve strongly recommends that PDs use the first RP to get onto a schedule of having each RP cover a calendar year.	1 month	24 months (initial) 12 months (subsequent)
Verification period (VP)	The period of time over which GHG reductions and adherence to GPP requirements are assessed by a verifier. The initial VP includes only the initial RP, but subsequent VPs may include up to six RPs, at the discretion of the PD.	1 RP	1 RP (initial) 6 RPs (subsequent)
Permanence period (PP)	The period of time following the CP during which no more GHG quantification or credit issuance will occur, but during which the project area must continue to be monitored and protected to ensure that there are no reversals of the stored carbon.	100 years	100 years

The figure below illustrates how these various periods of time relate to each other. In this example, the initial RP and VP are 24 months, each subsequent RP is 12 months, and each subsequent VP covers 6 RPs. This represents a project with the maximum length applied to each time period, resulting in the least possible number of RPs and VPs for a 50 year CP.



2.1 Project Initiation

A grassland project is defined by the permanent conservation of an area of eligible grassland or rangeland which is threatened by conversion to crop cultivation. The GHG credits represent the avoided loss of soil carbon and the avoided emissions from fertilizer and fossil fuel usage related to crop cultivation. *No credit is given for enhancing the sequestration of soil carbon in the project area.*

Before engaging in project development it is important to clearly answer these key questions:

- **Ownership**
  - Who owns the land?
  - Are there owners of mineral or other rights who need to be involved?
  - Who owns the rights to the GHG credits?
  - Will the project be part of a cooperative?
  - Who is responsible for project development, monitoring, and verification? Who will carry out and pay for these activities?
- **Conservation Easement**
  - Who will purchase and hold the conservation easement (conservation organization or public agency)?
  - Does the easement holder intend to own the GHG emission reductions?
  - Does the easement language meet the requirements of the protocol?
  - Do the terms of the easement include ongoing monitoring and enforcement?
- **Project Area**
  - Have you identified the specific land area which is to be included?
  - Have you taken steps to create GIS maps of the project area as required by the protocol?
- **Project Commencement**
  - What action will be used to determine the project start date?
  - Are you prepared to submit the project to the Reserve no more than 6 months after the start date?
- **Project Activities**
  - What activities will occur on the project area after the project has commenced?
  - Do you have a monitoring plan in place to ensure that you will be able to meet the protocol requirements during the reporting period?

2.2 Project Development

Once it has been decided that the project will go forward, there are several steps involved before CRTs can be issued. In the GPP, the term “Project Developer” (PD) specifically refers to the owner of the GHG emission reductions. However, the various tasks involved in developing a project may be carried out by another entity, or even several. Landowners or easement holders who do not have the capabilities to carry out these tasks may hire a third-party for assistance. Cooperatives will all be managed by a single cooperative developer, although that entity may or may not own the rights to the GHG emission reductions.

2.2.1 Reserve Account Creation

The first step in the official process is to open an account in the online registry system, also known as the Climate Action Reserve. The process for creating a Reserve user account is detailed at this site: http://www.climateactionreserve.org/open-an-account/. An account setup fee will be invoiced to the PD.[1] The important consideration at this step is that the account holder for the project must be the Project Developer, as defined in the GPP:

> *"A Project Developer is the entity which holds legal title to the emission reductions related to the grassland project, and is responsible for undertaking the grassland project and registering it with the Reserve."*

The key point here is ownership of the GHG emission reductions, as it is the PD to whom the Reserve will issue credits. Ownership of emission reductions should be determined prior to creation of a Project Developer account in the Reserve system, although it is possible to move the project to a different account at a later date if there is an error or a change in ownership.

2.2.2 Project Submittal

Once the Project Developer has created a Reserve user account, the PD may "create" the project in the Reserve. This process is described on this page of the Reserve website: http://www.climateactionreserve.org/how/projects/register/. After the PD has entered the project details in the online system it will be possible to upload the Project Submittal Form,[2] along with a basic map of the project area.

Reserve staff will review the submittal form and respond to the PD with any questions. If the form is complete and there is no indication that the project would violate either the protocol or the Reserve Program Manual, the project is accepted and becomes publicly listed in the Reserve. At this point project development can continue and verification can commence.

2.2.3 Project Commencement

There are three options for identifying the date of project commencement for a grassland project (Refer to Section 3.2 of the GPP to help determine which of these options is applicable to your project):

1. Recording the conservation easement
2. Execution of transfer of ownership
3. Notarized execution of a GHG rights contract *(applicable only to cooperative participants)*

To avoid missing the deadline for project submittal, the Reserve highly recommends that projects are submitted for listing prior to the start date.

Determination and documentation of the precise start date is critical to several aspects of the grassland project, including the initial reporting period and the 50-year project crediting period.

2.2.4 Monitoring Plan

All projects are required to prepare a detailed monitoring plan, per the requirements of Section 6 of the GPP. A comprehensive, organized monitoring plan will save time and effort during verification and will help ensure that important protocol requirements do not go overlooked. The monitoring plan should be viewed as a living document, updated for each reporting period as project activities change. A template monitoring plan is included here as Appendix A. This

[1] At the time of writing, the account setup fee is $500 and the submittal fee for a grassland project is $500. The updated fee schedule is available at: http://www.climateactionreserve.org/how/program/program-fees/.
[2] All forms and documents related to grassland projects may be found at: http://www.climateactionreserve.org/how/program/documents/.

template may be altered and edited to fit the context of the specific grassland project. For a cooperative, all participating projects should adopt the same monitoring plan format.

A comprehensive monitoring plan will address each requirement of the protocol and describe how it will be met. For example, the plan should include a detailed map and description of the project area, including the stratification and a description of the data sources used for the stratification. It should explain the ownership of the project area and the GHG emission reductions, and include references to specific evidence which will be used by the verifier to confirm this ownership. The monitoring plan will ultimately be a roadmap for the verification of the project, while also demonstrating to the verifier that the PD understands what they are doing.

2.3 Verification

Projects quantify emission reductions in blocks of time known as reporting periods. These reporting periods must be verified before credits are issued by the Reserve. The initial verification covers only the initial reporting period, which may include up to 24 months of time, beginning with the project start date. The basic steps are as follows:

1. Engage with a verification body approved by the Reserve to verify grassland projects.[3]
2. Verifier submits a Notice of Verification Services and Conflict of Interest (NOVS/COI) form to the Reserve for review.
3. Reserve first approves the verifier to verify this particular project, after which the verifier conducts the desk review and site visit (if applicable). Project verification entails assessing the following items against the requirements of the GPP:
    - Evidence for the project start date
    - Evidence for current and prior land use
    - Stratification of the project area
    - Ownership of the project area and the GHG emission reductions
    - Terms of the conservation easement
    - Quantification of emission reductions
    - Activities on the project area during the reporting period
    - Monitoring of project emission sources
        - Livestock grazing
        - Burning
        - Fossil fuel and/or electricity consumption
4. Verifier completes a detailed report and submits required documents to the Reserve for review.
5. Upon approval, CRTs are registered and an invoice is generated for the issuance fees.
6. Upon payment of the issuance fees, CRTs are issued to the Project Developer and may be transferred to a buyer’s account.

2.3.1 Subsequent Verifications

CRTs are only issued following successful verification of a reporting period. Following the initial verification, subsequent verification periods may include up to six reporting periods, at the discretion of the Project Developer. The decision about how long to wait between verifications is an economic decision, weighing the costs of verification against the potential revenues from CRT issuance.

[3] A list of approved verification bodies can be found at: http://www.climateactionreserve.org/how/verification/connect-with-a-verification-body/

Subsequent verifications will constitute a reduced effort compared to the initial verification. The basic steps are as follows:

1. Engage with a verification body (VB) approved by the Reserve to verify grassland projects.[4] The same verification body may be hired again, however, there are limits to the amount of time a VB can work with a project before a different VB must be hired to avoid a conflict of interest (COI).
2. Verifier submits a NOVS/COI form to the Reserve for review.
3. Upon approval, the verifier conducts the desk review and site visit, if applicable. Project verification entails assessing the following items against the requirements of the GPP:
   - Evidence for current land use
   - Changes in ownership of the project area and/or the GHG emission reductions
   - Quantification of emission reductions
   - Activities on the project area during the reporting period
   - Monitoring of project emissions sources
     - Livestock grazing
     - Burning
     - Fossil fuel and/or electricity consumption
4. Verifier completes a detailed report and submits required documents to the Reserve for review.
5. Upon approval, CRTs are registered and an invoice is generated for the issuance fees.
6. Upon payment of the issuance fees, CRTs are issued to the Project Developer and may be transferred to a buyer's account.

2.4 Credit Issuance

Once the Reserve approves the verification report, the reporting period is "registered" and the CRTs are created in the registry. When the PD requests issuance of the CRTs, an invoice will be generated for the issuance fees. Once the issuance fees are paid, the CRTs will be issued into the PD account for the project. If there is a cooperative with several PDs, CRTs for each project will go to the PD account associated with that project. The CRTs will have serial numbers which identify, among other things, the project ID and the vintage year.

CRTs can be held indefinitely, transferred into a retirement account (where they are locked forever), transferred into a subaccount (for internal tracking purposes), or transferred to another Reserve account holder. These transfers can be setup in the system prior to CRT issuance so that they happen immediately upon payment of the issuance fees.

[4] A list of approved verification bodies can be found at: http://www.climateactionreserve.org/how/verification/connect-with-a-verification-body/

3 Legal, Contracts, & Ownership

Before a grassland project can be verified, there are several legal issues that must be resolved. In preparation for the project, the following steps should be taken:

- Documentation for the ownership of the project area should be collected and organized.
- The holder of the conservation easement should be identified and engaged in project planning.
- It should be decided who will own the rights to the GHG emission reductions (the easement holder, the landowner, or a third party). This entity will be the Project Developer.
- The Project Developer should be familiar with the terms of the Project Implementation Agreement and be prepared to agree to them.

