

Voluntary Carbon Markets Applicable to Grazing Operations

Review and Considerations for Farmers and Ranchers

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(1) Background and Objectives

Why Consider Carbon Markets?

While carbon markets are not new, there has been a recent proliferation of approaches and increasing availability of multiple carbon-based markets and mitigation opportunities that actively engage farmers and ranchers. The increase in available carbon markets has been due to multiple factors, largely driven by growing awareness and concern related to the magnitude of climate change impacts. Moreover, there is a growing acknowledgement that farmers and ranchers have a potential role as a solution to climate change (Toensmeier et al., 2020). Many carbon markets have historically focused on row crop farming practices. Opportunities now exist for farmers and ranchers to receive monetary incentives for the soil carbon captured in beef cattle production systems, including for some that are using different grazing management systems. Grazing lands are estimated to contain 10–30% of the world's soil organic carbon (Schuman et al., 2002) and therefore have a high potential for sequestration.

The purpose of this review is to provide the beef industry a resource to understand voluntary carbon market programs and how producers using grazing management systems or other related conservation practices can access carbon credits. In addition, this document outlines the key factors for farmers or ranchers to consider when choosing to participate in a carbon market and compares available markets applicable to grazing management systems with criteria specific to the beef industry.

Grazing Management Improvement Opportunities

Grazing practices may not be accounted for in all carbon markets available in the marketplace due to limited available science, difficulty assessing arid rangeland, or the complexity and expense of monitoring quantifiable outcomes over time (Buckley Biggs et al., 2021). However, there are multiple ways that grazing operations manage land, vegetation, and water resources that improve carbon sequestration. These management decisions impact climate, water quality, water quantity, and biodiversity. Examples of management schemes include, but are not limited to:

- Prescribed/planned grazing (e.g., rotational grazing)
- Integrated ranch management planning
- Stocking rate optimization
- Beneficial fire management
- Specific range plantings (e.g., grasses, trees, shrubs)
- Brush management
- Forest restoration
- Riparian area management
- Improved wildlife habitats
- Avoiding conversion of grasslands to tillable farming

Farmers and ranchers implementing practices to conserve and capture additional carbon should be rewarded for their positive environmental impact(s). However, the decision to participate in carbon markets is multifaceted and should be carefully explored.

(2) Factors to Consider in Selecting a Carbon Market

General Considerations and Goals

Due to the complexity of carbon markets and the fact that several new markets are rapidly launching, it is essential to carefully compare the details of each market. Of markets that currently exist, there are broadly two main types: voluntary and compliance/regulatory.

Main Types of Carbon Markets:

- Voluntary
- Compliance / regulatory

Voluntary markets allow companies or individuals to purchase carbon credits based solely on voluntary reasons and are often used to demonstrate commitment to environmental stewardship and corporate social responsibility. Several different variables influence voluntary markets and their associated carbon credit price, including location and type of project, additionality, marketing, and others.

Compliance or regulatory markets are used to meet legal requirements related to GHG emissions and are regulated through the government. Participants in compliance or regulatory markets can either reduce emissions to the atmosphere or purchase carbon credits from sellers sequestering carbon. Typically, there are strict project protocols and standards to confirm additionality, permanence, and non-leakage. In general, carbon credit prices are more stable in compliance markets as compared to voluntary markets.

Carbon markets represent a type of program that provides payments for ecosystem services. Other types of incentive programs in the beef supply chain include:

- i. financial incentives for sustainability such as price premiums (e.g., USDA Certified Organic, Certified Grassfed, locally raised markets, etc.); and
- ii. government funding (e.g., Farm Bill programs, tax subsidies, etc.).

These types of programs do not remunerate based on a specific outcome of carbon reduction and are not included in the scope of this report.

Determining the ideal market will depend on the users' purpose and operational goals. The following are some examples of operational goals that may inform participation in a carbon market:

- Additional revenue for the operation;
- Promote a 'footprint' to quantify the impact of practices (e.g., carbon footprint, water footprint);
- Ensuring environmental stewardship and succession of the ranch; and,
- Respond to buyer requests related to sustainability and provide customer information on the impact of grazing management practices.

Buckley Biggs and colleagues (2021) surveyed members participating in Ecosystem Services Market Consortium (ESMC) and determined the main motivating factors for participation were to: (i) meet corporate commitments or be part of a broader business strategy for supply chain resilience, (ii) influence producers to change practices, (iii) collaborate across the industry, and/or (iv) establish more robust scientific protocols.