3.1 Ownership of GHG Emission Reductions

The owner of the rights to the GHG emission reductions is known as the Project Developer (this is described in detail in Section 2.3.2 of the GPP). Absent the offset project and the existence of any related contracts or easements, it is assumed that the fee owner of the land holds the title to any GHG emission reductions related to the physical project area. Although the recordation of a conservation easement does not by definition transfer this title to the easement holder, it does introduce uncertainty. For this reason the GPP requires that this ownership be clearly described through legal contracts, either as a part of the conservation easement, or through a separate GHG reduction rights agreement. All of these entities, the landowner, the easement holder, and the Project Developer (if a third party), must be a party to the contract that defines the GHG emission reduction rights.

Project Developer	Option A: Conservation Easement	Option B: Separate Contract
Grassland Owner	The conservation easement specifies that the title to the GHG reductions stays with the landowner. Document is signed by the landowner and the easement holder.	Conservation easement does not address GHG rights. A separate GHG rights contract is executed which specifies that these rights are retained by the landowner. Document is signed by the landowner and the easement holder, and references the conservation easement.
Easement Holder	The conservation easement specifies that the title to the GHG reductions is transferred to the easement holder. Document is signed by the landowner and the easement holder.	Conservation easement does not address GHG rights. A separate GHG rights contract is executed which specifies that these rights are transferred to the easement holder. Document is signed by the landowner and the easement holder, and references the conservation easement.
Third Party	The conservation easement specifies that the title to the GHG reductions is transferred to the third-party project developer. Document is signed by the landowner, easement holder, and project developer.	Conservation easement does not address GHG rights. A separate GHG rights contract is executed which specifies that these rights are transferred to the project developer. Document is signed by the landowner, easement holder, and project developer, and references the conservation easement.

3.2 Conservation Easements

The following points are important to keep in mind regarding conservation easements for grassland projects:

- The protocol assumes that all conservation easements will be permanent. However, at a minimum, the length of the easement must meet or exceed the entire project lifetime (which may be up to 150 years).
- For most projects, the recording of the conservation easement will denote the project start date.
- The Climate Action Reserve does not purchase or hold conservation easements, and does not participate in any of the legal or financial proceedings involved with the easement.
- The easement must cover the entire project area, but the area covered by the easement DOES NOT have to be identical to the project area. More than likely the project area will be only a portion of the land covered by the conservation easement.
- The easement must prohibit conversion of the project area. However, it does not necessarily need to prohibit such activities on the entire area covered by the easement. If the easement will be constructed to allow a certain amount of development or crop cultivation, it may simply reference the existence of the offset project and prohibit these activities on the project area during the lifetime of the offset project.
- The holder of the easement is not required to participate in the offset project beyond requirements for identifying ownership of the GHG reductions (see Section 3.1, above)

3.3 Project Implementation Agreement

The Project Implementation Agreement (PIA) is a contract between the Project Developer and the Reserve, whereby the PD agrees to be bound to the terms of the GPP for the life of the project, especially in regards to remedies for reversals. There are two legal options for the PIA:

- **Recorded PIA**: Where the Grassland Owner is acting as the PD, or where the Grassland Owner consents to such an action, the PIA may be recorded on the deed to the property. This means that the property owner, even if the property changes ownership, is bound to the terms of the GPP. This represents a lower risk for the Reserve, and thus projects that employ a Recorded PIA will have a smaller contribution to the risk buffer pool.
- **Contract PIA**: Where the Grassland Owner does not consent to having the PIA recorded on the deed to the property, it will simply be a contract between the Reserve and the PD. In this case, the project will make a larger contribution to the risk buffer pool.

The draft PIA is available on the Reserve website. This draft contract will be tailored for each project and executed prior to the completion of the initial verification and CRT issuance.

Within the Recorded PIA there is also a clause that controls whether the PIA may be subordinated to other deed restrictions on the property. Subordination Clause Type 1 stipulates that the PIA may not be subordinated, while Type 2 allows such subordination. This is an important distinction which represents an economic decision for the landowner. If the Type 1 clause is used, there is no contribution to the shared risk buffer pool. However, the landowner may experience difficulty in the future if they try to mortgage the property since the lender may not consent to being subordinated to the PIA. The Type 2 clause avoids this potential future difficulty, but results in an additional 10% contribution to the shared risk buffer pool.

4 Mapping & Stratification Resources

Developing a grassland project involves maps for several purposes. There are two official maps required to be submitted to the Reserve, as described in Section 7 of the GPP:

1. At project submittal: a basic area map, which will be publicly-available on the project registry.
2. At project registration: a detailed, georeferenced map, which will not be made public.

In addition to these two official maps, mapping tools will be necessary to carry out the stratification necessary for project quantification.

4.1 Data Sources

The following table identifies geographic information that is useful and/or necessary to develop a grassland project and suggested sources of data.

Data Item	Description	Data Source(s)
Major Land Resource Areas (MLRAs)	Polygons describing and identifying the MLRAs.	MLRA Explorer: http://apps.cei.psu.edu/mlra/ USDA NRCS Soils website: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053624
Soil texture	Polygons describing the Soil Map Units contained within the project area and identifying the soil surface texture for each.	SSURGO via the Web Soil Survey: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
Land Capability Classification (LCC)	Polygons describing the Soil Map Units contained within the project area and identifying the non-irrigated land capability classification for each.	SSURGO via the Web Soil Survey: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
Political boundaries	Lines or polygons describing relevant political boundaries such as states, counties, towns, etc.	Natural Earth: http://www.naturalearthdata.com/ Individual governments may provide local boundary data.
Roads	Lines describing any public or private roads which are relevant to the project area.	Natural Earth: http://www.naturalearthdata.com/
Watercourses and water bodies	Lines describing any watercourses and polygons describing any water bodies which are relevant to the project area.	Natural Earth: http://www.naturalearthdata.com/
Legal parcels	Polygons describing the legal parcels which contain the project area.	Local county assessor's office. GIS files are often available online. Boundaries may need to be surveyed if existing data are inadequate.

Data Item	Description	Data Source(s)
Public Land Survey System	If the project is located in an area covered by the Public Land Survey System, the map must contain lines describing the relevant townships, ranges, and sections.	DOI BLM GeoCommunicator: http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.htm
Latitude and longitude	The map should show the parallels and meridians relevant to the project area (i.e., the graticule).	Generally built into whatever GIS software package is being used.

4.2 Software & Service Options

There are myriad software options for GIS mapping, with widely varying levels of cost, capability, and user-friendliness. The following table identifies some popular software and service options. Projects may end up employing a combination of more than one of these options.

Mapping Tools	Type	Cost	Pros	Cons	Link to More Information
Consultant	Service	$1,000 - $20,000	▪ Expert service ▪ Relieves PD of need for specialized expertise	▪ Expensive ▪ Potential time delay if additional changes are needed	http://www.greeninfo.org/
ESRI ArcMap	Software	$1,500- $10,000+	▪ Industry standard GIS editor and layout program ▪ Available at a significantly reduced cost for nonprofits	▪ Expensive ▪ Not user-friendly for those without prior experience	http://www.esri.com/software/arcgis/arcgis-for-desktop/
DeLorme XMap	Software	$800	▪ Fairly powerful GIS software package ▪ Easily integrates with GPS hardware for on-site surveying ▪ Easier to learn than ArcMap ▪ Able to create and edit shapefiles	▪ Not as feature-rich as ArcMap or QGIS ▪ Not as widely-used or supported as ArcMap	www.delorme.com

Mapping Tools	Type	Cost	Pros	Cons	Link to More Information
ESRI ArcGIS Online	Service	FREE	▪ Fairly powerful and user-friendly online map-making service ▪ Several base map options which include some of the data required (e.g. roads and waterways) ▪ Can accept shapefiles ▪ Easy for sharing	▪ Limited map output capabilities ▪ Maps are made public ▪ Requires internet connection	http://www.arcgis.com/home/
Quantum GIS	Software	FREE	▪ Very powerful GIS editor and layout program ▪ Continued development means ongoing software updates	▪ Not user-friendly for those without prior GIS experience ▪ Potentially limited functionality for some esoteric functions and polished map layouts	http://qgis.org/en/site/
Google Maps	Service	FREE	▪ Easy to use	▪ Very limited functionality ▪ Requires internet connection	https://www.google.com/maps
Google Earth	Software & Service	FREE	▪ Easy to use ▪ Can load KML datasets as well as shapefiles ▪ Built-in historical aerial photos for many areas	▪ Limited ability to create and edit new data layers ▪ Limited map output capabilities ▪ Requires internet connection	http://www.google.com/earth/

5 Documenting Land Use: Past & Present

The amount of carbon stored in initial carbon pools at the start of a project is significantly influenced by how long that land was in grasslands before the project commenced. Project Developers are required to document that their land was either in grasslands for greater than 30 years or between 10 and 30 years, prior to the start of the project. Land in grasslands for less than 10 years is ineligible.[5]

How can you prove how long the project land was in grasslands before the project commenced?

Project Developers can use almost any evidence they like, subject to review by the verifier. Evidence must cover every year that the land is asserted to have been grassland. It is easier for a verifier to confirm that the project area was in grasslands when the Project Developer provides as specific and objective evidence as possible. The table below (Table 5.2 from the GPP) gives some examples of what types of evidence could be used, and the following sections further describe the evidence types, which are separated into two categories:

- **Category A** – one type of evidence from this category is sufficient
- **Category B** – two or more different types of evidence are needed

Category A: Evidence that is independently sufficient	Category B: Evidence that must be corroborated
▪ Site visit by the project verifier (applies only to the relevant reporting period) ▪ Time-referenced photos/videos of the project area taken during the relevant year(s) (applies to the areas that can reasonably be assessed with these photos) ▪ Time-referenced aerial photos/videos taken during the relevant year(s)	▪ Satellite data products, such as the Cropland Data Layer (CDL)[6], National Land Cover Database (NLCD),[7] or MODIS Enhanced Vegetative Index[8] ▪ Contract(s) covering the relevant year(s) whose terms would require that the project area be grassland, but that would not cause the project to fail the Legal Requirement Test (e.g. grazing leases or haying contracts) ▪ Tax records that indicate the land use during the relevant year(s) ▪ Notarized affidavit(s) from unrelated and unaffiliated parties attesting to the land use in the relevant year(s) ▪ Notarized affidavit from the Grassland Owner(s) attesting to the land use in the relevant year(s) ▪ Other official records submitted to or generated by a government agency that would indicate the land use or management during the relevant year(s)

[5] Further details on eligibility can be found in Section 1.1 of this Handbook.
[6] The Cropland Data Layer is a free remote sensing product developed and provided by the USDA National Agricultural Statistics Service. The data are available online at: http://nassgeodata.gmu.edu/CropScape/.
[7] The NLCD is a free remote sensing product provided by the Multi-Resolution Land Characteristics Consortium. The data are released every 5 years and is available online at: http://www.mrlc.gov/.
[8] MODIS data are provided by NASA and the USGS. Information regarding MOD13Q1 (the 16-day 250m global vegetation indices) is online at: https://lpdaac.usgs.gov/products/modis_products_table/mod13q1.

For example, if a Project Developer is attempting to prove grassland cover for 2010, and is able to provide a time-stamped image of the project area taken during that year from which the verifier can clearly identify the project area and confirm that it is undisturbed grassland, no additional evidence will be required. However, if the Project Developer is using the Cropland Data Layer for 2010 to show that the project area is identified as grassland, another form of evidence will be required. The PD could provide a copy of a grazing contract that shows the project area was leased for livestock grazing during the growing season. Taken together, these two items may be compelling evidence for the verifier. During project verification, if the PD elects to have the verifier visit the project site, the verifier can confirm that no disturbance has occurred, thus fulfilling this requirement for that year.

5.1 Category A: Evidence that is independently sufficient

Items in this category are able to stand alone as evidence of the land use status of the project area for a given year. Types of evidence not listed in the table are assumed to be Category B unless guidance to the contrary is received in writing from the Reserve.

5.1.1 Verification Site Visits

This may turn out to be the most expensive option, but it also requires the least amount of effort on the part of the PD and will provide the greatest level of certainty to the verifier. If the landowner is not the PD, they will need to be involved for site access, which not all landowners find acceptable. If working together with a co-op, it might be possible to arrange for multiple site visits to be conducted in one trip, to reduce costs.

During a site visit, the verifier will typically spend time touring all areas of the property that are related to the project and speaking to key management staff. The verifier will want to see enough of the project area to visually confirm that no soil disturbance has occurred.

Note: If other external experts such as agents of the easement holder, extension officers, or NRCS staff visit the project area, an affidavit from them could be used as Category B evidence.

5.1.2 Photographic Options

Time- and date-stamped photos of the project area might be a convenient and cost effective means to demonstrate land use in a particular year, but only for areas that can reasonably be assessed/identified using such photos. This could include aerial photos. Some counties conduct periodic updates to their aerial photography, which should be publicly available. Digital cameras and smartphones can also be used to take photos with both time and location information embedded in the digital file. A landowner or PD could simply tour the site and take comprehensive photos using a smartphone each year in order to comply with this requirement. Video may also be an option for this type of evidence, although photos may make the verification process simpler.

5.2 Category B: Evidence that must be corroborated

Items in this category are not able to stand alone as evidence of the land use status of the project area for a given year, and must be corroborated by at least one additional piece of evidence. Verifiers will apply professional judgment to determine whether they can conclude with reasonable assurance that the project area was in grassland cover during the period of time in question.

5.2.1 Satellite Data

Satellite images of the project area can be obtained using various kinds of satellite data products, including:

- **Cropland Data Layer:** http://nassgeodata.gmu.edu/CropScape/
- **National Land Cover Database:** http://www.mrlc.gov/index.php
- **MODIS Enhanced Vegetative Index:** https://lpdaac.usgs.gov/products/modis_products_table/mod13q1

Each website outlines how to use that particular tool, as well as phone numbers to call for further assistance. Project Developers could also speak to their local extension officer, NRCS officer, or similar advisors for further guidance. It is worthwhile to discuss each tool with an expert who is familiar with the region and land cover on the project area to ensure that the most relevant dataset and type of data are used. In certain cases, use of these tools may require additional software or expertise, which can increase the cost.

5.2.2 Contracts

Using contracts to prove historic land use requires careful consideration. Some types of contracts, such as those that give the contractual parties rights to force the landholder not to convert away from grasslands, will actually make a project ineligible. Contracts that require grasslands to be kept in place on the project area, but that do not contain specific provisions preventing the landholder from converting away from grasslands, may be useful.

Some examples of contracts that could convince a verifier of historic land use include:

- **Grazing leases:** Covering the particular fields and years included in the contract
- **Haying contracts:** The verifier may need additional information regarding volumes of hay and which land was used to supply such volumes

Some examples of contracts which might not meet the Legal Requirement Test include:

- A pre-existing conservation easement
- A contract with NRCS to keep an area in grasslands (these are likely to have provisions preventing conversion from grasslands to another land use)

Contact Reserve staff if you are not sure about a particular contract.

5.2.3 Other Options

In addition to the items listed above, there may be other practical ways of demonstrating that land was being used as grassland for the relevant years.

Such options might include:

- ***Tax records indicating the land use during the relevant years:*** the more detailed the records are regarding which fields or parts of the land in question were in that particular land use, the easier it will be to satisfy verifiers.
- ***Notarized affidavit(s) from third parties:*** this option should be commonly available to most landowners. Parties who are unrelated to the landowner and not affiliated with the offset project, but who would reasonably be believed to have direct knowledge of the project area, can attest to the land use in relevant years.

- o Specific examples are a neighbor, lessee, extension officer, agronomist, or an NRCS staff member
- o The more specific they are regarding which fields were in grasslands, the more satisfied the verifier will be that the particular fields were in grasslands

▪ ***Notarized affidavit from the grassland owner(s):*** attesting to the land use in the relevant year(s).

▪ ***Other specific records submitted to or generated by a government agency:*** records that demonstrate the land use or management during the relevant year(s).

▪ ***Other records*****:** if there are other records that might help a verifier confirm land use, then include those. Useful records may include invoices for the purchase of grass seed, hire of equipment /contractors for haying, time- and date-stamped drone footage, property insurance policies specifying the land use, etc.

Ultimately, the Reserve will be relying heavily on the project verifier to assess the appropriateness of evidence provided to prove historic grassland land use for the project area. The list of Category A documents are the only documents the Reserve would accept by themselves. The list of Category B documents however, is only meant to provide examples of what the verifier may want to see. Any alternatives used that are not listed as Category A documents will be considered Category B documents. It may be worth contacting the project verifier and/or the Reserve to discuss the specific project circumstances.

5.3 Example Land Use History

An example project has a start date of January 1, 2016 and is attempting to document 30 years of grassland cover on the project area. The following approach might be acceptable to a verifier.

<table>
<tr><td>2015</td><td>Site visit</td><td></td><td rowspan="10">Grazing leases</td><td rowspan="30">Signed affidavit from the landowner</td><td></td></tr>
<tr><td>2014</td><td></td><td rowspan="7">Annual Cropland Data Layer</td><td></td></tr>
<tr><td>2013</td><td></td><td></td></tr>
<tr><td>2012</td><td></td><td></td></tr>
<tr><td>2011</td><td></td><td></td></tr>
<tr><td>2010</td><td></td><td></td></tr>
<tr><td>2009</td><td></td><td></td></tr>
<tr><td>2008</td><td></td><td></td></tr>
<tr><td>2007</td><td></td><td>MODIS</td><td></td></tr>
<tr><td>2006</td><td></td><td>NLCD</td><td></td></tr>
<tr><td>2005</td><td>County aerial photography</td><td>MODIS</td><td></td><td></td></tr>
<tr><td>2004</td><td></td><td>MODIS</td><td></td><td></td></tr>
<tr><td>2003</td><td></td><td>MODIS</td><td></td><td></td></tr>
<tr><td>2002</td><td></td><td>MODIS</td><td></td><td></td></tr>
<tr><td>2001</td><td></td><td>NLCD</td><td></td><td></td></tr>
<tr><td>2000</td><td>County aerial photography</td><td></td><td></td><td rowspan="15">Tax records related to grazing activity</td></tr>
<tr><td>1999</td><td></td><td></td><td></td></tr>
<tr><td>1998</td><td></td><td></td><td></td></tr>
<tr><td>1997</td><td></td><td></td><td></td></tr>
<tr><td>1996</td><td></td><td></td><td></td></tr>
<tr><td>1995</td><td>County aerial photography</td><td></td><td></td></tr>
<tr><td>1994</td><td></td><td></td><td></td></tr>
<tr><td>1993</td><td></td><td></td><td></td></tr>
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<tr><td>1988</td><td></td><td></td><td></td></tr>
<tr><td>1987</td><td></td><td></td><td></td></tr>
<tr><td>1986</td><td></td><td></td><td></td></tr>
</table>

6 Ongoing Monitoring

There is a limited amount of monitoring and recordkeeping that must occur on a continuous basis in order to provide the necessary evidence at the time of verification. This data collection is necessary to be able to quantify the project emissions.

6.1 Grazing

Livestock grazing leads to GHG emissions from three different sources:

1. Methane (CH_4) from enteric fermentation (belching)
2. CH_4 and nitrous oxide (N_2O) from manure decomposition
3. CO_2 from vehicles and electricity used for livestock management

This section is only concerned with the first two items in this list, which relate to the direct emissions from the animals themselves. Use of fossil fuels and electricity is discussed below, in Section 6.3. In order to account for the emissions from livestock grazing, the Project Developer needs to be able to document the following parameters during the reporting period:

- Type of livestock grazed (categorized according to Appendix C of the GPP)
- Grazing days for each livestock category (“animal grazing days,” or AGD)
- Average ambient temperature during the entire grazing season

Temperature data may be recorded onsite, but more than likely it will be accessed from publicly-available data sources, such as those described in the following table:

Data Source	Link	Notes
Weather Underground	www.wunderground.com	Users can input a specific zip code, then select the History view and define a custom date range over which weather data can be assessed.
NOAA Climate Data Online	http://www.ncdc.noaa.gov/cdo-web/	Slightly less user-friendly than Weather Underground, but offering official government data. From the homepage there are several options for searching for past weather data.