Criteria for Choosing a Carbon Market

The list below summarizes some of the main questions that should be considered when determining participation in a carbon market program. Emphasis on any specific aspect listed below will depend on the motivation(s) for participating, as outlined above.

General Topic	Criteria
<p>Applicability</p> <p><i>Am I eligible?</i></p>	<ul style="list-style-type: none"> ▪ Does the market apply to grazing operations/systems? ▪ What geographic regions are eligible? ▪ Is there a minimum land size or acreage required for participation? ▪ Does the market apply to rented or leased land? <ul style="list-style-type: none"> • Does the market apply to federal land permit holders?
<p>Credibility</p> <p><i>Is the market credible and stable?</i></p>	<ul style="list-style-type: none"> ▪ Is the market based on scientifically justified and sound methodology? ▪ Is enrollment or monitoring based on outcome measures or specific practices? ▪ What verification is involved? ▪ How stable is the market? How long has the market been available and how many buyers/sellers are already participating?
<p>Data Input and Ownership</p> <p><i>What data is needed and who owns it?</i></p>	<ul style="list-style-type: none"> ▪ What are the ongoing data reporting requirements? ▪ Are tools provided or required to report data? <ul style="list-style-type: none"> • Are integrations with other data systems available to support data entry? ▪ Who owns the data?
<p>Cost to Implement</p> <p><i>How much does it cost?</i></p>	<ul style="list-style-type: none"> ▪ Are there costs to entry? ▪ Does the market recognize conservation efforts made before market entry? ▪ What new practices need to be implemented? What is the time for implementation? ▪ What are the costs for monitoring, verification, and/or reporting?
<p>Contract Details</p> <p><i>What is in the fine print?</i></p>	<ul style="list-style-type: none"> ▪ What are the contract terms and conditions? <ul style="list-style-type: none"> • What is the required length of the contract? • What is the required length of permanence? • Is it transferable? <ul style="list-style-type: none"> ▪ <i>Transferability could include between people/owners as well as between different markets.</i> • What are the requirements for exit? • Is it possible to enroll for other conservation or ecosystem service programs on the same land (i.e., stacking)? • Are there consequences of a reversal/reversion back on practices?
<p>Payment</p> <p><i>What is the payment?</i></p>	<ul style="list-style-type: none"> ▪ What is the payment per metric ton CO₂ equivalent or per acre? ▪ How are the payments disbursed?

Additional Tips When Choosing a Carbon Market

- If it seems too good to be true, it probably is. Carbon markets typically require some degree of outcome-based measurement to show a positive change in the amount of carbon sequestered. This requires additional management, cost, and time. If markets indicate less rigorous protocols to participate, the value of the carbon will likely also be less.
- Just because a change is made in grazing practices does not automatically mean an increase in soil carbon. Some soils may already be saturated due to historical stewardship (Booker et al., 2013). In addition, soil carbon sequestration can vary regionally based on soil moisture (Soussana et al., 2004). Additional research and modeling are also needed to better understand the potential impacts of climate change on carbon sequestration.
- In the case of semi-arid and arid grazing lands, more research is needed to understand soil carbon measuring or other remote monitoring technologies (Buckley Biggs et al., 2021).
- Carbon markets are constantly evolving. Make sure to conduct market research before entering. The stability and demand for carbon markets are still to be determined. As an example, Chicago Climate Exchange (CCX) previously allowed for payment for planting new pastureland. CCX was in place starting in 2003 and ended in 2010¹ and is an example of the importance of being cautious about engaging with carbon markets, especially those that are relatively new.

(3) Carbon Market Comparison

Key Available Markets for Grazing Operations

A precondition for this report was that the carbon market incorporates grazing management practices. While several carbon markets focus on row crop production and many more continue to be developed, those that did not explicitly apply to grazing management at the time of the review were excluded from the comparison. Some examples of markets not incorporated in the comparison include Nori, Indigo Ag, Nutrien, and several others. In addition, carbon markets supported through Native and Bayer, while applicable to grazing management, were not included in this report since they are in the early stages of development and insufficient information was available. These are briefly described below.