Documenting the animal categories and grazing days will require additional effort, but there are several approaches that a PD could take. Options for livestock monitoring are discussed in the following subsections. Users should also reach out to local and industry experts for additional guidance and advice on low-cost methods for monitoring grazing activity.

It is important to keep in mind that livestock emissions represent project emissions, and thus they reduce the total number of CRTs which will be issued, which means that overestimation is conservative. It is also not relevant to note where the animals are grazing within the project area, only that they were grazing on the project area. In other words, livestock grazing emissions are not location-dependent.

6.1.1 Paper Documentation

Some ranchers may keep paper records of herd movements during the grazing season. This could take the form of daily or weekly logs kept on a clipboard or in a notebook, including such information as the date, the number of animals, and the animal category(s). For example, if a rancher kept a log every time he moved his herd and kept track of the animal categories and an estimate of the number of animals in each category, as well as the date, it will be possible for the PD to determine the total AGD for each category.

6.1.2 Digital Documentation

Some ranchers may choose to employ digital means for herd tracking. These can range from basic to advanced, depending on the needs and capabilities of the rancher. Regardless, the same basic information is needed: dates, animal categories, and herd sizes. Some examples of digital methods of herd management:

- **Digital photographs or videos**: As discussed in Section 5.1.2 of this Handbook, when a photograph is taken by a camera on a smartphone it is tagged with additional "metadata" which identify the date and location of the photo. In this manner a rancher could use smartphone photos to document their herd each time it is moved or collected into an area where it could fit into a single photograph. Such photographs (or videos) may also be easily collected through the use of drone-mounted cameras, which have become affordable and widely available in recent years. These photos could be provided to the PD to identify the animal categories and count the animals in the pasture. Depending on the frequency and consistency of these photos, it may be necessary for the PD to apply a conservative factor to avoid underestimation of the herd size. The downside to photographs is the additional effort required to inventory the herd and calculate the Animal Grazing Days (AGD, the number of animals times the number of days those animals were grazed).

- **Spreadsheet**: Similar to the paper logs discussed above, a rancher could employ a digital grazing log in the form of a spreadsheet. This sheet could be stored locally or in the cloud, and accessed by several types of devices, such as a laptop, tablet, or smartphone. For example, if the rancher maintains a grazing log using a shared, cloud-based spreadsheet, such as Microsoft Office 365 or Google Sheets, the PD will be able to access the herd data in real-time during the reporting period and contact the rancher if they have any questions or concerns. This method will reduce the amount of effort needed to calculate AGD as compared to photographs and paper logs.

- **PastureMap**: This software service is available as an app for iOS (iPhones and iPads) which allows the user to define pastures and paddocks over satellite photos and control many aspects of their grazing management. The data generated by the software can be exported into an Excel spreadsheet for use by the PD. More information is available at http://www.summertechnologies.com/.

- **RFID Tags**: RFID stands for radio frequency identification, and refers to tiny radio transmitters which can be embedded in all manner of devices. For example, large distribution centers use RFID tags to track pallets of goods inside the warehouse. Livestock may be fitted with RFID ear tags which can be read either with permanent antennae installed in the pasture, or with portable receivers which can be mounted to a truck or ATV and driven through the pasture. This allows for more accurate herd inventories as compared to manually-entered data.[9] There are efforts to develop ear tags which can be tracked by satellite (using GPS rather than RFID) to reduce effort needed for data collection. This option may be viable in the near future.

[9] An example of the use of this technology is presented by Rangelands Natural Resource Management of Western Australia: http://www.rangelandswa.com.au/962/ear-tags-track-cattle-in-real-time (accessed 2/2/16).

6.1.3 Conservative Estimation Methods

For certain projects and certain ranchers, none of the above methods will be feasible and there will be no good way to directly document the actual grazing activities on the project area during the reporting period. When such primary evidence is not available, it will be necessary to develop secondary evidence in the form of a conservative estimation method for the inputs to the project emission quantification. To be clear, *the quantification method may not be changed*, but the choice of method of *determining the inputs* to the quantification is flexible. In any case, the inputs to the quantification will be assessed and approved by the project verifier.

Below are some examples of data sources which could be used to estimate grazing data for a project. If a PD decides that they must estimate grazing data, they should employ as many of these (or other) sources as possible, in parallel, in order to build a stronger case for the validity of the estimated values. Users should bear in mind that as the estimation method becomes increasingly removed from the actual activities on the project area, the potential for error is increased, and the final estimate should target the upper bound of this potential error to ensure that the estimate is conservative.

- **Limited grazing data**: If the rancher employs some form of monitoring of grazing activities, whether digital or hard copy, this should always be included in the development of an estimate. If the available data are not sufficient to complete the quantification, additional forms of evidence will be needed to support the estimate of AGD. This would also apply in situations where the rancher may have grazing data from a previous year, but not relevant to the current reporting period.

- **Grazing management plan**: If the rancher has developed a detailed grazing management plan, it may be possible to derive an estimate of AGD from the maximum allowable grazing intensity in the management plan. If there is ongoing monitoring associated with this plan, such as periodic visits from an NRCS field agent or the easement holder, documentation from these activities may help support the estimate based on the management plan.

- **Conservation easement**: Similar to the grazing management plan, the conservation easement which covers the project area may contain limits on grazing activities which are specific enough to derive an estimate of AGD. Again, the upper bounds of these limits would be used to ensure that the estimate of AGD is conservative.

- **Financial records**: Although the rancher may not have data on AGD for the project area, they may have financial records showing incoming and outgoing animals in their herd. It may be possible to at least estimate the rancher's animal population using these financial records. The rancher should also have financial records indicating whether there are other acres where the herd is grazed.

- **Local experts**: Local academics, extension agents, and other experts should be able to provide guidance on the typical animal categories which are grazed in the area of the project, typical forage production, and typical stocking rates for rangelands in those areas.

- **Government or academic guidance**: Government agencies, especially under the USDA, make available recommended methods for determining stocking rates for different areas of the country as well as methods for estimating forage production in different landscapes. These resources are also often published by universities.

- **Relevant literature**: Scientific literature is available which has tested methods for estimating stocking rates. It may be useful to locate literature which has studied the specific landscape and animal category which is relevant to the project area. This would help support the estimation of AGD using a stocking rate calculation.

- **Conservativeness factor**: When employing one or more of the methods in this list, it may be necessary to include a conservativeness factor to increase the estimate of AGD and account for potential variability and uncertainty. Grazing practices can vary from year to year, as well as between different ranchers. The inclusion of a conservativeness factor, such as an extra 20% over the estimated AGD, can help to ensure that the AGD are not underestimated.

- **Calculation of available forage:** The WSS may be used to determine the available forage per acre on the project area ("Range Productivity," averaged for the different soil map units). This estimate could then be paired with data on forage consumption for the specific animal category to determine a sustainable grazing rate for the project area. This estimate could be adjusted up or down depending on other, local information.

6.2 Fertilizer Use

The Project Developer will need to account for emissions associated with fertilizer use on project land for each year of the project. A project may employ organic fertilizer use (e.g. manure, compost, etc.), but may not employ synthetic fertilizer additions (GPP Section 2.2).

In order to account for these emissions, the Project Developer will need to know:

- Total number of types of organic fertilizer applied (other than manure from livestock grazing on the project lands)
- Quantity of each type of fertilizer used
- Nitrogen content of each type of fertilizer used

The types of evidence that might be useful for demonstrating the above three criteria to the verifier will depend on the fertilizer. Fertilizer products sourced from a third party could be evidenced by contracts, delivery receipts, affidavits from the supplier, etc. The more commercial the product, the more likely the product has undergone some sort of analysis by the producer, and the more likely the volume of product delivered to the project is recorded. Information on the nitrogen content of commercial organic fertilizers may be provided on the product packaging, or may be obtained from the manufacturer (e.g. in an affidavit, documentation of previous lab testing, etc.). Similarly, if there is not already documentation in place to record volumes of fertilizer used, then a sworn affidavit from the supplier, noting volumes/dates supplied may be useful.

If the landowner uses fertilizer they have developed themselves, they will need to find an independent source of information on nitrogen levels that can be reasonably expected from such material. Information provided by university extension officers or published research papers might provide typical values for the type of product developed. For instance, if the farmer has composted some drought spoiled hay, or corn crop residues, then they may be able to find independent documentation providing typical N values for composting such feedstocks. For fertilizers such as compost, the feedstocks going into the compost influences N levels in the final product, so documentation showing the type and volume of feedstocks may be useful.

If the landowner is unable to find any such documentation, they should contact the verifier and/or the Reserve to discuss their situation.

Once suitable values for any organic fertilizer inputs in the project year have been obtained, they must be entered into Equation 5.11 and used to quantify project fertilizer emissions. Further guidance on quantification is provided in Section 7 of this Handbook.

6.3 Fuels & Electricity

Project Developers must account for fuel and electricity related CO_2 emissions in both the baseline and project scenarios. Project Developers should monitor the ongoing electricity and fuels used by the project, in order to meet this requirement. Typically these can be demonstrated to verifiers using electricity billing/metering records, and records of fuel deliveries, onsite fuel stocks, vehicle inventory and usage patterns, mileage logbooks, etc. For fuel usage, the protocol does not require exact volumes to be demonstrated, but rather that the PD estimate relevant usage and associated emissions. Therefore, the PD must provide the verifier with sufficient evidence that the estimates they have provided for fuel usage are reasonable. For electricity usage, again the protocol does not require exact data, but verifiers may require more accurate information given that electricity usage is recorded and documented accurately in most situations.

6.4 Fires

Any fires that occur on project areas within a project year must be documented. Documentation must be provided to demonstrate the exact areas that are burned. This might include photographs or satellite imagery. Once the volume of area that is impacted is known, the protocol provides default factors which allow for the calculation of impacts on above ground grass and shrub biomass. Further guidance on calculating shrub biomass is in Section 9 of this Handbook.

6.5 Reversals

All carbon projects that sequester carbon into shrub biomass or into soils must ensure that the carbon stays ‘permanently’ in place for at least 100 years (see Section 3 of this Handbook for guidance on the types of legal agreements that must be put in place to ensure permanence). When stored carbon is released before the end of the 100-year permanence period after a carbon credit is issued, the release is called a ‘reversal’. This may occur, for example, if the land is tilled, or if shrubs that were accounted for previously in the project are removed. Thus, a reversal may occur over the whole project area or only part of it. This protocol distinguishes between two categories of reversals, avoidable and unavoidable reversals, and specifies separate remedies for each.

Avoidable reversals: When project proponents could have put measures in place to make sure reversals did not happen, such reversals are generally considered avoidable. Examples of avoidable reversals include:

- The Project Developer voluntarily terminating all or part of the project prior to the end of the 100 year permanence period. The reversal would only occur on parts of the project that are terminated
- The Project Developer violating certain terms of the PIA:
  - For instance, by ceasing to fulfill ongoing monitoring and verification requirements (see Sections 2.3 and 6 of this Handbook for further guidance on verification requirements and ongoing monitoring requirements, respectively)
  - When activities are undertaken on the project area that significantly disturb the soil carbon (such as the tiling/shrub removal examples given above, or converting some of the project area to cropping etc.)
- A natural disturbance occurring, but when the resulting reversals could have been avoided except for the negligence or intentional mismanagement of the Project Developer

If the Project Developer discovers that an avoidable reversal has occurred on project land in a project year, they must give written notice of the reversal to the Reserve within 30 days of making the discovery. After the Reserve is notified of an avoidable reversal (or if the Reserve discovers an avoidable reversal by some other means), the Reserve will provide written notice to the Project Developer. Within 30 days of receiving an avoidable reversal notice from the Reserve, the Project Developer must provide a written description and explanation of the reversal to the Reserve, including a map of the specific areas affected. Therefore, it might be easiest for a Project Developer to include this information when they initially advise the Reserve about the discovery of any reversal. The Project Developer must calculate the amount of carbon lost in an avoidable reversal using Equation 5.14 in the GPP. More details on quantification of reversals are provided in Section 7 of this Handbook.

Unavoidable reversals: Situations that the Project Developer could not have avoided through proper management of the project. Examples of unavoidable reversals include catastrophic floods, volcanic eruptions, and other natural disasters, that typically only occur in areas that have already been screened out by the eligibility criteria.

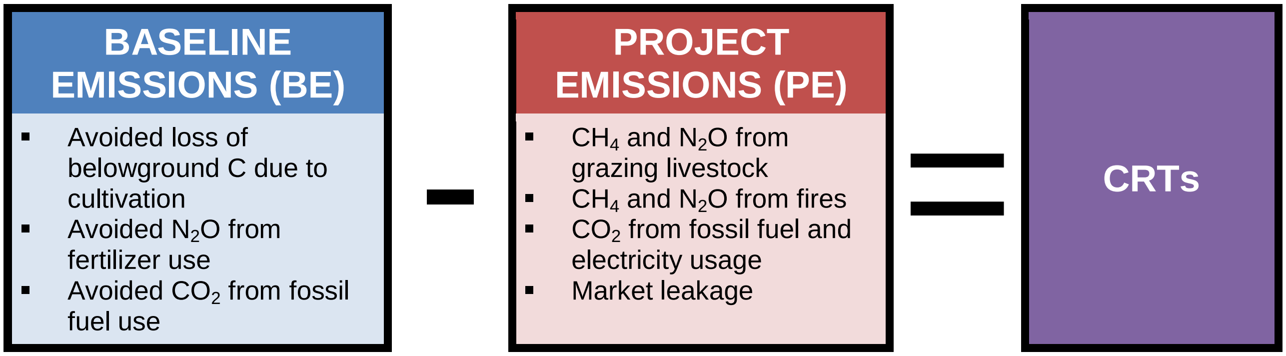
Calculating the amount of carbon lost in a reversal: Project Developers will need to use Equation 5.14 in the GPP and follow the guidance in Section 7 of this Handbook to calculate the amount of carbon lost in a reversal. In order to calculate credits affected by a reversal, the Project Developer will need to know the following:

- Total number of reporting periods for which CRTs have already been issued to the project
- Total number of project reporting periods that have been affected by the reversal
- Total area in acres for all parts of the project for which credits have been issued
- Total area in acres for all parts of the project for which credits have been issued, broken down into each stratum that have been affected by the reversal
- Modeling uncertainty discount factor, provided to the Project Developer by the Reserve

Once a Project Developer has this information, the reversal can be quantified. Areas of the project which have experienced a reversal must then be removed from the project area for all future reporting periods.

7 Quantification

For each reporting period, the Project Developer will quantify the amount of GHG reductions attributable to the project activities. The calculation of emission reductions involves comparing modeled baseline emissions to actual project emissions (GPP Equation 5.1). The diagram below summarizes how the protocol quantifies the difference between the sums.



The quantification methodology applied in the GPP relies heavily on predetermined values for many of the parameters, especially in regards to baseline emissions. Therefore, much of the effort involves determining how to apply the correct parameters, after which point the calculation is fairly straightforward. Section 7.1 discusses use of the project parameters spreadsheet.

Additionally, the Reserve has developed an Excel-based quantification tool (GrassTool) which can be used to conduct the quantification for an individual grassland project with several strata. The tool is available upon request by sending an email to max@climateactionreserve.org.

7.1 Using the Project Parameters Spreadsheet

Quantification of a grassland project (as well as determination of financial additionality) cannot be carried out without use of the project parameters spreadsheet, which is available on the Grassland protocol webpage.[10] This spreadsheet is generally updated annually, so the Reserve recommends checking the web periodically to determine whether a new file is available before the project's first verification. Unless otherwise instructed by the Reserve, the same version of this file will then be used for the entire crediting period. The project parameters spreadsheet contains three tabs: parameters by stratum, parameters by county, and DFσ, which are explained in more detail below.

7.1.1 Parameters by Stratum

The first step to using this worksheet is to determine which specific strata are applicable to the project area. A stratum is a unique combination of MLRA, soil texture, and land use history. For example, a project located in the Rolling Till Prairie MLRA (102A), on sandy soil, which has been in grassland cover for more than 30 years would be in the stratum named "102A_sand_30." **Columns A-D** identify the various components that make up each stratum, and **column E** identifies the stratum resulting from a given combination of those components.

[10] Available at: http://www.climateactionreserve.org/how/protocols/grassland/.

A	B	C	D	E	F
MLRA Symbol	**MLRA Name**	**Soil Texture Group**	**Prior Land Use Category**	**Stratum ID**	**Eligible**
102A	Rolling Till Prairie	sand	30	102A_sand_30	Yes

Column F identifies whether or not that stratum is eligible for crediting. Strata which do not have positive baseline belowground carbon emissions during the first 10 years after conversion are not eligible. If your stratum has a "Yes" in **column F**, then you can include those areas within your project area.

G	H	I	J	K
$BEF_{OC,s}$ Year 1-10 (kg CO_2/ac/yr)	**$BEF_{OC,s}$** Year 11-20 (kg CO_2/ac/yr)	**$BEF_{OC,s}$** Year 21-30 (kg CO_2/ac/yr)	**$BEF_{OC,s}$** Year 31-40 (kg CO_2/ac/yr)	**$BEF_{OC,s}$** Year 41-50 (kg CO_2/ac/yr)
1118.800	927.350	488.200	302.700	188.450

Columns G-K contain the emission factors for baseline emissions from belowground carbon. Each column applies to a specific 10-year period during the project's crediting period. The value in **column G** will be used for years 1-10. Starting with year 11, the project will switch to using the value in **column H**, and so on. For example, in the stratum identified above, the baseline emission factor for belowground organic carbon in year 1 is 1118.8 kg CO_2/ac/yr. In year 11, the value for this stratum changes to 927.35.

L	M	N	O	P
$BEF_{N2O,s}$ Year 1-10 (kg N_2O/ac/yr)	**$BEF_{N2O,s}$** Year 11-20 (kg N_2O/ac/yr)	**$BEF_{N2O,s}$** Year 21-30 (kg N_2O/ac/yr)	**$BEF_{N2O,s}$** Year 31-40 (kg N_2O/ac/yr)	**$BEF_{N2O,s}$** Year 41-50 (kg N_2O/ac/yr)
1.529	1.383	1.026	1.180	1.144

Columns L-P contain the emission factors for baseline N_2O emissions from fertilizer application. These columns are to be applied in exactly the same manner as described in the previous paragraph. So, for our example stratum, the baseline emission factor for N_2O in year 1 (**column L**) is 1.529 kg N_2O/ac/yr.

Column Q contains the emission factors for baseline CO_2 emissions from fossil fuel usage. This value is different for each stratum, but does not change over time. Once the correct stratum is identified, the same value for $BRC_{CO2,s}$ (baseline rate of consumption of diesel fuel due to cultivation activities) will be used in every project year. The value for our example stratum is 5.41 gal/ac/yr.

R	S	T	U	V
DM_s Year 1-10 (kg/ac)	**DM_s** Year 11-20 (kg/ac)	**DM_s** Year 21-30 (kg/ac)	**DM_s** Year 31-40 (kg/ac)	**DM_s** Year 41-50 (kg/ac)
2663.396	2804.566	2672.808	2724.570	2818.683

Finally, **columns R-V** contain the values for the amount of aboveground dry matter in the project area for a given year, which is used to quantify the emissions from fires. These columns are applied just like the baseline carbon and N_2O columns, with a different value for each 10-year period of time. The value for year 1 (**column R**) of the example stratum is 2663.396 kg/ac.

7.1.2 Parameters by County

This worksheet is used to determine three different parameters related to grassland project eligibility and quantification. Users should find the project state and then county to determine which row of values applies to the project. For this section, the example county will be Sonoma County, California.

A	B	C	D	E	F	G	H
State Abbreviation	State Name	County Name	County Code	2015 Cropland Premium	Eligible	DF_{conv}	Leaching?
CA	CALIFORNIA	SONOMA	06097	134%	Yes	0%	Yes

Columns A-B offer two ways to identify the correct state. Using the drop-down arrows in the top row, it is possible to sort or filter the table to include or exclude certain states.

Column C identifies the counties by name. It is important to first identify the state, as there are several states with duplicate county names.