Native, a Public Benefit Corporation, catalyzes climate action through channeling upfront investments into new, community-level projects that deliver carbon and biodiversity benefits that could not happen otherwise. Through Native's Northern Great Plains Regenerative Grazing Project, the company and its partner, The Western Sustainability Exchange, work with individual ranch families to develop a contract that suits their needs, including agreements for upfront financing of costs associated with improved grazing practices, such as fencing, water infrastructure, and labor. Native's project is in the early stages of development and thus, not included in this report.

¹ <https://civileats.com/2019/07/11/can-indigo-ags-new-carbon-market-pay-off-for-farmers/>

Similarly, Bayer Vegetation Management is exploring ways to incorporate existing grassland carbon protocol methodologies into their Rangeview™ digital rangeland offering for the purpose of creating an easy-to-use software platform that allows ranchers to gain access to carbon revenue opportunities. Bayer Vegetation Management is focused on driving positive soil carbon outcomes, but also on the quantification of other ecosystem services such as biodiversity enhancement and wildfire suppression. However, at the time of this report, Bayer Vegetation Management's carbon project is still in development and is anticipated to seek pilot ranches in 2022.

Carbon Markets that Incorporate Grazing Management Systems

- Bayer*
- Climate Action Reserve
- Ecosystem Services Market Consortium (ESMC)
- Grassroots Carbon
- Native*
- Regen Network
- Soil and Water Outcomes Fund

**not included in this report as still in early stages of development.*

The carbon markets that incorporate grazing management practices that were reviewed in this report include the following voluntary initiatives:

- **Climate Action Reserve** – A carbon offset registry for North America, encouraging methods to reduce GHG emissions and provide financial benefit for those projects. Its mission is to develop, promote, and support innovative, credible market-based climate change solutions that benefit economies, ecosystems, and society.
- **Ecosystem Services Market Consortium (ESMC)** – A voluntary, national market selling credits for GHG reduction, water quality, and water quantity. It is a subsidiary of the Soil Health Institute with a mission to advance ecosystem service markets that incentivize farmers and ranchers to improve soil health systems that benefit society. ESMC is a non-profit, member-based organization and a combination of public and private companies and organizations.
- **Grassroots Carbon** – Finds carbon storage buyers, arranges soil sampling, and 3rd party certification. It focuses on regenerative agricultural systems (focused on soil carbon) and provides tools to measure and record ranch information.
- **Regen Network** – Uses blockchain technology to track, verify and reward positive changes to ecological systems. It is an open-source ecosystem services registry for which projects can apply for credits, and in turn, transfer and sell them to buyers.
- **Soil & Water Outcomes Fund** – Actively enrolling farmers and landowners in Illinois, Iowa, and Ohio to incentivize farmers that transition to conservation practices that provide positive environmental outcomes like carbon sequestration and water quality improvement.

More details and comparison of each carbon market listed above is provided in the Appendix.

(4) Conclusions

This document outlines key considerations and criteria for stakeholders in the beef industry who may participate or may want to enter current carbon markets. Key criteria are defined and outlined for various carbon markets related to applicability, credibility, data input and ownership, cost to implement, as well as contract details, and associated payments.

A broad conclusion from the review of existing carbon markets applicable to grazing systems is to emphasize that there is a lot of information available that farmers and ranchers interested in participating in carbon markets need to successfully navigate to select the most appropriate market for their operation(s). Despite an apparent abundance of information, it can be difficult to locate the relevant information needed and/or not all program information may be available publicly through websites or associated documentation. In addition, the list of available markets is growing. Of the five carbon markets reviewed for the report, three are new (Soil & Water Outcomes Fund, Grassroots Carbon, Ecosystem Market Consortium), with more markets available soon (e.g., Native, Bayer).

Some general findings about the markets reviewed for this report are summarized below.

Geographic Region. Most markets have broad representation in the US, but there are examples of limitations for specific states (e.g., Soil & Water Outcomes).

Minimum Acreage. None of the programs have minimum acreage requirements for participation, but the financial return that a farmer/rancher receives may depend on acreage and a project may not be financially viable if too few acres are participating. A farmer or rancher who is interested in participating should check with the carbon market if there are recommendations for minimum acreage for a specific project to be viable.

Rented or Leased Land. Most markets allow farmers or ranchers with rented or leased land to participate. However, information is not consistently available on applicability for federal land permit holders.

Summary: How much does it cost? In addition to the costs to implement the practices on your farm or ranch, carbon markets typically involve costs for monitoring (e.g., soil carbon testing) and third-party verification. Some markets reviewed for this report did not have upfront costs, but the credit payment was split between the market and farmer or rancher. Make sure to check how often monitoring or verification is required and cost per verification or monitoring activity to determine total costs for participation.

Summary: Am I eligible? Check geographic scope, eligibility of landholding type (including federal lease permit holders), and minimum acreage to participate. Markets reviewed for this report were all applicable to grazing management systems, generally available in the US, open to rented/leased land as well as owned land, and did not require minimum acreage.

Monitoring and Costs to Implement. Most carbon markets require outcomes measurements based on soil carbon content and require third-party verification. Only a few of the carbon markets require confirmation of specific grazing management practices, as most rely primarily on soil carbon outcomes. In reviewing the carbon markets, farmers and ranchers should check the frequency requirements and methodology for soil

carbon monitoring and third-party auditing to help determine costs for participation.

Data Requirements. Some degree of recordkeeping is required for all markets as it relates to land boundaries, grazing practices and results of monitoring. Farmers or ranchers may be

required to keep more detailed records than in the past or maintain data in a specific way. Furthermore, determining data ownership and what party or parties have access to the data is important when considering involvement in carbon markets.

Contracts. Of the carbon markets reviewed for this report, contract lengths appear to vary considerably from one year to 30 years. In addition, there are several details on contracts that farmers and ranchers should review and confirm before committing to a particular carbon market, including length of permanence, requirements for exit, and transferability between markets or to other people/owners.

Summary: What is in the fine print? Carbon market contracts include various details, including length of the contract, ability to transfer credits, consequences of reversal of practices, length of time required for a practice or outcome to stay in place (“permanence”), and ability to stack payments for different types of ecosystem services. Carbon markets reviewed for this report varied according to these criteria so farmers or ranchers need to further investigate and determine what works best for their specific situation.

Payment. Carbon market payment can be made based on a per acre basis or by amount of carbon sequestered (metric tons CO₂ equivalent). Of markets reviewed for this report, payment varied from \$25 to \$40 per acre or \$8 to \$30 per metric ton CO₂ equivalent, but amounts can vary and will depend on carbon sequestration rate for a particular farm or ranch. Typically, carbon markets do not specify details on equivalency between acreage and amount of

Summary: What is the payment? Because the payment amount typically depends on amount of carbon sequestered, it can vary according to the type of practice implemented, capacity of soil to hold carbon, and other factors. Ranges for markets in this report varied from \$25 to \$40 per acre or \$8 to \$30 per metric ton CO₂ equivalent. Make sure to check with a representative to determine potential returns for your specific ranch or farm. A farm or ranch may consider enrolling a smaller parcel of their operations to ‘test’ the market before fully enrolling (if viable).

sequestered carbon because of variability in sequestration rate by practice, soil type, and other factors. The amounts of markets reviewed in this report are similar to carbon markets in the crop context that pay in the range of \$10 to \$20 per acre (Abbott, 2021; Brooks 2021b). Moreover, some markets recognize the opportunities of stacking benefits, while others specifically do not allow for this. Farmers and ranchers are encouraged to review program information in detail to determine rate of return.

Credibility and Stability. Carbon markets depend on a system that includes both buyers and sellers. There are several markets in development. With past examples of markets that existed but could not continue (e.g., Chicago Climate Exchange), farmers and ranchers are encouraged to review the current participation in the market of both buyers and sellers, as well as the overall credibility of the system – including main organizations that support the market. This will help ensure that the market is stable.

In summary, there are multiple and growing opportunities for farmers and ranchers with grazing management systems to participate in carbon markets. However, there is also an increasing amount of information related to carbon markets with variation between the different markets that are available. This report identifies some of the key questions and considerations for farmers and ranchers who are interested in exploring participation in carbon markets, but unfortunately there is not currently an easy or simple solution to help select the best market. Ultimately, detailed research and review of individual markets will be needed to determine how it would apply to a specific farm or ranch.

(5) Glossary of Terms

Additionality: Relative to carbon sequestration, a project or practice must demonstrate that the carbon sequestered only happened due to the new procedures implemented.

Footprint: Total amount of a resource used (e.g., water) or emitted (e.g., carbon) by a person, operation, or organization.

Metric: A system or standard of measurement (*from Jennings et al. 2020*).