Column D identifies the government code for each county, which is used by the Reserve for data management purposes and can be ignored by users.

Column E identifies the current value for the Cropland Premium for each county. This value will be periodically updated by the Reserve as new county-level rental rate data become available.[11] As described in Section 3.3.1.1 of the GPP, the Cropland Premium must be at least 40% for the project to be eligible, and must be at least 100% to avoid the application of an uncertainty discount. The 2015 Cropland Premium for Sonoma County, CA is 134%.

Column F provides a simple “Yes” or “No” for the eligibility of each county, based on the current cropland premium. Sonoma County is eligible, since the 2015 premium is above 40%.

Column G identifies the value for DF_{conv} (discount factor for the uncertainty of baseline conversion) for each county. This discount applies to counties whose cropland premium is between 40% and 100%, and is determined on a sliding scale from 50% to 0% discount. The value of DV_{conv} for Sonoma County is 0%.

Finally, **column H** identifies whether each county is subject to quantification of project N_2O emissions from leaching, volatilization, and run-off related to application of organic fertilizer or livestock grazing during the reporting period. This factor is related to the specific climate of each county. If the value in **column H** is “Yes,” then projects will use the leaching factor (0.00225) in Equations 5.11 and 5.12). The value for Sonoma County is “Yes.”

7.1.3 DFσ

DF_{σ} is a discount factor related to the uncertainty of modeling future climate and cultivation practices. The GPP does not require projects to carry out expensive site-specific soil sampling and modeling. This modeling has already been carried out during the development of the GPP. The trade-off for this streamlining is the introduction of uncertainty, and this uncertainty grows over time as the modeling exercise moves further into the past. The value of DF_{σ} is

[11] For more information on the frequency of updates to this table, please see the Clarification to the GPP V1.0 released on 2/1/2016, available at: http://www.climateactionreserve.org/how/protocols/grassland/.

predetermined for each calendar year, identified by the beginning date of each reporting period, and increases every 5 years. For all project reporting periods which begin in 2016, the value of DF_σ will be 1%. This table will be updated if and when the Reserve carries out new modeling of baseline emission factors.

Year of the Beginning Date of the Reporting Period	Discount Factor (DF_σ)
2016	1%
2017	1%
2018	1%
2019	1%
2020	2%

7.2 GrassTool

The Reserve has developed an Excel-based tool for the quantification of grassland projects. As of this writing, the tool is designed to be used for individual projects, not project cooperatives. However, quantification of a cooperative still requires quantification of each individual project. The GrassTool is updated periodically, and each version will be identified with a version number and letter. The number refers to the version of the GPP for which the tool is designed, and the letter identifies the revision iteration of that tool. For example "GrassTool v1.0d" would be the fourth revision of the tool for use with GPP V1.0. The current version of the tool can be obtained by sending an email request to max@climateactionreserve.org. Notices will be sent via email whenever a new version of the tool is released. The most current version of the tool should always be used (for the relevant protocol version).

Note: As of this writing, the GrassTool does not support the quantification of woody biomass.

7.2.1 Description of Worksheets

There are 13 different worksheets ("tabs") in the GrassTool:

Category	Worksheet Names	Descriptions
Instructions (orange)	Instructions	Basic instructions for using the tool and understanding the color coding, as well as a change log identification the changes between each revision of the tool.
User Tabs (blue)	Inputs	This is where the user will enter the general information about the project, identify the strata, and enter the data required for quantification. Default values are automatically populated as project information is entered.
	Calculations	The calculations worksheet is entirely automatic and is there to show the user the detailed calculation steps and results. This can be very useful for auditing the calculation and assessing any errors.
	Report	This worksheet is formatted for printing and contains a summary of basic project information and the calculation results.
Emission Factors and Lookups (purple)	EF Summary	A summary of the default emission factors for each stratum in the project for that year.
	Constants	Various constant values that are referenced for certain calculations.
	MLRAs	The lists of components for identifying each stratum.
	Counties	The parameters by county from the project parameters spreadsheet.

Category	Worksheet Names	Descriptions
	Baseline EFs	The parameters by stratum for baseline emissions from the project parameters spreadsheet.
	Project EFs	The parameters by stratum for aboveground dry matter from the project parameters spreadsheet.
	Grazing	Default values related to livestock grazing emissions, reproduced from the GPP Appendix C.
	eGRID	The most recent US eGRID emission factors for electricity.
	DFσ	Annual values for the discount factor for the uncertainty of modeling future climate and cultivation practices.

7.2.2 Entering Project Data

The “Inputs” worksheet is the only worksheet in the GrassTool where the user has to enter any information. This worksheet is divided into seven sections, with user inputs required in the first six of those. Light blue shading is used to indicate where user inputs are required. Cells with other shading contain formulas or constants and do not require user input.

GENERAL INFORMATION	Notes
Reserve project ID (CAR####)	The project ID will be generated when the project is setup in the Reserve’s online registry system. If this step has not been completed, there will not be a project ID to enter here.
Project name	This should match exactly the project name used in the Reserve’s online registry system.
Project Developer	This should match exactly the name of the account holder in the Reserve’s online registry system.
Project start date	See Section 2.2.3 of this Handbook.
Reporting period begin date	The date of the first day of the current reporting period.
Reporting period end date	The date of the last day of the current reporting period.
Reporting days	NO INPUT REQUIRED. This is automatically calculated based on the two dates entered above.
Emission factor group	NO INPUT REQUIRED. This is automatically populated based on the start date of the reporting period and its relationship to the project start date.
Project Implementation Agreement type	Drop-down menu. There are two options for the PIA, either a Contract PIA or a Recorded PIA (see Section 3.3 of this Handbook). This choice affects the project’s contribution to the shared risk buffer pool.
If Recorded PIA, choose Subordination Clause	Drop-down menu. There are two options for the subordination clause in the PIA, with different implications for the project’s contribution to the shared risk buffer pool.
Has a site visit occurred (for this verification or any prior)?	Drop-down menu, yes or no. The use of a site visit affects the project’s contribution to the shared risk buffer pool.
Financial threshold option	Drop-down menu. Select whether the project will follow the default table for county-specific determination of financial additionality, or will obtain a site-specific appraisal according to GPP Section 3.3.1.1.
Cropland Premium as Determined by Appraisal (optional) (%)	If the appraisal option is selected in the cell above, the appraisal result is entered here to determine eligibility.

GENERAL INFORMATION	Notes
Does the project site pass the Suitability Threshold?	Drop-down menu, yes or no. To answer this question the user must determine the Land Capability Classification for the project area and confirm that the entire area passes the Suitability Threshold as described in GPP Section 3.3.1.2.
Does the project site pass the entire Performance Standard Test?	NO INPUT REQUIRED. This cell indicates whether the project meets the suitability threshold and all strata are eligible. If the cell displays "Fail" after all information has been entered, then some aspect of the project fails the test.
[DFσ] Discount factor for the uncertainty of modeling future management practices and climatic conditions (%)	NO INPUT REQUIRED. This discount factor is automatically populated based on the year of the reporting period.

In this first section of the tool there is also additional space to enter information related to participation in a cooperative, if relevant, as well as general notes about the quantification. The next sections contain cells for the inputs relevant to the baseline and project emissions. From this point forward there are five separate columns allowing the user to input values for parameters which are relevant to the entire project (column C) as well as different values for up to four different strata (columns E, G, I, and K).

BASELINE EMISSIONS	Notes
State	Drop-down menu. Select the state where the project is located.
County	Drop-down menu. After selecting the state, select the county in which the project is located. Since the entire project must be covered by a single conservation easement, a project will not contain areas in more than one county.
ZIP Code	Enter the zip code for the project (determines the electricity emission factor).
County Code	NO INPUT REQUIRED. This is automatically populated based on the county selection and is used for formula references.
MLRA	Drop-down menu. Select the MLRA for the stratum. Refer to the MLRA maps to determine the correct value here.
Soil Texture Category	Drop-down menu. Select the relevant soil texture for the stratum.
Prior Land Use Category	Drop-down menu. Select the category for which prior land use can be documented (10-30 years or 30+ years).
Stratum Short Name	NO INPUT REQUIRED. This is automatically populated with the stratum name based on the other inputs above.
Maximum Crediting Period Length	NO INPUT REQUIRED. The maximum crediting period for each stratum will be identified based on the emission factor table.
Financial eligibility	NO INPUT REQUIRED. This field is populated based on the county selected above.
[DF_{conv}] Discount factor for the uncertainty of baseline conversion (%)	NO INPUT REQUIRED. This field is populated based on the county selected above.
[$Area_{p,s}$] Area of project in stratum *s*	Enter the number of acres identified for each stratum.

The next section contains the inputs for project emission sources, including fires, fossil fuels, fertilizer, and livestock. The fertilizer section is used for any organic fertilizer applied during the reporting period. The section is divided into three subsections, for compost, manure (from off-site livestock), and other sources. For each type of fertilizer the user must enter the kg of fertilizer applied and the nitrogen content of the fertilizer in kg N/kg fertilizer. If a fertilizer is used other than compost or manure, please enter a description of the other fertilizer in the available field.

Following the fertilizer section is the section for inputs related to livestock grazing on the project area during the reporting period. The first row of this section asks for the average ambient temperature at the site during the grazing season, in degrees Fahrenheit. The following rows allow the user to select up to five different categories of livestock, and enter the animal grazing days (AGD, calculated according to GPP Box 5.3) for each.