Offset: Reduction of GHG emissions or sequestration of carbon that compensates for emissions made elsewhere. Related also to the term “carbon inset” which can refer in this context to reduction of GHG emissions or sequestration of carbon within a supply chain.

Outcome: The short-term and medium-term effects of an intervention on the sustainability. As it relates to carbon markets, provides a guaranteed amount per acre or an amount based on the quantity of carbon sequestered as measured through models or soil tests.

Permanence: The state or quality of lasting or remaining unchanged indefinitely, thus the required length of time the conservation practice or outcome must stay beyond the duration of the contract.

Practice-based: As related to carbon markets, the fixed amount paid for adopting certain conservation practices (may be used in contrast with outcomes, or ‘outcomes-based’).

Scope 1/2/3 emissions: Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (definition from GHG Protocol Corporate Standard (WRI and WFCS, 2004)).

In the context of the ESMC market, producers can enroll in either “Scope 1” or “Scope 3” projects. Scope 1 projects provide credits that can be sold as part of a voluntary carbon offset market. Scope 3 projects have credits that can be sold as part of a corporate supply chain reporting market. More details are available here: <https://ecosystemservicesmarket.org/corporate-social-responsibility/>

Stacking: Receipt of multiple types of payments for ecosystem services provided by the same parcel of land (e.g., stacking could include the same area of land receiving payments for carbon credits as well as payment for conserving land to benefit endangered species).

Transferability: As related to carbon markets, the ability to transfer a contract when land ownership changes, the land is rented or leased.

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APPENDIX: Carbon Market Comparison Matrix

The comparison table below provides a review of carbon markets selected for potential applicability to grazing systems. Data for the table is based on publicly available resources (e.g., website, program policies and documentation) as well as through discussions with carbon market representatives. Where data was not available to complete the comparison matrix through these sources, it is denoted by “*Information not available*”.

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Launch Date	Founded as the California Climate Action Registry in 2001	Expected launch late 2022. Carbon projects in pilot phase.	2021 – PastureMap and Soil Value Exchange merger; PastureMap still exists but now operates under Grassroots Carbon.	Program Version 1: December 2020	2020
Applicability					
Grazing Systems	Grasslands Protocol provides credits for avoiding conversion of grasslands. Rotational grazing covered under Soil Enrichment Protocol. Practices such as rotational grazing not eligible if already common practice (>50%) within the county of the project (only for counties identified by the Reserve in its additionality tool).	Incorporation of cover crops and rotational grazing. Not prescriptive on practices, but rather soil health and water quality outcomes. In process of developing a biodiversity / habitat preservation asset. Additionality is required.	Encourages rotational grazing and overall holistic land management, but with an understanding that this is not prescriptive.	The Regen Registry platform hosts credits pertaining to agriculture, forestry, and other land use categories, including ocean carbon projects. The CarbonPlus Grasslands credit applies to grasslands, shrublands or pasturelands ecosystems where regenerative grazing practices are being implemented.	Practices that incorporate water quality improvements and implement carbon sequestration strategies/practices.
Geography	United States; Grasslands Protocol in Canada only.	Currently Southern and Northern Great Plains, Great Lakes, Pacific Northwest, and California (expanding to the Continental US).	Global; current focus for 2021 carbon projects is within the United States.	Global	Specific counties in IA, IL and OH Note that fields must be compliant with USDA-FSA Highly Erodible Land and Wetland Conservation provisions.

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Minimum Enrollment	No absolute minimum size for a field to be included in the project.	No minimum.	No minimum, but smaller ranches may have to group together to make sampling cost effective.	No minimum, but 100–200 hectares is where CarbonPlus Grasslands projects are economically viable.	No minimum.
Rented/ Leased Land	Grasslands Protocol – Lands must be owned. Soil Enrichment Protocol – Leased and owned lands are eligible.	Scope 1 markets currently preclude federal lands – private lands may be owned or rented.	Owned or leased/rented lands can participate, but landowner must agree to details including permanence requirements.	Allows for private, public and tribal lands; leased land – landowner agreement for all contractual obligations.	Allowed, but must have decision-making power over term of the contract.
Applicable to Federal Permit Holders	No	<i>*Information not available*</i>	Program is still in process of determining how this could work for federal grazing lands.	<i>*Information not available*</i>	<i>*Information not available*</i>
Credibility					
Outcomes or Practices	Outcomes-based; soil organic carbon must be measured; Characteristics of grazing must be defined (e.g., animal type; stocking rate).	Outcomes-based.	Outcomes-based, with no specifically required practices.	Outcomes-based; CarbonPlus Grasslands credits include practices such as: Adaptive Grazing/Holistic Management (HM), Holistic Grazing/Holistic Planned Grazing (HPM), Prescribed Grazing/Planned Grazing/Managed Grazing/Controlled Grazing/Management-Intensive Grazing (MIG)/Intensive Grazing, Rotational grazing/Rotational stocking, Time-Controlled Grazing.	Outcomes and practices are verified. Practices – no-till, cover crops, land retirement, conversion to pasture, extended rotations. Requires soil sampling.

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Verification	3 rd party review of monitoring data, at least once every 5 years.	3 rd party verification required; Incorporation of remote sensing tools when able.	bCarbon Carbon Storage Standard is used to certify the credit and there is 3 rd party verification, starting with defining of project area and boundaries through mapping/GSI Environmental. verification of outcomes in place every year for forward looking assessment.	Process-oriented: Establish baseline → verification → Credit Issuance → Permanence Monitoring and Verification Soil sampling and a remote sensing baseline are established in year 1, which is verified by a 3 rd party verification audit. Continued remote sensing monitoring events and soil samples are conducted in year 4 and 7. In the final project year (year 10), a final monitoring event occurs which is verified by a 3 rd party auditor.	<i>*Information not available*</i>
Data Input and Ownership					
Ongoing data reporting requirements	Annual reporting required.	Contact info, field boundaries, management info and soil sampling info. Frequency of ongoing requirements not clear from available information.	Soil samples year 1 (baseline) and year 5 of a meter deep. Yearly landowner affidavits required, along with PastureMap practice data when applicable (not required).	Yes - soil samples taken in year 1, 4, 7, and 10.	2–3 years baseline data, plus 2–3 years of proposed practice changes.
Ease of data input (tools/integrations)	Provides some tools and guidance, but typically depends on the project.	Developing their own platform to collect and aggregate data, however other platforms can be used.	Pasturemap by Grassroots is recommended, but other software could also be used.	Templates are available if needed to collect data; software repository (GitHub).	SWOF website included step-by-step guidance for creating an application, by entering data on their platform. Availability of integrations/APIs not clear from publicly available information.

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Data ownership	<i>*Information not available*</i>	Producers own and have full access to the data; data not shared with 3 rd party without producer consent.	Producers own data and not shared beyond stakeholders involved.	Open source and open data. Data on farmer practices or management are not collected, only soil samples and general language about practices. On each project page, this information, including the baseline data collection, baseline report, and subsequent monitoring reports are all publicly available. Farmers can elect to hide their personal contact information if requested. This data is stored within each carbon credit when it is issued on the Regen Ledger blockchain.	Operating entities retain rights to use data for purposes related to the operation. Data privacy policy is available on website.
Cost to Implement					
Cost to entry	Various project/set up fees (e.g., fee schedule in program documents like \$500 account setup fee; \$500 annual account maintenance fee, etc.).	None	Cost share model: 80% rancher and 20% Grassroots.	Adoption of practices (with any associated costs) and costs of soil sampling (4 rounds minimum). Credit issuance fee of 5% is paid to Regen Registry. Optional 5% brokerage fee. If a land steward elects to work with a project developer, the project developer may elect their own fees for their services.	<i>*Information not available*</i>

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Recognition for previous conservation efforts	Must be additional. Generally, projects can only be recognized if started within 6 -24 months of submitting to the Reserve. Guidance is included for specific projects.	Developing a potential market offering that recognizes Early Adopters and their inherently lower GHG footprint.	Does not exclude ranchers who have previously implemented sustainable/regenerative land management practices.	Land cannot be converted from forest land, wetlands, or other ecosystem within 10 years prior to the project start date.	Must be additional/new practices.
Costs for monitoring, verification, or reporting data	Dependent on project.	ESMC bundles the cost of soil sampling with their other expenses of quantifying, reporting, verifying, and transacting the producer's ecosystem service assets. ESMC recovers cost through a portion of sale proceeds.	Shared from credit revenue, but after costs: 80% rancher and 20% Grassroots. No data reporting costs. Website reports that there are no out-of-pocket costs to ranchers.	Producer responsible for sampling costs; Buyer responsible for monitoring costs via 5% monitoring fee. 3rd party monitors must be registered with Regen Registry and carry errors and omissions insurance. No data reporting costs.	Monitoring costs paid for by Soil & Water Outcomes Fund.
Contract Details					
Contract Length	Unclear, but permanence of 100 year minimum is required.	10-year min; 20-year max.	bCarbon (verifier for the market) has a 10 year forward rolling agreement with landowners.	10 years	1 year with option to renew.
Permanence Length	Permanence defined as equivalent to removing CO ₂ from atmosphere for 100 years.	TBD and depends on whether the producer enrolls in a Scope 1 or 3 project. Scope 1 is for the voluntary carbon offset market and Scope 3 is for the corporate supply chain reporting market.	10 years, though can be extended yearly with forward rolling agreement.	Minimum 25 years.	<i>*Information not available*</i>