PROJECT EMISSIONS	Notes
[$Area_{burn}$] Area which was burned during the reporting period (acres)	Enter the number of acres in each stratum which were burned during the current reporting period.
[FF_{diesel}] Gallons of diesel fuel consumed during the reporting period (gallons)	Enter the gallons of diesel fuel consumed on the project area during the reporting period.
[$FF_{gasoline}$] Gallons of gasoline consumed during the reporting period (gallons)	Enter the gallons of gasoline consumed on the project area during the reporting period.
[$FF_{natural\ gas}$] Gallons of natural gas consumed during the reporting period (gallons)	Enter the gallons of natural gas consumed on the project area during the reporting period.
[$EL_{p,rp}$] Quantity of electricity consumed during the reporting period (MWh)	Enter the MWh of electricity consumed on the project area during the reporting period.
[QF_{PR}] Quantity of fertilizer applied during the reporting period (kg)	For each category (compost, manure, and other) there is a cell to enter the amount of fertilizer which was applied to the project area during the reporting period (in kg).
[NC] % nitrogen content of fertilizer (kg N/kg)	For each category (compost, manure, and other) there is a cell to enter the nitrogen content of fertilizer which was applied to the project area during the reporting period (as a percentage based on mass).
OTHER (please describe)	If fertilizer other than compost or manure is used, there is a cell to enter a name/description for that type of fertilizer.
Average ambient temperature during the grazing season (rounded to the nearest °F value in Table C.2)	This is a drop-down menu to select the nearest temperature value.
[1] Category 1 of livestock grazed	The tool allows for the entry of five different categories of animals using drop-down menus. Select the category that best describes the animals grazed on the project area.
[AGD_1] Animal Grazing Days for livestock category 1	The total AGD for each animal category.

7.2.3 Estimated Emission Reductions

After the input sections, there is a section titled “estimated emission reductions.” This is purely informational and does not contain outputs which can be used for GHG assertions. However, this can be a useful tool for Project Developers to estimate the annual and total emission reductions over the project’s lifetime. This section makes the simplifying assumption that the future project emissions will always be the same as the current reporting period.

7.2.4 Calculations

The Calculations tab does not contain any user inputs. This tab displays the calculations following the GPP quantification guidance, using the inputs from the Inputs tab. After entering all of the project data, it is important to take time to go through this tab in detail to ensure that every result makes sense, and that there are no errors in the tool. The verifier will also review this tab in detail.

7.2.5 Report

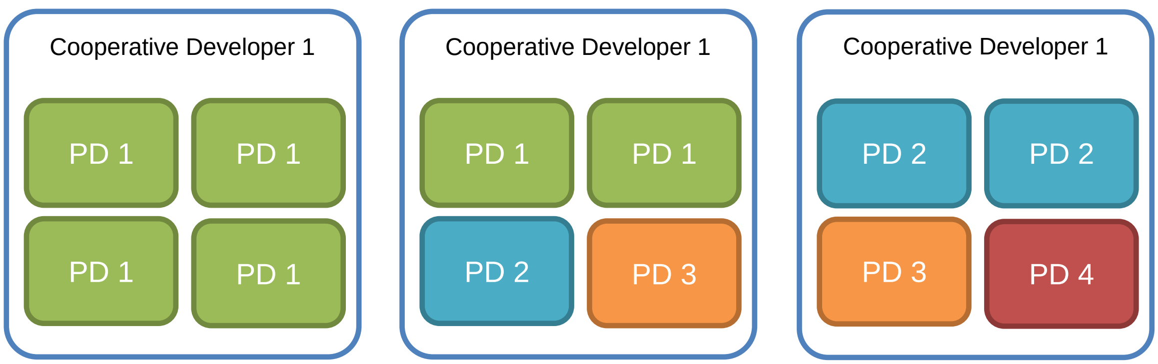
The Report tab contains a pre-formatted one-page summary report for the calculation. After all data have been input and the Calculations tab has been checked for completeness and accuracy, it is recommended that the Report tab be saved as a PDF in order to generate a fixed record of the results of the GrassTool calculations for the project.

8 Cooperatives

Project Developers can choose to enroll grassland projects into a “cooperative,” which is a collection of two or more individual grassland projects managed by a common entity (GPP Section 2.2.2). Cooperatives can reduce the administrative burden faced by individual grassland projects, as projects within a cooperative undergo joint monitoring, reporting, and verification activities. Project Developers who wish to minimize their interaction with the Reserve system and are willing to relinquish project management duties are strongly encouraged to join a cooperative.

8.1 Ownership

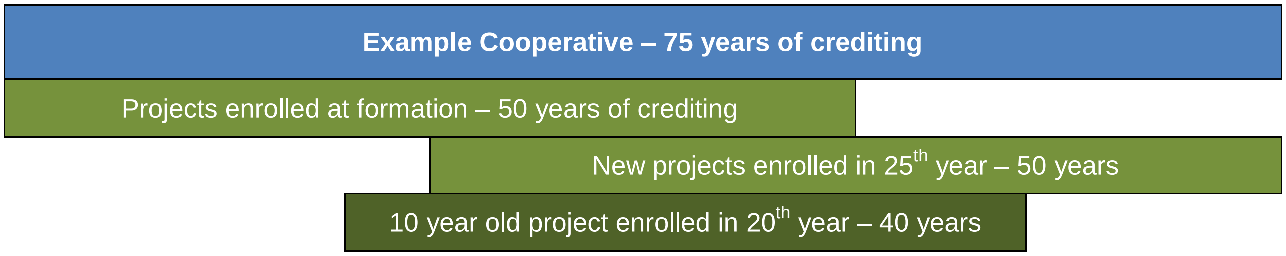
Each cooperative is managed by a “Cooperative Developer” (GPP Section 2.3.3), but this role does not necessarily impact the project ownership structures detailed in Section 3 of this Handbook. The Cooperative Developer may act as the Project Developer for all grassland projects within the cooperative, a portion of the projects, or none of the projects, i.e. have no GHG ownership claims to any of the projects within the cooperative. The diagram below illustrates various ownership structures which may occur within a cooperative (each smaller box represents a single project):



8.2 Formation

After opening a Reserve user account, the Cooperative Developer can form a cooperative in the Reserve system. The individual projects within the cooperative are created by Project Developers (see Handbook Section 2.2), but the Cooperative Developer must submit the information related to those projects in the Cooperative Submittal Form. New or pre-existing projects can be added to a cooperative after the cooperative has been formed, and projects can leave a cooperative at any time, provided the continuous reporting requirements are met. All of the projects within a cooperative must report under the same version of the protocol, and projects can choose to update to the latest version of the protocol in any reporting period.

Cooperatives are not bound to a specific crediting period; rather, the length of time a cooperative can report emission reductions corresponds to the crediting periods of the individual projects within the cooperative. When a new project enters an existing cooperative, that cooperative can continue to operate for the duration of that project’s remaining crediting period.



Details on the required enrollment and transfer forms are provided in the User Guide for Grassland Protocol Forms that is posted on the Reserve website: climateactionreserve.org/how/program/documents/.

8.3 Monitoring, Reporting, & Verification

Project Developers are not responsible for monitoring, reporting, or coordinating verification services of projects that are enrolled in a cooperative. The Cooperative Developer is tasked with fulfilling those requirements after the appropriate contracts with the Project Developer(s) have been secured (GPP Section 2.3.3).

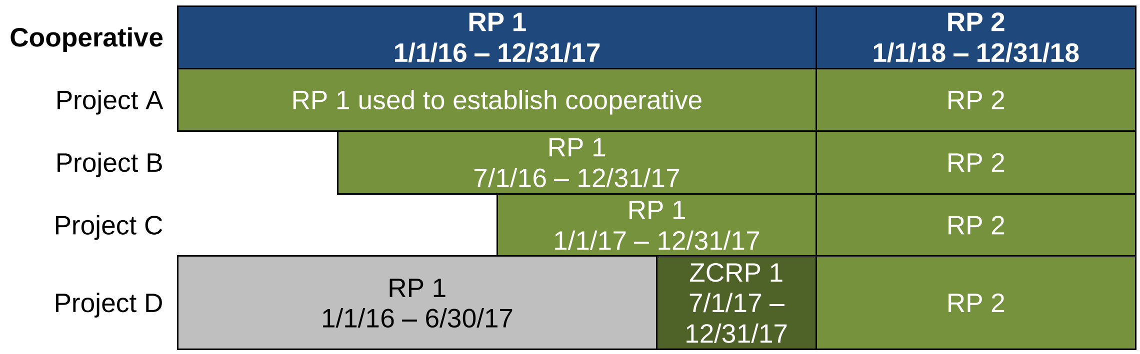
It is recommended that the Cooperative Developer draft and update a single monitoring plan that contains information on every project within the cooperative, since having all of the data in one place can reduce the costs and timeframe of a verification (see Table 6.1 in the GPP for a list of required monitoring parameters). However, if the Cooperative Developer chooses to aggregate monitoring data in this fashion, it must be demarcated such that the verifier can easily identify information pertaining to individual projects. This can be accomplished through the use of separate tabs, rows, etc. for each project.

GHG reductions must be quantified separately for each project (Section 7 of this Handbook), but the Cooperative Developer has the ability to consolidate the reported reductions of the entire cooperative much like the monitoring data. The required documentation must be uploaded to the Cooperative Developer's account in the Reserve system, and certain documents such as proof of ownership and maps must be submitted for each individual project within the cooperative (GPP Table 7.2). Cooperative Developers are allowed to consolidate project-specific documentation into a single file or zipped folder before uploading to the system. For example, the Attestations of Title for every project can be combined into a single PDF and uploaded once per cooperative reporting period.

8.3.1 Cooperative Verification Cycle

Cooperatives have the same verification scheduling options as individual projects: the initial verification period is limited to one reporting period up to 24 months in length and subsequent verification periods can cover one to six 12-month reporting periods (GPP Section 7.4).

Since projects within a cooperative will likely have different start dates, the initial project reporting periods will be different lengths in order to line up with the cooperative's reporting and verification schedule. In the example below, the cooperative is formed with Projects A, B, and C, all of which have different start dates. Project D reported as a standalone project before enrolling, so a zero-credit reporting period (ZCRP) was taken in order to align the verification periods.



8.4 CRT Issuance

In many cases, the Cooperative Developer will not have ownership rights to all of the projects within the cooperative. Therefore, the Reserve system issues CRTs to each Project Developer account based on the reductions generated per project rather than issuing the sum to the Cooperative Developer. This approach is designed to reduce transfer activities, simplify contracts, and minimize ownership disputes.

9 Glossary of Terms

Accredited verifier	A verification firm or individual 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_2 emissions	CO_2 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_2)	The most common of the six primary greenhouse gases, consisting of a single carbon atom and two oxygen atoms.
Climate Action Reserve	Two meanings: 1) The nonprofit organization which has developed the Grassland Project Protocol and operates a GHG offset program, and 2) the online registry platform through which projects are managed and credits are registered and tracked.
CO_2 equivalent (CO_2e)	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.
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.
Greenhouse gas (GHG)	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), 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_2.
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 2204.6 pounds or 1.1 short tons.
Methane (CH_4)	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 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 owns the rights to the GHG emission reductions and undertakes a GHG project, as identified in Section 2.3.2 of the GPP.
Registry system	See the second definition for “Climate Action Reserve,” above.
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.

Appendix A. Monitoring Plan Template

CLIMATE ACTION RESERVE

Grassland Monitoring Plan

THIS SECTION MAY BE DELETED WHEN USING THIS TEMPLATE

The Monitoring Plan is created at the beginning of a project, and updated over time as conditions change. This document should summarize the key aspects of the project in relation to the protocol, such as eligibility criteria and monitoring requirements, referencing other documents or evidence, where applicable.

Disclaimer:
The purpose of this template is to assist grassland project developers in organizing their project data around important aspects of the Grassland Project Protocol, and to help facilitate verification. This document is a tool for verification only and should not be considered project guidance. Completing all fields in this document does not guarantee that the project will be successfully verified. This document does not take the place of the relevant protocol and the information contained herein is not designed to be all-inclusive or exhaustive. Project developers should always reference the relevant protocol in order to meet all requirements under the Climate Action Reserve (Reserve) program.

General Project Information

Landowner	
Project Developer	
Technical Consultant	
Project Name and ID	
Cooperative ID (if applicable)	
Cooperative Developer (if applicable)	
Name of individual completing plan	
Protocol Version	
Current Verification Period	
Current Verification Body	
Previous Verification Bodies	
Last Updated	Click here to enter a date.

Calculated Reductions

List all estimates in units of tCO_2e. If the reporting period spans multiple vintages, please list the calculated reductions per vintage.

				Dates	
Vintage:	**Baseline emissions (tCO_2e):**	**Project emissions (tCO_2e):**	**Total emission reductions (tCO_2e):**	**Reporting Period Begin**	**Reporting Period End**
				Click here to enter a date.	Click here to enter a date.
				Click here to enter a date.	Click here to enter a date.
				Click here to enter a date.	Click here to enter a date.
				Click here to enter a date.	Click here to enter a date.

Project Information

1. **Project Description**
   Describe how the project area meets the definition of grassland, per the Reserve protocol.

2. **Project Start Date**
   Describe and justify the project start date, with reference to evidence demonstrating project commencement.

File Path[12]:

3. **Ownership of Reductions**
   Describe how clear and explicit ownership of grassland property is demonstrated. Describe how clear and explicit ownership of GHG emission reductions from the project are demonstrated. What relevant contracts/documents are used to demonstrate ownership?

File Path:

4. **Monitoring Land Use**

   - **Historical Land Use –** *Describe whether the project area was in grassland cover for greater than 30 years, or between 10 and 30 years, prior to the start of the project. What evidence is used to support this assertion?*

[12] You may include a hyperlink to all relevant files pertaining to each section (e.g. C:\My Folders\CAR###\Project Start Date)

Describe supporting evidence for each year of prior land use below:

File Path(s):

- **Current Land Use** – *Describe the evidence used to document that the project area remains in undisturbed grassland for each year following the project start date.*

File Path(s):

5. **Project Monitoring Parameters**

- **Livestock Grazing –** *Describe any livestock grazing which occurs on the project area, referencing any paper or digital documentation concerning the type of livestock, number of grazing days for each type of livestock, and temperature data during the grazing season. If these grazing data are estimated, describe in detail the estimation procedure and sources of information that are used.*

File Path:

- **Fertilizer Use** – *Describe whether organic fertilizer is used on the project area and if documentation is available concerning the type, quantity, and nitrogen content of the fertilizer.*

File Path:

- **Fires –** *Describe whether the project area is impacted by either prescribed or accidental burning, and what evidence exists to document fires (e.g., photographs, satellite imagery, insurance documents, government agency reports)*.

File Path:

- **Fossil Fuel and/or Electricity Consumption –** *Describe whether mobile or stationary equipment are used as part of project activities. How are fuel and electricity consumption documented?*

File Path:

6. **Legal Requirement Test**
Describe how the Project Developer will ascertain and demonstrate that, at the time of the project start date, the project passed all three parts of the Legal Requirement Test (GPP Section 3.3.2).

7. **Regulatory Compliance**
   Describe personnel and processes used to ensure that the project is in material compliance with all applicable regulations. Include a list of all project-related non-compliance events, their duration and whether they are considered material. Please reference relevant documents.

   Example:

Non-compliance event	Duration	Material or immaterial?

File Path:

8. **Record Keeping**
   Briefly describe how project data are recorded and maintained. Where are they stored and for how long? Identify relevant personnel and describe their responsibilities.

File Path:

9. **Operational/Personnel Changes**
   Describe any changes to land ownership, project area, management systems, or personnel that have occurred during the verification period, if applicable.

File Path:

10. **Calculation Method**
    Briefly describe the methods and software used to perform emission reduction calculations. If using the GrassTool, please list the version used.[13]

File Path:

11. **Original Logs**
    Please reference the location and storage procedure for original copies of any other routine operational logs that are maintained and carried out by staff, if not included above.

File Path:

[13] If requested by the Reserve, the Project Developer must supply a copy of the emission reduction calculations for the verification period covered by this report.

12. **Qualifications/Description of Training**
    Provide evidence that any staff performing monitoring and reporting activities was trained and/or is qualified to carry out these tasks.

File Path:

Appendix B. Annual Monitoring Report Template

CLIMATE ACTION RESERVE

Grassland Project Monitoring Report

TO BE DELETED BY THE USER

An annual monitoring report is used to summarize what happened during a reporting period which is not being verified at this time.

This report is required for projects that have selected a greater than annual verification period under the Grassland Project Protocol V1.0 (see Section 7 of the protocol for reporting period and verification cycle information and report submittal requirements). If the project has previously been verified, certain information may not have changed from the previous verification period, but any changes relevant to this reporting period shall be included in this report.

This report is also required for projects that have elected to take a zero-credit reporting period. Please refer to Section 3.4.6 of the Reserve Program Manual for when and how the report shall be submitted.

Date of Report	Click here to enter a date.
Landowner	
Project Developer	
Reserve Project ID	
Project Name	
Reserve Cooperative ID (if applicable)	
Cooperative Developer (if applicable)	
Name of Individual Completing Report	
Protocol Version	
Dates of Current Reporting Period[14]	Click here to enter a date. to Click here to enter a date.
Expected Dates of Current Verification Period[15]	Click here to enter a date. to Click here to enter a date.
Requested Duration of Zero-Credit Reporting Period (if applicable)	Click here to enter a date. to Click here to enter a date.

[14] Under the grassland protocol, there is a 12 month limit for the reporting period. See Section 7.4 of the protocol for more information. Please enter the dates of the 12 month (or fewer) reporting period covered by this report.
[15] The verification period is the period of time over which GHG reductions will be verified.

Project Information

1. **Reason for Zero-Credit Reporting Period (if applicable)**
   Briefly describe the reason(s) that GHG emission reductions are not being claimed for this period.

2. **Record Keeping**
   Briefly describe how project data was recorded and maintained during the period in question.

3. **Operational/Personnel/Ownership Changes**
   Describe any changes to project equipment, management systems, landowners, easement holders, or personnel that occurred during the period in question.

4. **Regulatory Compliance**
   List all instances of legal violations caused by the project or project activities that occurred during the period in question. Note that while the project is not required to meet regulatory compliance requirements as laid out in the protocol during a zero-credit reporting period, disclosure of violations is required.

Dates of Noncompliance	Description	Actions Taken

5. **Monitoring Requirements**
   Did the project meet the monitoring requirements, as laid out in the protocol, for the time period in question? If not, why and what monitoring was conducted in its place? Please describe for each item below.

   Current Land Use:

   Livestock Grazing:

   Fertilizer Use:

   Fires:

   Reversals:

   Fossil Fuel Use / Energy Consumption:

6. **Calculation Method**
Briefly describe the methods and software that were or will be used to perform emission reduction calculations. If using the GrassTool, please specify the version.

Estimated Emissions

List estimates in units of tCO_2e. If the reporting period spans multiple vintages (i.e. calendar years), please list the calculated reductions per vintage. If the emission reductions have yet to be calculated, please put "TBD" (to be determined) in the spaces provided.

Vintage:		
Baseline Emissions (A):		
Project Emissions (B):		
Total Emission Reductions (A-B):		

Monitoring Summary Table

(not required for Zero-Credit Reporting Period monitoring)

Parameter Monitored	Value	Description/Notes
State	Click here to enter text.	Click here to enter text.
County	Click here to enter text.	Click here to enter text.
Cropland Premium	Click here to enter text.	Click here to enter text.
DF_{conv}	Click here to enter text.	Click here to enter text.
DF_{σ}	Click here to enter text.	Click here to enter text.
Stratum 1 (acres)	Click here to enter text.	Click here to enter text.
Stratum 2 (acres)	Click here to enter text.	Click here to enter text.
Stratum 3 (acres)	Click here to enter text.	Click here to enter text.
Stratum 4 (acres)	Click here to enter text.	Click here to enter text.
Emission factor group for the reporting period	Choose an item.	Click here to enter text.
Buffer pool contribution percentage	Click here to enter text.	Click here to enter text.
Types and volumes of fossil fuels used	Click here to enter text.	Click here to enter text.
Quantity of electricity used	Click here to enter text.	Click here to enter text.
Types, quantities, and N contents of organic fertilizers	Click here to enter text.	Click here to enter text.
Livestock categories and AGD for each	Click here to enter text.	Click here to enter text.
Grazing season	Click here to enter text.	Click here to enter text.
Ambient temperature during grazing season	Click here to enter text.	Click here to enter text.

Parameter Monitored	Value	Description/Notes
Area burned by stratum	Click here to enter text.	Click here to enter text.
DM_s for each stratum burned	Click here to enter text.	Click here to enter text.