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
Transferable	Climate Reserve Tonnes (CRTs) can be transferred to another party with an approved account and transfer fee (\$0.03/CRT).	<i>*Information not available*</i>	Once it is sold, the credit can be retired or transferred.	Regen Registry credits can be retired or traded.	<i>*Information not available*</i>
Requirements for exit	<i>*Information not available*</i>	<i>*Information not available*</i>	Depends on the reason for exiting the contract and how much of the contract has elapsed.	No penalties if exit the project prematurely.	<i>*Information not available*</i>
Consequence for reversal / reversion	Reversals must be compensated for by the project and depends on whether the reversal is unavoidable or avoidable by the land holder.	<i>*Information not available*</i>	bCarbon (independent verifier for the market) has a 10% buffer in place to account for reversals. May be a penalty if producer disturbs soil health and cost shared.	5% permanence reversal buffer for every credit issuance. 20% buffer pool for every credit issuance monitoring uncertainty deduction based on probability of over estimation of GHG outcomes.	<i>*Information not available*</i>
Payment					
Payment amount	Grasslands Protocol: ~\$8/metric ton CO ₂ equivalent (assumes ~1 metric ton / acre). Soil Enrichment Protocol - TBD	Specific amounts are unclear as they are based on market rates. Producers are paid based on the amount of increased soil carbon sequestered, GHG's reduced, improvements in water quality, etc.	For ranchers selling their credits the payment per acre is determined by the ongoing market rate. Carbon buyers may pay up to \$30 per metric ton CO ₂ equivalent ranchlands.	\$15–30 per CarbonPlus Grasslands credit; revenue per acre varies with sequestration rate; other credits are priced differently.	\$25–40/acre Website claims payments for Soil & Water Outcomes higher than other carbon programs because water quality improvements are included in addition to carbon.
Payment disbursement	Credits issued after verification occurs. Verification frequency depends on the protocol and the project. Generally, it is annual for the	Annual	Annually paid based on a yearly initial forward-looking assessment until second round of soil sampling in year 5.	Issue credits and associated payments annually.	50% at signing and 50% after verification.

Criteria	Climate Action Reserve	Ecosystem Services Market Consortium	Grassroots Carbon	Regen Network	Soil & Water Outcomes Fund
	Grasslands Protocol (at least every 6 years) and every 5 years for the Soil Enrichment Protocol.				
Additional Info / Notes		Allows for stacking of benefits.			Cannot stack with government conservation payments.
How to Get Started	Users can submit and register a project online at https://www.climateactionreserve.org/how/projects/register/	Information for farmers and ranchers is available at https://ecosystemservicesmarket.org/farmers-ranchers/ The full ESMC launch is expected in 2022, and until that time farmers/ranchers can get involved in pilot projects in specific regions. Currently pilot projects related to grazing in Oregon and Texas.	Get Started information available on main landing page (https://buildgrassroots.com/) First step is to enter ranch details and GrassRoots team will determine eligibility. For producers looking to get started but are unsure if they want to start selling credits, the company recommends learning practices on PastureMap, pasturemap.com	Link available on https://www.regen.network/land-stewards/ to Start the Process, with initial questions about project, including name, address, area size, type of farming methods (e.g., prescribed grazing), number of years applying practice, and ecological outcomes	Enrollment information outlined on https://www.theoutcomesfund.com/enroll
Website	<i>climateactionreserve.org</i>	<i>ecosystemservicesmarket.org</i>	<i>buildgrassroots.com</i>	<i>regen.network</i>	<i>theoutcomesfund.com</i>